

DEPARTMENT OF AGRICULTURE FISHERIES AND FORESTRY
AUSTRALIA

Canberra, Australian Capital Territory, Australia



**Cold treatment and methyl bromide fumigation of Australian
cherries, peaches, nectarines and plums (8 cultivars)
infested with eggs and larvae of the Mediterranean fruit fly
(*Ceratitis capitata* Wiedemann) Diptera: Tephritidae**

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CONTENTS

		PAGE:
1.	SUMMARY	4
2.	GENERAL INFORMATION	9
3.	COLD TREATMENTS – MOST TOLERANT STAGE TRIALS	21
4.	COLD TREATMENTS – LARGE SCALE TRIALS AT 1°C and 3°C	125
5.	FUMIGATION TREATMENTS – MOST TOLERANT STAGE TRIALS	210
6.	FUMIGATION TREATMENTS – LARGE SCALE TRIALS.	235
7.	FUMIGATION + COLD TREATMENTS – LARGE SCALE TRIALS	303
8.	RESIDUE ANALYSIS OF METHYL BROMIDE IN STONE FRU	400
	Appendix 1 DAFWA Organisation Structure	
	Appendix 2 Facilities & Medfly colony	
	Appendix 3 Cold & Fumigation facilities & methods	
	Appendix 4 Cold & Fumigation facilities & methods MTS	
	Appendix 5 Cold & Fumigation facilities & methods LS	
	Appendix 6 Stone Fruit Quality	

1. SUMMARY

Australian horticultural growers produce high quality stone fruit cultivars which are much valued for export. However, data packages proving disinfestation of fruit flies must be supplied before overseas quarantine authorities accept imports from Australia.

New disinfestation methods were developed to disinfest stone fruit from Mediterranean fruit fly. Several varieties were tested: cherries (Sweetheart and Lapin), peaches (Snow King and Zee Lady), nectarines (Arctic Snow and August Red) and plums (Angelino and Tegan Blue).

Fruit containing immature stages of fruit fly were subjected to cold treatment at 1°C and 3°C as well as methyl bromide fumigation at 6°C and 11°C. Trials were also done with combined treatments to lessen the potential harm from one treatment alone. The data summarised in this section are supported by the work in this report which is based on internationally recognised disinfestation protocols.

Cold treatments

The most tolerant stage trials were conducted by exposing each stage at 24-hour intervals to cold treatment for 24 days. The second instar was found to be the most tolerant stage in all cultivars tested. Complete mortality was achieved in all stages following cold treatment for 12 days at 1°C and 16 days at 3°C. These results show that the 2nd instar is the most tolerant life stage at the LD₅₀ estimate. However at the LD₉₅ estimate, the analysis shows over-lap between 1st and 2nd instars.

For 1°C the 2nd instar is the most tolerant life stage at LD₅₀ and LD₉₉ estimates for cherries, peaches and nectarines while for plums it is 1st instar. For 3°C the 2nd instar is the most tolerant life stage at LD₅₀ and LD₉₉ estimates for peaches, nectarines and plums but for cherries it is the 1st instar. On the basis of these results it was decided that the large-scale trials should be done on both 1st and 2nd instar larvae. Therefore trials were conducted treating >10,000 individuals for 16 days at 1°C and 20 days at 3°C in three replicated trials (>30,000) at each temperature in all 8 stone fruit cultivars. Summary data combined for 1st and 2nd instars are given below. No survivors were found. Thus, treatments at 1 & 3°C for 16 & 20 days respectively were successfully achieved.

1°C for 16 days: In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart	543,200	123,608	0
	Lapin	949,700	197,534	0
Peaches	Snow King	452,900	111,336	0
	Zee Lady	515,200	138,068	0
Nectarines	Arctic Snow	404,100	115,430	0
	August Red	270,600	114,452	0
Plums	Angelino	675,600	160,366	0
	Tegan Blue	776,800	175,316	0

3°C for 20 days: In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	493,400	134,832	0
		1,028,200	204,062	0
Peaches	Snow King Zee Lady	427,600	116,460	0
		477,500	134,712	0
Nectarines	Arctic Snow August Red	423,500	128,878	0
		325,000	125,520	0
Plums	Angelino Tegan Blue	745,900	164,366	0
		799,200	158,704	0

Methyl bromide fumigation at 6°C

The results show that the egg stage is the most tolerant life stage at LD₅₀ and LD₉₉ estimates for all varieties. The highest upper fiducial limit is 172.5 g.h.m⁻³ in Lapin cherries. It was decided that the large-scale trials should be done on the egg stage at 180 g.h.m⁻³. Large scale trials were conducted by exposing >10,000 individuals to methyl bromide dose x time periods in three replicates (>30,000) in all 8 stone fruit cultivars. Two dose x time combinations selected for 6°C trials successfully proved the efficacy of the treatments summarised below.

6°C: 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	1,101,832	155,422	0
		1,172,314	164,812	0
Peaches	Snow King Zee Lady	703,944	131,184	0
		765,006	129,845	0
Nectarines	Arctic Snow August Red	938,720	137,037	0
		1,027,258	142,620	0
Plums	Angelino Tegan Blue	1,138,376	177,272	0
		1,100,814	172,892	0

6°C: 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	1,019,702	153,868	0
		1,185,098	138,845	0
Peaches	Snow King Zee Lady	790,752	129,872	0
		888,162	128,547	0
Nectarines	Arctic Snow August Red	1,147,296	135,667	0
		1,153,872	141,194	0
Plums	Angelino Tegan Blue	1,082,896	193,228	0
		1,269,094	188,454	0

Methyl bromide fumigation at 11°C

The results show that the egg stage is the most tolerant life stage at LD₅₀ and LD₉₉ estimates for all varieties. The highest upper fiducial limit is 99.3 g.h.m⁻³ in Snow King peaches. It was decided that the large-scale trials should be done on the eggs at 120 g.h.m⁻³. Large scale trials were conducted by exposing >10,000 individuals to methyl bromide dose x time periods in three replicates (>30,000) in all 8 stone fruit cultivars. Two dose x time combinations selected for 11°C trials successfully proved the efficacy of the treatments summarised below.

11°C: 40g/m³ for 3 hour exposure = 120 g.h.m⁻³. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	1,081,017	145,498	0
		1,219,022	151,340	0
Peaches	Snow King Zee Lady	793,142	122,808	0
		815,320	121,554	0
Nectarines	Arctic Snow August Red	896,260	128,286	0
		827,904	133,515	0
Plums	Angelino Tegan Blue	826,980	189,360	0
		1,138,610	184,686	0

11°C: 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	1,117,588	158,594	0
		1,037,754	166,474	0
Peaches	Snow King Zee Lady	987,206	133,863	0
		741,696	132,495	0
Nectarines	Arctic Snow August Red	1,059,214	139,836	0
		1,107,432	145,533	0
Plums	Angelino Tegan Blue	1,079,240	187,468	0
		1,254,080	182,838	0

Methyl bromide fumigation at 6°C & 11°C + cold treatment 1°C

The combination of methyl bromide fumigation with cold treatment enables both treatments to be used at lower levels. Following the research reported above on cold treatments and methyl bromide treatments alone, it was found that combining the LD₅₀ doses of each treatment produced an effective treatment. The applied treatment dose was estimated at the highest upper Fiducial Limit LD₅₀ at each fumigation temperature 6°C (86.3 g.h.m⁻³) or 11°C (49.2 g.h.m⁻³) with the highest upper Fiducial Limit LD₅₀ dose obtained for the most tolerant stage in 1°C cold treatment (3.88 days). Two dose x time combinations were selected for 6 and 11°C + 4 days 1°C cold treatment. Large scale trials successfully proved the efficacy of these 4 combined treatments summarised below.

Methyl bromide fumigation at 6°C+ cold treatment 1°C for 4 days

6°C: $32\text{g/m}^3 \times 3\text{ h} = 96\text{ g.h.m}^3 + 96\text{ h } 1^\circ\text{C cold treatment}$. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	1,029,706	218,108	0
		1,009,210	240,342	0
Peaches	Snow King Zee Lady	1,298,138	154,530	0
		957,087	161,216	0
Nectarines	Arctic Snow August Red	1,016,513	141,274	0
		882,904	136,836	0
Plums	Angelino Tegan Blue	665,882	147,964	0
		657,192	141,184	0

6°C: $48\text{g/m}^3 \times 2\text{ h} = 96\text{ g.h.m}^3 + 96\text{ h } 1^\circ\text{C cold treatment}$. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	1,070,184	226,044	0
		971,747	218,284	0
Peaches	Snow King Zee Lady	1,049,021	154,894	0
		870,240	158,892	0
Nectarines	Arctic Snow August Red	862,758	140,190	0
		673,377	136,496	0
Plums	Angelino Tegan Blue	662,565	146,698	0
		650,658	143,326	0

Methyl bromide fumigation at 11°C+ cold treatment 1°C for 4 days

11°C: $21\text{g/m}^3 \times 3\text{ h} = 63\text{ g.h.m}^3 + 96\text{ h } 1^\circ\text{C cold treatment}$. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	996,501	213,198	0
		1,125,235	226,746	0
Peaches	Snow King Zee Lady	917,122	166,242	0
		751,292	156,758	0
Nectarines	Arctic Snow August Red	898,178	154,640	0
		739,819	149,566	0
Plums	Angelino Tegan Blue	757,252	149,824	0
		680,443	144,594	0

11°C: $32 \text{ g/m}^3 \times 2 \text{ h} = 64 \text{ g.h.m}^3 + 96 \text{ h } 1^\circ\text{C}$ cold treatment. In large scale trials, no survivors were found after treatment. Probit 9 level of control was achieved. The estimated numbers of insects killed were:

Fruit	Variety	Total number of larvae treated	Total number of pupae in control	Number of pupae recovered from treated fruits
Cherries	Sweetheart Lapin	965,737	215,752	0
		1,058,816	208,054	0
Peaches	Snow King Zee Lady	1,135,993	161,900	0
		815,470	160,136	0
Nectarines	Arctic Snow August Red	958,442	151,678	0
		850,188	151,164	0
Plums	Angelino Tegan Blue	755,857	147,186	0
		834,386	144,576	0

Quality assessment: The quality of fruit assessed for several days after treatment did not show any significant external damage when compared with control fruits. There was no significant internal injury from either methyl bromide or cold treatments.

Residue analysis: Samples of fruit collected after fumigation showed no significant residue levels of methyl bromide or inorganic bromine remaining in the fruits.

In summary, all the treatments reported above are recommended for use in the stone fruit industry. The 6 new quarantine treatments recommended for export of Australian stone fruit are:

1. Cold treatment: 16 days at 1°C
2. Cold treatment: 20 days at 3°C
3. Methyl bromide fumigation at 6°C : 48g/m^3 for 4 hours or 60g/m^3 for 3 hours
4. Methyl bromide fumigation at 11°C : 40g/m^3 for 3 hours or 48g/m^3 for 2.5 hours
5. Combined treatments at 6°C : $32\text{g/m}^3 \times 3$ hours or $48\text{g/m}^3 \times 2$ hours + 1°C cold storage for 4 days
6. Combined treatments at 11°C : $21\text{g/m}^3 \times 3$ hours or $32\text{g/m}^3 \times 2$ hours + 1°C cold storage for 4 days

2. GENERAL INFORMATION

This section contains an introduction to the work, general background information on the research facilities and general methods and materials that apply across all trials. Specific methods and materials are provided in each section for each set of most tolerant stage and large scale trials for cold and methyl bromide treatments.

2.1 INTRODUCTION

Australian producers are in a unique position to supply fresh high quality stone fruit to markets in the Northern Hemisphere when local supplies in those countries are not available because of the difference in the growing seasons. There is considerable interest, both from overseas importers and from Australian exporters to develop markets for summer fruit during periods of seasonal scarcity.

However, stone fruits are subject to quarantine restrictions because they are host to the Queensland fruit fly, *Bactrocera tryoni* (Froggatt) and the Mediterranean fruit fly, *Ceratitidis capitata* (Wiedemann).

Cold treatments offer a commercially viable method for quarantine disinfestation of stone fruit which retain quality under cold storage. Previous work has proved the successful disinfestation by cold storage of grapefruit, oranges, lemons, mandarins, tangelos, and table grapes for export at 1, 2 and 3°C.

Methyl bromide treatment offers a rapid disinfestation method but generic methyl bromide doses are sometimes phytotoxic to stone fruit and can shorten shelf life. Data are required for more suitable doses and treatment temperatures.

International protocols require quarantine levels of disinfestation to be demonstrated through a carefully conducted series of experiments. The first stage is to develop a standard infestation procedure that gives a reproducible method of establishing the life history of the target pest. This is followed by the Most-Tolerant Stage (MTS) trials requiring a series of dose-response tests (replicated 3 times) to determine the LD₅₀ and LD₉₅ mortality values for each life-stage of Medfly found in host fruit. Some countries require data at LD₅₀ and LD₉₉ levels.

The results of these trials are used to select the life-stage most tolerant to the treatment and to plan and conduct a series of large-scale trials under simulated export conditions. These large-scale trials comprise three separate replicates of the selected treatment applied to the most tolerant stage in each cultivar. To be considered successful, each replicate trial should demonstrate that no survivors are obtained when at least 10,000 individuals are exposed to the treatment.

This report provides the required disinfestation research on quarantine level of control for Mediterranean fruit fly (Medfly) which is only present in Western Australia. All Medfly trials were conducted at the Department of Agriculture and Food, South Perth, Western Australia.

2.2 MATERIALS AND METHODS

This section contains general background information required on test insects, test fruits, research laboratories, cold room facilities, fumigation facilities, gas chromatography, temperature monitoring devices and methods used in the trials.

2.2.1. Research Laboratories

Organisation: Department of Agriculture and Food Western Australia. The organisation structure is given in **Appendix 1**.

Location of Trials: The Mediterranean fruit fly trials were conducted at the Fresh Fruit Disinfestation Laboratory, South Perth. This laboratory is part of the Entomology Section, Plant Biosecurity Program. The Entomology Section is responsible for the research and advisory work on insects and related pests of agriculture and allied industries in Western Australia.

2.2.2 Facilities of the Fresh Fruit Disinfestation Laboratory

The site plan for the facilities is given in **Appendix 2**. In summary the facilities include the following:

- (1) Building No. 47
 - Fruit Holding Controlled Environment Room No. #2
 - Controlled Environment Fumigation Room #1
 - Gas Chromatography Laboratory #1
- (2) Building No. 51
 - Fruit Holding Controlled Environment Room No. #1
 - Fruit Preparation Laboratory
- (3) Building No. 52
 - Cold Room Nos. #3, #4, #5.
- (4) Building No. 52 A
 - Cold Room Nos. #6, #7, #8.
- (5) Building No. 53:
 - Research Laboratory
 - Adult Rearing Controlled Environment Room
 - Main Preparation Laboratory
 - Cold Room Nos. #1 and #2 for fruit holding and trials
- (6) Building No. 54
 - Larval Rearing Controlled Environment Room
- (7) Building No. 55
 - Fruit Holding Controlled Environment Room No. #3
 - Controlled atmosphere treatment facilities
- (8) Building No. 29
 - Fruit Holding Controlled Environment Room No. #4
- (9) Transportable Facilities
 - Controlled Environment Fumigation Rooms #2 and #3
 - Gas Chromatography Laboratory #2
 - Refrigerated shipping containers: 20ft & 40 ft

2.2.3 Specifications of the Cold Treatment Facilities.

There are 8 cold rooms available at the South Perth Fresh Fruit Disinfestation Laboratory. The specifications are given below at saturated suction temperature of -5°C and 6K (Kelvin) Temperature Differential, space temperature 1°C.

COLD ROOM NO.	DIMENSIONS	CAPACITY (m ³)	REFRIGERATION CAPACITY (Watts)
# 1	366x280x228 cm	23.37 m ³	3760
# 2	366x308x228 cm	25.70 m ³	3760
# 3	433x378x210 cm	34.37 m ³	4580
# 4	433x378x210 cm	34.37 m ³	4580
# 5	433x378x210 cm	34.37 m ³	4580
# 6	435x382x210 cm	34.90 m ³	5090
# 7	435x382x210 cm	34.90 m ³	5090
# 8	435x382x210 cm	34.90 m ³	5090

(1) Cold Rooms #1 and #2

(a) Design:

These two cold rooms are prefabricated with walls and ceilings of 100 mm expanded polystyrene with an external of 22-gauge zinc sheeting. Internal cladding is 20-gauge colour-bond glued under pressure to the insulating material. Joints are sealed with mastic to produce a surface approved by the Public Health Department. The floor is covered with a 19 mm tongue-and-grooved hardwood with a sheathing of 16 gauge zinc. The door is 2030 mm high and 1350 mm wide. The doors are 100 mm thick, insulated with expanded polystyrene and sheathed in 20 gauge stainless steel. The sealing strip for the door is rubber. A breather port is located in the rear of the room.

(b) Refrigeration units:

Refrigeration for each cold room is supplied by 1 x Kirby (Model AW43MHGB2) belt driven condensing unit, on R22 refrigerant + 1 x Kirby Model KCR45 Induced Drought Evaporator with a refrigeration capacity of 3760 Watts at 1°C. The temperature of the room is controlled through a surface mounted electronic thermostat (DIXELL, Italy) having a temperature range of -50 to +110°C with a probe in the return air path. Each room has two fans (400 mm 4 blade propeller type) to circulate air across the evaporator at an air flow averaging 650 litres/second measured at various points in the room. Each room is fitted with an alarm thermostat which energises both an external red light and a bell on alarm cycle. The AKO (Spain) alarm thermostats are set 2°C above trial temperature to provide sufficient warning to call up the refrigeration engineer for attention.

(2) Cold Rooms #3, #4, #5.

(a) Design:

The cold rooms are a prefabricated unit with walls and ceilings of 100 mm expanded polystyrene with an external skin of white colorbond. Joints and base of rooms are sealed with silicon sealant under aluminium covering extrusions. The floor is concrete; the door is 1500 mm wide 1900 mm high and 100 mm thick and is insulated with expanded polystyrene. The sealing strip for the door is rubber. A breather port is located at the rear of the room.

(b) Refrigeration units:

Refrigeration for the 3 cold rooms is supplied by 3 x Kirby (Model AW54MHGB2) air cooled Condensing Unit with R22 refrigerant + 3 x Muller MNDE33 Induced Draught Evaporator with

refrigeration capacity of 4580 Watts at 1°C. The temperature of each room is separately controlled through a surface mounted electronic thermostat (CAREL, Italy) having a temperature range of -10 to +70 °C. with a probe mounted in the return air path.

1 x Defrost cycle is at 2000 hrs. Six fans, two for each room (350 mm 4 blade propeller type) circulate air across the evaporator at an air flow of averaging 800 litres/second measured at various points in the room. The fans are switched off during the defrost cycle.

This configuration of 3 individual compressor units to serve one replicate cold room each was found to give the least variation in temperatures and was therefore ideal for the uniformity of replication required for the cold disinfestation work. Each room is fitted with an alarm thermostat which energises both an external red light and a bell on alarm cycle. The DIXELL (Italy) alarm thermostats are set 2°C above trial temperature to provide sufficient warning to call up the refrigeration engineer for attention.

(3) Cold Rooms #6, #7, #8.

(a) Design:

The cold rooms are a prefabricated unit with walls and ceilings of 100 mm expanded polystyrene with an external skin of white colorbond. Joints and base of rooms are sealed with silicon sealant under aluminium covering extrusions. The floor is concrete; the door is 1500 mm wide 1900 mm high and 100 mm thick and is insulated with expanded polystyrene. The sealing strip for the door is rubber.

(b) Refrigeration units:

Refrigeration for the 3 cold rooms is supplied by 3 x Patton (Model CCH 250) air cooled Condensing Unit with R22 refrigerant + 3 x Patton BL 38 Induced Draught Evaporator with refrigeration capacity of 5090 Watts at 1°C. The temperature of each room is separately controlled through a surface mounted electronic thermostat (DIXEL, Italy) having a temperature range of -50 to +110°C with a probe mounted in the return air path.

Up to 4 x Defrost cycles can occur per 24 hours if required. Six fans, two for each room (300 mm 5 blade propeller type) circulate air across the evaporator at an air flow of averaging 960 litres/second measured at various points in the room. The fans are switched off during the defrost cycle.

This configuration of 3 individual compressor units to serve one replicate cold room each was found to give the least variation in temperatures and was therefore ideal for the uniformity of replication required for the cold disinfestation work. Each room is fitted with an alarm thermostat which energises both an external red light and a bell on alarm cycle. The DIXELL (Italy) Relays are set 2°C above trial temperature to provide sufficient warning to call up the refrigeration engineer for attention.

2.2.4 Measurement of Temperature

Each cold room is fitted with a separate logger located in a central console outside the cold room. The thermistor probes are connected to the logger by factory built and calibrated cables of 10 – 34 metres length according to the desired location of the probe in the cold room (**Appendix 3**)

Temperature recording loggers

- (1) Type: Grant Squirrel meter/logger with 16 channels (Models: 1256 & 2020, Cambridge, UK.).
- (2) Temperature sensor type: U mini thermistors; Number of probes: 16 probes; (12 probes for fruits/ 4 probes for air). Accuracy: $\pm 0.01^{\circ}\text{C}$ (in the range of -25 to +125°C).

Temperature readings were taken every 60 minutes during the trial from the time the fruit is placed into the cold room to the time the treatment is concluded. For fumigation trials, records are made at 10 minute intervals.

The readings recorded by data logger were stored on hard drive using an IBM compatible PC computer via an RS232 or Ethernet interface. Each probe was calibrated against a certified mercury glass thermometer immersed in melting ice. The calibration data is used to correct for the true values.

Points of measurement in each trial cultivar

The air temperature is measured at 6 positions to give a good representation of the flow of cold air in the cold room from the refrigeration system.

The fruit temperature is measured in every stack in the cold room. 10 fruit sensors are distributed through the stacks to be present in as many layers as possible to measure how the cool down process occurs and to give a good representation of the temperature in the centre of the fruit. Sensor probes are placed in the centre of the fruit and sealed with polyvinyl acetate adhesive. This fruit is then placed in the centre of the carton in the designated layer of the stack. For fumigation treatments fewer measurement points are needed since higher temperatures are used.

The points of measurement are summarised below:

Cold Treatments:

Air =	6 positions: inlet of air / outlet of cooled air / centre of room / top corner rear/ door end of cold room
Fruits =	10 positions in fruit stacks throughout the cold room
Total =	16 points

Fumigation Treatments:

Air =	3 positions: inlet of air / outlet of cooled air / centre of room
Fruits =	3 positions: top, middle, bottom in fruit stacks in fumigation room
Total =	6 points

Arrangement of cartons in the cold rooms for large scale trials

There were 8 stacks of stone fruit in each cold room in ventilated cartons. Sensor probes were placed in fruit in cartons in each stack to measure temperature distribution in different layers in the cold room (**Appendix 5**)

2.2.5 Facilities for fumigation trials

Most tolerant stage trials

Laboratory tests were done in individually calibrated glass desiccators 6.6 – 7.1 L each containing a magnetic stirrer rod in the base and the lid fitted with a self sealing septum. (**Appendix 4**)

Controlled temperature fumigation rooms

There are 2 rooms each: 2310cm (H) x 2500cm (W) x 2500cm (L) = 14.44 m³

The rooms each have a thermostatically controlled compressor of 7200 watts manufactured by EIDIS Refrigeration systems

Temperature controller DIXELL SCPME IP56-686.404

Fume hoods

Make: Johndec Engineering Plastics P/L; Drg No: 3386-M1; Model: MRFC1800; Description: Mobile Recirculating Fume Cabinet; Construction: 6mm White Chemical Resistant and Flame Retardant UPVC Sheet; Work chamber: 6mm Clear Acrylic
Removable tray: 6mm White Chemical Resistant and Flame Retardant UPVC Sheet
Overall dimensions: 1000mm wide x 700mm deep x 1800mm high
Control System: Fan ON/OFF Switch; Hour Clock; Pre-Filter: 600 x 600 x 50 Disposable Filter; Main filter: CAM Carb F19-9 610 x 610 x 405 deep; Exhaust Fan: Kruger KDD 9/7 Complete with VA 2.8; Power Supply: Mobile Filtration Fume Cupboard will be pre-wired to a 3 metre cord and plug for connection to a 240V 50Hz 10A GPO.

Large scale facilities

Controlled temperature room holding the 1.067 m³ fumigation chamber

The 1.067 m³ fumigation chamber is housed in a controlled temperature room 16.4m³ sealed with contact seals around the door. The conditions in the room are maintained through a thermostatically controlled compressor of 7200 watts. The fumigation chamber is connected to an external vent to achieve aeration when the treatment is complete. (**Appendix 5**)

Description of the commercial fumigation chamber

Modern commercial fumigation chambers at Welshpool industrial area are made of similar materials as cold storage rooms and are prefabricated units with walls and ceilings of 100mm expanded polystyrene with an external skin of white colorbond. Joints and base of rooms are sealed with silicon sealant under stainless steel covering extrusions. The floor is concrete. The door is insulated with expanded polystyrene. The sealing strip for the door is rubber. An exhaust port is located at the rear of the room in the ceiling. The exhaust fan is turned on when aeration of the chamber is required and exhaust gases are vented externally through a 3 metre high stack. The volume of the chamber is 44.14m³. Temperatures in the chamber are maintained through thermostatically controlled compressors. (**Appendix 5**)

Tests for gas-tightness

The gas-tightness of the fumigation chambers were measured through a pressure test in which air under pressure is introduced into the chamber at 250 Pascals and its decay to 125 Pascals measured using a Dwyer Magnahelic® Differential Pressure Gauge series 2000. The seal is considered satisfactory if the pressure is maintained above 125 Pascals for 2 minutes.

Other methods of evaluating gas-tightness are the licensing procedures conducted by the Department of Occupational Safety, Health and Welfare each year to certify the gas-tightness of rooms. This test involves the use of an electrical smoke generator that produces a high volume of smoke. The test is conducted with the chamber circulation fans turned on. The machine used is Electronic ZR20, High Power Portable Fog Generator®, manufactured in England by Jem Smoke Generator Co. The solution used to generate smoke is ethylene glycol based and is called ZR20 Fog Liquid®.

Dispensing methyl bromide

The chamber is fitted with a tubular heating element which surrounds the copper dispensing tube to volatilise the liquid methyl bromide as it passes through into the fumigation chamber, an internal circulating fan, an exhaust fan for removing fumigant from the chamber, and four gas sampling ports. The internal circulating fan is operated continuously while the fumigation is in progress. The four gas sampling ports allow gas samples to be drawn from the

containers (3 lines) and from the free space (1 line) in the fumigation chamber at the specified intervals.

Liquid methyl bromide (BOC 100%) is supplied in a pressurised gas cylinder. The amount required for fumigation is measured out into a sealed graduated glass tube, calibrated in ml, by opening a needle valve. The gas is released through a volatiliser to ensure that fumigant is dispersed into the chamber as a gas. All fumigations are conducted at Normal Atmospheric Pressure (NAP).

The air circulation fan in the fumigation chamber is operated continuously throughout the fumigation period. After fumigation the fruit is aerated for 60 minutes, by opening the exhaust valve and operating the exhaust fan.

Monitoring of fumigant concentration during fumigation

Methyl bromide concentrations are monitored by drawing gas samples through nylon gas lines that are placed in the fruit cartons and in the chamber. There are 4 gas lines provided for this purpose. A first measurement is taken before introduction of the gas to ensure that no fumigant was present. After the chamber had been sealed and gas had been introduced, measurements are taken at 10, 30, 60, 120, 180 and 240 minutes from the start of the fumigation, according to the desired length of the exposure period using a Riken® Gas Interferometer Type 18. After each sample is measured using the Interferometer, a further two samples are extracted from each location using a SGE Australia Gas sampler GAV-200 with re-useable 200 ml Mylar sample bags for analysis by gas chromatography..

Monitoring of temperatures

The fruit is equilibrated to the fumigation temperature of 6 or 11°C overnight before being exposed to the treatment. Temperatures are monitored using a Grant Instruments Squirrel data logger and thermistor probes. Three thermistors record the air temperatures and three thermistors record the temperatures in the fruit pulp. Temperatures are recorded at 10 minute intervals.

Gas Chromatography

Model: Varian 3400 Gas Chromatograph

Detector: Flame Ionisation Detector

Column: Poropak Q

Injection Temperature: 150°C

Column Temperature: 165°C

Detector Temperature: 280°C

Carrier Gas: Nitrogen 30ml / min

Sample loop: A factory installed 0.1 ml gas sampling loop in the temperature controlled injection port maintains uniformity of input sample.

Data Analysis: The gas chromatograph is fully programmable using Varian propriety software to analyse GC output. The data obtained from each run is analysed for area under the peak and stored on the hard drive. A known standard is run before fumigation and the program uses the standard to determine the sample concentration.

Sorption of methyl bromide fumigant

Tests for absorption and adsorption were done for most tolerant stage and large scale trials and applied doses were adjusted to account for sorption.

2.2.6 TEST INSECTS

Mediterranean fruit fly *Ceratitis capitata* (Wiedemann)

Origin

The Medfly colony was first established in April 1983 from stock collected in Carnarvon from citrus. The genetic fitness was maintained by adding wild flies to the colony in January 1987 and in December 1989. Since 1991, wild flies have been obtained from 4-6 locations in the south west, and a new colony produced every year from November to March. The aim is to have a vigorous colony less than 12 months old for disinfestation research work. The identity of the colony has been validated every year from 1991 to 2011, through supply of colony flies for phylogenetic studies being conducted with laboratories in Austria (International Atomic Energy Authority IAEA Sibersdorf), Italy (University of Pavia), the USA (USDA laboratories in Hawaii, Florida and Washington DC) and the Fruit Fly Morphology and DNA group in the Africa Museum in Belgium.

Rearing Methods

Maintenance of the colony's population is achieved by artificially breeding new stock from eggs. Adult females oviposit through the cloth side walls of the cages and eggs drop into troughs of chlorinated water. Eggs aged from 8-10 hrs are removed to a separate larval rearing room where they are introduced to an artificial rearing medium. Mature pupae are collected from the medium 13-16 days after oviposition. The pupae are removed to the adult rearing room and used in renewed sterilised cages to breed adult flies. After a cage has remained in the adult colony room for 4 weeks it is cleaned out, sterilised and renewed with fresh pupae. When more adult flies or eggs are required for experimental work, additional cages are prepared to give insects of known age. To infest fruits for the trials, flies aged between 2-3 weeks after emergence from puparia are used. These adult flies are fertile to produce eggs of high (approximately 85-90%) viability.

(i) **Adults:** Approximately 6 litres of pupae are introduced into the adult rearing cages. Cage dimensions are 200 cm (length) x 150 cm (height) x 40 cm (depth). The adult flies that emerge are fed on a diet of yeast hydrolysate, crystalline sugar and water all placed in separate containers. The quantities consumed by an adult colony over a 4 week period are approximately:

840 g Yeast hydrolysate

2500 g Crystalline sugar

12 litres water. It is expected that a large proportion of the water is lost in evaporation.

Number of adult flies emerging per cage: 250,000 - 300,000 viable adult flies emerge/cage.

Sex ratio: 50:50

Number of cages in routine colony: 4 cages are constantly maintained. Every week the cage that is approximately 4 weeks old is renewed with a fresh cage. When more eggs or adults are required for experimental purposes the colony size is increased to 6 -8 cages.

Rearing room conditions: Constant temperature $26 \pm 1.0^{\circ}\text{C}$. ; 60 - 65% rh. and a darkness: light cycle of 15-16:8-9 hrs is constantly maintained in the adult breeding room.

Method of egg collection: The eggs are deposited through the sides of the cages by the adult females into sterilised water about 10 days after their emergence from the puparium and mating of the adult flies.

Quantity of eggs collected: Approximately 20-60 ml /day/cage.

(ii) **Larvae:** The larval rearing is done on an artificial medium based on sterilised paper pulp. Special larval rearing cages are prepared and larval rearing is done in a separate room from the adult colony. The following ingredients are mixed in the specified proportions into a homogenous mix, which is then spread on stainless steel trays for egg deposition.

Medium:

2.5 kg Paper pulp
6.25 kg Crystalline cane sugar
3.25 kg Yeast hydrolysate
50 g Methyl propylhydroxybenzoate (Nipagin)
50 g Propylhydroxybenzoate (Nipasol)
50 g Sodium benzoate
20 ml Hydrochloric acid
20 litres Water
pH = 5.4

Quantity of medium: Approximately 50 kg of medium is made in each mix. It is distributed in the following way: approx. 4.5 kg/tray x 11 trays/cage (tray size: 53x53x3 cm); Size of rearing cage; 1.83m x 0.78m x 0.83m

Quantity of eggs inoculated: 5 ml/tray x 11 trays/cage (number of eggs inoculated : approx. 100,000 -116,000 eggs/tray x 11 trays/cage).

Rearing Room conditions: $23 \pm 1.0^{\circ}\text{C}$; 70 - 75% rh.

Period of developmental stages:

Eggs: 2 days

1st - 3rd instar larvae: 6 - 8 days.

Pupae: 10 - 11 days.

Adults: 4 - 6 weeks.

Rate of egg hatch: approx. 60 - 90%

Rate of larval pupation: 80 - 90%

Collection of pupae in larval rearing cage: The 3rd instar larvae jump out of the trays into the bottom of the cage and pupate in sterilised sand in trays(53x53x3 cm).

(iii) **Pupae:**

Maturation of pupae: The trays containing larvae in sand (53x53x3 cm) are transferred to another cage (1.83m x 0.78m x 0.83m) for 5-6 days until most of the larvae have pupated. This pupae maturation cage is located in the same controlled environment room as the adults. Thereafter the pupae are transferred to the adult colony cages for emergence as described above.

Number of pupae reared: Approx. 80,000 pupae/tray x 10-11 trays x cage = approx. 800,000 pupae (10-11 litres).

Rearing temperature/humidity: $26 \pm 1.0^{\circ}\text{C}$. ; 60 - 65% rh.

Rate of emergence: Approx. 90%.

2.2.7 TEST FRUITS

The trials were conducted over a period of 6 seasons from 2006 - 2011. The fruit infested for the trials were all sourced from specialised farmers growing particular cultivars in areas free from fruit flies in Pemberton and Manjimup districts in Western Australia and in South Australia and Tasmania. These areas also had very little or no pesticide use for other insects. The fruits were obtained when required and in season. They were of excellent quality in terms of maturity and °Brix values (summarised below) and were suitable for the survival of immature stages of Medfly at the time of infestation.

Summary of fruit quality:

Fruit Characteristics	Fruit / Variety	Fruit / Variety
Cherries <i>Prunus avium</i>	Cherries - Lapin	Cherries – Sweetheart
Colour:	Cherry Red	Cherry Red
Condition	Firm / Ripe	Firm / Ripe
Shape	Oval; Seeded	Oval; Seeded
Diameter (mm)	260	260
Weight (g)	8.1 – 10.5	7.1 – 9.7
Acidity (pH)	3.78 – 4.58	3.24 – 3.99
Sugar (°Brix)	14.2 – 22.4	16.0 – 24.0
Average No Fruit / 10 kg	1250	1250
Nectarines <i>Prunus persica</i>	Nectarines (White) Arctic Snow	Nectarines (Yellow) August Red
Colour:	Red Blush	Dark Red Blush
Condition	Firm / Ripe	Firm / Ripe
Shape	Round; Seeded	Round; Seeded
Diameter (mm)	640	660
Weight (g)	122.1 – 142.4	127.2 – 133.2
Acidity (pH)	3.66 – 4.03	3.40 – 4.01
Sugar (°Brix)	11.2 – 15.5	10.5 – 13.0
Average No Fruit / 10 kg	75	75
Peaches <i>Prunus persica</i>	Peaches (White) Snow King	Peaches (Yellow) Zee Lady
Colour:	Dark Red Blush	Dark Red Blush
Condition	Firm / Ripe	Firm / Ripe
Shape	Round; Seeded	Round; Seeded
Diameter (mm)	770	600
Weight (g)	155.5 – 187.5	131.7 – 157.0
Acidity (pH)	4.63 – 5.04	4.14 – 4.23
Sugar (°Brix)	11.5 – 16.5	11.0 – 14.0
Average No Fruit / 10 kg	65	65
Plums <i>Prunus domestica</i>	Plums Angelino	Plums Tegan Blue
Colour:	Black	Dark Blue
Condition	Firm / Ripe	Firm / Ripe
Shape	Round; Seeded	Round; Seeded
Diameter (mm)	540	600
Weight (g)	72.3 – 91.3	93.5 – 110.8
Acidity (pH)	5.30 – 5.36	3.44 – 4.23
Sugar (°Brix)	9.0 – 14.5	14.0 – 18.5
Average No Fruit / 10 kg	110	110

2.2.8 Method of fruit storage before infestation

All fruits were held at 1°C to preserve good quality prior to use in the trials. Fruit were warmed up to $26 \pm 1.0^{\circ}\text{C}$; 60 - 65% rh for 24 – 48 hours prior to infestation and after infestation they were held under the same conditions suitable for incubation of eggs and for hatching to the required stages:

2.2.9 Determination of life history of immature stages of Medfly in test fruit

Medfly readily infests stone fruit and production of larvae and pupae are good. Therefore, to obtain the required disinfestation data a natural infestation method was employed. To determine the course of development of the immature stages of Medfly in the 8 stone fruit cultivars, the warmed-up fruits were naturally infested by placing them in single layers in two trays specially built to slide into the colony containing 10 – 15 day old gravid females. An exposure period of 4 hours to approximately 50,000 gravid females in infesting cages similar to those used for adult rearing gave an average of 90-120 eggs per 10 gm of fruit. After infestation, the fruits were stored in ventilated plastic boxes of size 38x29x12 cm = 13 litres at $26 \pm 1^{\circ}\text{C}$; 60-65% rh for the required period for development of life stages.

A total of 3 kg cherries and 20 kg each of peaches, nectarines and plums were infested for life history tests and thereafter were placed in the controlled environment room for incubation at $26 \pm 1^{\circ}\text{C}$; 60 - 65% rh. Thereafter at 24 hourly intervals, samples of 5 - 10 fruits were taken for determination of the life stages present. This was done by dissecting the fruit over a series of sieves (Endecotts Ltd., London, U. K.) ranging in aperture size from 2.0 mm to 125 microns. The fruit pulp was washed with a gentle stream of tap water to separate the eggs and larvae from the fruit medium. The numbers of live and dead individuals present in each stage were counted and the proportion present in each stage, each day after initial infestation was determined. When the test batch of fruit was found suitable, the quantity required for trials was obtained from the same orchards and infested for the most tolerant stage trials and subsequently for the large scale trials. To determine the number of pupae / gm obtained from fruit, 1kg cherries and 3kg each of peaches, nectarines and plums from the infested batch was set aside and incubated to pupation. The total number of pupae collected was divided by the weight of fruit to give the number of pupae / gm / fruit type. This information enabled a decision to be made of the weight of fruit required per treatment replicate.

The results of the life stage development of Medfly in each batch of test fruits are given in **Section 3** for most tolerant stage trials and **Sections 4 and 7** for large scale trials of cold and methyl bromide treatments. This data was used to determine the day of treatment for each stage in each variety. The life history data was used to plan the infestation schedule of the fruit for the trials, to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

2.2.10 Characteristics of Test Containers used in the Trials

(1) Containers for most tolerant stage trials

In the most tolerant stage trials ventilated plastic boxes of size 38 x 29 x 12 cm = 13.2 litres were used. Each box contained 5mm sand in the bottom to assist larvae emerging from fruit to pupate. The box containing the infested fruit was covered with Terylene voile to allow air exchange and sealed in place with a plastic lid having a large aperture in the centre. The fruit were held at $26 \pm 1^{\circ}\text{C}$; 60 - 65% rh for the period of time required for the fruit flies to develop to the stage required for the experiment. The ventilated plastic boxes were used because only a small amount of fruit was tested in each replicate and in the most tolerant stage trials only the direct effects of the cold treatment must be assessed. A similar process was used for rearing insect stages before and after fumigation treatments.

(2) Containers for large scale trials

Large-scale trials were carried out in commercial export cartons with filler fruit. Infested fruit was placed on trays in selected cartons in each trial. The cartons used were ventilated cartons with dimensions 210 x 285 x 430 mm = 25.7 litres.

2.3 RESIDUE ANALYSIS

Cherry, peach, nectarine and plum samples were taken for residue analysis over 2 seasons during the large scale methyl bromide fumigation treatments and for the combined methyl bromide + cold treatments. Analysis was performed by the Government Chemistry Centre.

2.4 STATISTICAL ANALYSIS

The data obtained from cold treatment and methyl bromide fumigation trials for the four stages: eggs, 1st, 2nd and 3rd instar at various temperatures were subjected to probit analysis (Finney 1971). The data were analysed for the estimates at LD₅₀ and LD₉₉ and for lower and upper fiducial limits using the GenStat package (GenStat 2008). Details of analysis are given in **Sections 3 & 5** for cold and methyl bromide treatments respectively.

3. COLD TREATMENTS – MOST TOLERANT STAGE TRIALS

3.1 MOST TOLERANT LIFE STAGE TRIALS AT 1°C and 3°C.

PLAN OF THE TRIALS

The trials were conducted in the following manner:

1. All fruit was received directly from the farms were held in cold rooms #1 or #2 as described in **Section 2** until required for the trials.
2. A life history study of Medfly (**Section 2**) was conducted at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh for each cultivar to determine the rate of development of immature stages to be tested and to evaluate suitability of fruit source.
3. From the life history data obtained, the date when eggs had reached $\geq 50\%$ development and when 1st, 2nd and 3rd instars were $\geq 50\%$ in test fruit was recorded. Incubation of all stages was carried out at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh.
4. The most tolerant life stage trials were conducted by infesting sufficient fruit to contain more than 200 insects for each dose in each replicate test of each life-stage. The trials required exposure to 16 dose-exposure periods (including controls) in each series of trials at $1.0 \pm 0.5^\circ\text{C}$, and 19 dose-exposure periods (including controls) in each series of trials at $3.0 \pm 0.5^\circ\text{C}$.
5. Exposure periods began at 24 h for 1°C and at 48 h for 3°C.
6. The dose mortality data obtained from these trials were subjected to probit analysis to compare LD₅₀ and LD₉₉ values for each life-stage in each cultivar and determine the most tolerant stage.
7. From this analysis the stages to be tested and the treatment periods at 1°C and 3°C required for control of the most tolerant stage was determined for the large-scale trials.

3.2 INFESTATION OF FRUIT FOR THE TRIALS

Fruit were infested as described in **Section 2**. The total weight of fruit infested for each cultivar and treatment exposure periods for each trial at 1°C, and 3°C are given below. Estimated number of fruits in the trials is made from the test fruit data in **Section 2**. To determine the number of pupae obtained per 100 g fruit, Cherries (200 g), peaches, nectarines, plums (600 g) were selected at random from the infested batch and were set aside and incubated to pupation. The total number of pupae collected was divided by 2 for cherries and 6 for peaches, nectarines, and plums to give the number of pupae per 100 g fruit. This information enabled a decision to be made of the weight of fruit required to be infested per replicate. This procedure was repeated before each set of trials.

Number of replicates, treatments and stages:

CHERRIES

1°C: A total of 38.4 kg fruit were infested for each cultivar as follows:

Wt. fruit / replicate = 200 g

No. of treatments = 16

No. of life stages = 4

No. of replicates = 3

3°C: a total of 45.6 kg fruit were infested for each cultivar as follows:

Wt. fruit / replicate = 200 g

No. of treatments = 19

No. of life stages = 4

No. of replicates = 3

PEACHES, NECTARINES AND PLUMS

1°C: A total of 115.2 kg fruit were infested for each cultivar as follows:

Wt. fruit / replicate = 600 g

No. of treatments = 16

No. of life stages = 4

No. of replicates = 3

3°C: a total of 136.8 kg fruit were infested for each cultivar as follows:

Wt. fruit / replicate = 600 g

No. of treatments = 19

No. of life stages = 4

No. of replicates = 3

Calculation of weight of fruits required to be infested for each trial:

Fruit	Variety	1°C (kg)	3°C (kg)	Total for both trials (kg)	No. of fruit in 10 kg	No. of fruit in both trials
Cherries	Sweetheart	38.4	45.6	84.0	1,250	10,500
	Lapin	38.4	45.6	84.0	1,250	10,500
Peaches	Snow King	115.2	136.8	252.0	65	1,638
	Zee Lady	115.2	136.8	252.0	65	1,638
Nectarines	Arctic Snow	115.2	136.8	252.0	75	1,890
	August Red	115.2	136.8	252.0	75	1,890
Plums	Angelino	115.2	136.8	252.0	100	2,520
	Tegan Blue	115.2	136.8	252.0	100	2,520
	Total infested fruit all trials	768kg	912kg	1,680kg		33,096

3.3 SET-UP OF MOST TOLERANT STAGE EXPERIMENTS

1°C: The experiments consisted of 16 treatments including the untreated control.

3°C: The experiments consisted of 19 treatments including the untreated control.

Cherries (200 g), peaches, nectarines, plums (600 g) were selected at random from the infested batch for each replicated treatment and placed 2 polystyrene trays. These trays was then placed in a large labelled plastic box, having a 10 mm layer of sterilised sand to permit emerging larvae to drop into the sand for pupation. The box containing the infested fruit was covered with Terylene voile to allow air exchange and sealed in place with a plastic lid having a large aperture in the centre.

The fruit were held at $26 \pm 1^\circ\text{C}$ for the period of time required for the fruit flies to develop to the stage required for the experiment. Each exposure therefore consisted of 3 replicated boxes (600 g cherries, 1,800 g peaches, nectarines, plums) for each stage. Since four stages were tested at each dose, infested fruit (2,400 g cherries, 7,200 g peaches, nectarines, plums) were exposed to each dose. The total number of treatment doses and fruits exposed are shown above.

1°C: The treatments consisted of 15 periods of cold exposure and one untreated control. The 15 cold exposures were incremental doses of cold beginning with 24 hours as the lowest dose and increasing by 24 hours up to 240 hours (10 days). After this the dose was increased by 48 hours up to 480 hours (20 days). Timing of exposure period began when the last probe in the fruit reached $1.0 \pm 0.5^{\circ}\text{C}$. The treatment conditions were held at $1.0 \pm 0.5^{\circ}\text{C}$ over the entire experimental period for each cultivar.

3°C: The treatments consisted of 18 periods of cold exposure and one untreated control. The 18 cold exposures were incremental doses of cold beginning with 48 hours as the lowest dose and increasing by 24 hours up to 336 hours (14 days). After this the dose was increased by 48 hours up to 576 hours (24 days). Timing of exposure period began when the probes in the fruit reached $3.0 \pm 0.5^{\circ}\text{C}$. The treatment conditions were held at $3.0 \pm 0.5^{\circ}\text{C}$ over the entire experimental period for each cultivar.

Dose increments were chosen to obtain responses that fell between 10 - 95% mortality range required to calculate an accurate probit regression line (Finney, 1971). The additional doses were used to confirm 100% mortality and to establish at least two successive dose levels at 100% to enable confidence in selecting the treatment for the large-scale trials.

Each of the 3 replicated trials was set-up in separate cold rooms each approximately 34 m^3 (Cold Rooms #3, #4, #5). Fruit pulp temperatures were recorded by placing thermistor probes into the core of uninfested fruit placed in similar plastic labelled boxes in the cold room.

After exposure to the specified cold treatment, the box containing the fruits was removed to the controlled environment room containing the control fruits for collection of surviving stages as pupae (**Appendix 4**). The number of pupae emerging at each dose was compared with the number from the untreated controls to obtain the percentage responding to the treatment. The criterion for survival was the formation of an apparently normal puparium.

Record of temperatures during the trials

Temperatures were recorded on a “Squirrel” (Grant Instruments, Cambridge, England) data logger with an accuracy of $\pm 0.01^{\circ}\text{C}$. A total of 16 thermistor probes were used, 6 to record air temperatures at various positions in the cold room, including the inlet and outlet air temperatures of the cooler. The remaining 10 thermistors were used to record fruit pulp temperatures by placing the probes in the core of uninfested fruit at different positions in the experimental stacks containing the infested fruit. Temperature recordings were automatically logged at 60-minute intervals throughout the trial. The trial arrangements in the cold rooms are shown in **Appendix 4**.

3.4 STATISTICAL ANALYSIS

The data obtained from a series of exposure periods (days) to 1°C and 3°C of the four stages: eggs, 1st, 2nd and 3rd instar were subjected to probit analysis (Finney 1971). The total number from all replicates were combined to obtain the number treated (puparia in control) and the number responding (from puparia obtained for each exposure period) and analysed using the GenStat package (GenStat Release 8.1 2005). The probit model uses a generalized linear procedure, assuming a binomial distribution for the number of responses and a probit link function between the number of responses and the logarithm (\log_{10}) of the dose. Tests on data using the logit link function and the complementary log-log function did not significantly reduce the residual deviance and the probit link function was retained in analysis.

3.5 RESULTS OF MOST TOLERANT LIFE STAGE COLD TREATMENT TRIALS OF MEDFLY AT $1.0 \pm 0.5^{\circ}\text{C}$.

The trials at $1.0 \pm 0.5^{\circ}\text{C}$ were conducted from November 2006 to July 2008.

Data for each cultivar: life history of all stages in test fruits, cold treatment temperatures and insect mortality of the four life stages of Medfly replicated 3 times is given under the respective fruit varieties treated.

3.5.1 Cherries - Sweetheart

Life history data

The life history data (table 3.1) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.1: Sweetheart Cherries : Incubation of immature stages of Medfly at $26 \pm 1^{\circ}\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	2/11/2006	100	0	0	0	100	eggs
1	3/11/2006	100	0	0	0	100	eggs
2	4/11/2006	100	0	0	0	100	eggs
3	5/11/2006	34	66	0	0	100	1 st
4	6/11/2006	24	71	5	0	100	1 st
5	7/11/2006	0	29	71	0	100	2 nd
6	8/11/2006	0	20	74	6	100	2 nd
7	9/11/2006	0	7	27	66	100	3 rd
8	10/11/2006	0	11	29	60	100	3 rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.2. Cold treatment records are given in tables 3.3 – 3.5. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.6 – 3.8.

Table 3.2 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $1.0 \pm 0.5^{\circ}\text{C}$. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Sweetheart		03.12.2006	03.12.2006		23.12.2006			02.12.2006
	1	07:22 am	15:22 pm	8.0	15:22 pm	# 3	KS0606016	13:08 pm
	2	07:54 am	15:54 pm	8.0	15:54 pm	# 4	KS0547009	14:30 pm
	3	08:21 am	16:21 pm	8.0	16:21 pm	# 5	KS0606017	15:19 pm

Table 3.3: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #3 (Rep 1)**

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		0.8	0.3	0.7	1.1	1.6	1.3	1.1	1.3	1.0	1.2	0.9	1.0	1.1	0.9	1.0	1.1
24	1	0.8	0.2	1.3	1.2	1.9	1.4	1.1	1.1	1.0	1.1	1.1	1.1	1.2	1.1	1.2	1.2
36		0.8	0.2	1.0	1.1	1.7	1.4	1.1	1.2	1.1	1.1	1.2	1.2	1.2	1.1	1.2	1.2
48	2	0.9	0.2	1.7	1.2	2.1	1.7	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.2	1.1
60		0.9	0.2	1.2	1.2	1.8	1.5	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.2	1.2
72	3	0.9	0.2	2.0	1.3	2.2	1.7	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.1
84		0.9	0.2	1.5	1.2	1.9	1.6	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
96	4	0.9	0.1	2.1	1.3	2.4	1.8	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.2	1.1
108		0.9	0.2	1.7	1.2	2.0	1.7	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
120	5	1.1	0.0	2.4	1.4	2.6	2.0	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.2	1.1
132		1.0	0.2	2.0	1.2	2.2	1.9	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
144	6	1.1	0.0	2.5	1.4	2.6	2.0	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.3	1.1
156		0.9	0.1	1.6	1.2	1.9	1.6	1.1	1.2	1.1	1.2	1.2	1.2	1.3	1.2	1.3	1.3
168	7	1.0	0.2	1.5	1.3	2.2	1.5	1.0	1.1	1.0	1.1	1.2	1.2	1.2	1.1	1.3	1.2
180		0.8	0.2	1.2	1.1	1.8	1.4	1.1	1.2	1.1	1.2	1.2	1.2	1.3	1.2	1.3	1.3
192	8	0.8	0.1	1.4	1.2	2.0	1.4	1.0	1.1	1.0	1.1	1.2	1.2	1.2	1.1	1.3	1.2
204		0.8	0.2	1.1	1.1	1.7	1.4	1.1	1.2	1.1	1.2	1.2	1.2	1.3	1.2	1.3	1.3
216	9	0.9	0.2	1.5	1.2	2.0	1.5	1.0	1.1	1.1	1.0	1.2	1.2	1.2	1.1	1.3	1.2
228		0.9	0.2	1.2	1.1	1.8	1.4	1.1	1.2	1.1	1.2	1.2	1.2	1.3	1.2	1.3	1.3
240	10	0.9	0.2	1.5	1.3	2.1	1.5	1.0	1.1	1.0	1.1	1.2	1.2	1.2	1.1	1.3	1.2
252		0.9	0.1	1.5	1.1	1.9	1.6	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
264	11	1.1	0.1	2.0	1.3	2.3	1.7	1.1	1.1	1.0	1.1	1.2	1.2	1.2	1.1	1.3	1.2
276		1.0	0.1	1.7	1.2	2.0	1.6	1.2	1.3	1.2	1.3	1.2	1.2	1.2	1.1	1.3	1.2
288	12	1.0	0.1	2.0	1.3	2.2	1.7	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
300		1.0	0.2	1.7	1.2	1.9	1.6	1.2	1.3	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
312	13	0.9	0.2	1.3	1.1	1.8	1.3	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.3	1.1
324		0.9	0.2	1.2	1.1	1.6	1.3	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.3	1.1
336	14	0.9	0.2	1.5	1.3	1.8	1.5	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.3	1.1
348		0.9	0.3	1.0	1.1	1.6	1.4	1.2	1.2	1.1	1.2	1.1	1.1	1.2	1.1	1.3	1.2
360	15	0.9	0.2	1.6	1.2	1.9	1.5	1.1	1.1	1.0	1.1	1.1	1.1	1.0	1.0	1.2	1.0
372		1.0	0.3	1.3	1.2	1.7	1.5	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.2	1.1
384	16	0.9	0.1	1.8	1.2	2.0	1.6	1.1	1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.2	1.0
396		0.9	0.1	1.2	1.1	1.7	1.3	1.1	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.3	1.1
408	17	0.8	0.2	1.1	1.0	1.7	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.1
420		0.9	0.1	1.7	1.2	1.8	1.6	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.0	1.2	1.1
432	18	0.7	0.2	0.6	1.0	1.5	1.1	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.3	1.2
444		0.9	0.2	1.8	1.3	2.0	1.6	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.1
456	19	0.9	0.3	1.4	1.2	1.8	1.5	1.1	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.2	1.1
468		0.8	0.2	1.5	1.1	1.8	1.4	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.0	1.2	1.1
480	20	0.9	0.2	1.8	1.3	2.0	1.7	1.1	1.1	1.1	1.2	1.1	1.1	1.0	1.0	1.2	1.0
Average over trial period		0.9	0.2	1.5	1.2	1.9	1.5	1.1	1.2	1.1	1.2	1.1	1.1	1.2	1.1	1.3	1.2
± standard deviation		0.3	0.2	0.8	0.3	0.4	0.5	0.2	0.3	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2
Average of Fruit temperatures						1.2 ± 0.2											
Average of Air temperatures						1.2 ± 0.4											

Table 3.4: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #4 (Rep 2)**

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		0.9	0.7	1.1	1.5	1.7	0.8	1.3	1.2	1.4	1.1	1.0	1.1	1.2	0.9	1.1	1.0
24	1	1.1	0.7	1.6	1.8	2.2	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
36		1.1	0.7	1.3	1.6	2.0	0.8	1.0	1.1	1.0	1.2	1.2	1.0	1.0	1.0	1.1	1.1
48	2	1.3	0.7	1.8	1.9	2.4	0.8	1.0	1.1	1.1	1.3	1.3	1.0	1.0	1.0	1.2	1.1
60		1.1	0.6	1.4	1.6	2.1	0.6	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
72	3	1.4	0.7	1.9	2.0	2.6	0.8	1.0	1.2	1.1	1.3	1.3	1.0	1.0	1.1	1.2	1.1
84		1.2	0.7	1.5	1.8	2.3	0.8	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.2	1.1
96	4	1.5	0.7	2.1	2.1	2.7	0.8	1.1	1.2	1.1	1.3	1.3	1.1	1.0	1.1	1.2	1.1
108		1.3	0.7	1.6	1.9	2.4	0.8	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
120	5	1.7	0.8	2.3	2.4	3.1	0.9	1.1	1.2	1.2	1.3	1.3	1.1	1.1	1.1	1.2	1.1
132		1.4	0.7	1.7	2.1	2.7	0.8	1.0	1.1	1.1	1.2	1.3	1.0	1.0	1.0	1.1	1.1
144	6	1.6	0.8	2.4	2.4	3.1	1.0	1.1	1.2	1.2	1.3	1.3	1.1	1.1	1.1	1.3	1.2
156		1.2	0.6	1.5	2.0	2.4	0.7	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
168	7	1.3	0.8	1.8	2.1	2.5	0.9	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.2	1.1
180		1.1	0.6	1.4	1.8	2.1	0.7	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
192	8	1.2	0.7	1.6	1.9	2.3	0.8	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
204		1.0	0.6	1.3	1.7	2.0	0.7	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
216	9	1.2	0.7	1.7	1.9	2.3	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
228		1.1	0.6	1.4	1.7	2.0	0.7	1.0	1.1	1.0	1.2	1.2	1.0	1.0	1.0	1.1	1.1
240	10	1.2	0.7	1.7	2.0	2.4	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
252		1.2	0.8	1.6	2.0	2.4	0.9	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
264	11	1.4	0.7	2.0	2.3	2.8	0.8	1.1	1.2	1.1	1.3	1.3	1.0	1.0	1.1	1.2	1.1
276		1.3	0.7	1.6	2.1	2.5	0.9	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
288	12	1.4	0.7	1.9	2.3	2.7	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
300		1.2	0.7	1.6	2.1	2.4	0.9	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
312	13	1.1	0.7	1.5	1.8	2.1	0.8	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
324		1.1	0.7	1.3	1.7	2.0	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
336	14	1.1	0.6	1.6	1.8	2.2	0.7	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
348		0.9	0.6	1.2	1.5	1.9	0.7	1.0	1.1	1.0	1.2	1.2	1.0	1.0	1.0	1.1	1.1
360	15	1.2	0.7	1.6	1.9	2.3	0.7	1.0	1.1	1.1	1.3	1.3	1.0	1.0	1.0	1.1	1.1
372		1.1	0.7	1.4	1.7	2.1	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
384	16	1.3	0.7	1.8	2.0	2.5	0.8	1.0	1.2	1.1	1.3	1.3	1.0	1.0	1.1	1.1	1.1
396		0.9	0.8	1.2	1.4	1.7	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
408	17	1.4	0.9	1.9	2.1	2.7	0.8	1.1	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
420		0.9	0.7	1.2	1.4	1.8	0.8	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.1
432	18	1.3	0.7	1.9	2.3	2.6	0.8	1.0	1.1	1.1	1.2	1.2	1.0	1.0	1.0	1.1	1.0
444		1.0	0.7	1.3	1.6	1.9	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
456	19	1.6	0.8	2.2	2.6	3.2	0.9	1.0	1.1	1.1	1.3	1.3	1.0	1.0	1.0	1.1	1.1
468		1.1	0.6	1.5	1.8	2.2	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
480	20	1.5	0.7	2.0	2.5	2.9	0.8	1.1	1.2	1.1	1.3	1.3	1.1	1.0	1.1	1.2	1.1
Average over trial period		1.2	0.7	1.6	1.9	2.3	0.8	1.0	1.1	1.1	1.3	1.2	1.0	1.0	1.0	1.1	1.1
± standard deviation		0.8	0.2	0.5	0.6	0.7	0.2	0.2	0.1	0.3	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Average of Fruit temperatures							1.1 ± 0.2										
Average of Air temperatures							1.4 ± 0.5										

Table 3.5: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #5 (Rep 3)**

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		0.6	0.2	0.8	0.7	0.8	1.9	1.0	1.4	1.2	1.1	1.3	1.2	1.0	1.1	1.1	1.1
24	1	1.1	0.0	1.2	0.9	1.7	2.6	1.0	1.2	1.0	1.0	1.2	1.1	1.0	1.1	1.0	1.1
36		0.9	0.2	1.3	0.8	1.1	2.2	1.0	1.2	1.1	0.9	1.1	1.2	1.0	1.1	1.0	1.0
48	2	1.6	0.2	1.6	1.0	2.0	2.8	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1	1.1
60		1.2	0.1	1.5	0.9	1.5	2.4	1.0	1.2	1.1	1.0	1.1	1.2	1.0	1.1	1.0	1.0
72	3	1.7	0.0	1.9	1.0	2.3	3.0	1.0	1.3	1.1	1.0	1.2	1.1	1.1	1.2	1.1	1.1
84		1.5	0.2	1.9	1.0	1.7	2.7	1.0	1.2	1.1	1.0	1.2	1.2	1.0	1.2	1.0	1.1
96	4	1.9	0.2	2.0	1.1	2.6	3.3	1.0	1.3	1.1	1.1	1.2	1.1	1.1	1.3	1.1	1.1
108		1.6	0.3	2.2	1.1	1.9	2.9	1.0	1.3	1.1	1.0	1.2	1.2	1.1	1.2	1.1	1.1
120	5	2.3	0.0	2.3	1.2	3.1	3.5	1.1	1.3	1.2	1.1	1.3	1.1	1.2	1.3	1.1	1.2
132		2.0	0.2	2.8	1.1	2.3	3.3	1.0	1.3	1.1	1.1	1.3	1.2	1.1	1.3	1.1	1.1
144	6	2.4	0.0	2.3	1.2	3.2	3.7	1.1	1.4	1.2	1.1	1.4	1.1	1.2	1.3	1.2	1.2
156		1.4	0.1	1.8	1.0	1.9	3.0	1.0	1.3	1.1	1.1	1.3	1.2	1.1	1.3	1.1	1.1
168	7	1.4	0.0	1.5	1.0	2.2	3.1	1.0	1.4	1.1	1.1	1.3	1.2	1.1	1.3	1.1	1.1
180		1.0	0.2	1.5	0.9	1.6	2.7	1.0	1.3	1.1	1.1	1.2	1.2	1.0	1.2	1.1	1.1
192	8	1.2	0.0	1.3	0.9	1.9	2.8	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
204		0.9	-0.1	1.3	0.8	1.4	2.4	1.0	1.3	1.1	1.0	1.2	1.2	1.0	1.2	1.1	1.1
216	9	1.3	-0.1	1.5	0.9	2.0	2.9	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
228		0.9	0.1	1.4	0.8	1.2	2.5	1.0	1.3	1.1	1.0	1.2	1.2	1.0	1.2	1.1	1.1
240	10	1.3	0.0	1.6	0.9	2.1	3.0	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
252		1.3	0.1	2.2	0.9	1.6	2.8	1.0	1.3	1.1	1.0	1.2	1.2	1.0	1.2	1.1	1.1
264	11	1.9	0.0	2.1	1.1	2.6	3.5	1.1	1.4	1.1	1.1	1.3	1.2	1.1	1.3	1.1	1.2
276		1.5	0.2	2.1	1.0	1.9	3.2	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
288	12	1.8	0.1	2.0	1.1	2.5	3.4	1.1	1.4	1.1	1.1	1.3	1.2	1.1	1.3	1.1	1.2
300		1.4	0.1	1.8	0.9	1.8	3.1	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
312	13	1.1	0.1	1.1	0.8	1.5	2.6	1.0	1.3	1.1	1.1	1.2	1.3	1.1	1.2	1.1	1.1
324		0.8	0.1	1.3	0.8	1.3	2.6	1.0	1.3	1.1	1.0	1.2	1.3	1.0	1.2	1.1	1.1
336	14	1.0	0.1	1.4	0.9	1.7	2.8	1.0	1.3	1.1	1.1	1.2	1.3	1.1	1.2	1.1	1.1
348		0.7	0.2	1.0	0.8	1.0	2.1	1.0	1.3	1.1	1.0	1.2	1.3	1.0	1.1	1.0	1.0
360	15	1.2	0.1	1.5	0.9	1.9	2.7	1.0	1.3	1.1	1.1	1.2	1.3	1.0	1.2	1.1	1.1
372		1.0	0.1	1.6	0.8	1.4	2.5	1.0	1.3	1.1	1.0	1.2	1.3	1.0	1.1	1.0	1.0
384	16	1.5	0.2	1.8	1.1	2.2	3.1	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
396		1.0	0.3	1.4	0.9	1.3	2.5	1.0	1.3	1.1	1.0	1.2	1.3	1.0	1.2	1.1	1.1
408	17	1.0	0.3	1.2	0.9	1.6	2.6	1.0	1.2	1.1	1.0	1.1	1.1	1.0	1.1	1.0	1.0
420		1.1	0.5	1.7	1.0	1.5	2.6	1.0	1.2	1.1	1.0	1.1	1.2	1.0	1.1	1.0	1.0
432	18	1.1	0.3	0.7	0.9	1.5	2.2	1.0	1.2	1.1	1.0	1.1	1.1	1.0	1.2	1.0	1.1
444		1.9	-0.1	2.6	1.0	2.4	3.2	1.0	1.2	1.1	1.0	1.2	1.1	1.1	1.2	1.1	1.1
456	19	1.1	0.2	1.2	0.9	1.5	2.3	1.0	1.3	1.1	1.0	1.2	1.2	1.0	1.2	1.0	1.1
468		1.8	0.1	2.1	1.0	2.4	3.2	1.0	1.3	1.1	1.0	1.2	1.1	1.1	1.2	1.1	1.1
480	20	2.2	0.3	3.1	1.2	2.6	3.6	1.1	1.3	1.1	1.1	1.2	1.1	1.1	1.3	1.1	1.1
Average over trial period		1.4	0.1	1.7	0.9	1.9	2.8	1.0	1.3	1.1	1.1	1.2	1.2	1.1	1.2	1.1	1.1
± standard deviation		0.8	0.4	1.4	0.3	0.9	0.9	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.1
Average of Fruit temperatures							1.1 ±0.2										
Average of Air temperatures							1.5±0.8										

Insect mortality from cold treatment temperatures during each trial

The data in these tables 3.6 – 3.8 show that complete mortality was achieved in all stages after 14 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.6: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Sweetheart cherries** (200g/stage)
at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3).
Date of experiment : 3rd December – 23rd December 2006

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	896	792	833	932				
1	200	798	616	770	674	10.9	22.2	7.6	27.7
2	200	528	497	567	565	41.1	37.2	31.9	39.4
3	200	242	299	435	429	73.0	62.2	47.8	54.0
4	200	192	207	294	202	78.6	73.9	64.7	78.3
5	200	102	138	170	86	88.6	82.6	79.6	90.8
6	200	26	78	63	31	97.1	90.2	92.4	96.7
7	200	10	26	28	15	98.9	96.7	96.6	98.4
8	200	3	9	16	2	99.7	98.9	98.1	99.8
9	200	0	5	7	2	100.0	99.4	99.2	99.8
10	200	0	2	3	1	100.0	99.7	99.6	99.9
12	200	0	0	1	0	100.0	100.0	99.9	100.0
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.7 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Sweetheart cherries** (200g/stage)
at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4).
Date of experiment : 3rd December – 23rd December 2006

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	841	1059	931	1159				
1	200	641	846	745	907	23.8	20.1	20.0	21.7
2	200	420	564	573	736	50.1	46.7	38.5	36.5
3	200	343	437	352	382	59.2	58.7	62.2	67.0
4	200	246	272	291	292	70.7	74.3	68.7	74.8
5	200	128	192	178	81	84.8	81.9	80.9	93.0
6	200	43	95	78	54	94.9	91.0	91.6	95.3
7	200	13	36	36	13	98.5	96.6	96.1	98.9
8	200	4	16	31	2	99.5	98.5	96.7	99.8
9	200	0	9	14	3	100.0	99.2	98.5	99.7
10	200	0	4	4	1	100.0	99.6	99.6	99.9
12	200	0	2	1	0	100.0	99.8	99.9	100.0
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.8 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Sweetheart cherries** (200g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5).
Date of experiment : 3rd December – 23rd December 2006

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	1010	905	862	1061				
1	200	853	782	762	900	15.5	13.6	11.6	15.2
2	200	554	604	707	685	45.1	33.3	18.0	35.4
3	200	381	387	425	446	62.3	57.2	50.7	58.0
4	200	220	303	355	223	78.2	66.5	58.8	79.0
5	200	130	189	268	109	87.1	79.1	68.9	89.7
6	200	87	106	152	79	91.4	88.3	82.4	92.6
7	200	25	34	58	22	97.5	96.2	93.3	97.9
8	200	2	13	31	7	99.8	98.6	96.4	99.3
9	200	0	6	4	0	100.0	99.3	99.5	100.0
10	200	0	3	3	0	100.0	99.7	99.7	100.0
12	200	0	0	1	0	100.0	100.0	99.9	100.0
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0

3.5.2 Cherries - Lapin

Life history data

The life history data (table 3.9) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.9: **Lapin Cherries** - Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	14/1/2008	100	0	0	0	100	eggs
1	15/1/2008	100	0	0	0	100	eggs
2	16/1/2008	100	0	0	0	100	eggs
3	17/1/2008	15	85	0	0	100	1st
4	18/1/2008	0	98	2	0	100	1st
5	19/1/2008	0	30	70	0	100	2nd
6	20/1/2008	0	9	91	0	100	2nd
7	21/1/2008	0	8	32	60	100	3rd
8	22/1/2008	0	0	24	76	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.10. Cold treatment records are given in tables 3.11 – 3.13. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.14 – 3.16.

Table 3.10 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at 1.0 ± 0.5 °C. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Lapin		02.02.2008	02.02.2008		22.02.2008			01.02.2008
	1	07:34 am	15:34 pm	8.0	15:34 pm	# 3	KS0606016	13:16 pm
	2	08:04 am	16:04 pm	8.0	16:04 pm	# 4	KS0547009	13:36 am
	3	08:33 am	16:33 pm	8.0	16:33 pm	# 5	KS0606017	14:31 pm

Table 3.11: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #3 (Rep 1)**

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.1	0.3	2.1	1.0	1.9	1.2	1.1	1.3	1.5	1.1	1.2	1.1	1.3	1.2	1.2	1.2
24	1	1.3	0.2	3.0	1.3	2.4	1.5	1.1	1.1	1.3	1.1	1.2	1.1	1.1	1.0	1.2	1.2
36		1.2	0.2	2.4	1.1	2.1	1.3	1.0	1.0	1.3	1.2	1.1	1.1	1.3	1.1	1.2	1.2
48	2	1.3	0.2	3.5	1.3	2.6	1.7	1.0	1.1	1.3	1.1	1.2	1.1	1.2	1.0	1.1	1.1
60		1.3	0.2	2.7	1.1	2.2	1.4	1.1	1.1	1.3	1.1	1.3	1.1	1.3	1.1	1.2	1.1
72	3	1.4	0.2	3.7	1.3	2.7	1.8	1.2	1.2	1.3	1.3	1.2	1.1	1.2	1.0	1.1	1.2
84		1.2	0.2	2.9	1.1	2.3	1.5	1.2	1.1	1.2	1.1	1.2	1.3	1.4	1.1	1.3	1.2
96	4	1.4	0.1	3.9	1.4	2.9	1.9	1.3	1.2	1.2	1.1	1.3	1.2	1.3	1.0	1.2	1.2
108		1.3	0.2	3.0	1.1	2.3	1.6	1.3	1.0	1.1	1.1	1.2	1.2	1.4	1.1	1.3	1.1
120	5	1.5	0.0	4.2	1.4	3.1	2.1	1.4	1.1	1.2	1.2	1.2	1.1	1.2	1.0	1.2	1.0
132		1.4	0.2	3.4	1.2	2.5	1.8	1.2	1.0	1.1	1.1	1.2	1.3	1.4	1.1	1.3	0.9
144	6	1.6	0.0	4.3	1.4	3.1	2.1	1.2	1.0	1.1	1.2	1.4	1.2	1.3	1.0	1.2	1.0
156		1.3	0.1	3.1	1.1	2.3	1.5	1.1	1.0	0.9	1.1	1.2	1.3	1.4	1.1	1.3	1.0
168	7	1.5	0.2	3.3	1.3	2.6	1.6	1.1	1.0	1.1	1.1	1.1	1.3	1.3	1.1	1.3	1.1
180		1.2	0.2	2.7	1.1	2.2	1.4	1.1	1.0	1.1	1.2	1.0	1.2	1.3	1.1	1.3	1.0
192	8	1.3	0.1	3.1	1.2	2.5	1.5	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.3	1.1
204		1.2	0.2	2.6	1.0	2.1	1.3	1.1	1.0	1.1	1.2	1.1	1.1	1.3	1.1	1.3	1.0
216	9	1.3	0.2	3.3	1.3	2.5	1.6	1.2	1.0	1.3	1.2	1.1	1.0	1.2	1.2	1.2	1.0
228		1.3	0.2	2.6	1.1	2.2	1.4	1.2	1.0	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.0
240	10	1.3	0.1	3.2	1.3	2.6	1.6	1.2	1.0	1.3	1.3	1.3	1.2	1.3	1.1	1.2	1.0
252		1.3	0.1	3.0	1.1	2.3	1.5	1.2	1.0	1.2	1.3	1.3	1.2	1.3	1.1	1.3	1.0
264	11	1.5	0.1	3.7	1.4	2.8	1.8	1.1	1.1	1.3	1.3	1.3	1.1	1.2	1.0	1.2	0.9
276		1.4	0.1	3.3	1.2	2.4	1.6	1.2	1.0	1.2	1.3	1.2	1.2	1.3	1.1	1.3	1.1
288	12	1.4	0.1	3.6	1.3	2.6	1.7	1.2	1.1	1.2	1.3	1.1	1.1	1.3	1.1	1.2	1.3
300		1.4	0.2	3.2	1.2	2.3	1.5	1.2	1.1	1.2	1.3	1.1	1.1	1.4	1.1	1.3	1.3
312	13	1.3	0.2	3.0	1.1	2.2	1.4	1.3	1.1	1.1	1.3	1.1	1.3	1.3	1.2	1.4	1.3
324		1.2	0.2	2.8	1.0	2.0	1.3	1.3	1.2	1.1	1.3	1.1	1.3	1.4	1.3	1.4	1.2
336	14	1.4	0.2	3.2	1.3	2.3	1.6	1.3	1.1	1.1	1.3	1.1	1.3	1.3	1.2	1.4	1.2
348		1.3	0.3	2.5	1.0	1.9	1.3	1.2	1.1	1.1	1.3	1.0	1.4	1.4	1.3	1.5	1.2
360	15	1.3	0.1	3.3	1.2	2.4	1.5	1.3	1.2	1.1	1.3	1.1	1.3	1.4	1.2	1.4	1.2
372		1.3	0.3	2.8	1.1	2.1	1.4	1.2	1.1	1.1	1.2	1.2	1.3	1.4	1.3	1.4	1.2
384	16	1.3	0.1	3.6	1.3	2.5	1.6	1.2	1.2	1.1	1.3	1.3	1.2	1.3	1.1	1.3	1.2
396		1.2	0.2	2.7	1.3	2.2	1.5	1.2	1.2	1.1	1.2	1.3	1.3	1.4	1.2	1.4	1.1
408	17	1.2	0.1	4.5	1.8	3.4	2.5	1.3	1.2	1.0	1.3	1.3	1.2	1.3	1.1	1.2	1.1
420		1.5	0.1	2.9	1.0	2.4	1.3	1.2	1.2	1.1	1.2	1.3	1.3	1.3	1.1	1.3	1.1
432	18	1.2	0.1	3.7	1.4	2.7	1.8	1.1	1.0	1.0	1.3	1.3	1.2	1.3	1.1	1.3	1.0
444		1.2	0.2	2.6	1.1	2.3	1.3	1.1	1.0	1.1	1.4	1.3	1.2	1.4	1.2	1.4	1.1
456	19	1.4	0.2	3.3	1.3	2.5	1.7	1.1	1.0	1.1	1.3	1.2	1.2	1.3	1.2	1.4	1.1
468		1.1	0.1	2.4	0.9	2.1	1.1	1.1	1.0	1.0	1.3	1.1	1.3	1.5	1.3	1.5	1.1
480	20	1.4	0.2	3.5	1.4	2.6	1.9	1.2	1.1	1.0	1.2	1.2	1.1	1.4	1.2	1.4	1.1
Average over trial period		1.3	0.2	3.1	1.2	2.4	1.6	1.2	1.1	1.2	1.2	1.2	1.2	1.3	1.1	1.3	1.1
± standard deviation		0.3	0.2	0.8	0.3	0.5	0.5	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2
Average of Fruit temperatures						1.2 ±0.2											
Average of Air temperatures						1.6±0.4											

Table 3.12: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.3	0.8	3.1	1.7	2.1	1.1	1.3	1.0	1.2	1.1	1.2	1.3	1.5	1.1	1.4	1.4
24	1	2.5	0.8	3.6	1.9	2.4	1.2	1.3	1.1	1.2	1.0	1.1	1.3	1.4	1.0	1.4	1.2
36		2.5	0.8	3.5	1.9	2.3	1.2	1.4	1.2	1.3	1.0	1.1	1.3	1.5	1.1	1.4	1.3
48	2	3.3	1.0	3.8	2.2	2.9	1.4	1.4	1.2	1.2	1.0	1.2	1.3	1.5	1.1	1.4	1.2
60		2.5	0.8	3.3	1.8	2.3	1.2	1.4	1.1	1.2	1.0	1.1	1.3	1.5	1.1	1.4	1.3
72	3	2.6	0.8	3.4	2.0	2.4	1.1	1.4	1.1	1.2	1.1	1.2	1.3	1.5	1.0	1.4	1.2
84		2.4	0.8	3.2	1.7	2.1	1.0	1.4	1.1	1.2	1.0	1.1	1.3	1.5	1.1	1.4	1.3
96	4	2.5	0.8	3.3	2.0	2.3	1.1	1.3	1.1	1.2	1.1	1.2	1.3	1.4	1.0	1.3	1.2
108		2.3	0.8	3.1	1.6	2.1	1.0	1.3	1.1	1.2	1.0	1.1	1.3	1.5	1.1	1.4	1.3
120	5	2.5	0.8	3.2	1.9	2.4	1.1	1.4	1.1	1.2	1.1	1.2	1.3	1.4	1.0	1.3	1.2
132		2.4	0.8	3.0	1.6	2.1	1.1	1.4	1.1	1.2	1.0	1.2	1.3	1.5	1.1	1.4	1.3
144	6	2.5	0.8	3.3	1.8	2.5	1.0	1.4	1.1	1.2	1.1	1.2	1.3	1.4	1.1	1.3	1.2
156		2.3	0.7	3.0	1.5	2.1	0.9	1.4	1.1	1.2	1.0	1.1	1.3	1.4	1.1	1.4	1.2
168	7	2.5	0.8	3.3	1.9	2.5	1.0	1.4	1.1	1.2	1.0	1.1	1.3	1.4	1.0	1.3	1.2
180		2.2	0.6	2.9	1.5	2.0	0.8	1.5	1.1	1.2	1.0	1.1	1.3	1.4	1.1	1.4	1.2
192	8	2.5	0.8	3.3	1.9	2.4	1.0	1.3	1.1	1.1	1.0	1.1	1.3	1.4	1.1	1.3	1.1
204		2.3	0.7	3.0	1.5	2.1	0.9	1.2	1.1	1.0	1.0	1.1	1.3	1.5	1.1	1.4	0.9
216	9	2.2	0.6	2.9	1.5	2.1	0.8	1.2	1.1	1.0	1.1	1.2	1.2	1.4	1.1	1.3	0.9
228		2.1	0.5	2.8	1.3	2.0	0.7	1.2	1.1	1.0	1.2	1.3	1.3	1.5	1.1	1.4	1.0
240	10	2.2	0.6	3.0	1.6	2.1	0.8	1.2	1.1	1.0	1.3	1.4	1.3	1.4	1.1	1.3	1.0
252		2.0	0.6	2.6	1.3	1.9	0.8	1.2	1.1	1.0	1.2	1.3	1.3	1.4	1.1	1.3	1.0
264	11	2.1	0.6	2.7	1.5	2.1	0.8	1.2	1.2	1.0	1.3	1.4	1.2	1.4	1.1	1.3	1.0
276		1.9	0.4	2.6	1.1	1.7	0.6	1.2	1.2	1.0	1.2	1.3	1.2	1.4	1.1	1.3	1.0
288	12	2.1	0.5	2.9	1.5	2.1	0.7	1.2	1.2	1.0	1.3	1.4	1.2	1.4	1.1	1.3	1.0
300		2.1	0.5	2.7	1.2	1.9	0.6	1.2	1.3	1.0	1.2	1.3	1.3	1.5	1.2	1.3	1.0
312	13	2.2	0.5	3.0	1.5	2.2	0.7	1.2	1.3	1.0	1.2	1.3	1.3	1.4	1.1	1.4	1.0
324		2.1	0.6	2.9	1.4	2.0	0.8	1.2	1.3	1.0	1.2	1.3	1.3	1.5	1.2	1.4	1.0
336	14	2.4	0.6	3.3	1.7	2.3	0.7	1.2	1.3	1.1	1.3	1.4	1.3	1.4	1.1	1.4	1.0
348		2.2	0.7	3.0	1.5	2.1	0.9	1.2	1.3	1.0	1.2	1.3	1.3	1.5	1.2	1.4	1.0
360	15	2.6	1.2	2.7	2.1	2.6	1.5	1.2	1.3	1.0	1.3	1.4	1.2	1.4	1.1	1.3	1.0
372		1.9	0.4	2.6	1.1	1.8	0.6	1.2	1.3	1.0	1.2	1.3	1.3	1.5	1.1	1.4	1.0
384	16	2.2	0.5	2.8	1.5	2.1	0.7	1.3	1.3	1.0	1.3	1.4	1.3	1.4	1.1	1.4	1.0
396		2.1	0.6	2.9	1.3	2.0	0.7	1.2	1.3	1.0	1.2	1.3	1.2	1.5	1.1	1.4	1.0
408	17	1.9	0.5	2.7	1.3	1.9	0.6	1.2	1.2	1.0	1.2	1.3	1.3	1.4	1.1	1.3	1.0
420		2.0	0.6	3.0	1.4	2.0	0.7	1.2	1.3	1.0	1.2	1.3	1.3	1.4	1.1	1.3	1.0
432	18	1.6	0.5	2.2	1.1	1.7	0.6	1.2	1.2	1.0	1.3	1.4	1.2	1.4	1.1	1.3	1.0
444		2.0	0.5	2.9	1.4	2.0	0.6	1.2	1.2	1.0	1.3	1.4	1.3	1.4	1.1	1.3	1.0
456	19	1.6	0.5	2.1	1.1	1.6	0.6	1.2	1.2	1.0	1.3	1.4	1.2	1.4	1.1	1.3	1.0
468		2.1	0.5	3.1	1.5	2.1	0.7	1.2	1.3	1.0	1.3	1.3	1.3	1.4	1.1	1.4	1.0
480	20	1.8	0.5	2.4	1.2	1.8	0.6	1.2	1.2	1.0	1.2	1.3	1.2	1.4	1.2	1.3	1.0
Average over trial period		2.2	0.7	3.0	1.6	2.1	0.9	1.3	1.2	1.1	1.2	1.3	1.3	1.5	1.1	1.4	1.1
± standard deviation		0.9	0.4	0.6	0.6	0.6	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Average of Fruit temperatures						1.2 ±0.1											
Average of Air temperatures						1.7±0.6											

Table 3.13: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit:** Lapin cherries in **Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.2	0.1	0.3	1.0	2.3	2.0	1.2	1.0	1.1	1.1	0.9	1.2	1.0	1.1	1.0	1.0
24	1	3.0	0.2	1.5	1.1	2.5	2.9	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.0	0.9
36		3.2	0.0	1.1	1.1	2.9	2.6	1.2	1.1	1.1	1.1	1.1	1.2	1.0	1.1	1.1	1.0
48	2	3.3	0.2	2.0	1.2	2.9	3.0	1.0	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.0
60		2.7	0.3	0.5	1.2	2.5	2.2	1.1	1.2	1.1	1.2	1.1	1.3	1.1	1.1	1.2	1.0
72	3	2.7	0.4	1.3	1.3	2.5	3.0	1.1	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
84		2.5	0.3	0.3	1.1	2.3	2.3	1.2	1.2	1.2	1.3	1.1	1.3	1.2	1.1	1.2	1.1
96	4	2.5	0.4	1.1	1.3	2.3	2.9	1.2	1.3	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
108		2.2	0.3	0.1	1.1	2.0	2.0	1.2	1.3	1.2	1.3	1.2	1.3	1.2	1.1	1.2	1.1
120	5	2.5	0.4	0.9	1.3	2.2	2.8	1.2	1.3	1.2	1.2	1.1	1.3	1.2	1.1	1.2	1.1
132		2.5	0.4	0.1	1.2	2.0	1.9	1.2	1.2	1.2	1.3	1.1	1.3	1.2	1.1	1.2	1.1
144	6	2.6	0.5	1.0	1.3	2.1	2.6	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
156		2.4	0.3	0.1	1.1	2.0	1.8	1.2	1.2	1.2	1.2	1.1	1.3	1.1	1.2	1.2	1.1
168	7	2.6	0.1	1.1	1.1	2.3	2.7	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
180		2.3	0.3	0.0	1.2	2.1	2.0	1.2	1.2	1.2	1.3	1.1	1.3	1.2	1.2	1.2	1.1
192	8	2.7	0.2	1.1	1.3	2.5	2.9	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
204		2.5	0.2	0.1	1.1	2.4	2.0	1.2	1.2	1.2	1.2	1.1	1.3	1.1	1.2	1.2	1.1
216	9	2.5	0.6	0.2	1.2	2.1	2.3	1.2	1.3	1.3	1.3	1.2	1.3	1.2	1.2	1.2	1.1
228		2.4	0.3	0.1	1.1	2.1	1.8	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
240	10	2.6	0.2	0.6	1.1	2.3	2.6	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
252		2.3	0.3	-0.5	1.1	1.8	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.2	1.2	1.3	1.1
264	11	2.5	0.7	0.2	1.3	1.9	2.1	1.3	1.3	1.3	1.3	1.2	1.3	1.2	1.2	1.3	1.2
276		2.2	0.3	-0.6	1.0	1.8	1.1	1.3	1.3	1.3	1.3	1.2	1.4	1.2	1.2	1.3	1.1
288	12	2.5	0.2	0.4	1.1	2.0	2.2	1.2	1.3	1.2	1.2	1.2	1.4	1.3	1.2	1.3	1.2
300		2.4	0.3	-0.2	1.1	2.1	1.6	1.2	1.2	1.2	1.3	1.1	1.3	1.2	1.2	1.2	1.1
312	13	2.5	0.2	0.8	1.0	2.2	2.5	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.2	1.2	1.1
324		2.5	0.3	0.0	1.1	2.2	1.9	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.1	1.2	1.1
336	14	2.9	0.2	1.3	1.2	2.7	2.9	1.1	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.2	1.1
348		2.5	0.3	0.2	1.2	2.4	2.1	1.2	1.2	1.2	1.2	1.2	1.3	1.1	1.1	1.2	1.0
360	15	2.7	0.2	1.1	1.2	2.6	2.9	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.2	1.1
372		2.5	0.2	0.1	1.1	2.4	1.9	1.2	1.3	1.2	1.3	1.2	1.3	1.2	1.1	1.3	1.1
384	16	2.5	0.6	0.3	1.2	2.1	2.3	1.2	1.1	1.2	1.1	1.2	1.3	1.1	1.1	1.1	1.0
396		2.2	0.0	0.1	0.9	2.2	1.7	1.2	1.1	1.0	1.0	1.1	1.1	1.1	1.1	1.0	1.1
408	17	2.3	-0.1	0.9	0.9	2.2	2.1	1.2	1.0	1.0	1.1	1.1	1.1	1.0	1.1	1.0	0.9
420		2.8	0.0	1.5	1.1	3.0	2.6	1.2	1.1	1.0	1.1	1.1	1.2	1.0	1.0	1.1	1.0
432	18	2.5	0.0	1.5	1.0	2.5	2.3	1.2	1.2	1.2	1.2	1.2	1.3	1.1	1.1	1.2	1.0
444		2.4	0.0	0.9	1.0	2.7	2.3	1.1	1.1	1.1	1.2	1.2	1.2	1.1	1.0	1.1	1.0
456	19	2.3	0.2	0.8	1.1	2.2	2.2	1.2	1.3	1.2	1.2	1.2	1.3	1.2	1.1	1.2	1.1
468		2.3	0.2	0.6	1.1	2.4	2.4	1.1	1.2	1.2	1.2	1.1	1.3	1.1	1.1	1.2	1.1
480	20	2.3	0.3	0.8	1.1	2.1	2.3	1.2	1.3	1.2	1.3	1.2	1.3	1.2	1.1	1.2	1.1
Average over trial period		2.5	0.3	0.6	1.1	2.3	2.3	1.2	1.2	1.2	1.2	1.1	1.3	1.2	1.1	1.2	1.1
± standard deviation		1.1	0.8	1.3	0.6	0.8	1.5	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ±0.1											
Average of Air temperatures						1.5±1.0											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.14 – 3.16 show that complete mortality was achieved in all stages after 14 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.14: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Lapin cherries** (200g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 2nd February 2008 – 22nd February 2008

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	1170	1164	1095	1003				
1	200	936	916	904	792	20.0	21.3	17.4	21.0
2	200	803	690	753	638	31.4	40.7	31.2	36.4
3	200	648	591	652	505	44.6	49.2	40.5	49.7
4	200	510	282	362	365	56.4	75.8	66.9	63.6
5	200	398	149	204	169	66.0	87.2	81.4	83.2
6	200	190	102	150	80	83.8	91.2	86.3	92.0
7	200	66	31	51	17	94.4	97.3	95.3	98.3
8	200	12	14	26	4	99.0	98.8	97.6	99.6
9	200	0	5	10	0	100.0	99.6	99.1	100.0
10	200	0	1	6	0	100.0	99.9	99.5	100.0
12	200	0	0	2	0	100.0	100.0	99.8	100.0
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.15 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Lapin cherries** (200g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 2nd February 2008 – 22nd February 2008

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	1160	929	1063	926				
1	200	1024	875	961	747	11.7	5.8	9.6	19.3
2	200	905	743	812	592	22.0	20.0	23.6	36.1
3	200	640	615	662	527	44.8	33.8	37.7	43.1
4	200	611	336	369	393	47.3	63.8	65.3	57.6
5	200	301	245	282	264	74.1	73.6	73.5	71.5
6	200	86	103	122	101	92.6	88.9	88.5	89.1
7	200	12	41	90	21	99.0	95.6	91.5	97.7
8	200	2	19	35	5	99.8	98.0	96.7	99.5
9	200	1	5	13	2	99.9	99.5	98.8	99.8
10	200	0	3	9	1	100.0	99.7	99.2	99.9
12	200	0	2	4	1	100.0	99.8	99.6	99.9
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.16 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Lapin cherries** (200g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 2nd February 2008 – 22nd February 2008

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	1052	1023	1102	980				
1	200	958	914	1035	754	8.9	10.7	6.1	23.1
2	200	798	678	856	516	24.1	33.7	22.3	47.3
3	200	563	463	658	403	46.5	54.7	40.3	58.9
4	200	400	257	418	283	62.0	74.9	62.1	71.1
5	200	215	174	247	165	79.6	83.0	77.6	83.2
6	200	99	105	161	82	90.6	89.7	85.4	91.6
7	200	18	32	50	38	98.3	96.9	95.5	96.1
8	200	4	9	21	3	99.6	99.1	98.1	99.7
9	200	0	7	13	3	100.0	99.3	98.8	99.7
10	200	0	4	6	0	100.0	99.6	99.5	100.0
12	200	0	0	0	0	100.0	100.0	100.0	100.0
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0

3.5.3 Peaches – Snow King

Life history data

The life history data (table 3.17) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.17: **Snow King Peaches:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	6/1/2007	100	0	0	0	100	eggs
1	7/1/2007	100	0	0	0	100	eggs
2	8/1/2007	100	0	0	0	100	eggs
3	9/1/2007	17	83	0	0	100	1st
4	10/1/2007	9	91	0	0	100	1st
5	11/1/2007	0	28	72	0	100	2nd
6	12/1/2007	0	11	78	11	100	2nd
7	13/1/2007	0	0	20	80	100	3rd
8	14/1/2007	0	0	13	87	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.18. Cold treatment records are given in tables 3.18 – 3.21. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.22 – 3.24

Table 3.18 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at 1.0 ± 0.5 °C. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Snow King		02.02.2007	02.02.2007		22.02.2007			01.02.2007
	1	07:24 am	15:24 pm	8.0	15:24 pm	# 3	KS0606016	14:22 pm
	2	07:55 am	15:55 pm	8.0	15:55 pm	# 4	KS0547009	13:50 pm
	3	08:25 am	16:25 pm	8.0	16:25 pm	# 5	KS0606017	15:11 am

Table 3.19: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		1.1	0.1	2.7	0.9	1.5	0.9	1.4	1.3	1.4	1.3	1.3	1.2	1.4	1.3	1.3	1.4
24	1	1.2	0.5	2.3	0.9	1.5	1.0	1.3	1.2	1.3	1.3	1.3	1.2	1.3	1.2	1.3	1.3
36		1.2	0.4	2.2	0.9	1.5	1.0	1.2	1.2	1.3	1.2	1.3	1.1	1.3	1.2	1.2	1.3
48	2	1.2	0.2	2.2	0.9	1.5	1.0	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.2	1.2	1.3
60		1.3	-0.1	2.4	0.7	1.7	0.9	1.2	1.2	1.3	1.2	1.2	1.1	1.3	1.2	1.2	1.3
72	3	1.3	0.1	2.5	0.9	1.7	1.0	1.2	1.2	1.3	1.2	1.3	1.1	1.3	1.2	1.2	1.3
84		1.4	0.4	2.4	1.0	1.7	1.1	1.3	1.3	1.3	1.2	1.3	1.1	1.3	1.3	1.3	1.4
96	4	1.4	-0.2	2.4	0.7	1.7	0.8	1.3	1.3	1.4	1.3	1.3	1.2	1.4	1.3	1.3	1.4
108		1.4	0.3	2.3	0.9	1.6	1.0	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3	1.4
120	5	1.4	0.0	2.1	0.8	1.5	0.8	1.2	1.2	1.3	1.3	1.3	1.2	1.3	1.3	1.3	1.4
132		1.3	0.2	2.5	0.9	1.7	1.0	1.3	1.3	1.3	1.2	1.3	1.2	1.3	1.3	1.3	1.4
144	6	1.3	0.1	2.3	1.0	1.5	1.0	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.5
156		1.2	0.1	2.3	0.9	1.4	1.0	1.3	1.3	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.5
168	7	1.1	0.3	2.3	0.9	1.3	1.0	1.3	1.3	1.4	1.4	1.4	1.3	1.4	1.4	1.4	1.4
180		1.0	0.1	2.3	0.8	1.3	0.9	1.2	1.2	1.3	1.3	1.3	1.3	1.2	1.3	1.3	1.3
192	8	1.1	0.2	2.7	1.0	1.5	1.1	1.2	1.2	1.3	1.4	1.4	1.3	1.3	1.4	1.3	1.4
204		1.0	0.1	2.6	0.8	1.4	1.0	1.2	1.2	1.4	1.5	1.5	1.4	1.3	1.5	1.4	1.5
216	9	1.2	0.0	2.3	0.8	1.6	0.9	1.2	1.2	1.3	1.3	1.3	1.1	1.3	1.3	1.2	1.3
228		1.3	-0.1	2.5	0.7	1.7	0.8	1.3	1.2	1.3	1.2	1.3	1.1	1.3	1.2	1.2	1.3
240	10	1.4	0.1	2.5	0.9	1.7	0.9	1.3	1.2	1.3	1.2	1.3	1.1	1.3	1.2	1.2	1.3
252		1.4	0.4	2.3	0.9	1.7	1.0	1.3	1.2	1.3	1.2	1.3	1.1	1.3	1.3	1.2	1.3
264	11	1.4	-0.2	2.4	0.7	1.7	0.8	1.3	1.3	1.4	1.3	1.4	1.2	1.3	1.3	1.3	1.4
276		1.4	0.3	2.3	0.9	1.6	1.0	1.3	1.3	1.4	1.3	1.4	1.3	1.4	1.4	1.3	1.4
288	12	1.4	0.0	2.1	0.8	1.5	0.8	1.2	1.2	1.3	1.3	1.3	1.2	1.3	1.3	1.2	1.4
300		1.4	0.2	2.5	0.9	1.6	1.0	1.3	1.2	1.3	1.2	1.3	1.2	1.3	1.3	1.2	1.3
312	13	1.4	0.1	2.2	1.0	1.5	1.0	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
324		1.2	0.1	2.2	0.9	1.4	1.0	1.4	1.3	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.5
336	14	1.1	0.3	2.3	0.9	1.3	1.0	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5
348		1.0	0.1	2.3	0.8	1.2	0.9	1.2	1.1	1.3	1.3	1.3	1.2	1.3	1.3	1.2	1.3
360	15	1.1	0.2	2.7	0.9	1.5	1.1	1.3	1.2	1.3	1.4	1.4	1.4	1.3	1.4	1.3	1.4
372		1.0	0.1	2.6	0.8	1.4	1.0	1.3	1.2	1.3	1.5	1.5	1.4	1.3	1.4	1.4	1.5
384	16	1.3	-0.1	2.4	0.7	1.6	0.9	1.3	1.3	1.4	1.3	1.4	1.2	1.3	1.3	1.3	1.4
396		1.4	0.3	2.3	0.9	1.5	1.0	1.3	1.3	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.4
408	17	1.0	0.3	2.1	0.8	1.4	0.9	1.2	1.2	1.3	1.2	1.3	1.1	1.2	1.2	1.2	1.3
420		1.1	0.3	2.2	0.8	1.4	1.0	1.2	1.2	1.3	1.2	1.2	1.1	1.2	1.1	1.1	1.3
432	18	1.2	0.2	2.5	0.9	1.6	1.0	1.2	1.2	1.3	1.2	1.2	1.1	1.3	1.2	1.2	1.2
444		1.2	0.0	2.5	0.8	1.7	0.9	1.3	1.2	1.3	1.2	1.2	1.1	1.3	1.2	1.2	1.3
456	19	1.3	0.2	2.4	0.8	1.6	1.0	1.3	1.2	1.3	1.2	1.3	1.1	1.3	1.2	1.2	1.3
468		1.3	-0.1	2.4	0.7	1.6	0.8	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.2	1.3
480	20	1.4	0.3	2.3	0.9	1.6	1.0	1.3	1.3	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.4
Average over trial period		1.2	0.2	2.4	0.9	1.5	1.0	1.3	1.2	1.3	1.3	1.3	1.2	1.3	1.3	1.3	1.4
± standard deviation		0.3	0.5	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.3 ±0.1											
Average of Air temperatures						1.2 ±0.3											

Table 3.20: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.3	0.1	2.2	1.5	1.9	0.6	1.3	1.3	1.4	1.2	1.4	1.4	1.3	1.3	1.2	1.0
24	1	1.3	0.0	1.9	1.3	1.7	0.4	1.2	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1
36		1.2	-0.2	1.8	1.2	1.7	0.3	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
48	2	1.2	-0.1	1.8	1.3	1.8	0.4	1.1	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1
60		1.3	-0.1	2.1	1.5	2.3	0.4	1.1	1.3	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0
72	3	1.3	0.0	2.2	1.7	2.4	0.5	1.2	1.3	1.3	1.2	1.3	1.3	1.2	1.2	1.1	1.0
84		1.4	0.1	2.1	1.6	2.4	0.6	1.2	1.3	1.3	1.2	1.3	1.3	1.2	1.2	1.2	1.1
96	4	1.4	0.1	2.2	1.7	2.4	0.7	1.3	1.3	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.1
108		1.3	0.1	2.0	1.7	2.2	0.6	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.2
120	5	1.3	0.0	1.9	1.7	2.3	0.5	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.1
132		1.3	0.3	2.2	1.8	2.3	0.7	1.2	1.3	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.1
144	6	1.5	0.2	2.1	1.8	2.2	0.7	1.4	1.4	1.4	1.4	1.3	1.4	1.3	1.3	1.3	1.3
156		1.4	0.2	1.9	1.6	2.0	0.7	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3
168	7	1.3	-0.1	2.0	1.4	1.9	0.5	1.4	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3
180		1.1	-0.1	1.8	1.3	1.8	0.4	1.3	1.3	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.3
192	8	1.1	-0.2	2.2	1.4	2.3	0.4	1.3	1.4	1.2	1.3	1.2	1.3	1.3	1.2	1.2	1.3
204		0.9	-0.3	2.1	1.3	2.2	0.3	1.4	1.4	1.2	1.4	1.2	1.3	1.3	1.2	1.3	1.3
216	9	1.3	0.1	2.0	1.7	2.3	0.6	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.3
228		1.3	0.3	2.2	1.8	2.3	0.7	1.2	1.3	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.1
240	10	1.5	0.2	2.1	1.8	2.2	0.7	1.4	1.4	1.4	1.4	1.3	1.4	1.3	1.3	1.3	1.3
252		1.4	0.2	1.9	1.6	2.0	0.7	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3
264	11	1.3	-0.1	2.0	1.4	1.9	0.5	1.4	1.3	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3
276		1.1	-0.1	1.8	1.3	1.8	0.4	1.3	1.3	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.3
288	12	1.1	-0.2	2.2	1.4	2.3	0.4	1.3	1.4	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.3
300		0.9	-0.3	2.1	1.3	2.2	0.3	1.4	1.4	1.2	1.4	1.2	1.3	1.3	1.2	1.3	1.3
312	13	1.3	0.1	2.0	1.7	2.3	0.6	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.2
324		1.3	0.3	2.2	1.8	2.3	0.7	1.2	1.3	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.1
336	14	1.5	0.2	2.1	1.8	2.2	0.7	1.4	1.4	1.4	1.4	1.3	1.4	1.3	1.3	1.3	1.3
348		1.4	0.2	1.9	1.6	2.0	0.7	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3
360	15	1.3	-0.1	2.0	1.4	1.9	0.5	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.3	1.3
372		1.1	-0.1	1.8	1.3	1.8	0.4	1.3	1.4	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.3
384	16	1.1	-0.2	2.2	1.4	2.3	0.4	1.3	1.4	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.3
396		0.9	-0.3	2.1	1.3	2.2	0.3	1.4	1.4	1.2	1.4	1.2	1.3	1.3	1.2	1.3	1.3
408	17	1.1	-0.1	1.8	1.2	1.7	0.3	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
420		1.1	-0.2	1.8	1.3	1.7	0.4	1.1	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1
432	18	1.2	0.0	2.0	1.4	2.1	0.4	1.1	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.0
444		1.2	-0.1	2.2	1.6	2.3	0.5	1.1	1.2	1.2	1.1	1.3	1.2	1.1	1.1	1.1	1.0
456	19	1.3	0.0	2.1	1.6	2.4	0.6	1.2	1.3	1.3	1.2	1.3	1.3	1.2	1.2	1.2	1.0
468		1.4	0.2	2.2	1.7	2.4	0.7	1.3	1.3	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.1
480	20	1.4	0.3	2.1	1.7	2.3	0.7	1.3	1.3	1.3	1.2	1.3	1.3	1.3	1.2	1.3	1.1
Average over trial period		1.3	0.0	2.0	1.5	2.1	0.5	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2
± standard deviation		0.3	0.6	0.2	0.4	0.4	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							1.3 ±0.1										
Average of Air temperatures							1.2 ±0.4										

Table 3.21: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.6	0.2	1.4	1.8	1.7	1.2	1.3	1.4	1.1	1.4	1.4	1.2	1.4	1.4	1.3	1.3
24	1	1.3	0.5	0.9	1.6	1.5	1.2	1.3	1.4	1.1	1.3	1.3	1.1	1.3	1.4	1.3	1.2
36		1.2	0.4	0.7	1.6	1.4	1.1	1.2	1.3	1.0	1.3	1.2	1.1	1.2	1.3	1.2	1.2
48	2	1.3	0.5	0.8	1.7	1.5	1.2	1.2	1.3	1.0	1.2	1.2	1.1	1.2	1.3	1.2	1.2
60		1.8	0.5	1.8	1.8	1.9	1.4	1.2	1.4	1.1	1.2	1.2	1.1	1.2	1.3	1.2	1.2
72	3	1.7	0.5	2.0	1.8	2.1	1.5	1.3	1.4	1.1	1.3	1.3	1.1	1.2	1.3	1.2	1.3
84		1.6	0.4	1.9	1.7	1.9	1.2	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
96	4	1.6	0.4	2.0	1.7	1.9	1.4	1.3	1.5	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
108		1.6	0.4	1.6	1.7	1.6	1.2	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
120	5	1.7	0.5	2.0	1.8	1.7	1.4	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
132		1.7	0.3	1.9	1.8	1.8	1.4	1.3	1.5	1.2	1.3	1.3	1.2	1.3	1.4	1.3	1.3
144	6	1.6	0.4	1.6	1.7	1.6	1.4	1.3	1.5	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
156		1.4	0.4	1.1	1.6	1.4	1.1	1.2	1.4	1.1	1.3	1.3	1.2	1.2	1.3	1.2	1.3
168	7	1.5	0.3	1.0	1.6	1.4	1.2	1.1	1.4	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.3
180		1.5	0.2	1.1	1.6	1.4	1.2	1.1	1.3	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
192	8	2.1	0.4	1.9	1.8	2.1	1.4	1.1	1.4	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
204		2.1	0.3	1.9	1.7	2.1	1.2	1.1	1.3	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
216	9	1.7	0.4	1.4	1.8	1.8	1.3	1.1	1.3	1.0	1.2	1.2	1.1	1.1	1.2	1.1	1.2
228		1.8	0.5	1.8	1.8	1.9	1.4	1.2	1.4	1.1	1.2	1.2	1.1	1.2	1.3	1.2	1.2
240	10	1.7	0.5	2.0	1.8	2.1	1.5	1.3	1.4	1.1	1.3	1.3	1.1	1.2	1.3	1.2	1.3
252		1.6	0.4	1.9	1.7	1.9	1.2	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
264	11	1.6	0.4	2.0	1.7	1.9	1.4	1.3	1.5	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
276		1.6	0.4	1.6	1.7	1.6	1.2	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
288	12	1.7	0.5	2.0	1.8	1.7	1.4	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
300		1.7	0.3	1.9	1.8	1.8	1.4	1.3	1.5	1.2	1.3	1.3	1.2	1.3	1.4	1.3	1.3
312	13	1.6	0.4	1.6	1.7	1.6	1.4	1.3	1.5	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
324		1.4	0.4	1.1	1.6	1.4	1.1	1.2	1.4	1.1	1.3	1.3	1.2	1.2	1.3	1.2	1.3
336	14	1.5	0.3	1.0	1.6	1.4	1.2	1.1	1.4	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.3
348		1.5	0.2	1.1	1.6	1.4	1.2	1.1	1.3	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
360	15	2.1	0.4	1.9	1.8	2.1	1.4	1.1	1.4	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
372		2.1	0.3	1.9	1.7	2.1	1.2	1.1	1.3	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
384	16	1.6	0.4	1.3	1.7	1.6	1.3	1.1	1.3	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
396		1.5	0.4	1.0	1.6	1.4	1.2	1.1	1.3	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2
408	17	1.3	0.5	0.8	1.6	1.5	1.2	1.2	1.3	1.0	1.2	1.2	1.1	1.2	1.3	1.2	1.2
420		1.1	0.4	0.6	1.6	1.4	1.1	1.2	1.3	1.0	1.2	1.2	1.1	1.2	1.3	1.2	1.2
432	18	1.5	0.4	1.6	1.7	1.7	1.3	1.2	1.3	1.0	1.2	1.2	1.1	1.2	1.3	1.2	1.2
444		1.6	0.4	2.0	1.7	2.0	1.4	1.2	1.4	1.1	1.3	1.3	1.1	1.2	1.3	1.2	1.3
456	19	1.6	0.5	2.0	1.7	1.9	1.3	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
468		1.6	0.5	2.0	1.7	1.9	1.3	1.3	1.5	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
480	20	1.5	0.4	1.6	1.7	1.7	1.3	1.3	1.4	1.1	1.3	1.3	1.2	1.3	1.4	1.3	1.3
Average over trial period		1.6	0.4	1.5	1.7	1.7	1.3	1.2	1.4	1.1	1.3	1.3	1.1	1.2	1.3	1.2	1.3
± standard deviation		0.7	0.3	0.9	0.3	0.6	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ±0.1											
Average of Air temperatures						1.4 ±0.6											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.22 – 3.24 show that complete mortality was achieved in all stages after 12 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.22: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Snow King Peaches** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 2nd February 2007 – 22nd February 2007

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	833	853	986	870				
1	600	591	686	845	682	29.1	19.6	14.3	21.6
2	600	321	401	511	459	61.5	53.0	48.2	47.2
3	600	239	248	322	277	71.3	70.9	67.3	68.2
4	600	182	177	265	172	78.2	79.2	73.1	80.2
5	600	82	96	173	133	90.2	88.7	82.5	84.7
6	600	44	47	91	48	94.7	94.5	90.8	94.5
7	600	7	1	45	9	99.2	99.9	95.4	99.0
8	600	1	9	17	1	99.9	98.9	98.3	99.9
9	600	0	1	12	0	100.0	99.9	98.8	100.0
10	600	0	0	2	0	100.0	100.0	99.8	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.23 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Snow King Peaches** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 2nd February 2007 – 22nd February 2007

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	979	923	1053	914				
1	600	773	741	818	731	21.0	19.7	22.3	20.0
2	600	460	394	415	460	53.0	57.3	60.6	49.7
3	600	330	345	322	327	66.3	62.6	69.4	64.2
4	600	215	157	226	153	78.0	83.0	78.5	83.3
5	600	84	69	99	96	91.4	92.5	90.6	89.5
6	600	11	14	24	20	98.9	98.5	97.7	97.8
7	600	0	5	12	6	100.0	99.5	98.9	99.3
8	600	1	4	6	1	99.9	99.6	99.4	99.9
9	600	0	2	5	0	100.0	99.8	99.5	100.0
10	600	0	1	2	0	100.0	99.9	99.8	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.24 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Snow King Peaches** (600g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 2nd February 2007 – 22nd February 2007

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1046	1017	862	927				
1	600	809	738	716	752	22.7	27.4	16.9	18.9
2	600	462	436	464	507	55.8	57.1	46.2	45.3
3	600	241	234	292	299	77.0	77.0	66.1	67.7
4	600	170	180	216	232	83.7	82.3	74.9	75.0
5	600	49	67	132	109	95.3	93.4	84.7	88.2
6	600	7	46	86	40	99.3	95.5	90.0	95.7
7	600	4	17	55	5	99.6	98.3	93.6	99.5
8	600	2	9	23	2	99.8	99.1	97.3	99.8
9	600	0	4	11	0	100.0	99.6	98.7	100.0
10	600	0	0	4	0	100.0	100.0	99.5	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

3.5.4 Peaches – Zee Lady

Life history data

The life history data (table 3.25) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.25: **Zee Lady Peaches** : Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	3/11/2007	100	0	0	0	100	eggs
1	4/11/2007	100	0	0	0	100	eggs
2	5/11/2007	100	0	0	0	100	eggs
3	6/11/2007	19	81	0	0	100	1st
4	7/11/2007	9	86	5	0	100	1st
5	8/11/2007	0	33	67	0	100	2nd
6	9/11/2007	0	20	64	16	100	2nd
7	10/11/2007	0	6	37	57	100	3rd
8	11/11/2007	0	2	17	81	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.26. Cold treatment records are given in tables 3.27- 3.29. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.30 – 3.32

Table 3.26 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $1.0 \pm 0.5^\circ\text{C}$. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Zee Lady		30.11.2007	30.11.2007		20.12.2007			29.11.2007
	1	07:15 am	15:15 pm	8.0	15:15 pm	# 3	KS0606016	13:38 pm
	2	07:47 am	15:47 pm	8.0	15:47 pm	# 4	KS0547009	14:43 pm
	3	08:18 am	16:18 pm	8.0	16:18 pm	# 5	KS0606017	15:11 pm

Table 3.27: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.3	0.5	0.9	0.7	1.2	0.8	1.3	1.1	1.2	1.0	1.1	1.1	1.3	1.1	1.1	1.1
24	1	1.9	0.6	1.8	1.2	1.5	1.4	1.2	1.1	1.2	1.0	1.0	1.1	1.2	1.0	0.9	1.0
36		1.6	0.6	1.1	0.9	1.3	1.0	1.2	1.1	1.1	1.0	1.0	1.1	1.2	1.0	0.9	1.0
48	2	2.0	0.6	2.0	1.4	1.5	1.6	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
60		1.6	0.7	1.1	1.0	1.4	1.0	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
72	3	2.1	0.6	2.1	1.4	1.6	1.6	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
84		1.7	0.6	1.2	1.0	1.4	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
96	4	2.3	0.6	2.5	1.3	1.6	1.8	1.1	1.1	1.1	1.0	1.0	1.1	1.2	1.0	0.9	1.0
108		1.6	0.6	1.1	0.9	1.4	1.0	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.0	0.9	1.1
120	5	1.9	0.6	1.5	1.0	1.5	1.3	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
132		1.8	0.7	1.4	1.0	1.5	1.2	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.0	0.9	1.1
144	6	2.6	0.7	3.0	1.6	1.7	2.1	1.0	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
156		1.9	0.6	1.6	1.2	1.5	1.3	1.1	1.0	1.0	1.0	1.0	1.1	1.2	1.0	0.9	1.1
168	7	2.0	0.7	1.7	1.2	1.5	1.3	1.1	1.0	1.0	1.0	1.1	1.0	1.2	0.9	0.9	1.0
180		1.9	0.7	1.5	1.2	1.4	1.3	1.0	1.0	1.0	1.0	1.1	1.0	1.2	1.0	0.9	1.0
192	8	2.3	0.7	2.4	1.6	1.7	1.7	1.0	1.1	0.9	1.0	1.1	1.0	1.2	0.9	0.9	1.0
204		1.8	0.6	1.4	1.0	1.4	1.2	1.1	1.1	1.0	1.0	1.1	1.0	1.2	1.0	0.9	1.0
216	9	1.8	0.6	1.4	1.1	1.5	1.2	1.0	1.0	0.9	1.0	1.0	1.0	1.1	0.9	0.9	1.1
228		1.6	0.7	1.0	1.0	1.3	1.0	1.1	1.0	0.9	1.0	1.1	1.0	1.2	0.9	0.9	1.0
240	10	1.9	0.6	1.6	1.1	1.5	1.3	1.0	1.0	1.0	1.0	1.1	1.0	1.2	1.0	0.9	1.0
252		1.6	0.7	1.0	1.0	1.3	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.2	1.0	0.9	1.0
264	11	2.1	0.6	2.0	1.5	1.6	1.6	1.0	1.1	1.0	1.1	1.0	1.0	1.2	1.0	0.9	1.1
276		1.6	0.7	1.1	1.0	1.4	1.1	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.0	0.9	1.1
288	12	1.9	0.6	1.8	1.3	1.5	1.4	1.0	1.0	0.9	1.1	1.1	1.0	1.2	0.9	0.9	1.1
300		1.5	0.7	0.9	0.8	1.3	0.9	1.1	1.0	1.0	1.0	1.1	1.0	1.2	1.1	0.9	1.1
312	13	2.1	0.6	2.0	1.0	1.6	1.6	1.1	1.1	0.9	1.0	1.1	1.0	1.2	1.1	1.1	1.2
324		1.5	0.6	1.0	0.8	1.3	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.2	1.2	1.1	1.1
336	14	2.2	0.7	2.4	1.2	1.6	1.8	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.1	1.1	1.0
348		1.7	0.7	1.2	0.9	1.4	1.1	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.2	1.1	1.0
360	15	2.6	0.7	3.0	1.4	1.7	2.1	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.1	1.1	1.0
372		2.0	0.6	1.6	1.0	1.5	1.4	1.0	1.1	1.0	1.1	1.1	1.0	1.2	1.2	1.1	1.1
384	16	2.7	0.7	2.9	1.4	1.8	2.1	1.1	1.1	1.0	1.1	1.0	1.0	1.2	1.1	1.1	1.1
396		1.6	0.6	1.0	0.9	1.3	0.9	1.1	1.1	1.1	1.0	1.0	1.1	1.2	1.1	1.0	1.1
408	17	1.9	0.7	1.3	0.9	1.4	1.3	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.0	0.9	1.0
420		1.4	0.6	1.9	1.3	1.5	1.5	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
432	18	2.3	0.6	1.3	1.0	1.4	1.2	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
444		1.5	0.6	2.0	1.4	1.5	1.6	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1	0.9	1.0
456	19	2.0	0.6	1.4	1.1	1.4	1.4	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.0	0.9	1.0
468		1.4	0.7	2.4	1.3	1.7	1.9	1.0	1.1	1.1	1.0	1.0	1.1	1.2	1.0	0.9	1.0
480	20	2.2	0.6	1.2	0.9	1.4	1.2	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.0	0.9	1.1
Average over trial period		1.9	0.6	1.6	1.1	1.5	1.4	1.1	1.1	1.1	1.0	1.0	1.1	1.2	1.1	1.0	1.1
± standard deviation		0.5	0.2	0.8	0.3	0.2	0.6	0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.2
Average of Fruit temperatures						1.1 ±0.2											
Average of Air temperatures						1.4 ±0.4											

Table 3.28: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.0	0.7	1.8	1.2	2.0	1.1	1.2	1.4	1.4	1.2	1.3	1.4	1.5	1.3	1.5	1.4
24	1	1.3	0.7	2.1	1.8	3.0	1.0	1.1	1.3	1.3	1.2	1.2	1.3	1.2	1.2	1.3	1.3
36		1.2	0.7	2.0	1.4	2.4	1.1	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.2	1.3	1.2
48	2	1.3	0.7	2.0	1.6	2.6	1.1	1.0	1.2	1.2	1.1	1.0	1.2	1.1	1.1	1.2	1.1
60		1.0	0.6	1.7	1.1	1.8	1.0	1.0	1.1	1.1	1.0	1.0	1.2	1.1	1.1	1.2	1.1
72	3	1.2	0.6	2.0	1.7	2.8	1.0	1.0	1.1	1.1	1.0	0.9	1.2	1.0	1.0	1.2	1.1
84		1.0	0.6	1.7	1.2	1.9	1.0	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
96	4	1.3	0.7	2.1	1.7	2.9	1.0	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.1	1.0
108		1.1	0.8	1.9	1.3	2.1	1.2	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
120	5	1.4	0.6	2.2	1.8	3.1	1.0	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.1	1.0
132		1.1	0.6	1.9	1.3	2.3	1.0	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
144	6	1.4	0.7	2.2	1.8	3.2	1.0	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
156		1.1	0.7	2.0	1.4	2.4	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
168	7	1.3	0.7	2.5	1.6	2.7	1.2	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
180		1.2	0.6	1.9	1.3	2.2	1.1	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
192	8	1.3	0.7	2.1	1.7	2.9	1.0	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
204		0.9	0.6	1.7	1.1	1.8	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
216	9	1.4	0.6	2.2	1.8	3.3	0.9	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.1	1.0
228		1.1	0.6	2.0	1.4	2.4	1.0	1.0	1.1	1.0	1.0	0.9	1.2	1.0	0.9	1.2	1.0
240	10	1.2	0.7	2.1	1.6	2.7	1.1	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
252		1.1	0.7	1.9	1.3	2.1	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
264	11	1.3	0.6	2.1	1.7	3.0	1.0	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
276		1.2	0.7	2.0	1.4	2.4	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
288	12	1.4	0.7	2.2	1.8	3.1	1.0	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
300		1.0	0.6	1.8	1.2	2.0	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
312	13	1.4	0.7	2.2	1.8	3.2	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
324		1.2	0.7	2.0	1.5	2.5	1.1	1.0	1.1	1.0	1.0	0.9	1.2	1.0	0.9	1.2	1.0
336	14	1.5	0.8	2.3	2.0	3.3	1.1	1.0	1.0	1.0	1.0	0.9	1.2	1.0	0.9	1.2	1.0
348		1.3	0.6	2.1	1.5	2.7	1.0	1.0	1.1	1.0	1.0	0.9	1.2	1.0	0.9	1.2	1.0
360	15	1.4	0.7	2.3	1.7	3.0	1.1	1.0	1.1	0.9	1.0	0.9	1.2	1.0	0.9	1.2	1.0
372		1.2	0.7	2.1	1.5	2.6	1.1	0.9	1.1	0.9	1.0	0.9	1.2	1.0	0.9	1.2	1.0
384	16	1.4	0.7	2.3	1.8	3.1	1.1	1.0	1.1	0.9	1.0	0.9	1.2	1.0	0.9	1.2	1.0
396		1.0	0.5	2.0	1.5	2.5	0.9	1.0	1.1	0.9	1.1	0.9	1.2	1.0	0.9	1.2	1.0
408	17	0.6	0.5	1.6	1.2	1.9	0.8	1.1	1.1	0.9	1.1	1.1	1.2	1.0	0.9	1.2	1.0
420		0.6	0.3	1.6	1.3	2.2	0.7	1.0	1.1	0.9	1.1	1.0	1.2	1.0	0.9	1.2	1.0
432	18	0.2	0.1	1.2	0.8	1.3	0.5	1.0	1.1	1.0	1.0	1.0	1.3	1.0	0.9	1.2	1.0
444		0.6	0.3	1.5	1.4	2.4	0.6	1.0	1.1	1.1	1.0	0.9	1.2	1.0	0.9	1.2	1.0
456	19	0.4	0.3	1.3	0.9	1.5	0.7	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
468		0.7	0.3	1.7	1.4	2.5	0.6	0.9	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.1	1.0
480	20	0.4	0.3	1.4	1.0	1.6	0.7	1.0	1.1	1.0	1.0	0.9	1.2	1.0	1.0	1.2	1.0
Average over trial period		1.1	0.6	2.0	1.5	2.5	1.0	1.0	1.1	1.0	1.0	1.0	1.2	1.0	1.0	1.2	1.1
± standard deviation		1.5	0.8	1.0	0.7	1.1	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ±0.1											
Average of Air temperatures						1.4 ±1.0											

Table 3.29: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.2	0.8	1.0	1.1	2.7	1.6	1.4	1.3	1.2	1.2	1.3	1.3	1.6	1.5	1.3	1.3
24	1	1.4	0.4	2.8	0.9	3.2	2.5	1.2	1.3	1.2	1.3	1.2	1.2	1.3	1.3	1.3	1.2
36		1.2	0.8	1.5	1.1	3.0	1.8	1.2	1.2	1.3	1.3	1.2	1.2	1.3	1.2	1.4	1.1
48	2	1.3	0.7	2.2	1.1	3.1	2.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2	1.2	1.4	1.1
60		1.2	0.9	0.8	1.1	2.5	1.5	1.2	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.4	1.2
72	3	1.4	0.7	2.6	1.1	3.0	2.5	1.2	1.3	1.3	1.4	1.2	1.2	1.1	1.2	1.4	1.2
84		1.2	1.0	1.0	1.2	2.6	1.6	1.2	1.3	1.2	1.3	1.2	1.2	1.2	1.2	1.4	1.2
96	4	1.4	0.6	2.6	1.0	3.3	2.3	1.2	1.2	1.2	1.3	1.2	1.2	1.1	1.2	1.4	1.2
108		1.2	0.8	1.1	1.1	2.7	1.6	1.2	1.2	1.2	1.3	1.1	1.1	1.1	1.2	1.3	1.2
120	5	1.5	0.6	3.1	1.1	3.4	2.6	1.3	1.2	1.2	1.3	1.2	1.1	1.2	1.1	1.3	1.1
132		1.3	0.8	1.5	1.1	2.9	1.8	1.2	1.2	1.1	1.2	1.1	1.1	1.2	1.1	1.3	1.1
144	6	1.4	0.4	3.0	0.9	3.5	2.5	1.3	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.3	1.2
156		1.3	0.8	1.6	1.1	3.0	1.9	1.3	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.3	1.1
168	7	1.3	0.6	2.3	1.0	3.2	2.2	1.3	1.1	1.1	1.3	1.1	1.1	1.1	1.1	1.3	1.1
180		1.3	1.0	1.4	1.3	2.9	1.8	1.3	1.2	1.1	1.3	1.1	1.1	1.1	1.1	1.3	1.2
192	8	1.3	0.6	2.6	1.0	3.3	2.3	1.3	1.2	1.1	1.3	1.2	1.1	1.1	1.1	1.3	1.1
204		1.2	1.0	0.8	1.2	2.5	1.5	1.3	1.2	1.1	1.3	1.1	1.1	1.1	1.2	1.3	1.2
216	9	1.5	0.4	3.5	0.9	3.5	2.6	1.3	1.2	1.2	1.3	1.2	1.1	1.1	1.1	1.3	1.1
228		1.2	0.7	1.8	1.1	3.1	1.9	1.3	1.1	1.1	1.2	1.0	1.1	1.2	1.1	1.3	1.0
240	10	1.3	0.5	2.5	1.0	3.3	2.2	1.3	1.1	1.1	1.3	1.1	1.1	1.2	1.1	1.3	1.1
252		1.2	0.8	1.3	1.1	2.8	1.7	1.3	1.2	1.1	1.3	1.1	1.1	1.2	1.1	1.3	1.1
264	11	1.4	0.4	2.9	0.9	3.5	2.4	1.3	1.2	1.1	1.3	1.1	1.1	1.1	1.1	1.3	1.1
276		1.3	0.6	1.8	1.0	3.1	1.8	1.2	1.2	1.1	1.2	1.1	1.1	1.2	1.1	1.3	1.1
288	12	1.5	0.6	3.0	1.0	3.6	2.4	1.3	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.3	1.1
300		1.2	0.8	1.1	1.1	2.7	1.6	1.3	1.1	1.1	1.2	1.1	1.1	1.2	1.1	1.3	1.1
312	13	1.5	0.4	3.2	0.9	3.5	2.5	1.3	1.2	1.1	1.3	1.1	1.1	1.1	1.1	1.3	1.2
324		1.4	0.8	1.9	1.2	3.2	2.0	1.3	1.1	1.1	1.2	1.0	1.1	1.2	1.1	1.3	1.1
336	14	1.5	0.4	3.2	0.9	3.8	2.6	1.3	1.1	1.0	1.2	1.0	1.0	1.1	1.0	1.2	1.1
348		1.5	0.8	2.2	1.2	3.4	2.1	1.2	1.0	1.0	1.1	1.0	1.0	1.1	1.0	1.2	1.1
360	15	1.4	0.5	2.8	1.0	3.6	2.3	1.2	1.1	1.0	1.2	1.0	1.0	1.1	1.0	1.2	1.1
372		1.2	0.4	2.1	0.8	3.2	1.9	1.2	1.1	1.0	1.2	1.0	1.1	1.1	1.0	1.2	1.0
384	16	1.5	0.7	2.9	1.2	3.7	2.5	1.2	1.1	1.0	1.2	1.0	1.1	1.1	1.0	1.2	1.1
396		0.9	0.5	2.0	0.9	3.2	1.9	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.3	1.1
408	17	0.5	0.3	1.2	0.7	2.8	1.4	1.1	1.3	1.2	1.3	1.2	1.2	1.2	1.2	1.4	1.1
420		0.7	0.4	1.9	0.7	3.0	1.8	1.2	1.2	1.3	1.3	1.2	1.2	1.1	1.2	1.4	1.1
432	18	0.4	0.7	0.4	0.9	2.3	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2	1.2	1.4	1.2
444		0.6	0.2	2.2	0.6	2.8	1.9	1.2	1.3	1.3	1.4	1.2	1.2	1.1	1.2	1.4	1.2
456	19	0.5	0.6	0.7	0.9	2.4	1.3	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.4	1.2
468		0.7	0.2	2.3	0.6	3.2	1.9	1.2	1.2	1.2	1.3	1.2	1.1	1.1	1.2	1.4	1.2
480	20	0.5	0.5	0.8	0.8	2.5	1.3	1.2	1.2	1.2	1.3	1.1	1.1	1.1	1.2	1.3	1.1
Average over trial period		1.2	0.6	2.0	1.0	3.1	2.0	1.3	1.2	1.2	1.3	1.1	1.1	1.2	1.1	1.3	1.1
± standard deviation		1.5	0.7	1.2	0.7	0.6	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ±0.1											
Average of Air temperatures						1.6 ±0.9											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.30 – 3.32 show that complete mortality was achieved in all stages after 12 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.30: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Zee Lady Peaches** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 30th November – 20th December 2007

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1029	1103	1128	915				
1	600	785	958	1013	629	23.7	13.1	10.2	31.3
2	600	607	522	794	447	41.0	52.7	29.6	51.1
3	600	380	365	632	280	63.1	66.9	44.0	69.4
4	600	187	201	436	170	81.8	81.8	61.3	81.4
5	600	45	131	262	115	95.6	88.1	76.8	87.4
6	600	22	53	257	32	97.9	95.2	77.2	96.5
7	600	3	9	81	18	99.7	99.2	92.8	98.0
8	600	1	4	30	9	99.9	99.6	97.3	99.0
9	600	0	3	11	2	100.0	99.7	99.0	99.8
10	600	0	3	2	0	100.0	99.7	99.8	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.31 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Zee Lady Peaches** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 30th November – 20th December 2007

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1003	1033	1023	919				
1	600	737	775	880	624	26.5	25.0	14.0	32.1
2	600	580	641	611	503	42.2	37.9	40.3	45.3
3	600	439	314	460	253	56.2	69.6	55.0	72.5
4	600	242	211	202	118	75.9	79.6	80.3	87.2
5	600	80	115	106	70	92.0	88.9	89.6	92.4
6	600	29	46	45	26	97.1	95.5	95.6	97.2
7	600	9	8	16	9	99.1	99.2	98.4	99.0
8	600	0	4	9	2	100.0	99.6	99.1	99.8
9	600	0	3	3	0	100.0	99.7	99.7	100.0
10	600	0	0	1	0	100.0	100.0	99.9	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.32 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Zee Lady Peaches** (600g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 30th November – 20th December 2007

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1002	1005	1115	918				
1	600	914	872	1048	739	8.8	13.2	6.0	19.5
2	600	663	547	813	460	33.8	45.6	27.1	49.9
3	600	473	343	669	273	52.8	65.9	40.0	70.3
4	600	254	167	467	147	74.7	83.4	58.1	84.0
5	600	115	112	332	118	88.5	88.9	70.2	87.1
6	600	44	59	235	32	95.6	94.1	78.9	96.5
7	600	10	24	139	17	99.0	97.6	87.5	98.1
8	600	1	9	30	1	99.9	99.1	97.3	99.9
9	600	0	2	11	0	100.0	99.8	99.0	100.0
10	600	0	0	3	0	100.0	100.0	99.7	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

3.5.5 Nectarines – Arctic Snow

Life history data

The life history data (table 3.33) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.33: **Arctic Snow Nectarines:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	4/3/2007	100	0	0	0	100	eggs
1	5/3/2007	100	0	0	0	100	eggs
2	6/3/2007	100	0	0	0	100	eggs
3	7/3/2007	8	92	0	0	100	1st
4	8/3/2007	0	76	24	0	100	1st
5	9/3/2007	0	25	75	0	100	2nd
6	10/3/2007	0	1	91	8	100	2nd
7	11/3/2007	0	0	29	71	100	3rd
8	12/3/2007	0	0	11	89	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.34. Cold treatment records are given in tables 3.35- 3.37. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.38 – 3.40

Table 3.34 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $1.0 \pm 0.5^\circ\text{C}$. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / Arctic Snow		28.03.2007	28.03.2007		17.04.2007			27.03.2007
	1	08:35 am	16:35 pm	8.0	16:35 pm	# 3	KS0606016	15:15 pm
	2	09:05 am	17:05 pm	8.0	17:05 pm	# 4	KS0547009	14:54 am
	3	09:35 am	17:35 pm	8.0	17:35 pm	# 5	KS0606017	14:57 am

Table 3.35: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		0.5	1.1	1.6	0.6	0.7	0.6	1.0	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.0	1.0
24	1	1.0	1.0	3.0	1.4	1.1	1.2	1.1	1.0	1.2	1.2	1.2	1.1	1.2	1.2	1.0	0.9
36		0.7	0.9	1.8	0.7	0.8	0.7	1.0	1.1	1.1	1.2	1.1	1.1	1.3	1.1	0.9	1.0
48	2	1.0	0.8	3.1	1.5	1.1	1.2	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.2	1.0	1.1
60		0.7	1.1	2.0	0.7	0.8	0.8	1.1	1.1	1.1	1.1	1.2	1.1	1.3	1.1	0.9	1.1
72	3	1.3	0.3	4.5	1.6	1.3	1.7	1.2	1.2	1.1	1.3	1.2	1.2	1.3	1.2	1.0	1.1
84		0.9	0.7	2.7	0.9	1.0	1.0	1.2	1.2	1.0	1.1	1.2	1.3	1.4	1.2	1.0	1.2
96	4	1.3	0.2	5.2	1.8	1.3	1.8	1.3	1.2	1.1	1.2	1.3	1.4	1.4	1.2	1.0	1.3
108		1.0	0.4	3.4	1.1	1.0	1.2	1.3	1.0	1.0	1.2	1.3	1.3	1.5	1.2	1.0	1.2
120	5	1.3	0.3	4.9	2.1	1.4	1.7	1.3	1.2	1.1	1.3	1.3	1.4	1.4	1.3	1.1	1.2
132		0.9	0.5	3.1	1.6	1.0	1.1	1.2	1.2	1.0	1.2	1.4	1.4	1.4	1.3	1.1	1.1
144	6	1.1	0.5	4.2	2.1	1.3	1.5	1.1	1.1	1.1	1.3	1.5	1.5	1.5	1.4	1.2	1.2
156		0.9	1.0	2.6	1.1	0.9	1.0	1.1	1.2	1.1	1.2	1.3	1.4	1.4	1.3	1.1	1.2
168	7	1.1	0.4	4.0	1.9	1.2	1.4	1.1	1.2	1.3	1.3	1.3	1.4	1.4	1.3	1.1	1.2
180		0.7	0.7	2.3	0.9	0.8	0.9	1.0	1.2	1.1	1.3	1.1	1.3	1.3	1.3	1.1	1.1
192	8	1.1	0.7	3.7	1.7	1.2	1.4	1.1	1.2	1.1	1.3	1.2	1.2	1.2	1.3	1.1	1.2
204		0.8	0.8	2.1	0.8	0.9	0.9	1.0	1.2	1.0	1.3	1.2	1.1	1.3	1.3	1.1	1.1
216	9	1.2	1.0	3.8	1.6	1.3	1.5	1.1	1.1	1.3	1.3	1.2	1.2	1.3	1.3	1.1	1.1
228		0.7	1.1	1.9	0.7	0.8	0.8	1.1	1.2	1.1	1.2	1.3	1.3	1.3	1.3	1.1	1.1
240	10	1.0	0.7	3.1	1.4	1.2	1.2	1.1	1.1	1.2	1.3	1.4	1.3	1.3	1.3	1.1	1.1
252		0.8	1.1	2.1	0.9	0.9	0.9	1.1	1.1	1.1	1.4	1.3	1.2	1.3	1.3	1.1	1.0
264	11	1.1	0.7	3.8	1.8	1.2	1.4	1.2	1.3	1.3	1.4	1.5	1.4	1.3	1.4	1.2	1.2
276		0.7	0.9	2.5	1.0	0.8	0.9	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.3	1.1	1.3
288	12	0.8	0.7	4.0	1.6	1.1	1.4	1.2	1.3	1.2	1.3	1.2	1.3	1.4	1.3	1.1	1.3
300		0.5	0.8	2.2	0.8	0.8	0.8	1.2	1.3	1.2	1.3	1.2	1.2	1.4	1.3	1.1	1.4
312	13	0.9	0.6	3.8	1.5	1.1	1.3	1.3	1.3	1.1	1.4	1.2	1.4	1.4	1.3	1.1	1.3
324		0.7	1.1	1.9	0.7	0.8	0.8	1.2	1.3	1.1	1.3	1.2	1.3	1.3	1.3	1.1	1.3
336	14	1.0	0.7	3.1	1.4	1.2	1.2	1.2	1.3	1.1	1.3	1.2	1.3	1.3	1.3	1.1	1.3
348		0.8	1.1	2.2	0.9	0.9	0.9	1.2	1.3	1.1	1.4	1.2	1.4	1.3	1.3	1.1	1.4
360	15	0.6	1.0	1.9	0.6	0.7	0.7	1.2	1.3	1.0	1.3	1.2	1.4	1.4	1.3	1.1	1.3
372		0.7	0.5	3.2	1.2	1.0	1.1	1.2	1.3	1.0	1.3	1.3	1.3	1.3	1.3	1.1	1.3
384	16	0.5	0.6	2.3	0.8	0.8	0.7	1.2	1.3	1.0	1.4	1.4	1.3	1.4	1.3	1.1	1.3
396		0.6	0.6	2.5	0.9	0.8	0.9	1.1	1.3	1.1	1.3	1.3	1.3	1.3	1.2	1.0	1.2
408	17	0.5	0.6	2.5	1.0	0.8	0.9	1.2	1.2	1.1	1.4	1.3	1.2	1.2	1.2	1.0	1.1
420		0.5	0.9	2.2	0.8	0.8	0.9	1.0	1.1	1.0	1.2	1.2	1.2	1.2	1.1	0.9	1.1
432	18	0.5	0.4	2.7	1.0	0.8	0.9	1.0	1.0	1.1	1.3	1.3	1.1	1.3	1.2	1.0	1.1
444		0.6	0.7	2.6	0.7	0.8	1.0	1.0	1.0	1.0	1.3	1.2	1.0	1.2	1.1	0.9	1.0
456	19	0.6	0.2	4.1	1.1	1.0	1.3	1.0	1.1	1.2	1.4	1.2	1.1	1.2	1.2	1.0	1.1
468		0.6	0.5	3.2	0.8	0.8	1.1	1.0	1.1	1.0	1.3	1.1	1.1	1.2	1.2	1.0	1.1
480	20	0.8	-0.1	4.8	1.3	1.0	1.5	1.1	1.2	1.2	1.4	1.3	1.1	1.4	1.3	1.1	1.2
Average over trial period		0.8	0.7	3.0	1.2	1.0	1.1	1.2	1.2	1.1	1.3	1.3	1.3	1.3	1.3	1.1	1.2
± standard deviation		0.9	0.8	1.2	0.8	0.5	0.6	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
Average of Fruit temperatures						1.2 ±0.2											
Average of Air temperatures						1.3 ±0.8											

Table 3.36: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.0	-0.2	1.6	1.3	2.0	0.3	1.2	1.3	1.2	1.2	1.4	1.3	1.2	1.3	1.4	1.3
24	1	1.2	-0.2	2.3	2.0	2.8	0.4	1.3	1.2	1.1	1.1	1.3	1.3	1.3	1.3	1.2	1.1
36		0.9	-0.1	1.7	1.3	2.0	0.3	1.1	1.1	1.0	1.1	1.1	1.2	1.4	1.3	1.1	1.0
48	2	1.2	-0.2	2.4	2.0	2.9	0.4	1.2	1.2	1.1	1.1	1.2	1.3	1.3	1.3	1.2	1.2
60		1.0	-0.2	1.8	1.4	2.1	0.3	1.2	1.2	1.0	1.3	1.3	1.2	1.3	1.3	1.1	1.2
72	3	1.5	-0.1	2.8	2.4	3.3	0.5	1.3	1.3	1.1	1.3	1.3	1.3	1.3	1.3	1.2	1.3
84		1.2	-0.2	2.1	1.7	2.5	0.4	1.3	1.2	0.9	1.3	1.2	1.4	1.4	1.3	1.2	1.3
96	4	1.6	-0.3	3.1	2.7	3.7	0.5	1.4	1.3	1.0	1.4	1.4	1.4	1.3	1.4	1.2	1.4
108		1.4	0.1	2.4	2.0	2.9	0.5	1.4	1.1	1.0	1.4	1.3	1.4	1.4	1.4	1.2	1.3
120	5	1.7	-0.2	3.1	2.7	3.8	0.6	1.3	1.3	1.0	1.4	1.3	1.4	1.4	1.4	1.3	1.3
132		1.3	0.0	2.2	2.1	2.8	0.5	1.2	1.2	1.1	1.3	1.3	1.3	1.1	1.3	1.3	1.2
144	6	1.5	-0.2	2.7	2.6	3.5	0.5	1.1	1.1	1.2	1.3	1.4	1.3	1.2	1.4	1.3	1.2
156		1.2	-0.1	1.9	1.7	2.4	0.4	1.0	1.1	1.0	1.2	1.2	1.3	1.1	1.3	1.2	1.2
168	7	1.5	-0.2	2.7	2.5	3.4	0.5	1.1	1.2	1.2	1.4	1.2	1.4	1.1	1.4	1.3	1.2
180		1.1	0.0	1.9	1.5	2.3	0.5	1.0	1.1	1.2	1.3	1.0	1.2	1.0	1.3	1.2	1.1
192	8	1.4	0.0	2.6	2.3	3.2	0.5	1.0	1.2	1.3	1.4	1.2	1.2	1.0	1.3	1.2	1.2
204		1.0	-0.1	1.8	1.4	2.1	0.4	1.0	1.1	1.1	1.3	1.1	1.1	1.0	1.3	1.1	1.1
216	9	1.3	-0.2	2.6	2.2	3.1	0.5	1.1	1.1	1.2	1.3	1.1	1.2	1.1	1.3	1.2	1.1
228		1.0	-0.1	1.7	1.3	2.0	0.3	1.1	1.1	1.1	1.2	1.2	1.2	1.0	1.3	1.1	1.1
240	10	1.2	-0.1	2.4	2.0	2.9	0.4	1.1	1.1	1.3	1.4	1.3	1.3	1.1	1.3	1.2	1.1
252		1.1	0.0	1.8	1.4	2.2	0.4	1.1	1.1	1.2	1.4	1.3	1.2	1.0	1.3	1.1	1.1
264	11	1.5	-0.1	2.7	2.3	3.2	0.5	1.1	1.2	1.2	1.4	1.3	1.3	1.0	1.3	1.2	1.2
276		1.2	-0.2	2.1	1.7	2.5	0.4	1.1	1.2	1.2	1.3	1.2	1.2	1.1	1.3	1.2	1.2
288	12	1.6	-0.3	3.1	2.7	3.7	0.5	1.2	1.3	1.3	1.3	1.2	1.3	1.2	1.4	1.2	1.3
300		1.4	0.1	2.4	2.0	2.9	0.5	1.2	1.2	1.3	1.3	1.2	1.3	1.2	1.4	1.2	1.4
312	13	1.7	-0.2	3.1	2.7	3.8	0.6	1.2	1.3	1.2	1.4	1.3	1.3	1.2	1.3	1.3	1.4
324		1.3	0.0	2.2	2.1	2.8	0.5	1.1	1.2	1.1	1.2	1.2	1.3	1.1	1.3	1.3	1.3
336	14	1.5	-0.2	2.7	2.6	3.5	0.5	1.1	1.2	1.2	1.3	1.2	1.4	1.0	1.4	1.3	1.4
348		1.2	-0.1	1.9	1.7	2.4	0.4	1.1	1.2	1.1	1.3	1.0	1.4	1.0	1.3	1.2	1.3
360	15	1.5	-0.2	2.7	2.5	3.4	0.5	1.3	1.4	1.2	1.3	1.2	1.4	1.1	1.4	1.3	1.4
372		1.1	0.0	1.9	1.5	2.3	0.5	1.2	1.2	1.0	1.1	1.2	1.3	1.0	1.3	1.2	1.3
384	16	1.4	0.0	2.6	2.3	3.2	0.5	1.1	1.3	1.1	1.2	1.3	1.3	1.1	1.3	1.2	1.3
396		1.2	-0.3	1.9	1.6	2.3	0.3	1.1	1.3	1.0	1.2	1.3	1.3	1.0	1.3	1.2	1.3
408	17	1.3	-0.3	2.2	1.8	2.7	0.4	1.3	1.3	1.0	1.2	1.3	1.4	1.0	1.3	1.2	1.3
420		1.2	-0.1	1.9	1.6	2.2	0.4	1.1	1.2	1.0	1.1	1.2	1.3	1.0	1.2	1.1	1.2
432	18	1.3	-0.1	2.3	1.9	2.8	0.5	1.1	1.1	1.0	1.3	1.3	1.2	1.1	1.3	1.2	1.2
444		1.2	0.0	1.9	1.6	2.3	0.4	1.1	1.0	1.0	1.2	1.2	1.1	1.0	1.2	1.1	1.1
456	19	1.6	-0.2	2.8	2.4	3.3	0.5	1.1	1.1	1.2	1.3	1.3	1.2	1.0	1.3	1.2	1.3
468		1.3	-0.2	2.2	1.9	2.7	0.4	1.1	1.1	1.0	1.2	1.2	1.2	1.0	1.3	1.2	1.2
480	20	1.7	-0.2	3.1	2.7	3.6	0.5	1.2	1.3	1.1	1.3	1.3	1.2	1.2	1.4	1.3	1.3
Average over trial period		1.3	-0.1	2.3	2.0	2.8	0.4	1.2	1.2	1.1	1.3	1.2	1.3	1.1	1.3	1.2	1.3
± standard deviation		0.4	0.4	0.6	0.7	0.8	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Average of Fruit temperatures							1.2 ±0.1										
Average of Air temperatures							1.5 ±0.5										

Table 3.37: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.6	0.6	1.6	0.8	2.0	0.1	1.3	1.2	1.2	1.1	1.0	1.0	1.1	1.0	1.0	1.0
24	1	1.7	0.7	2.2	1.2	2.5	0.3	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.1
36		1.7	0.6	1.8	0.9	2.3	0.1	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
48	2	1.9	0.7	2.5	1.3	2.8	0.3	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.1	1.0	1.1
60		1.8	0.5	2.0	1.1	2.5	0.0	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
72	3	2.0	0.6	2.7	1.4	3.0	0.3	1.1	1.3	1.1	1.1	1.1	1.1	1.0	1.2	1.1	1.1
84		1.9	0.6	2.1	1.3	2.7	0.1	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
96	4	2.1	0.8	2.9	1.6	3.1	0.5	1.2	1.3	1.1	1.1	1.1	1.1	1.0	1.2	1.1	1.1
108		2.0	0.7	2.2	1.4	2.9	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
120	5	2.3	0.8	3.1	1.8	3.4	0.4	1.2	1.3	1.2	1.1	1.1	1.1	1.1	1.2	1.1	1.1
132		2.2	0.7	2.5	1.6	3.1	0.3	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
144	6	2.3	0.7	3.1	1.8	3.4	0.4	1.2	1.3	1.2	1.1	1.1	1.1	1.1	1.2	1.1	1.2
156		1.8	0.6	2.2	1.5	2.7	0.2	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
168	7	1.9	0.7	2.4	1.5	2.7	0.4	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
180		1.7	0.6	2.0	1.2	2.5	0.2	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
192	8	1.7	0.6	2.3	1.3	2.6	0.3	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
204		1.7	0.6	1.9	1.1	2.4	0.2	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
216	9	1.8	0.7	2.4	1.3	2.7	0.3	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
228		1.7	0.6	1.9	1.2	2.4	0.2	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1
240	10	1.9	0.7	2.4	1.4	2.7	0.3	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
252		1.9	0.7	2.1	1.4	2.7	0.3	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
264	11	2.0	0.6	2.7	1.7	3.1	0.3	1.2	1.3	1.1	1.1	1.1	1.0	1.0	1.2	1.1	1.1
276		1.9	0.6	2.2	1.5	2.8	0.3	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
288	12	2.1	0.7	2.5	1.7	3.0	0.4	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
300		1.8	0.6	2.2	1.5	2.7	0.2	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
312	13	1.7	0.6	2.0	1.1	2.3	0.2	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
324		1.7	0.6	1.8	1.1	2.3	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
336	14	1.7	0.6	2.2	1.2	2.5	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
348		1.7	0.6	1.7	1.0	2.2	0.1	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1
360	15	1.8	0.7	2.4	1.3	2.6	0.3	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.1	1.0	1.1
372		1.8	0.7	2.0	1.2	2.5	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
384	16	1.9	0.7	2.5	1.5	2.9	0.4	1.2	1.3	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1
396		1.8	0.8	2.0	0.9	2.4	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
408	17	2.0	0.7	2.3	1.6	2.9	0.3	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
420		1.6	0.6	2.0	0.9	2.1	0.2	1.1	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
432	18	2.0	0.8	2.4	1.7	2.9	0.4	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
444		1.6	0.6	2.0	1.0	2.2	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
456	19	2.2	0.7	2.6	1.9	3.3	0.4	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1
468		1.8	0.6	2.3	1.3	2.6	0.2	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
480	20	2.1	0.6	2.5	1.9	3.2	0.3	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
Average over trial period		1.9	0.6	2.3	1.3	2.7	0.3	1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.1
± standard deviation		1.3	1.1	1.5	0.9	1.8	0.7	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ±0.1											
Average of Air temperatures						1.5 ±1.2											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.38 – 3.40 show that complete mortality was achieved in all stages after 12 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.38: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Arctic Snow Nectarines** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 28th March – 17th April 2007

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	900	984	993	1242				
1	600	551	794	803	896	38.8	19.3	19.1	27.9
2	600	324	519	574	646	64.0	47.3	42.2	48.0
3	600	189	343	334	374	79.0	65.1	66.4	69.9
4	600	107	227	259	226	88.1	76.9	73.9	81.8
5	600	55	132	160	152	93.9	86.6	83.9	87.8
6	600	26	81	86	39	97.1	91.8	91.3	96.9
7	600	8	43	45	4	99.1	95.6	95.5	99.7
8	600	2	22	21	1	99.8	97.8	97.9	99.9
9	600	0	4	10	0	100.0	99.6	99.0	100.0
10	600	0	0	3	0	100.0	100.0	99.7	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.39: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Arctic Snow Nectarines** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 28th March – 17th April 2007

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	814	1010	1081	1205				
1	600	603	771	898	751	25.9	23.7	16.9	37.7
2	600	351	580	672	509	56.9	42.6	37.8	57.8
3	600	271	398	476	279	66.7	60.6	56.0	76.8
4	600	128	203	302	226	84.3	79.9	72.1	81.2
5	600	39	86	184	131	95.2	91.5	83.0	89.1
6	600	8	46	52	23	99.0	95.4	95.2	98.1
7	600	4	23	37	9	99.5	97.7	96.6	99.3
8	600	1	13	23	1	99.9	98.7	97.9	99.9
9	600	0	7	8	1	100.0	99.3	99.3	99.9
10	600	0	3	6	0	100.0	99.7	99.4	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.40: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Arctic Snow Nectarines** (600g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 28th March – 17th April 2007

Exposure Period to 1.0 ± 0.5 °C (days)	Number of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1009	1045	1072	1197				
1	600	609	818	826	867	39.6	21.7	22.9	27.6
2	600	454	693	661	677	55.0	33.7	38.3	43.4
3	600	226	388	423	375	77.6	62.9	60.5	68.7
4	600	130	256	271	232	87.1	75.5	74.7	80.6
5	600	39	161	170	114	96.1	84.6	84.1	90.5
6	600	9	59	84	42	99.1	94.4	92.2	96.5
7	600	6	44	61	6	99.4	95.8	94.3	99.5
8	600	0	22	24	1	100.0	97.9	97.8	99.9
9	600	0	7	13	0	100.0	99.3	98.8	100.0
10	600	0	3	6	0	100.0	99.7	99.4	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

3.5.6 Nectarines – August Red

Life history data

The life history data (table 3.41) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.41: **August Red Nectarines:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	2/5/2008	100	0	0	0	100	eggs
1	3/5/2008	100	0	0	0	100	eggs
2	4/5/2008	100	0	0	0	100	eggs
3	5/5/2008	30	70	0	0	100	1st
4	6/5/2008	7	90	3	0	100	1st
5	7/5/2008	0	22	78	0	100	2nd
6	8/5/2008	0	0	74	26	100	2nd
7	9/5/2008	0	0	36	64	100	3rd
8	10/5/2008	0	0	17	83	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.42. Cold treatment records are given in tables 3.43- 3.45. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.46 – 3.48

Table 3.42 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at 1.0 ± 0.5 °C. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / August Red		23.05.2008	23.05.2008		12.06.2008			22.05.2008
	1	07:32 am	15:32 pm	8.0	15:32 pm	# 3	KS0606016	13:37 pm
	2	08:02 am	16:02 pm	8.0	16:02 pm	# 4	KS0547009	14:34 am
	3	08:34 am	16:34 pm	8.0	16:34 pm	# 5	KS0606017	15:20 am

Table 3.43: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		0.8	-0.1	1.5	0.2	0.7	0.9	1.3	1.3	1.3	1.1	1.5	1.4	1.2	1.3	1.3	1.5
24	1	1.4	0.0	2.4	0.7	1.0	1.5	1.1	1.2	1.0	1.0	1.3	1.3	1.0	1.1	1.2	1.3
36		1.1	0.0	1.7	0.4	0.8	1.1	1.0	1.1	1.0	1.1	1.3	1.2	1.1	1.0	1.1	1.2
48	2	1.5	0.0	2.6	0.9	1.0	1.7	0.9	1.1	1.0	1.0	1.3	1.2	1.1	0.9	1.1	1.2
60		1.1	0.1	1.7	0.5	0.9	1.1	1.0	1.1	1.1	1.2	1.3	1.2	1.1	1.0	1.1	1.3
72	3	1.6	0.0	2.7	0.9	1.1	1.7	1.1	1.1	1.0	1.2	1.4	1.2	1.1	1.0	1.1	1.2
84		1.2	0.0	1.8	0.5	0.9	1.2	1.1	1.1	1.1	1.1	1.3	1.3	1.2	1.0	1.1	1.3
96	4	1.8	0.0	3.1	0.8	1.1	1.9	1.1	1.1	1.0	1.0	1.4	1.1	1.1	1.0	1.1	1.3
108		1.1	0.0	1.7	0.4	0.9	1.1	1.1	1.0	1.0	1.1	1.3	1.1	1.2	1.0	1.1	1.2
120	5	1.4	0.0	2.1	0.5	1.0	1.4	1.2	1.1	1.0	1.1	1.2	1.0	1.1	0.9	1.1	1.0
132		1.3	0.1	2.0	0.5	1.0	1.3	1.2	1.1	1.0	1.1	1.3	1.2	1.2	0.9	1.1	1.1
144	6	2.1	0.1	3.6	1.1	1.2	2.2	1.0	1.0	1.0	1.0	1.4	1.1	1.1	0.9	1.1	1.1
156		1.4	0.0	2.2	0.7	1.0	1.4	1.0	1.1	1.0	1.0	1.3	1.1	1.1	1.0	1.1	1.1
168	7	1.5	0.1	2.3	0.7	1.0	1.4	1.0	1.2	1.1	1.1	1.2	1.1	1.1	1.0	1.1	1.1
180		1.4	0.1	2.1	0.7	0.9	1.4	1.0	1.2	1.1	1.2	1.1	1.1	1.0	1.0	1.1	1.1
192	8	1.8	0.1	3.0	1.1	1.2	1.8	1.0	1.2	1.0	1.1	1.3	1.0	0.9	1.0	1.1	1.1
204		1.3	0.0	2.0	0.5	0.9	1.3	1.0	1.2	1.0	1.2	1.2	1.0	1.0	1.1	1.1	1.1
216	9	1.3	0.0	2.0	0.6	1.0	1.3	1.1	1.2	1.1	1.2	1.1	1.0	1.0	1.0	1.1	1.0
228		1.1	0.1	1.6	0.5	0.8	1.1	1.1	1.3	1.2	1.2	1.3	1.2	1.1	1.0	1.1	1.1
240	10	1.4	0.0	2.2	0.6	1.0	1.4	1.2	1.3	1.2	1.2	1.3	1.2	1.1	1.0	1.0	1.0
252		1.1	0.1	1.6	0.5	0.8	1.1	1.2	1.3	1.1	1.0	1.3	1.2	1.1	1.0	1.0	1.0
264	11	1.6	0.0	2.6	1.0	1.1	1.7	1.1	1.3	1.0	1.0	1.4	1.2	1.0	1.0	1.0	1.1
276		1.1	0.1	1.7	0.5	0.9	1.2	1.1	1.3	1.0	1.1	1.2	1.1	1.1	1.0	1.0	1.1
288	12	1.4	0.0	2.4	0.8	1.0	1.5	1.2	1.3	1.0	1.1	1.2	1.1	1.1	1.0	1.0	1.2
300		1.0	0.1	1.5	0.3	0.8	1.0	1.2	1.3	1.0	1.2	1.1	1.1	1.2	1.0	1.0	1.2
312	13	1.6	0.0	2.6	0.5	1.1	1.7	1.2	1.3	1.0	1.1	1.2	1.1	1.1	1.0	1.0	1.1
324		1.0	0.0	1.6	0.3	0.8	1.1	1.2	1.3	1.1	1.2	1.1	1.2	1.1	1.0	1.0	1.2
336	14	1.7	0.1	3.0	0.7	1.1	1.9	1.2	1.2	1.0	1.1	1.2	1.2	1.0	1.0	1.0	1.2
348		1.2	0.1	1.8	0.4	0.9	1.2	1.1	1.2	1.0	1.2	1.1	1.1	1.1	1.0	1.0	1.2
360	15	2.1	0.1	3.6	0.9	1.2	2.2	1.2	1.2	1.0	1.0	1.2	1.2	1.0	1.0	1.0	1.2
372		1.5	0.0	2.2	0.5	1.0	1.5	1.1	1.2	1.0	1.0	1.3	1.1	1.1	1.0	1.1	1.2
384	16	2.3	0.1	3.7	1.0	1.3	2.4	1.0	1.2	0.9	1.1	1.4	1.0	1.0	1.1	1.1	1.2
396		1.6	0.0	2.5	0.7	1.0	1.7	1.1	1.2	0.9	1.1	1.4	1.0	1.0	1.1	1.1	1.1
408	17	2.2	0.1	3.1	0.9	1.2	2.0	1.2	1.3	1.0	1.0	1.4	1.2	1.1	1.1	1.1	1.2
420		1.9	0.0	2.7	0.9	1.0	1.8	1.2	1.4	1.1	1.0	1.4	1.3	1.1	1.3	1.1	1.3
432	18	1.4	0.0	1.7	0.4	0.8	1.2	1.1	1.2	1.1	1.2	1.3	1.2	1.2	1.2	1.1	1.2
444		2.1	0.1	2.9	1.0	1.1	2.0	1.1	1.2	1.1	1.2	1.4	1.1	1.1	1.1	1.1	1.2
456	19	1.6	0.0	1.8	0.5	0.9	1.3	1.1	1.1	1.1	1.2	1.3	1.0	1.1	1.1	1.1	1.2
468		2.1	0.1	3.2	0.9	1.2	2.1	1.0	1.1	1.0	1.1	1.3	1.0	1.1	1.1	1.1	1.2
480	20	1.6	0.0	1.8	0.4	0.9	1.2	1.1	1.2	1.0	1.1	1.3	0.9	1.2	1.1	1.1	1.2
Average over trial period		1.5	0.0	2.3	0.6	1.0	1.5	1.1	1.2	1.0	1.1	1.3	1.1	1.1	1.0	1.1	1.2
± standard deviation		0.7	0.2	0.8	0.3	0.2	0.6	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1
Average of Fruit temperatures						1.1 ±0.1											
Average of Air temperatures						1.2 ±0.5											

Table 3.44: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.8	0.6	1.6	0.7	1.6	0.6	1.2	1.4	1.3	1.4	1.1	1.2	1.0	1.1	1.2	1.4
24	1	2.2	0.7	2.2	0.9	2.1	0.6	1.1	1.4	1.3	1.4	1.0	1.3	1.2	1.0	1.1	1.3
36		1.8	0.6	1.7	0.7	1.7	0.5	1.0	1.3	1.2	1.3	0.9	1.3	1.3	1.1	1.0	1.3
48	2	2.2	0.6	2.3	0.8	2.2	0.4	1.0	1.2	1.3	1.4	1.0	1.2	1.3	1.1	1.0	1.4
60		1.9	0.6	1.7	0.8	1.7	0.6	1.1	1.3	1.3	1.5	1.1	1.2	1.3	1.1	1.0	1.4
72	3	2.3	0.7	2.3	0.9	2.3	0.5	1.1	1.2	1.3	1.4	1.0	1.3	1.3	1.1	1.0	1.4
84		1.9	0.6	1.8	0.8	1.8	0.6	1.1	1.2	1.3	1.3	1.0	1.3	1.3	1.1	1.0	1.4
96	4	2.4	0.7	2.5	0.9	2.4	0.6	1.2	1.2	1.2	1.3	1.1	1.3	1.3	1.1	1.1	1.4
108		1.9	0.6	1.8	0.7	1.7	0.6	1.2	1.2	1.2	1.4	1.1	1.3	1.3	1.1	1.1	1.3
120	5	2.2	0.7	2.1	0.8	2.0	0.6	1.2	1.2	1.2	1.4	1.2	1.3	1.3	1.1	1.1	1.2
132		2.0	0.6	1.9	0.8	1.9	0.6	1.1	1.2	1.2	1.3	1.2	1.3	1.3	1.1	1.1	1.2
144	6	2.6	0.6	2.6	0.9	2.6	0.5	1.0	1.2	1.3	1.3	1.1	1.3	1.3	1.0	1.1	1.2
156		2.2	0.7	2.0	0.9	2.1	0.6	1.1	1.3	1.2	1.3	1.0	1.3	1.3	1.1	1.1	1.3
168	7	2.3	0.6	2.1	0.8	2.3	0.5	1.3	1.4	1.4	1.3	1.0	1.3	1.2	1.1	1.1	1.2
180		2.1	0.7	1.9	0.8	2.0	0.6	1.1	1.4	1.2	1.3	1.0	1.2	1.1	1.1	1.1	1.3
192	8	2.5	0.7	2.5	0.9	2.5	0.5	1.2	1.4	1.2	1.3	1.1	1.1	1.1	1.0	1.1	1.3
204		2.1	0.6	1.9	0.7	1.9	0.5	1.3	1.4	1.3	1.5	1.1	1.1	1.2	1.1	1.1	1.2
216	9	2.1	0.6	2.0	0.7	2.0	0.4	1.3	1.4	1.4	1.4	1.1	1.2	1.2	1.1	1.1	1.2
228		1.9	0.7	1.7	0.8	1.7	0.6	1.3	1.4	1.4	1.4	1.2	1.3	1.2	1.1	1.1	1.2
240	10	2.1	0.6	2.1	0.8	2.0	0.5	1.3	1.4	1.3	1.3	1.2	1.3	1.2	1.1	1.1	1.2
252		1.8	0.6	1.7	0.8	1.6	0.6	1.3	1.4	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.2
264	11	2.3	0.6	2.3	0.9	2.3	0.5	1.2	1.4	1.2	1.3	1.1	1.2	1.1	1.1	1.1	1.3
276		1.9	0.7	1.8	0.9	1.7	0.7	1.3	1.3	1.2	1.3	1.0	1.2	1.3	1.1	1.1	1.3
288	12	2.2	0.7	2.2	0.9	2.1	0.7	1.4	1.4	1.2	1.4	1.0	1.1	1.3	1.0	1.1	1.4
300		1.8	0.6	1.7	0.7	1.6	0.6	1.3	1.3	1.2	1.3	0.9	1.2	1.3	1.1	1.1	1.4
312	13	2.2	0.6	2.3	0.8	2.2	0.5	1.2	1.3	1.1	1.4	1.0	1.3	1.2	1.1	1.1	1.3
324		1.8	0.6	1.7	0.7	1.6	0.5	1.2	1.3	1.1	1.3	1.0	1.2	1.2	1.1	1.1	1.4
336	14	2.4	0.7	2.4	0.9	2.3	0.6	1.2	1.2	1.1	1.4	1.0	1.3	1.2	1.1	1.1	1.4
348		2.0	0.7	1.9	0.8	1.8	0.7	1.1	1.3	1.3	1.3	1.0	1.3	1.3	1.1	1.1	1.5
360	15	2.6	0.7	2.7	1.0	2.6	0.6	1.2	1.3	1.3	1.3	1.2	1.3	1.3	1.1	1.1	1.5
372		2.1	0.6	2.0	0.7	1.9	0.5	1.1	1.4	1.3	1.3	1.1	1.2	1.3	1.1	1.1	1.4
384	16	2.7	0.8	2.8	1.0	2.7	0.6	1.1	1.4	1.2	1.3	1.1	1.2	1.3	1.0	1.1	1.4
396		2.4	0.7	2.3	0.9	2.2	0.7	1.1	1.3	1.2	1.3	1.1	1.3	1.3	1.1	1.2	1.4
408	17	2.1	0.7	2.3	0.9	2.2	0.6	1.3	1.4	1.4	1.4	1.0	1.3	1.3	1.1	1.1	1.4
420		1.7	0.6	1.8	0.7	1.6	0.6	1.2	1.3	1.4	1.3	1.0	1.3	1.3	1.1	1.1	1.4
432	18	2.1	0.6	2.2	0.9	2.2	0.5	1.1	1.1	1.3	1.4	1.1	1.2	1.3	1.1	1.1	1.3
444		1.8	0.6	1.9	0.7	1.7	0.5	1.1	1.3	1.4	1.4	1.0	1.1	1.3	1.1	1.1	1.4
456	19	2.2	0.7	2.4	1.0	2.3	0.6	1.1	1.3	1.3	1.4	1.1	1.3	1.2	1.1	1.1	1.3
468		1.8	0.6	1.9	0.7	1.7	0.5	1.1	1.3	1.2	1.3	1.1	1.3	1.3	1.1	1.1	1.3
480	20	1.9	0.6	2.0	0.8	1.9	0.5	1.1	1.3	1.3	1.4	1.1	1.3	1.2	1.1	1.1	1.3
Average over trial period		2.1	0.6	2.1	0.8	2.0	0.6	1.2	1.3	1.3	1.4	1.1	1.3	1.2	1.1	1.1	1.3
± standard deviation		0.6	0.2	0.4	0.2	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							1.2 ±0.1										
Average of Air temperatures							1.4 ±0.3										

Table 3.45: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.2	1.2	1.0	2.1	2.1	1.8	1.3	1.3	1.1	1.2	1.3	1.1	1.3	1.2	1.4	1.2
24	1	0.9	0.7	2.8	2.2	2.9	2.4	1.1	1.3	1.1	1.2	1.1	1.2	1.2	0.9	1.3	1.1
36		1.3	1.3	1.5	2.2	2.3	2.0	1.0	1.4	1.2	1.4	1.1	1.3	1.4	1.1	1.4	1.1
48	2	1.1	0.9	3.3	2.4	3.2	2.7	1.0	1.2	1.1	1.3	1.0	1.1	1.3	1.0	1.2	1.0
60		1.2	1.2	1.3	2.2	2.3	1.9	1.1	1.3	1.2	1.4	1.3	1.2	1.2	1.1	1.3	1.1
72	3	0.9	0.7	3.4	2.3	3.2	2.7	1.2	1.3	1.1	1.3	1.1	1.1	1.3	1.0	1.2	1.0
84		1.1	1.1	1.7	2.3	2.5	2.1	1.1	1.3	1.2	1.4	1.2	1.3	1.4	1.0	1.3	1.1
96	4	0.7	0.6	3.9	2.4	3.2	2.8	1.2	1.2	1.0	1.2	1.1	1.2	1.4	1.0	1.2	1.1
108		0.9	0.9	1.6	2.3	2.4	1.9	1.1	1.3	1.1	1.4	1.2	1.3	1.4	1.1	1.3	1.1
120	5	0.9	0.8	2.4	2.3	2.8	2.2	1.2	1.4	1.1	1.4	1.1	1.3	1.3	1.2	1.3	1.0
132		1.1	0.9	2.2	2.3	2.7	2.1	1.1	1.4	1.1	1.5	1.2	1.3	1.3	1.2	1.4	1.0
144	6	0.9	0.7	4.7	2.5	3.6	3.0	1.0	1.1	1.0	1.1	1.1	1.1	1.3	1.0	1.2	1.0
156		1.0	0.8	2.3	2.4	2.9	2.3	1.2	1.3	1.0	1.2	1.1	1.2	1.4	1.1	1.2	1.1
168	7	0.9	0.7	2.8	2.4	2.9	2.2	1.2	1.4	1.1	1.3	1.0	1.2	1.3	1.1	1.2	1.0
180		1.1	0.9	2.3	2.4	2.7	2.3	1.2	1.4	1.1	1.4	1.1	1.2	1.3	1.2	1.3	1.1
192	8	0.8	0.6	4.0	2.4	3.5	2.9	1.2	1.3	1.0	1.2	1.0	1.0	1.2	1.1	1.2	1.0
204		1.1	1.0	2.1	2.3	2.6	2.1	1.2	1.4	1.0	1.4	1.1	1.1	1.3	1.2	1.3	1.0
216	9	1.2	1.1	2.2	2.3	2.7	2.1	1.2	1.3	1.2	1.5	1.1	1.1	1.1	1.2	1.3	1.1
228		1.3	1.2	1.2	2.3	2.3	1.9	1.2	1.4	1.3	1.5	1.4	1.3	1.2	1.3	1.4	1.2
240	10	0.9	0.7	2.4	2.2	2.7	2.1	1.2	1.4	1.4	1.5	1.3	1.1	1.2	1.2	1.4	1.0
252		1.3	1.3	1.4	2.2	2.2	1.9	1.3	1.5	1.3	1.4	1.4	1.2	1.3	1.3	1.4	1.1
264	11	1.0	0.9	3.6	2.3	3.2	2.8	1.3	1.4	1.1	1.2	1.1	1.0	1.3	1.1	1.3	1.0
276		1.2	1.0	1.5	2.2	2.3	2.0	1.3	1.5	1.1	1.4	1.2	1.1	1.4	1.2	1.4	1.1
288	12	1.1	1.0	2.9	2.3	3.0	2.6	1.3	1.4	1.1	1.2	1.0	1.1	1.4	1.2	1.3	1.0
300		1.4	1.5	1.2	2.3	2.2	1.9	1.3	1.5	1.2	1.4	1.1	1.1	1.4	1.3	1.4	1.2
312	13	0.9	0.7	3.1	2.4	2.9	2.3	1.2	1.4	1.0	1.3	1.0	1.1	1.3	1.2	1.3	1.1
324		1.4	1.3	1.3	2.3	2.3	1.9	1.2	1.4	1.0	1.4	1.1	1.1	1.3	1.2	1.4	1.1
336	14	0.7	0.5	3.5	2.3	3.0	2.3	1.1	1.3	1.0	1.2	1.0	1.0	1.2	1.1	1.3	1.0
348		1.1	1.0	1.8	2.3	2.5	1.9	1.0	1.4	1.2	1.3	1.0	1.2	1.2	1.2	1.3	1.1
360	15	0.7	0.4	4.4	2.4	3.4	2.6	1.1	1.3	1.0	1.1	1.0	1.1	1.2	1.1	1.2	1.0
372		1.0	0.8	2.5	2.4	2.9	2.1	1.1	1.4	1.0	1.2	1.2	1.2	1.3	1.1	1.2	1.1
384	16	0.7	0.3	4.9	2.6	3.8	2.9	1.0	1.2	1.0	1.0	1.1	1.1	1.3	1.1	1.1	1.0
396		0.7	0.4	2.6	2.0	2.9	1.9	1.1	1.3	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.1
408	17	0.3	-0.1	2.8	1.5	2.8	1.8	1.0	1.4	1.2	1.1	1.0	1.2	1.2	1.1	1.1	1.1
420		0.6	0.3	1.1	1.3	2.0	1.3	1.0	1.4	1.3	1.3	1.2	1.3	1.2	1.2	1.2	1.2
432	18	0.3	-0.1	2.9	1.6	2.9	1.9	1.0	1.2	1.1	1.1	1.0	1.0	1.3	1.0	1.1	1.0
444		0.5	0.2	1.5	1.4	2.2	1.4	1.1	1.3	1.2	1.3	1.1	1.1	1.4	1.1	1.2	1.1
456	19	0.1	-0.2	3.4	1.6	2.9	1.9	1.1	1.2	1.1	1.1	1.1	1.1	1.2	1.0	1.1	1.0
468		0.3	0.0	1.2	1.4	2.1	1.2	1.0	1.3	1.1	1.2	1.2	1.3	1.3	1.0	1.1	1.1
480	20	0.4	0.1	1.9	1.5	2.5	1.5	1.0	1.3	1.1	1.2	1.3	1.2	1.2	1.1	1.1	1.0
Average over trial period		0.9	0.7	2.4	2.2	2.7	2.1	1.1	1.3	1.1	1.3	1.1	1.2	1.3	1.1	1.3	1.1
± standard deviation		1.3	1.6	1.8	1.9	0.8	1.5	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ±0.1											
Average of Air temperatures						1.9 ±1.5											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.46 – 3.48 show that complete mortality was achieved in all stages after 12 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.46: Mortality Tests of the Most Tolerant Stage of Medfly in infested **August Red Nectarines** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 23rd May – 12th June 2008

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	922	931	817	845				
1	600	648	522	669	660	29.7	43.9	18.1	21.9
2	600	432	415	481	387	53.1	55.4	41.1	54.2
3	600	259	269	340	254	71.9	71.1	58.4	69.9
4	600	87	141	171	99	90.6	84.9	79.1	88.3
5	600	34	57	84	40	96.3	93.9	89.7	95.3
6	600	29	30	48	29	96.9	96.8	94.1	96.6
7	600	8	4	26	5	99.1	99.6	96.8	99.4
8	600	2	1	14	3	99.8	99.9	98.3	99.6
9	600	0	0	5	0	100.0	100.0	99.4	100.0
10	600	0	0	1	0	100.0	100.0	99.9	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.47: Mortality Tests of the Most Tolerant Stage of Medfly in infested **August Red Nectarines** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 23rd May – 12th June 2008

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	956	817	807	952				
1	600	623	580	611	664	34.8	29.0	24.3	30.3
2	600	405	492	424	346	57.6	39.8	47.5	63.7
3	600	296	293	280	270	69.0	64.1	65.3	71.6
4	600	137	103	144	130	85.7	87.4	82.2	86.3
5	600	33	53	70	51	96.5	93.5	91.3	94.6
6	600	22	34	35	33	97.7	95.8	95.7	96.5
7	600	4	11	14	4	99.6	98.7	98.3	99.6
8	600	1	5	4	1	99.9	99.4	99.5	99.9
9	600	0	1	3	1	100.0	99.9	99.6	99.9
10	600	0	0	2	0	100.0	100.0	99.8	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.48: Mortality Tests of the Most Tolerant Stage of Medfly in infested **August Red Nectarines** (600g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 23rd May – 12th June 2008

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	50	1008	820	973	800				
1	50	606	617	761	631	39.9	24.8	21.8	21.1
2	50	443	401	559	449	56.1	51.1	42.5	43.9
3	50	324	297	411	316	67.9	63.8	57.8	60.5
4	50	140	114	201	147	86.1	86.1	79.3	81.6
5	50	41	80	140	51	95.9	90.2	85.6	93.6
6	50	31	38	81	30	96.9	95.4	91.7	96.3
7	50	7	21	42	12	99.3	97.4	95.7	98.5
8	50	1	1	13	3	99.9	99.9	98.7	99.6
9	50	0	1	5	1	100.0	99.9	99.5	99.9
10	50	0	1	2	0	100.0	99.9	99.8	100.0
12	50	0	0	0	0	100.0	100.0	100.0	100.0
14	50	0	0	0	0	100.0	100.0	100.0	100.0
16	50	0	0	0	0	100.0	100.0	100.0	100.0
18	50	0	0	0	0	100.0	100.0	100.0	100.0
20	50	0	0	0	0	100.0	100.0	100.0	100.0

3.5.7 Plums – Angelino

Life history data

The life history data (table 3.49) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.49: **Angelino Plums:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	23/4/2007	100	0	0	0	100	eggs
1	24/4/2007	100	0	0	0	100	eggs
2	25/4/2007	100	0	0	0	100	eggs
3	26/4/2007	24	76	0	0	100	1st
4	27/4/2007	10	88	2	0	100	1st
5	28/4/2007	0	37	63	0	100	2nd
6	29/4/2007	0	19	77	4	100	2nd
7	30/4/2007	0	3	34	63	100	3rd
8	1/5/2007	0	0	22	78	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.50. Cold treatment records are given in tables 3.51- 3.53. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.54 – 3.56

Table 3.50 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $1.0 \pm 0.5^\circ\text{C}$. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Angelino		19.05.2007	19.05.2007		08.06.2007			18.05.2007
	1	07:09 am	15:09 pm	8.0	15:09 pm	# 3	KS0606016	13:07 pm
	2	07:38 am	15:38 pm	8.0	15:38 pm	# 4	KS0547009	14:20 pm
	3	08:08 am	16:08 pm	8.0	16:08 pm	# 5	KS0606017	14:33 pm

Table 3.51: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		0.7	0.5	0.7	0.8	1.5	1.2	1.3	1.3	1.3	1.0	1.2	1.3	1.1	1.5	1.5	1.3
24	1	1.4	0.5	2.5	1.0	2.0	2.0	1.3	1.2	1.2	1.0	1.2	1.3	1.1	1.5	1.4	1.3
36		0.7	0.5	0.7	0.8	1.5	1.2	1.4	1.2	1.1	1.0	1.2	1.3	1.0	1.4	1.4	1.1
48	2	1.6	0.5	3.1	1.1	2.2	2.1	1.4	1.3	1.1	1.0	1.1	1.4	1.0	1.2	1.4	1.0
60		1.0	0.5	1.3	1.0	1.8	1.5	1.3	1.2	1.2	0.9	1.2	1.2	1.0	1.2	1.4	1.0
72	3	1.2	0.5	1.7	1.0	1.9	1.7	1.3	1.2	1.2	1.1	1.1	1.3	1.0	1.1	1.3	1.0
84		0.8	0.5	0.8	0.8	1.6	1.3	1.2	1.1	1.1	1.0	1.2	1.1	1.0	1.1	1.3	1.0
96	4	1.1	0.5	1.4	0.9	1.7	1.5	1.3	1.1	1.2	1.1	1.2	1.3	1.0	1.0	1.3	1.0
108		0.7	0.5	0.5	0.9	1.5	1.1	1.2	1.1	1.1	1.0	1.3	1.1	1.1	1.0	1.4	1.0
120	5	1.3	0.5	1.9	1.0	1.9	1.8	1.3	1.1	1.1	1.1	1.2	1.2	1.0	1.1	1.3	1.0
132		0.6	0.5	0.5	0.9	1.5	1.1	1.3	1.1	1.1	1.1	1.1	1.2	1.0	1.1	1.3	1.0
144	6	1.4	0.5	2.3	1.1	2.0	2.0	1.3	1.1	1.2	1.1	1.1	1.4	1.0	1.1	1.3	1.0
156		0.7	0.5	0.7	0.9	1.5	1.2	1.3	1.1	1.2	1.1	1.1	1.4	1.0	1.1	1.3	1.0
168	7	1.5	0.5	2.4	1.2	2.1	2.0	1.3	1.2	1.2	1.2	1.1	1.4	1.0	1.1	1.3	1.0
180		1.0	0.5	1.4	1.0	1.8	1.5	1.3	1.1	1.2	1.1	1.2	1.3	1.0	1.1	1.3	1.0
192	8	1.4	0.5	2.6	1.1	2.1	2.0	1.3	1.2	1.2	1.2	1.1	1.4	1.0	1.1	1.3	1.0
204		0.7	0.5	0.8	0.9	1.6	1.2	1.3	1.1	1.2	1.1	1.2	1.1	1.0	1.1	1.3	1.0
216	9	1.4	0.5	2.1	1.1	2.0	1.9	1.3	1.1	1.2	1.1	1.2	1.3	1.1	1.1	1.4	1.0
228		1.0	0.5	1.2	0.9	1.7	1.4	1.2	1.1	1.2	1.1	1.3	1.1	1.1	1.1	1.4	1.0
240	10	1.5	0.5	2.9	1.2	2.2	2.2	1.3	1.1	1.2	1.1	1.2	1.2	1.0	1.0	1.3	1.0
252		0.9	0.5	1.2	0.9	1.8	1.4	1.2	1.0	1.1	1.0	1.2	1.1	1.0	1.1	1.4	1.0
264	11	1.5	0.5	3.0	1.2	2.2	2.2	1.3	1.1	1.2	1.1	1.2	1.3	1.0	1.1	1.4	1.0
276		0.9	0.5	1.2	1.0	1.7	1.4	1.2	1.1	1.2	1.1	1.2	1.2	1.0	1.1	1.4	1.0
288	12	1.5	0.4	2.6	1.0	2.1	2.1	1.3	1.1	1.2	1.1	1.2	1.3	1.0	1.0	1.4	1.0
300		0.9	0.4	1.3	0.9	1.8	1.4	1.2	1.0	1.1	1.0	1.2	1.0	1.0	1.1	1.4	1.0
312	13	1.6	0.5	2.9	1.3	2.2	2.2	1.2	1.0	1.1	1.1	1.2	1.1	1.0	1.0	1.4	1.0
324		0.8	0.5	1.1	1.0	1.7	1.4	1.2	1.0	1.1	1.0	1.3	1.0	1.0	1.0	1.4	1.0
336	14	1.5	0.4	2.8	1.2	2.1	2.1	1.2	1.0	1.1	1.1	1.2	1.1	1.0	1.0	1.4	1.0
348		1.1	0.4	1.5	1.0	1.8	1.5	1.2	1.0	1.1	1.0	1.2	1.0	1.0	1.1	1.4	1.0
360	15	1.4	0.5	2.0	1.2	2.1	1.8	1.2	1.0	1.1	1.1	1.2	1.1	1.0	1.0	1.4	1.0
372		0.9	0.5	1.0	0.9	1.6	1.3	1.2	1.0	1.1	1.0	1.2	1.0	1.0	1.1	1.4	1.0
384	16	1.2	0.5	1.6	1.0	1.9	1.7	1.2	1.0	1.1	1.1	1.2	1.1	1.0	1.0	1.4	1.0
396		0.9	0.5	1.0	0.8	1.6	1.3	1.2	1.0	1.1	1.0	1.2	1.0	1.0	1.1	1.4	1.0
408	17	1.4	0.5	1.9	1.1	2.0	1.8	1.2	1.0	1.1	1.1	1.2	1.0	1.0	1.1	1.4	1.0
420		1.1	0.6	1.2	1.0	1.7	1.6	1.3	1.1	1.2	1.1	1.2	1.1	1.0	1.2	1.4	1.1
432	18	1.3	0.5	2.1	1.1	2.0	1.8	1.4	1.3	1.3	1.1	1.1	1.5	1.0	1.3	1.4	1.1
444		1.1	0.5	1.6	1.0	1.8	1.7	1.3	1.2	1.1	1.0	1.2	1.2	1.0	1.2	1.4	1.1
456	19	1.2	0.4	2.2	1.0	2.0	1.7	1.3	1.2	1.2	1.1	1.1	1.4	1.0	1.1	1.3	1.0
468		1.0	0.5	1.1	0.9	1.6	1.5	1.3	1.1	1.1	1.0	1.2	1.1	1.0	1.1	1.3	1.0
480	20	1.3	0.5	1.9	1.1	2.0	1.7	1.3	1.1	1.2	1.1	1.2	1.3	1.0	1.0	1.3	1.0
Average over trial period		1.1	0.5	1.7	1.0	1.8	1.6	1.3	1.1	1.2	1.1	1.2	1.2	1.0	1.1	1.4	1.0
± standard deviation		0.5	0.1	0.9	0.2	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ±0.1											
Average of Air temperatures						1.3 ±0.4											

Table 3.52: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		0.6	0.4	0.9	1.2	2.2	0.6	1.0	1.1	1.1	1.0	1.1	1.3	1.0	1.1	1.1	1.0
24	1	1.2	0.5	1.7	2.0	3.2	0.7	1.0	1.1	1.1	1.0	1.1	1.3	1.1	1.0	1.1	1.0
36		0.8	0.6	1.3	1.4	2.4	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.1
48	2	1.3	0.6	2.0	2.2	3.4	0.9	1.1	1.2	1.2	1.1	1.2	1.3	1.2	1.1	1.2	1.1
60		0.8	0.6	1.2	1.3	2.2	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.1
72	3	1.3	0.6	1.9	2.1	3.2	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.1
84		0.8	0.5	1.2	1.3	2.2	0.7	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.1	1.1
96	4	1.3	0.6	1.9	2.2	3.3	0.8	1.1	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.2	1.1
108		0.7	0.5	1.1	1.2	2.1	0.7	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.2	1.1
120	5	1.3	0.6	1.9	2.2	3.3	0.8	1.1	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.2	1.1
132		0.8	0.6	1.2	1.3	2.2	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.1
144	6	1.3	0.5	1.8	2.1	3.2	0.7	1.2	1.2	1.2	1.2	1.2	1.2	1.0	1.0	1.1	1.0
156		0.8	0.5	1.1	1.3	2.1	0.7	1.2	1.2	1.2	1.2	1.2	1.1	1.0	1.0	1.0	1.0
168	7	1.3	0.6	1.8	2.1	3.1	0.8	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0
180		0.7	0.5	1.0	1.2	2.0	0.7	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.0	1.1
192	8	1.2	0.5	1.7	2.0	3.0	0.7	1.0	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0
204		0.8	0.6	1.0	1.3	2.1	0.8	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.1
216	9	1.2	0.5	1.6	2.0	2.9	0.7	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.1
228		0.8	0.5	1.0	1.3	2.0	0.8	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
240	10	1.2	0.5	1.6	1.8	2.7	0.7	1.1	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.1
252		1.0	0.7	1.2	1.5	2.3	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
264	11	1.2	0.6	1.7	2.2	2.9	0.8	1.1	1.1	1.2	1.1	1.1	1.3	1.1	1.2	1.1	1.2
276		0.9	0.5	1.3	1.4	2.3	0.6	1.1	1.2	1.2	1.1	1.1	1.3	1.1	1.3	1.1	1.2
288	12	1.2	0.6	1.7	2.1	2.9	0.8	1.1	1.1	1.1	1.1	1.1	1.3	1.1	1.2	1.1	1.2
300		0.8	0.5	1.2	1.4	2.2	0.7	1.1	1.2	1.2	1.1	1.1	1.3	1.1	1.2	1.1	1.2
312	13	1.2	0.5	1.7	2.1	2.9	0.8	1.1	1.2	1.2	1.1	1.1	1.2	1.2	1.1	1.1	1.2
324		0.7	0.5	1.0	1.2	2.0	0.7	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.1	1.1
336	14	1.2	0.6	1.6	2.1	2.9	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.1	1.1
348		0.7	0.5	1.0	1.2	2.0	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.2
360	15	1.1	0.6	1.6	2.0	2.9	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.1	1.2	1.2
372		0.6	0.5	0.9	1.1	1.9	0.7	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.1
384	16	1.1	0.6	1.6	2.0	2.9	0.8	1.1	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.2
396		0.7	0.6	1.0	1.2	2.0	0.8	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.1
408	17	1.0	0.7	1.5	1.8	2.6	0.9	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.2	1.2
420		1.1	0.8	2.0	2.1	3.1	1.1	1.1	1.2	1.2	1.1	1.2	1.3	1.2	1.1	1.2	1.2
432	18	0.8	0.6	1.3	1.6	2.4	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.2	1.2
444		1.1	0.7	1.9	2.0	3.0	0.9	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.2	1.2
456	19	0.9	0.7	1.3	1.7	2.4	1.0	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.0	1.1	1.1
468		1.1	0.7	1.9	2.0	3.0	0.9	1.2	1.2	1.2	1.2	1.2	1.3	1.2	1.1	1.2	1.2
480	20	0.8	0.6	1.2	1.6	2.4	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.2	1.2
Average over trial period		1.0	0.6	1.4	1.7	2.6	0.8	1.1	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.1	1.1
± standard deviation		0.6	0.2	0.5	0.5	0.6	0.3	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2
Average of Fruit temperatures						1.1 ±0.1											
Average of Air temperatures						1.3 ±0.5											

Table 3.53: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		0.5	0.4	0.9	0.9	1.0	1.8	1.3	1.3	1.5	1.2	1.5	1.5	1.5	1.3	1.3	1.2
24	1	0.8	0.5	4.6	1.4	2.2	3.6	1.3	1.3	1.3	1.2	1.4	1.2	1.2	1.2	1.3	1.2
36		0.7	1.1	1.6	1.6	1.7	2.3	1.2	1.2	1.2	1.0	1.3	1.2	1.2	1.1	1.3	1.1
48	2	1.1	0.7	5.2	1.6	2.7	4.0	1.1	1.1	1.1	1.0	1.3	1.1	1.1	1.1	1.3	1.1
60		0.7	1.2	1.1	1.7	1.5	2.2	1.1	1.1	1.0	1.0	1.3	1.1	1.1	1.1	1.3	1.2
72	3	1.0	0.6	4.6	1.5	2.5	3.6	1.2	1.1	1.0	1.1	1.3	1.0	1.1	1.1	1.3	1.2
84		0.8	1.1	1.0	1.4	1.4	2.1	1.1	1.1	1.0	1.0	1.3	1.1	1.1	1.1	1.3	1.2
96	4	1.4	0.5	5.1	1.5	2.5	3.8	1.1	1.1	1.0	1.0	1.3	1.0	1.0	1.1	1.2	1.2
108		0.6	1.2	0.9	1.7	1.4	2.1	1.1	1.1	1.0	1.0	1.2	1.1	1.0	1.1	1.2	1.2
120	5	0.9	0.6	5.0	1.5	2.6	3.8	1.1	1.1	1.0	1.0	1.2	1.1	1.1	1.1	1.2	1.1
132		0.9	1.1	1.3	1.4	1.6	2.1	1.1	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.2	1.1
144	6	0.7	0.7	4.8	1.5	2.5	3.7	1.0	1.0	1.0	1.0	1.2	1.0	1.1	1.0	1.2	1.0
156		0.9	1.3	1.1	1.6	1.5	2.2	1.0	1.0	1.0	1.0	1.2	1.0	1.1	1.0	1.2	1.1
168	7	0.9	0.6	4.8	1.5	2.3	3.7	1.0	1.0	1.0	1.1	1.2	1.0	1.0	1.0	1.2	1.1
180		0.5	1.2	0.7	1.5	1.1	1.9	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.2
192	8	1.0	0.8	4.6	1.6	2.1	3.7	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.0	1.2	1.1
204		0.6	1.1	1.0	1.5	1.1	2.0	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.2
216	9	1.0	0.7	4.5	1.6	2.1	3.6	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.1
228		0.7	1.1	0.9	1.4	1.1	1.9	1.0	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.2	1.1
240	10	0.8	0.9	3.5	1.6	1.9	3.0	1.0	1.0	1.1	1.1	1.2	1.1	1.1	1.0	1.2	1.1
252		0.5	1.1	1.6	1.5	1.4	2.4	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.1	1.2	1.2
264	11	0.9	0.6	4.8	1.5	2.2	4.0	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.0	1.2	1.1
276		0.5	0.8	2.4	1.2	1.4	2.5	1.1	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.2	1.1
288	12	0.7	0.6	4.6	1.3	1.9	3.7	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.2	1.0
300		0.4	1.0	1.8	1.3	1.2	2.3	1.0	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.2	1.1
312	13	0.5	0.6	4.9	1.4	1.9	3.8	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.0	1.2	1.1
324		0.2	1.1	0.9	1.3	0.8	1.9	1.0	1.0	1.0	1.0	1.2	1.1	1.1	1.0	1.2	1.1
336	14	0.9	0.7	4.7	1.4	1.8	3.7	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.1	1.0
348		0.4	1.2	0.9	1.4	0.8	1.9	0.9	0.9	0.9	0.9	1.1	1.1	1.1	1.0	1.1	1.0
360	15	1.0	0.6	4.9	1.3	1.8	3.6	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.0
372		0.3	1.0	0.6	1.2	0.6	1.7	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.0	1.2	1.0
384	16	0.8	0.8	5.2	1.5	2.2	3.6	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0
396		0.5	1.1	1.3	1.4	1.2	1.9	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.0	1.2	1.1
408	17	0.1	0.7	2.7	1.4	1.6	2.5	1.2	1.2	1.1	1.1	1.3	1.2	1.2	1.1	1.3	1.2
420		0.3	0.3	3.7	1.2	2.5	2.9	1.1	1.1	1.1	1.1	1.3	1.1	1.1	1.1	1.3	1.1
432	18	0.0	0.5	2.0	1.3	1.4	2.2	1.2	1.2	1.2	1.2	1.3	1.1	1.1	1.2	1.3	1.3
444		0.1	0.3	3.4	1.1	2.4	2.6	1.1	1.1	1.1	1.1	1.2	1.0	1.0	1.1	1.2	1.2
456	19	-0.1	0.5	2.1	1.1	1.4	2.3	1.2	1.2	1.2	1.2	1.3	1.1	1.1	1.2	1.3	1.3
468		0.1	0.3	3.6	1.2	2.4	2.8	1.1	1.1	1.0	1.1	1.2	1.0	1.0	1.1	1.2	1.1
480	20	-0.1	0.5	2.1	1.3	1.3	2.3	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.2	1.2
Average over trial period		0.6	0.8	2.9	1.4	1.7	2.8	1.1	1.1	1.1	1.1	1.2	1.1	1.1	1.1	1.2	1.1
± standard deviation		1.8	0.9	2.3	0.7	0.7	1.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ±0.1											
Average of Air temperatures						1.7 ±1.3											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.54 – 3.56 show that complete mortality was achieved in all stages after 12 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.54: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Angelino Plums** (600g/stage) at $1.0 \pm 0.5^{\circ}\text{C}$
(Replicate 1 : Cold Room # 3). Date of experiment : 19th May – 8th June 2007

Exposure Period to $1.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	784	960	1311	1175				
1	600	588	682	861	902	25.0	29.0	34.3	23.2
2	600	337	588	694	524	57.0	38.8	47.1	55.4
3	600	220	352	471	371	71.9	63.3	64.1	68.4
4	600	54	222	291	270	93.1	76.9	77.8	77.0
5	600	30	93	165	145	96.2	90.3	87.4	87.7
6	600	3	67	103	62	99.6	93.0	92.1	94.7
7	600	0	34	89	25	100.0	96.5	93.2	97.9
8	600	1	19	57	11	99.9	98.0	95.7	99.1
9	600	0	9	15	2	100.0	99.1	98.9	99.8
10	600	0	2	1	0	100.0	99.8	99.9	100.0
12	600	0	1	1	0	100.0	99.9	99.9	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.55: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Angelino Plums** (600g/stage) at $1.0 \pm 0.5^{\circ}\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 19th May – 8th June 2007

Exposure Period to $1.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	899	1007	1126	1260				
1	600	705	727	968	856	21.6	27.8	14.0	32.1
2	600	568	689	763	563	36.8	31.6	32.2	55.3
3	600	430	491	585	526	52.2	51.2	48.0	58.3
4	600	142	408	449	259	84.2	59.5	60.1	79.4
5	600	77	228	237	225	91.4	77.4	79.0	82.1
6	600	13	77	80	94	98.6	92.4	92.9	92.5
7	600	9	61	43	40	99.0	93.9	96.2	96.8
8	600	1	15	12	17	99.9	98.5	98.9	98.7
9	600	0	7	4	8	100.0	99.3	99.6	99.4
10	600	0	4	2	2	100.0	99.6	99.8	99.8
12	600	0	2	2	0	100.0	99.8	99.8	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.56: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Angelino Plums** (600g/stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 19th May – 8th June 2007

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	879	1070	1153	1243				
1	600	670	1020	957	892	23.8	4.7	17.0	28.2
2	600	504	842	708	589	42.7	21.3	38.6	52.6
3	600	427	579	585	419	51.4	45.9	49.3	66.3
4	600	164	400	289	307	81.3	62.6	74.9	75.3
5	600	80	283	218	156	90.9	73.6	81.1	87.4
6	600	20	106	161	85	97.7	90.1	86.0	93.2
7	600	10	61	89	44	98.9	94.3	92.3	96.5
8	600	5	27	54	14	99.4	97.5	95.3	98.9
9	600	0	9	12	8	100.0	99.2	99.0	99.4
10	600	0	5	3	1	100.0	99.5	99.7	99.9
12	600	0	2	1	0	100.0	99.8	99.9	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

3.5.8 Plums – Tegan Blue

Life history data

The life history data (table 3.57) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were treated when more than 50% development had occurred. Similarly, the 1st, 2nd and 3rd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8.

Table 3.57: **Tegan Blue Plums:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Most Tolerant Stage (MTS) trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	26/2/2008	100	0	0	0	100	eggs
1	27/2/2008	100	0	0	0	100	eggs
2	28/2/2008	100	0	0	0	100	eggs
3	29/2/2008	33	67	0	0	100	1st
4	1/3/2008	7	93	0	0	100	1st
5	2/3/2008	0	30	70	0	100	2nd
6	3/3/2008	0	0	69	31	100	2nd
7	4/3/2008	0	0	43	57	100	3rd
8	5/3/2008	0	0	35	65	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 3.58. Cold treatment records are given in tables 3.59- 3.61. The mortality data from cold exposure to a graded series of exposure periods from 1 to 20 days are given in tables 3.62 – 3.64

Table 3.58 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at 1.0 ± 0.5 °C. The exposure period begins after temperature probes in the fruit have reached the treatment temperature.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Tegan Blue		27.03.2008	27.03.2008		16.04.2008			26.03.2008
	1	08:44 am	16:44 pm	8.0	16:44 pm	# 3	KS0606016	14:35 pm
	2	09:14 am	17:14 pm	8.0	17:14 pm	# 4	KS0547009	15:34 pm
	3	09:45 am	17:45 pm	8.0	17:45 pm	# 5	KS0606017	15:52 pm

Table 3.59: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		1.0	0.4	2.2	1.0	2.1	1.6	1.5	1.6	1.5	1.1	1.5	1.3	1.4	1.5	1.5	1.5
24	1	0.9	0.6	1.6	1.0	1.9	1.5	1.5	1.5	1.3	1.2	1.4	1.3	1.3	1.4	1.4	1.3
36		1.1	0.5	2.5	1.1	2.2	1.8	1.5	1.4	1.3	1.2	1.3	1.4	1.2	1.4	1.4	1.1
48	2	0.8	0.6	1.6	1.0	1.8	1.5	1.5	1.4	1.1	1.3	1.3	1.5	1.1	1.4	1.4	1.1
60		0.9	0.5	2.5	1.1	2.1	1.8	1.4	1.3	1.1	1.2	1.3	1.3	1.2	1.3	1.4	1.1
72	3	1.3	0.5	3.0	1.0	2.2	2.1	1.4	1.3	1.1	1.3	1.3	1.4	1.1	1.3	1.4	1.2
84		0.7	0.5	1.5	0.9	1.8	1.4	1.4	1.2	1.1	1.2	1.3	1.2	1.2	1.2	1.3	1.1
96	4	1.4	0.5	3.3	1.1	2.3	2.2	1.4	1.2	1.2	1.3	1.4	1.4	1.2	1.2	1.3	1.1
108		0.6	0.5	1.5	1.0	1.8	1.4	1.4	1.2	1.2	1.2	1.4	1.2	1.2	1.1	1.3	1.2
120	5	1.6	0.5	3.9	1.2	2.4	2.3	1.4	1.2	1.2	1.2	1.3	1.3	1.2	1.1	1.3	1.2
132		0.9	0.5	2.1	1.1	2.0	1.6	1.4	1.2	1.2	1.2	1.3	1.3	1.1	1.2	1.4	1.2
144	6	1.2	0.5	2.5	1.2	2.1	1.8	1.5	1.2	1.2	1.3	1.3	1.5	1.1	1.2	1.3	1.2
156		0.7	0.4	1.6	0.9	1.8	1.4	1.5	1.2	1.2	1.3	1.2	1.5	1.1	1.2	1.3	1.2
168	7	1.0	0.5	2.1	1.0	2.0	1.7	1.5	1.3	1.3	1.3	1.3	1.5	1.1	1.2	1.3	1.2
180		0.6	0.6	1.2	1.0	1.7	1.2	1.4	1.2	1.3	1.3	1.3	1.4	1.2	1.2	1.3	1.2
192	8	1.2	0.5	2.6	1.1	2.1	2.0	1.5	1.3	1.3	1.3	1.3	1.5	1.2	1.2	1.3	1.3
204		0.6	0.5	1.2	1.0	1.7	1.3	1.4	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.3	1.2
216	9	1.3	0.5	3.0	1.2	2.2	2.1	1.4	1.2	1.3	1.3	1.4	1.4	1.2	1.2	1.3	1.2
228		0.7	0.5	1.5	1.0	1.8	1.4	1.4	1.2	1.2	1.2	1.4	1.2	1.2	1.2	1.4	1.2
240	10	1.5	0.6	3.3	1.3	2.4	2.2	1.4	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.4	1.2
252		1.0	0.4	2.3	1.1	2.0	1.6	1.4	1.1	1.2	1.2	1.4	1.2	1.2	1.1	1.4	1.2
264	11	1.4	0.4	3.5	1.2	2.4	2.1	1.4	1.2	1.2	1.3	1.4	1.4	1.2	1.2	1.3	1.2
276		0.7	0.4	1.7	1.0	1.9	1.4	1.4	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.4	1.2
288	12	1.4	0.5	3.1	1.2	2.4	2.1	1.4	1.2	1.2	1.3	1.4	1.4	1.2	1.2	1.4	1.2
300		1.0	0.4	2.1	1.0	2.1	1.5	1.3	1.1	1.2	1.2	1.4	1.0	1.2	1.1	1.4	1.2
312	13	1.6	0.5	3.8	1.3	2.5	2.3	1.4	1.1	1.2	1.2	1.4	1.2	1.2	1.2	1.4	1.2
324		0.9	0.5	2.1	1.1	2.1	1.6	1.3	1.1	1.2	1.1	1.4	1.1	1.2	1.1	1.4	1.2
336	14	1.5	0.5	3.8	1.3	2.5	2.3	1.4	1.1	1.2	1.2	1.3	1.2	1.2	1.2	1.4	1.2
348		0.9	0.5	2.0	1.1	2.0	1.5	1.3	1.1	1.2	1.2	1.3	1.0	1.1	1.1	1.4	1.2
360	15	1.5	0.4	3.5	1.1	2.4	2.2	1.4	1.1	1.2	1.2	1.4	1.2	1.2	1.2	1.4	1.2
372		0.9	0.4	2.1	1.0	2.0	1.5	1.3	1.1	1.1	1.1	1.4	1.1	1.2	1.1	1.4	1.2
384	16	1.6	0.5	3.8	1.4	2.5	2.3	1.4	1.1	1.2	1.2	1.3	1.2	1.2	1.2	1.4	1.2
396		0.8	0.5	1.9	1.1	2.0	1.5	1.3	1.1	1.1	1.1	1.4	1.1	1.2	1.1	1.4	1.2
408	17	1.5	0.4	3.6	1.3	2.4	2.2	1.4	1.1	1.2	1.2	1.3	1.1	1.2	1.2	1.4	1.2
420		1.0	0.4	2.3	1.1	2.1	1.7	1.4	1.1	1.2	1.2	1.3	1.1	1.1	1.2	1.4	1.2
432	18	1.3	0.5	2.9	1.1	2.4	1.7	1.4	1.1	1.2	1.2	1.3	1.3	1.3	1.2	1.4	1.2
444		0.9	0.5	1.8	1.0	2.0	1.5	1.4	1.2	1.2	1.3	1.3	1.5	1.2	1.2	1.4	1.2
456	19	1.4	0.5	2.9	1.2	2.3	2.0	1.4	1.2	1.3	1.2	1.3	1.4	1.1	1.3	1.4	1.3
468		1.0	0.5	2.0	1.0	2.0	1.6	1.5	1.3	1.3	1.2	1.3	1.4	1.1	1.3	1.4	1.3
480	20	1.5	0.5	3.8	1.3	2.4	2.3	1.4	1.3	1.2	1.2	1.4	1.3	1.2	1.2	1.4	1.2
Average over trial period		1.1	0.5	2.5	1.1	2.1	1.8	1.4	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.4	1.2
± standard deviation		0.5	0.2	1.0	0.2	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.3 ±0.1											
Average of Air temperatures						1.5 ±0.4											

Table 3.60: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.1	0.4	1.6	1.3	2.4	0.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.3	1.2
24	1	1.6	0.5	2.4	2.1	3.5	0.9	1.3	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.3	1.3
36		1.4	0.6	2.0	1.5	2.7	0.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3
48	2	1.8	0.6	2.7	2.3	3.7	1.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.4
60		1.3	0.6	1.9	1.4	2.5	0.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.3	1.3
72	3	1.7	0.6	2.5	2.2	3.5	1.0	1.4	1.5	1.5	1.4	1.5	1.4	1.4	1.2	1.3	1.4
84		1.3	0.5	1.8	1.4	2.5	0.9	1.4	1.4	1.4	1.4	1.4	1.3	1.4	1.2	1.3	1.3
96	4	1.8	0.6	2.6	2.3	3.6	1.0	1.4	1.5	1.5	1.4	1.5	1.4	1.4	1.2	1.3	1.4
108		1.2	0.5	1.8	1.4	2.4	0.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.3	1.3
120	5	1.8	0.6	2.6	2.3	3.6	0.9	1.4	1.5	1.5	1.4	1.5	1.5	1.5	1.3	1.4	1.4
132		1.3	0.6	1.9	1.5	2.5	0.9	1.4	1.5	1.5	1.4	1.5	1.4	1.4	1.2	1.4	1.4
144	6	1.8	0.5	2.5	2.2	3.4	0.9	1.4	1.5	1.5	1.4	1.5	1.3	1.3	1.1	1.2	1.2
156		1.3	0.5	1.9	1.4	2.4	0.9	1.4	1.5	1.5	1.4	1.5	1.3	1.3	1.1	1.2	1.2
168	7	1.7	0.5	2.5	2.2	3.4	0.9	1.3	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.2	1.2
180		1.2	0.5	1.7	1.3	2.3	0.9	1.3	1.4	1.4	1.3	1.4	1.3	1.3	1.2	1.2	1.2
192	8	1.7	0.5	2.3	2.1	3.3	0.9	1.3	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2
204		1.3	0.5	1.7	1.4	2.3	0.9	1.3	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2
216	9	1.7	0.5	2.3	2.1	3.2	0.9	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2
228		1.2	0.5	1.7	1.4	2.3	0.9	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2
240	10	1.7	0.5	2.3	1.9	3.0	0.8	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.3
252		1.5	0.7	1.9	1.6	2.6	1.1	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.3
264	11	1.7	0.6	2.4	2.3	3.2	0.9	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.4
276		1.4	0.5	2.0	1.5	2.6	0.8	1.4	1.4	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.4
288	12	1.7	0.6	2.3	2.2	3.1	1.0	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.3	1.4
300		1.3	0.5	1.8	1.5	2.4	0.8	1.4	1.5	1.5	1.4	1.5	1.4	1.3	1.3	1.3	1.4
312	13	1.7	0.5	2.3	2.2	3.2	0.9	1.4	1.5	1.5	1.4	1.4	1.4	1.4	1.2	1.3	1.3
324		1.3	0.5	1.7	1.3	2.3	0.9	1.4	1.5	1.5	1.4	1.5	1.3	1.4	1.2	1.3	1.3
336	14	1.6	0.6	2.3	2.2	3.1	1.0	1.4	1.5	1.5	1.4	1.5	1.3	1.4	1.2	1.3	1.3
348		1.2	0.5	1.7	1.4	2.3	0.9	1.4	1.5	1.5	1.4	1.5	1.4	1.4	1.2	1.3	1.4
360	15	1.6	0.6	2.3	2.1	3.2	0.9	1.4	1.5	1.5	1.4	1.5	1.3	1.4	1.2	1.4	1.3
372		1.0	0.5	1.5	1.2	2.1	0.9	1.3	1.4	1.4	1.3	1.4	1.3	1.3	1.2	1.3	1.3
384	16	1.6	0.6	2.2	2.1	3.1	1.0	1.3	1.4	1.4	1.3	1.4	1.3	1.4	1.2	1.4	1.3
396		1.2	0.6	1.7	1.3	2.3	0.9	1.3	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.3	1.3
408	17	1.3	0.7	2.2	1.7	2.8	1.0	1.3	1.4	1.4	1.3	1.4	1.3	1.3	1.2	1.3	1.4
420		1.7	0.8	2.5	2.3	3.4	1.2	1.3	1.4	1.4	1.3	1.4	1.4	1.3	1.2	1.3	1.4
432	18	1.4	0.7	2.4	1.7	2.9	1.1	1.3	1.5	1.4	1.3	1.1	1.4	1.3	1.2	1.4	1.4
444		1.5	0.6	2.4	2.0	3.1	1.0	1.3	1.5	1.3	1.3	1.1	1.3	1.3	1.2	1.3	1.4
456	19	1.4	0.7	2.4	1.7	2.9	1.1	1.3	1.5	1.4	1.3	1.1	1.4	1.3	1.1	1.3	1.4
468		1.7	0.8	2.4	2.3	3.2	1.2	1.3	1.5	1.4	1.3	1.1	1.3	1.3	1.1	1.3	1.3
480	20	1.3	0.6	2.2	1.6	2.8	0.9	1.3	1.5	1.4	1.4	1.2	1.4	1.3	1.2	1.4	1.4
Average over trial period		1.5	0.6	2.1	1.8	2.9	0.9	1.3	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.3	1.3
± standard deviation		0.6	0.2	0.5	0.5	0.6	0.3	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.3 ±0.1											
Average of Air temperatures						1.6 ±0.5											

Table 3.61: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.0	0.8	0.9	1.1	2.5	1.5	1.2	1.4	1.5	1.1	1.2	1.2	1.5	1.1	1.5	1.1
24	1	1.2	0.4	2.8	0.9	3.0	2.5	1.3	1.3	1.3	1.0	1.0	1.1	1.3	1.0	1.4	1.0
36		1.1	0.8	1.5	1.1	2.8	1.8	1.2	1.2	1.0	1.0	1.0	1.0	1.2	1.0	1.3	1.0
48	2	1.2	0.7	2.1	1.0	3.0	2.1	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.3	1.0
60		1.0	0.9	0.8	1.1	2.3	1.4	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.3	1.1
72	3	1.3	0.8	2.5	1.1	2.8	2.4	1.1	1.2	1.0	1.1	1.0	1.0	1.1	1.0	1.3	1.1
84		1.1	1.0	0.9	1.2	2.4	1.5	1.2	1.1	1.0	1.0	1.0	1.0	1.2	1.0	1.3	1.1
96	4	1.3	0.6	2.6	1.0	3.1	2.2	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.3	1.1
108		1.1	0.8	1.1	1.1	2.6	1.6	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.0	1.2	1.1
120	5	1.4	0.6	3.0	1.1	3.2	2.5	1.1	1.1	1.0	1.0	1.1	1.0	1.2	1.0	1.2	1.0
132		1.2	0.8	1.4	1.0	2.7	1.7	1.1	1.1	0.9	1.0	1.0	0.9	1.2	1.0	1.2	1.0
144	6	1.3	0.4	3.0	0.9	3.4	2.4	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.2	1.0
156		1.2	0.8	1.6	1.1	2.8	1.9	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.2	1.0
168	7	1.2	0.6	2.2	1.0	3.1	2.1	1.0	1.0	0.9	0.9	1.0	0.9	1.0	1.0	1.2	1.0
180		1.2	1.0	1.3	1.3	2.7	1.8	1.1	1.1	0.9	1.0	1.0	1.0	1.0	1.1	1.2	1.1
192	8	1.2	0.6	2.6	1.0	3.2	2.2	1.1	1.1	1.0	1.0	1.1	1.0	1.0	1.1	1.2	1.0
204		1.0	1.0	0.7	1.2	2.3	1.4	1.1	1.1	1.1	1.0	1.1	1.0	1.0	1.1	1.2	1.1
216	9	1.4	0.4	3.4	0.9	3.3	2.5	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.1	1.2	1.1
228		1.1	0.7	1.7	1.0	2.9	1.8	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.2	1.0
240	10	1.2	0.5	2.4	0.9	3.1	2.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.0
252		1.1	0.9	1.2	1.1	2.6	1.6	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.0
264	11	1.3	0.4	2.8	0.9	3.2	2.3	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.0
276		1.1	0.7	1.6	1.0	2.8	1.8	1.1	1.1	1.0	0.9	1.0	1.0	1.1	1.0	1.2	1.0
288	12	1.3	0.6	2.9	1.0	3.4	2.4	1.0	1.0	1.0	1.0	1.0	0.9	1.1	1.0	1.2	1.0
300		1.0	0.9	1.0	1.1	2.5	1.5	1.1	1.0	1.0	1.0	1.0	0.9	1.1	1.0	1.2	1.1
312	13	1.3	0.4	3.1	0.9	3.2	2.4	1.0	1.1	1.0	1.1	1.0	1.0	1.0	1.0	1.2	1.1
324		1.3	0.8	1.8	1.1	3.0	1.9	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.2	1.0
336	14	1.4	0.4	3.2	0.9	3.6	2.5	1.0	1.0	1.0	1.1	1.0	1.1	1.0	1.0	1.2	1.0
348		1.3	0.8	2.2	1.1	3.2	2.0	1.0	0.9	1.0	1.2	1.1	1.1	1.0	1.0	1.1	1.0
360	15	1.3	0.5	2.7	0.9	3.4	2.2	0.9	1.0	1.0	1.2	1.1	1.1	1.0	1.0	1.1	1.0
372		1.1	0.4	2.0	0.8	3.0	1.8	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.0	1.2	1.0
384	16	1.4	0.7	2.9	1.1	3.5	2.4	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.0	1.1	1.0
396		1.1	0.7	1.8	1.0	2.9	1.9	1.0	1.0	1.0	1.0	1.2	1.0	1.2	1.1	1.2	1.0
408	17	0.9	0.6	1.7	0.9	3.0	1.8	1.2	1.2	1.1	1.0	1.1	1.0	1.2	1.2	1.3	1.1
420		1.2	0.7	1.7	1.0	2.8	1.9	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.2	1.3	1.2
432	18	1.2	0.8	2.0	1.1	3.0	2.1	1.1	1.1	0.9	1.0	1.1	1.0	1.1	1.2	1.3	1.2
444		1.2	1.0	1.6	1.2	2.7	1.9	1.2	1.2	1.0	1.1	1.2	1.0	1.1	1.3	1.3	1.3
456	19	1.2	0.6	2.0	1.0	3.0	1.9	1.1	1.1	0.9	1.0	1.1	1.0	1.2	1.2	1.2	1.2
468		1.2	0.9	1.4	1.2	2.4	1.7	1.1	1.2	1.0	1.0	1.1	1.0	1.1	1.2	1.3	1.2
480	20	1.3	0.4	3.1	0.8	3.4	2.3	1.1	1.1	1.0	0.9	1.0	0.9	1.1	1.2	1.2	1.1
Average over trial period		1.2	0.7	2.0	1.0	2.9	2.0	1.1	1.1	1.0	1.0	1.1	1.0	1.1	1.1	1.2	1.1
± standard deviation		1.6	0.7	1.2	0.7	0.6	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ±0.1											
Average of Air temperatures						1.6 ±1.0											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.62 – 3.64 show that complete mortality was achieved in all stages after 12 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.62: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Tegan Blue Plums** (600g/stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 27th March – 16th April 2008

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1125	1141	1112	970				
1	600	814	1001	932	826	27.6	12.3	16.2	14.8
2	600	569	775	745	722	49.4	32.1	33.0	25.6
3	600	387	652	553	537	65.6	42.9	50.3	44.6
4	600	222	482	325	288	80.3	57.8	70.8	70.3
5	600	83	247	171	119	92.6	78.4	84.6	87.7
6	600	37	174	117	66	96.7	84.8	89.5	93.2
7	600	4	48	50	40	99.6	95.8	95.5	95.9
8	600	2	20	38	17	99.8	98.2	96.6	98.2
9	600	0	11	11	4	100.0	99.0	99.0	99.6
10	600	0	5	0	0	100.0	99.6	100.0	100.0
12	600	0	1	1	0	100.0	99.9	99.9	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.63: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Tegan Blue Plums** (600g/Stage) at $1.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 27th March – 16th April 2008

Exposure Period to $1.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1025	1191	1143	1055				
1	600	930	1087	960	952	9.3	8.7	16.0	9.8
2	600	669	795	719	753	34.7	33.2	37.1	28.6
3	600	433	576	613	600	57.8	51.6	46.4	43.1
4	600	283	416	364	441	72.4	65.1	68.2	58.2
5	600	93	300	263	154	90.9	74.8	77.0	85.4
6	600	25	128	127	88	97.6	89.3	88.9	91.7
7	600	3	69	48	45	99.7	94.2	95.8	95.7
8	600	0	16	13	18	100.0	98.7	98.9	98.3
9	600	0	6	6	5	100.0	99.5	99.5	99.5
10	600	0	2	1	1	100.0	99.8	99.9	99.9
12	600	0	1	1	0	100.0	99.9	99.9	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.64: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Tegan Blue Plums** (600g/Stage) at 1.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 27th March – 16th April 2008

Exposure Period to 1.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	919	1142	1217	1266				
1	600	758	934	822	945	17.5	18.2	32.5	25.4
2	600	593	714	703	693	35.5	37.5	42.2	45.3
3	600	459	620	582	568	50.1	45.7	52.2	55.1
4	600	342	442	455	401	62.8	61.3	62.6	68.3
5	600	103	321	225	193	88.8	71.9	81.5	84.8
6	600	44	154	134	126	95.2	86.5	89.0	90.0
7	600	8	63	72	48	99.1	94.5	94.1	96.2
8	600	4	39	35	21	99.6	96.6	97.1	98.3
9	600	1	13	11	12	99.9	98.9	99.1	99.1
10	600	0	4	3	0	100.0	99.6	99.8	100.0
12	600	0	0	0	0	100.0	100.0	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.65: Comparison of the number of days exposure at $1.0 \pm 0.5^{\circ}\text{C}$ required to kill 50% (LD₅₀) and 99% (LD₉₉) of the four immature life stages of Mediterranean fruit fly (Medfly), *Ceratitis capitata* Wiedemann, in 8 stone fruit cultivars. The analysis is based on three replicate trials for each life stage.

Stone fruit Cultivar and Life stage treated	Days	95% confidence intervals		Days	95% confidence intervals	
	LD ₅₀	<u>Lower</u>	<u>Upper</u>	LD ₉₉	<u>Lower</u>	<u>Upper</u>
<i>Cherries - Sweetheart</i>						
<i>Eggs</i>	2.837	2.792	2.883	8.545	8.400	8.695
<i>1st instar larvae</i>	3.186	3.137	3.234	9.593	9.437	9.756
<i>2nd instar larvae</i>	3.500	3.447	3.553	10.540	10.366	10.721
<i>3rd instar larvae</i>	2.864	2.820	2.908	8.625	8.484	8.772
<i>Cherries- Lapin</i>						
<i>Eggs</i>	3.795	3.751	3.840	9.836	9.699	9.978
<i>1st instar larvae</i>	3.488	3.445	3.531	9.040	8.916	9.169
<i>2nd instar larvae</i>	3.837	3.791	3.882	9.945	9.812	10.083
<i>3rd instar larvae</i>	3.467	3.423	3.510	8.985	8.856	9.118
<i>Peaches - Snow King</i>						
<i>Eggs</i>	2.347	2.298	2.395	8.156	7.998	8.321
<i>1st instar larvae</i>	2.413	2.363	2.462	8.385	8.226	8.552
<i>2nd instar larvae</i>	2.747	2.693	2.801	9.548	9.374	9.730
<i>3rd instar larvae</i>	2.590	2.537	2.642	9.000	8.825	9.183
<i>Peaches - Zee Lady</i>						
<i>Eggs</i>	2.808	2.765	2.852	8.419	8.278	8.566
<i>1st instar larvae</i>	2.716	2.674	2.758	8.143	8.012	8.278
<i>2nd instar larvae</i>	3.596	3.545	3.646	10.780	10.613	10.955
<i>3rd instar larvae</i>	2.572	2.529	2.614	7.710	7.581	7.845
<i>Nectarines - Arctic Snow</i>						
<i>Eggs</i>	2.345	2.300	2.391	7.239	7.103	7.380
<i>1st instar larvae</i>	3.063	3.010	3.115	9.452	9.290	9.621
<i>2nd instar larvae</i>	3.245	3.191	3.299	10.015	9.847	10.191
<i>3rd instar larvae</i>	2.657	2.612	2.702	8.200	8.060	8.345
<i>Nectarines - August Red</i>						
<i>Eggs</i>	2.535	2.487	2.582	7.361	7.223	7.506
<i>1st instar larvae</i>	2.753	2.700	2.805	7.994	7.842	8.153
<i>2nd instar larvae</i>	3.121	3.063	3.178	9.064	8.897	9.238
<i>3rd instar larvae</i>	2.660	2.609	2.710	7.724	7.576	7.878
<i>Plums - Angelino</i>						
<i>Eggs</i>	2.747	2.699	2.795	8.106	7.960	8.259
<i>1st instar larvae</i>	3.554	3.500	3.608	10.487	10.319	10.662
<i>2nd instar larvae</i>	3.457	3.407	3.507	10.201	10.046	10.361
<i>3rd instar larvae</i>	2.984	2.940	3.029	8.807	8.672	8.946
<i>Plums – Tegan Blue</i>						
<i>Eggs</i>	3.033	2.991	3.075	8.129	8.005	8.258
<i>1st instar larvae</i>	3.810	3.763	3.857	10.210	10.068	10.357
<i>2nd instar larvae</i>	3.591	3.546	3.637	9.625	9.491	9.763
<i>3rd instar larvae</i>	3.504	3.458	3.549	9.389	9.255	9.528

3.5.9 ANALYSIS OF MORTALITY DATA FOR COLD EXPOSURE AT $1.0 \pm 0.5^{\circ}\text{C}$.

Most tolerant stage bio-assay data

The above bio-assay data obtained from the exposure of the four Medfly stages - eggs, 1st, 2nd, and 3rd instar larvae were subjected to probit regression analysis (Finney, 1972) and analysed using the Genstat Program (Anon 2006) to obtain the LD₅₀ and LD₉₉ values together with their 95% confidence limits. These are given in **Table 3.65**.

The results show that the 2nd instar is the most tolerant life stage at the LD₅₀ and at the LD₉₉ estimates for cherries, peaches and nectarines while for plums it is 1st instar. However, the difference between these 2 instars is small, and on the basis of these results it was decided that the large-scale trials should be done on both 1st and 2nd instar larvae. Therefore 3 replicated trials were conducted by exposing >10,000 individuals to $1.0 \pm 0.5^{\circ}\text{C}$ in each of three replicated trials (>30,000) in all 8 stone fruit cultivars. The results of these large-scale trials are given in **Section 4**.

3.5.10 SUMMARY OF COLD TREATMENT DATA FOR THE MOST TOLERANT STAGE TRIALS AT $1.0 \pm 0.5^{\circ}\text{C}$.

The records of the temperatures from the cold treatment trials for each replicate treatment summarised in the tables above show that the required temperatures of $1.0 \pm 0.5^{\circ}\text{C}$ was maintained throughout the trials.

3.6 RESULTS OF MOST TOLERANT LIFE STAGE COLD TREATMENT TRIALS OF MEDFLY AT $3.0 \pm 0.5^{\circ}\text{C}$.

The trials at $3.0 \pm 0.5^{\circ}\text{C}$ were conducted from November 2006 to July 2008.

Data for each cultivar: cold treatment temperatures and insect mortality of the four life stages of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits is the same as for the 1°C trials since the same batch of fruit was used for 3°C trials.

3.6.1 Cherries - Sweetheart

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.66. Cold treatment 12 hour summary records are given in tables 3.67 - 3.69. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.70 – 3.72

Table 3.66 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Sweetheart		04.01.2007	04.01.2007		28.01.2007			03.01.2007
	1	08:20 am	14:20 pm	6.0	14:20 pm	# 3	KS0606016	14:56 pm
	2	08:49 am	15:49 pm	7.0	15:49 pm	# 4	KS0547009	14:50 pm
	3	09:20 am	15:20 pm	6.0	15:20 pm	# 5	KS0606017	15:27 pm

Table 3.67: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.1	2.9	4.2	4.1	3.7	3.5	3.0	3.1	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0
24	1	3.8	2.7	4.8	4.2	3.6	3.3	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.1	3.0	3.0
36		3.6	2.6	4.3	4.0	3.5	3.3	3.1	3.0	3.1	3.2	3.0	3.0	3.1	3.1	3.0	3.1
48	2	3.7	2.6	4.9	4.4	3.7	3.2	3.2	3.0	3.0	3.3	3.1	3.1	3.1	3.1	3.0	3.1
60		3.6	2.7	4.3	4.1	3.5	3.4	3.2	3.1	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
72	3	3.7	2.6	4.8	4.1	3.7	3.3	3.2	3.0	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
84		3.6	2.7	4.1	3.8	3.5	3.4	3.2	3.1	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
96	4	3.7	2.5	4.8	4.2	3.6	3.1	3.2	3.0	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
108		3.5	2.6	4.1	4.0	3.4	3.1	3.2	3.1	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.0
120	5	3.6	2.5	4.5	4.3	3.5	3.0	3.3	3.1	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.0
132		3.4	2.5	3.9	3.8	3.3	3.0	3.3	3.1	3.0	3.3	3.1	3.2	3.0	3.1	2.9	3.1
144	6	3.5	2.8	4.2	3.9	3.4	3.2	3.3	3.2	3.0	3.3	3.0	3.2	3.0	3.1	2.9	3.1
156		3.3	2.8	3.6	3.6	3.2	3.3	3.3	3.1	3.0	3.4	3.1	3.2	3.0	3.1	3.0	3.1
168	7	3.5	2.8	4.0	3.8	3.3	3.3	3.3	3.2	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.1
180		3.4	2.8	3.6	3.6	3.2	3.4	3.3	3.2	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
192	8	3.4	2.6	3.9	3.6	3.2	3.2	3.3	3.2	3.0	3.4	3.1	3.3	3.0	3.1	3.0	3.1
204		3.4	2.8	3.7	3.7	3.2	3.5	3.3	3.2	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
216	9	3.6	2.5	4.2	3.8	3.2	3.4	3.3	3.1	3.0	3.4	3.1	3.3	3.0	3.1	3.0	3.1
228		3.5	2.5	3.9	3.7	3.2	3.6	3.3	3.1	3.0	3.4	3.1	3.2	3.0	3.1	3.0	3.1
240	10	3.7	2.3	4.6	4.0	3.4	3.5	3.2	3.1	3.0	3.4	3.1	3.2	3.0	3.1	3.0	3.1
252		3.4	2.4	3.8	3.8	3.1	3.5	3.3	3.2	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
264	11	3.7	2.3	4.6	4.0	3.3	3.5	3.4	3.2	3.1	3.4	3.1	3.3	3.0	3.1	3.0	3.1
276		3.5	2.8	4.0	3.9	3.3	3.7	3.3	3.2	3.1	3.4	3.2	3.3	3.0	3.2	3.0	3.1
288	12	3.6	2.6	4.3	3.9	3.3	3.5	3.3	3.2	3.0	3.4	3.1	3.2	3.0	3.1	3.0	3.1
300		3.5	2.7	3.8	3.7	3.2	3.7	3.4	3.2	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.1
312	13	3.5	2.5	4.2	3.8	3.1	3.5	3.4	3.2	3.0	3.4	3.1	3.2	3.0	3.1	3.0	3.1
324		3.4	2.6	3.8	3.6	3.1	3.5	3.4	3.3	3.1	3.4	3.1	3.3	3.0	3.2	3.0	3.1
336	14	3.2	2.8	3.3	3.5	2.9	3.7	3.4	3.3	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.1
348		3.3	2.8	3.2	3.7	2.9	3.7	3.4	3.3	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.1
360	15	3.4	2.7	3.8	3.9	3.0	3.8	3.3	3.3	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.1
372		3.3	2.8	3.3	3.6	3.0	3.9	3.3	3.3	3.0	3.2	3.1	3.2	3.0	3.1	3.0	3.1
384	16	3.3	2.7	3.7	3.7	3.0	3.8	3.3	3.2	3.0	3.2	3.1	3.2	2.9	3.1	3.0	3.1
396		3.2	2.9	3.3	3.5	2.9	3.9	3.3	3.2	3.0	3.1	3.1	3.2	3.0	3.1	2.9	3.1
408	17	3.4	2.7	3.9	3.8	3.1	3.9	3.2	3.2	2.9	3.1	3.1	3.2	2.9	3.1	2.9	3.1
420		3.2	2.7	3.4	3.5	2.9	3.9	3.2	3.2	3.0	3.1	3.1	3.2	3.0	3.1	2.9	3.1
432	18	3.5	2.4	4.2	3.9	3.1	3.7	3.2	3.2	3.0	3.1	3.2	3.2	3.0	3.1	3.0	3.1
444		3.3	2.6	3.8	3.8	3.1	3.8	3.2	3.2	3.0	3.1	3.1	3.2	3.0	3.1	3.0	3.2
456	19	3.4	2.7	4.1	3.9	3.1	3.6	3.3	3.2	3.1	3.2	3.2	3.3	3.1	3.0	3.0	3.1
468		3.3	2.6	4.1	3.9	3.2	3.3	3.2	3.2	2.9	3.2	3.1	3.3	3.1	3.1	3.0	3.1
480	20	3.5	2.6	4.5	4.3	3.3	3.3	3.3	3.2	3.0	3.3	3.1	3.3	3.1	3.0	3.0	3.1
492		3.3	2.8	3.8	3.7	3.1	3.4	3.2	3.2	2.9	3.3	3.1	3.2	3.1	3.0	3.0	3.1
504	21	4.1	2.8	4.6	4.3	3.5	3.6	3.3	3.3	2.9	3.3	3.1	3.2	3.1	3.0	3.0	3.1
516		3.9	2.5	4.0	3.9	3.3	3.7	3.2	3.2	3.0	3.2	3.1	3.2	3.1	3.1	2.9	3.1
528	22	3.9	2.6	4.4	4.0	3.4	3.6	3.2	3.2	3.0	3.3	3.1	3.3	3.1	3.1	3.0	3.2
540		4.0	2.7	4.5	4.1	3.5	3.7	3.3	3.2	3.0	3.3	3.1	3.3	3.1	3.1	3.0	3.1
552	23	3.4	2.6	3.9	3.7	3.1	3.6	3.3	3.3	3.0	3.4	3.1	3.2	3.0	3.1	3.0	3.1
564		3.5	2.6	4.0	3.7	3.1	3.5	3.3	3.3	3.1	3.3	3.1	3.2	3.0	3.1	3.0	3.1
576	24	3.4	2.7	3.8	3.7	3.2	3.6	3.2	3.3	3.0	3.3	3.1	3.3	3.0	3.1	3.0	3.1
Average over trial period		3.5	2.6	4.1	3.9	3.3	3.5	3.3	3.2	3.0	3.3	3.1	3.2	3.0	3.1	3.0	3.1
± standard deviation		0.6	0.4	0.7	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.5 ± 0.5											

Table 3.68: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.4	2.7	3.5	2.8	3.4	3.3	3.2	3.3	3.2	3.2	3.3	3.1	3.2	3.1	3.0	3.1
24	1	4.6	2.7	3.8	3.2	3.8	3.3	3.1	3.3	3.2	3.1	3.2	3.1	3.2	3.1	3.0	3.2
36		4.3	2.6	3.5	2.9	3.5	3.3	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.1	3.0	3.2
48	2	4.4	2.6	3.8	3.4	3.9	3.3	3.1	3.3	3.2	3.1	3.2	3.1	3.2	3.1	3.0	3.2
60		4.3	2.6	3.8	2.9	3.6	3.2	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.1	3.0	3.2
72	3	4.3	2.6	3.8	3.1	3.8	3.2	3.1	3.3	3.2	3.2	3.2	3.2	3.2	3.1	3.0	3.2
84		4.2	2.5	3.6	2.8	3.5	3.3	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.1	3.0	3.2
96	4	4.6	2.6	3.9	3.5	4.0	3.4	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
108		4.2	2.5	3.7	2.9	3.6	3.2	3.2	3.4	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.2
120	5	4.3	2.6	3.9	3.5	3.9	3.3	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
132		4.2	2.6	3.7	2.9	3.6	3.2	3.2	3.4	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
144	6	4.2	2.6	3.6	3.1	3.7	3.3	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1	2.9	3.1
156		4.0	2.5	3.4	2.5	3.2	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
168	7	4.1	2.5	3.3	2.9	3.5	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.1	3.0	2.9	3.1
180		4.0	2.7	3.4	2.6	3.3	3.3	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	2.9	3.1
192	8	4.2	2.5	3.3	2.9	3.5	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.1	3.0	2.9	3.1
204		4.1	2.6	3.5	2.7	3.4	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	2.9	3.2
216	9	4.2	2.7	3.6	3.0	3.7	3.2	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.0	2.9	3.1
228		4.2	2.6	3.4	2.7	3.4	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.1	3.0	2.9	3.1
240	10	4.4	2.6	3.7	3.3	3.9	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.1	3.0	2.9	3.1
252		4.0	2.4	3.2	2.6	3.2	3.0	3.2	3.4	3.3	3.2	3.3	3.1	3.1	3.0	2.9	3.1
264	11	4.5	2.6	3.5	3.2	3.7	3.2	3.2	3.4	3.3	3.2	3.3	3.0	3.1	3.0	2.9	3.1
276		4.1	2.6	3.6	2.7	3.4	3.1	3.3	3.4	3.3	3.3	3.3	3.1	3.2	3.1	3.0	3.1
288	12	4.2	2.5	3.4	3.0	3.6	3.1	3.2	3.4	3.3	3.2	3.3	3.0	3.1	3.0	2.9	3.1
300		4.1	2.5	3.3	2.5	3.2	3.1	3.3	3.4	3.3	3.2	3.3	3.1	3.2	3.1	2.9	3.1
312	13	4.0	2.4	3.4	2.9	3.5	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1	2.9	3.2
324		4.1	2.6	3.6	2.6	3.4	3.1	3.2	3.4	3.3	3.2	3.2	3.1	3.2	3.1	3.0	3.2
336	14	4.1	2.7	3.2	2.4	3.1	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
348		3.9	2.5	3.2	2.3	2.9	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
360	15	3.9	2.5	3.3	2.9	3.3	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.0	3.0
372		3.9	2.5	3.2	2.3	3.0	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1	2.9	3.1
384	16	4.2	2.7	3.4	2.7	3.3	3.2	3.1	3.3	3.2	3.2	3.2	3.0	3.1	3.0	2.9	3.0
396		3.9	2.6	3.2	2.3	3.0	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1	2.9	3.1
408	17	3.9	2.6	3.5	2.7	3.4	3.1	3.1	3.1	3.2	3.0	3.2	3.0	3.2	3.1	2.9	3.1
420		4.1	2.7	3.3	2.4	3.1	3.1	3.1	3.1	3.2	3.0	3.2	3.1	3.3	3.2	3.0	3.2
432	18	4.1	2.5	3.5	3.0	3.6	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.2	3.2	3.0	3.2
444		4.1	2.6	3.6	2.6	3.3	3.1	3.1	3.1	3.2	3.0	3.2	3.1	3.3	3.2	3.1	3.2
456	19	4.0	2.7	3.7	3.0	3.6	3.2	3.1	3.2	3.2	3.1	3.2	3.1	3.1	3.0	3.0	3.1
468		3.9	2.5	3.4	2.5	3.3	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
480	20	4.1	2.6	3.7	3.1	3.8	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.1	3.0	3.1	3.1
492		4.0	2.6	3.2	2.4	3.1	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
504	21	4.0	2.5	3.4	2.9	3.5	3.2	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.1
516		4.0	2.7	3.4	2.6	3.3	3.3	3.2	3.4	3.3	3.2	3.3	3.1	3.1	3.1	3.0	3.1
528	22	4.1	2.5	3.3	2.9	3.4	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.1	3.0	3.1	3.1
540		4.2	2.6	3.6	2.8	3.5	3.2	3.2	3.4	3.3	3.2	3.3	3.1	3.1	3.1	3.1	3.1
552	23	4.1	2.7	3.5	2.9	3.5	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.1	3.0	3.1	3.1
564		4.4	2.5	3.4	2.8	3.4	3.1	3.3	3.4	3.3	3.3	3.3	3.1	3.1	3.1	2.9	3.2
576	24	4.2	2.6	3.5	3.1	3.6	3.2	3.2	3.4	3.3	3.2	3.3	3.1	3.1	3.0	3.0	3.1
Average over trial period		4.2	2.6	3.5	2.8	3.5	3.2	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.1
± standard deviation		1.0	1.1	1.2	0.9	1.0	0.7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ± 0.1											
Average of Air temperatures						3.3 ± 1.0											

Table 3.69: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.6	2.8	2.8	4.2	3.3	3.2	3.0	3.1	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0
24	1	3.8	2.7	4.3	4.4	3.6	4.1	3.0	3.0	3.0	3.2	3.2	3.0	3.1	3.1	3.0	3.1
36		3.9	2.7	3.4	4.3	3.6	3.3	3.1	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.1	3.0
48	2	4.2	2.6	4.7	4.5	3.8	4.2	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.1
60		3.9	2.7	3.2	4.3	3.6	3.4	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.0
72	3	3.8	2.6	4.3	4.3	3.6	3.9	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.1
84		3.8	2.7	3.1	4.2	3.5	3.1	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.0	3.0	3.1
96	4	4.2	2.5	4.8	4.5	3.8	4.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.0	2.9	3.1
108		3.6	2.7	2.9	4.3	3.6	3.2	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.0
120	5	4.1	2.6	4.4	4.5	3.8	4.3	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.0	3.1
132		3.8	2.8	3.0	4.3	3.5	3.3	3.2	3.1	3.1	3.3	3.1	3.2	3.0	3.1	3.1	3.1
144	6	3.7	2.6	3.7	4.2	3.3	3.7	3.2	3.2	3.1	3.2	3.1	3.2	3.0	3.1	3.0	3.1
156		3.4	2.8	2.3	4.0	3.0	2.6	3.2	3.2	3.2	3.2	3.1	3.2	3.0	3.1	3.1	3.1
168	7	3.6	2.8	3.5	4.2	3.1	3.6	3.2	3.3	3.2	3.3	3.2	3.3	3.1	3.2	3.1	3.2
180		3.5	2.8	2.4	4.0	3.1	2.7	3.2	3.2	3.2	3.3	3.2	3.2	3.1	3.1	3.2	3.1
192	8	3.6	2.7	3.4	4.2	3.1	3.5	3.2	3.3	3.2	3.3	3.2	3.3	3.1	3.2	3.1	3.2
204		3.6	2.8	2.7	4.1	3.2	2.8	3.2	3.2	3.2	3.3	3.2	3.2	3.1	3.1	3.2	3.1
216	9	3.7	2.7	3.8	4.2	3.3	3.6	3.2	3.3	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2
228		3.9	2.7	3.0	4.2	3.5	3.0	3.1	3.1	3.2	3.3	3.1	3.2	3.0	3.1	3.1	3.1
240	10	4.2	2.5	4.6	4.4	3.8	4.0	3.2	3.2	3.2	3.3	3.1	3.2	3.1	3.1	3.0	3.1
252		3.7	2.7	2.5	4.1	3.3	2.9	3.2	3.1	3.1	3.3	3.1	3.2	3.0	3.1	3.2	3.1
264	11	4.2	2.7	4.3	4.5	3.7	4.0	3.2	3.3	3.2	3.3	3.2	3.3	3.1	3.2	3.1	3.2
276		3.7	2.7	2.9	4.1	3.5	3.0	3.3	3.2	3.2	3.3	3.1	3.2	3.0	3.1	3.2	3.1
288	12	4.0	2.6	3.9	4.3	3.4	3.7	3.2	3.3	3.2	3.3	3.1	3.3	3.1	3.2	3.1	3.2
300		3.7	2.8	2.7	4.1	3.3	2.8	3.2	3.2	3.2	3.3	3.1	3.2	3.1	3.1	3.1	3.1
312	13	3.6	2.7	3.9	4.3	3.3	3.8	3.2	3.3	3.1	3.3	3.2	3.3	3.1	3.2	3.0	3.2
324		3.6	2.8	3.1	4.1	3.4	3.1	3.2	3.2	3.1	3.3	3.2	3.2	3.0	3.1	3.1	3.1
336	14	3.1	2.9	2.2	3.8	2.7	2.7	3.3	3.3	3.0	3.3	3.2	3.3	3.1	3.2	3.2	3.2
348		3.0	2.9	2.1	3.8	2.6	2.8	3.3	3.3	3.1	3.4	3.2	3.3	3.1	3.2	3.2	3.2
360	15	3.3	2.8	3.4	4.2	3.1	3.6	3.2	3.3	3.1	3.4	3.2	3.3	3.1	3.2	3.1	3.2
372		3.3	3.1	2.0	4.0	2.7	2.7	3.2	3.2	3.0	3.3	3.2	3.2	3.0	3.1	3.1	3.1
384	16	3.4	2.9	3.2	4.1	2.8	3.4	3.2	3.3	3.1	3.3	3.2	3.3	3.1	3.2	3.1	3.2
396		3.2	2.8	2.0	3.8	2.7	2.4	3.1	3.2	3.1	3.2	3.2	3.2	3.0	3.1	3.1	3.2
408	17	3.5	2.8	3.7	4.1	2.9	3.4	3.1	3.3	3.1	3.3	3.2	3.3	3.1	3.2	3.0	3.2
420		3.3	3.0	2.1	4.0	2.6	2.6	3.2	3.1	3.0	3.2	3.2	3.2	3.0	3.1	3.1	3.1
432	18	3.8	2.6	4.4	4.3	3.3	3.8	3.1	3.3	3.1	3.3	3.2	3.3	3.1	3.2	3.0	3.2
444		3.6	2.8	2.9	4.1	3.1	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.0	3.1	3.2	3.1
456	19	3.6	2.8	3.4	4.0	2.8	3.2	3.2	3.2	3.1	3.2	3.2	3.3	3.1	3.1	3.1	3.1
468		3.4	2.8	3.4	4.0	2.9	3.2	3.1	3.2	3.0	3.3	3.2	3.3	3.1	3.1	3.1	3.1
480	20	3.7	2.7	4.7	4.3	3.3	3.9	3.1	3.2	3.0	3.3	3.2	3.3	3.1	3.1	3.0	3.2
492		3.2	2.9	2.7	4.0	2.7	2.8	3.1	3.2	3.0	3.3	3.2	3.2	3.1	3.0	3.1	3.1
504	21	3.4	2.8	3.6	4.0	2.8	3.4	3.2	3.3	3.0	3.3	3.2	3.3	3.1	3.2	3.1	3.2
516		3.2	2.8	2.0	3.8	2.7	2.4	3.2	3.2	3.0	3.3	3.2	3.3	3.1	3.1	3.1	3.1
528	22	3.6	2.9	3.6	4.1	2.8	3.4	3.1	3.3	3.0	3.3	3.2	3.3	3.1	3.2	3.0	3.2
540		3.4	2.8	2.5	4.0	2.8	2.7	3.2	3.2	3.1	3.3	3.2	3.2	3.1	3.1	3.1	3.1
552	23	3.5	2.7	3.7	4.2	3.0	3.5	3.1	3.2	3.0	3.3	3.1	3.2	3.1	3.1	3.1	3.1
564		3.7	2.7	3.0	4.2	3.3	3.2	3.2	3.2	3.1	3.4	3.2	3.3	3.1	3.2	3.1	3.2
576	24	3.2	2.8	3.0	3.9	2.7	3.1	3.3	3.2	3.0	3.3	3.2	3.3	3.1	3.1	3.0	3.2
Average over trial period		3.6	2.8	3.3	4.2	3.2	3.3	3.2	3.2	3.1	3.3	3.2	3.2	3.1	3.1	3.1	3.1
± standard deviation		2.6	0.6	1.4	0.5	0.6	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ± 0.1											
Average of Air temperatures						3.4 ± 1.2											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.70 – 3.72 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.70: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Sweetheart cherries** (200/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 4th January – 28th January 2007

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	689	506	744	598				
2	200	586	359	653	500	14.9	29.1	12.2	16.4
3	200	454	285	453	334	34.1	43.7	39.1	44.1
4	200	241	231	373	164	65.0	54.3	49.9	72.6
5	200	71	199	242	109	89.7	60.7	67.5	81.8
6	200	27	194	195	49	96.1	61.7	73.8	91.8
7	200	10	119	109	20	98.5	76.5	85.3	96.7
8	200	3	79	45	7	99.6	84.4	94.0	98.8
9	200	1	48	31	1	99.9	90.5	95.8	99.8
10	200	0	24	16	1	100.0	95.3	97.8	99.8
11	200	0	5	6	0	100.0	99.0	99.2	100.0
12	200	0	4	2	0	100.0	99.2	99.7	100.0
13	200	0	2	0	0	100.0	99.6	100.0	100.0
14	200	0	0	1	0	100.0	100.0	99.9	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0
22	200	0	0	0	0	100.0	100.0	100.0	100.0
24	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.71: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Sweetheart cherries** (200g/Stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 4th January – 28th January 2007

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	675	568	558	758				
2	200	561	509	498	652	31.9	32.6	36.6	37.6
3	200	460	383	354	473	66.2	46.5	55.2	57.3
4	200	228	304	250	324	87.6	55.8	55.9	74.4
5	200	84	251	246	194	94.5	62.5	62.4	87.5
6	200	37	213	210	95	97.8	77.3	80.5	96.2
7	200	15	129	109	29	98.8	85.4	90.9	99.2
8	200	8	83	51	6	99.7	96.7	92.3	99.7
9	200	2	19	43	2	100.0	97.9	96.4	99.7
10	200	0	12	20	2	100.0	99.1	98.4	100.0
11	200	0	5	9	0	100.0	99.5	99.6	100.0
12	200	0	3	2	0	100.0	99.8	99.8	100.0
13	200	0	1	1	0	100.0	100.0	100.0	100.0
14	200	0	0	0	0	100.0	100.0	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0
22	200	0	0	0	0	100.0	100.0	100.0	100.0
24	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.72 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Sweetheart cherries** (200g/Stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 4th January – 28th January 2007

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	614	596	682	731				
2	200	498	563	612	535	18.9	5.5	10.3	26.8
3	200	391	415	475	424	36.3	30.4	30.4	42.0
4	200	206	264	382	213	66.4	55.7	44.0	70.9
5	200	87	206	226	154	85.8	65.4	66.9	78.9
6	200	31	155	199	75	95.0	74.0	70.8	89.7
7	200	17	86	135	21	97.2	85.6	80.2	97.1
8	200	9	58	62	12	98.5	90.3	90.9	98.4
9	200	0	38	23	14	100.0	93.6	96.6	98.1
10	200	0	22	6	0	100.0	96.3	99.1	100.0
11	200	0	14	3	1	100.0	97.7	99.6	99.9
12	200	0	6	3	0	100.0	99.0	99.6	100.0
13	200	0	5	2	0	100.0	99.2	99.7	100.0
14	200	0	1	0	0	100.0	99.8	100.0	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0
22	200	0	0	0	0	100.0	100.0	100.0	100.0
24	200	0	0	0	0	100.0	100.0	100.0	100.0

3.6.2 Cherries - Lapin

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.73. Cold treatment 12 hour summary records are given in tables 3.74- 3.76. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.77 – 3.79

Table 3.73 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Lapin		28.02.2008	28.02.2008		23.03.2008			27.02.2008
	1	07:51 am	14:51 pm	7.0	14:51 pm	# 3	KS0606016	13:54 pm
	2	08:22 am	14:22 pm	6.0	14:22 pm	# 4	KS0547009	14:47 am
	3	08:54 am	15:54 pm	7.0	15:54 pm	# 5	KS0606017	14:39 pm

Table 3.74: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.5	2.9	3.8	3.4	3.4	3.3	3.1	3.0	3.1	2.9	3.0	3.0	3.0	2.9	3.0	3.2
24	1	4.5	2.6	4.3	3.1	3.4	3.4	3.0	3.0	3.1	2.9	3.0	2.9	3.0	2.9	3.0	3.2
36		4.5	2.8	4.1	3.3	3.5	3.4	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
48	2	4.4	2.5	4.4	3.1	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
60		4.4	2.8	4.1	3.3	3.4	3.3	3.1	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2
72	3	4.3	2.9	4.3	3.3	3.4	3.5	3.1	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.2
84		4.5	2.9	3.9	3.4	3.4	3.4	3.1	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.1
96	4	4.5	2.6	4.3	3.3	3.5	3.3	3.1	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.2
108		4.4	2.9	3.9	3.4	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
120	5	4.4	2.3	4.0	3.0	3.2	3.1	3.1	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2
132		4.4	2.6	3.7	3.3	3.3	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
144	6	4.1	2.7	3.8	3.2	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
156		4.2	2.9	3.4	3.3	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.1
168	7	4.3	2.8	3.7	3.3	3.2	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
180		4.3	2.9	3.4	3.4	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
192	8	4.2	2.7	3.6	3.2	3.1	3.2	3.1	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
204		4.3	2.9	3.5	3.4	3.2	3.2	3.1	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
216	9	4.4	2.7	3.9	3.4	3.2	3.4	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
228		4.4	2.7	3.8	3.4	3.3	3.3	3.1	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
240	10	4.5	2.5	4.3	3.4	3.3	3.4	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
252		4.4	2.8	3.7	3.5	3.2	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
264	11	4.4	2.5	4.1	3.2	3.0	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
276		4.2	2.6	3.7	3.3	3.1	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
288	12	4.5	2.4	4.0	3.2	3.1	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
300		4.3	2.7	3.7	3.4	3.2	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
312	13	4.3	2.6	3.8	3.2	2.9	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
324		4.1	2.5	3.5	3.1	3.0	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
336	14	4.1	3.1	3.1	3.4	3.0	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
348		4.0	2.9	3.0	3.3	3.0	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
360	15	4.1	2.7	3.5	3.3	3.0	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
372		4.2	2.9	3.1	3.3	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
384	16	4.1	2.6	3.4	3.2	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
396		4.2	2.9	3.1	3.3	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
408	17	4.2	2.6	3.6	3.2	3.1	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
420		4.1	2.7	3.2	3.2	2.9	3.1	3.1	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1
432	18	4.1	2.5	3.8	3.2	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
444		4.2	2.6	3.5	3.3	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
456	19	4.2	2.7	3.8	3.3	3.1	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
468		4.1	2.7	3.8	3.3	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
480	20	4.3	2.5	4.1	3.2	3.1	3.1	3.1	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.1
492		4.1	2.9	3.6	3.4	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
504	21	4.1	2.6	4.0	3.2	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
516		4.3	2.5	3.5	3.2	2.8	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
528	22	4.3	2.6	3.4	3.1	2.7	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
540		4.2	2.2	3.6	2.9	2.6	2.8	3.1	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.2
552	23	4.1	2.6	3.5	3.1	2.8	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
564		4.2	2.6	3.3	3.2	2.8	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1
576	24	4.3	2.4	3.7	3.0	2.7	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
Average over trial period		4.3	2.7	3.7	3.3	3.1	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1
± standard deviation		0.5	0.8	0.9	0.6	1.1	0.8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.4 ± 0.8											

Table 3.75: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.3	3.2	4.6	3.6	4.0	3.2	3.1	3.1	3.1	3.1	3.0	3.1	3.1	3.1	3.0	3.0
24	1	4.7	3.2	4.9	3.9	4.2	3.3	3.1	3.1	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.0
36		4.4	3.0	4.6	3.7	4.1	3.2	3.1	3.1	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.0
48	2	4.6	3.0	4.8	3.9	4.2	3.2	3.1	3.1	3.1	3.2	3.0	3.1	3.1	3.0	3.0	3.0
60		4.6	3.3	4.8	3.8	4.2	3.3	3.1	3.1	3.1	3.2	3.0	3.1	3.1	3.0	3.0	3.0
72	3	4.7	3.1	4.9	3.9	4.3	3.2	3.1	3.1	3.0	3.2	3.0	3.1	3.1	3.0	2.9	3.0
84		4.3	3.0	4.6	3.7	4.1	3.2	3.1	3.1	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.0
96	4	4.7	2.9	4.9	4.0	4.3	3.2	3.1	3.1	3.1	3.2	3.0	3.1	3.1	3.0	3.0	3.0
108		4.6	3.0	4.8	3.7	4.2	3.2	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.0	3.0
120	5	4.7	3.1	4.9	4.0	4.4	3.3	3.1	3.1	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1
132		4.6	3.1	4.8	3.8	4.2	3.3	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.0
144	6	4.6	3.1	4.7	3.8	4.2	3.2	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
156		4.3	3.0	4.5	3.5	4.0	3.1	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.0	3.1
168	7	4.3	2.8	4.4	3.7	4.1	3.1	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
180		4.3	3.0	4.5	3.5	4.0	3.1	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
192	8	4.3	2.9	4.4	3.7	4.0	3.1	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.0	3.1
204		4.4	3.2	4.6	3.7	4.1	3.2	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
216	9	4.5	3.0	4.6	3.7	4.1	3.0	3.1	3.1	3.1	3.2	3.0	3.2	3.0	3.1	3.0	3.1
228		4.3	3.0	4.4	3.6	4.0	3.0	3.1	3.1	3.1	3.2	3.0	3.2	3.0	3.1	3.0	3.1
240	10	4.6	2.9	4.7	3.9	4.3	3.1	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
252		4.2	2.8	4.3	3.4	3.9	3.0	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
264	11	4.6	2.9	4.6	3.7	4.2	3.0	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
276		4.4	3.1	4.6	3.6	4.1	3.1	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
288	12	4.4	2.9	4.5	3.7	4.1	3.0	3.2	3.1	3.1	3.2	3.0	3.2	3.0	3.1	3.0	3.1
300		4.2	2.9	4.4	3.4	3.9	3.0	3.2	3.1	3.1	3.2	3.0	3.2	3.0	3.1	3.0	3.0
312	13	4.4	2.9	4.5	3.7	4.1	3.1	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
324		4.4	3.1	4.7	3.5	4.0	3.0	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
336	14	4.2	3.1	4.3	3.4	3.9	3.1	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
348		4.1	3.0	4.2	3.4	3.8	3.0	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
360	15	4.3	3.0	4.4	3.7	4.0	3.1	3.2	3.2	3.1	3.2	3.0	3.2	3.0	3.1	3.0	3.1
372		4.2	3.1	4.4	3.4	3.8	3.0	3.2	3.2	3.1	3.2	3.0	3.2	3.0	3.1	3.0	3.1
384	16	4.4	3.0	4.4	3.5	4.0	3.0	3.1	3.2	3.1	3.1	3.0	3.2	3.0	3.1	3.0	3.1
396		4.2	3.1	4.3	3.3	3.8	3.0	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.1
408	17	4.4	3.0	4.6	3.6	4.0	3.0	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.0	2.9	3.1
420		4.3	3.2	4.4	3.4	3.9	3.1	3.1	3.1	3.1	3.1	3.0	3.2	3.0	3.1	3.0	3.1
432	18	4.4	3.0	4.6	3.8	4.1	3.2	3.1	3.1	3.1	3.1	3.0	3.2	3.1	3.1	3.0	3.1
444		4.4	3.1	4.6	3.5	4.0	3.1	3.1	3.1	3.1	3.1	3.0	3.2	3.1	3.0	3.0	3.1
456	19	4.4	3.1	4.5	3.5	4.0	3.1	3.1	3.1	3.1	3.1	3.0	3.2	3.1	3.0	3.0	3.0
468		4.5	3.1	4.6	3.6	4.1	3.1	3.1	3.1	3.1	3.2	3.0	3.2	3.1	3.0	3.0	3.0
480	20	4.6	3.0	4.7	3.7	4.2	3.1	3.1	3.1	3.0	3.1	3.0	3.1	3.1	3.0	2.9	3.0
492		4.2	3.0	4.3	3.4	3.9	3.0	3.1	3.1	3.0	3.2	3.0	3.2	3.1	3.0	2.9	3.0
504	21	4.3	3.0	4.7	3.7	4.2	3.1	3.1	3.2	3.0	3.2	3.0	3.2	3.1	3.0	2.9	3.1
516		4.4	3.0	4.6	3.7	4.1	3.2	3.1	3.1	3.0	3.1	3.0	3.1	3.0	3.0	2.9	3.0
528	22	4.8	3.0	4.9	4.0	4.4	3.3	3.1	3.1	3.1	3.2	3.0	3.2	3.1	3.1	2.9	3.0
540		4.7	3.0	5.0	3.8	4.2	3.2	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.0	3.0	3.1
552	23	4.6	3.0	4.8	4.0	4.3	3.2	3.1	3.1	3.0	3.2	3.0	3.1	3.0	3.0	2.9	3.1
564		4.6	3.1	4.9	3.9	4.2	3.3	3.1	3.1	3.0	3.2	3.0	3.2	3.1	3.1	2.9	3.0
576	24	4.5	3.0	4.6	3.8	4.2	3.2	3.1	3.2	3.0	3.2	3.0	3.2	3.1	3.1	2.9	3.1
Average over trial period		4.4	3.0	4.6	3.7	4.1	3.1	3.1	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.1
± standard deviation		1.6	1.2	1.2	0.9	1.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.0											
Average of Air temperatures						3.8 ± 1.1											

Table 3.76: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.3	2.9	3.1	3.5	3.3	3.7	3.3	3.3	3.3	3.4	3.4	3.3	3.3	3.3	3.3	3.2
24	1	3.2	2.5	4.2	3.5	3.5	5.2	3.1	3.3	3.3	3.4	3.3	3.3	3.2	3.3	3.3	3.3
36		3.4	3.0	3.5	3.6	3.7	4.1	3.1	3.4	3.3	3.4	3.3	3.2	3.3	3.2	3.3	3.3
48	2	3.5	2.5	4.4	3.5	3.7	5.6	3.1	3.4	3.3	3.4	3.3	3.2	3.2	3.3	3.3	3.3
60		3.3	2.7	3.4	3.4	3.6	4.2	3.1	3.4	3.3	3.5	3.3	3.2	3.2	3.3	3.3	3.2
72	3	3.3	2.5	4.2	3.5	3.5	5.1	3.2	3.4	3.3	3.5	3.3	3.2	3.2	3.3	3.3	3.3
84		3.3	2.7	3.3	3.4	3.6	3.7	3.1	3.4	3.4	3.5	3.3	3.2	3.2	3.3	3.2	3.2
96	4	3.4	2.5	4.5	3.5	3.9	5.5	3.1	3.4	3.4	3.5	3.3	3.2	3.2	3.2	3.2	3.2
108		3.0	2.7	3.2	3.4	3.7	3.9	3.1	3.4	3.4	3.5	3.3	3.2	3.2	3.2	3.2	3.2
120	5	3.5	2.5	4.2	3.5	3.8	5.6	3.2	3.4	3.4	3.5	3.2	3.2	3.2	3.2	3.2	3.2
132		3.1	2.7	3.2	3.4	3.6	3.9	3.2	3.5	3.5	3.5	3.3	3.2	3.2	3.2	3.2	3.2
144	6	3.2	2.7	3.8	3.5	3.4	4.7	3.2	3.4	3.4	3.5	3.2	3.2	3.1	3.2	3.2	3.2
156		3.2	3.1	2.7	3.5	3.1	2.9	3.3	3.4	3.4	3.5	3.3	3.2	3.2	3.2	3.2	3.1
168	7	3.1	2.6	3.5	3.4	3.1	4.1	3.3	3.4	3.4	3.5	3.2	3.1	3.1	3.2	3.1	3.1
180		3.1	3.0	2.8	3.5	3.2	2.9	3.3	3.4	3.4	3.5	3.2	3.2	3.1	3.1	3.2	3.1
192	8	3.1	2.8	3.6	3.5	3.2	4.2	3.3	3.4	3.4	3.5	3.2	3.1	3.1	3.2	3.1	3.1
204		3.1	2.7	3.0	3.3	3.3	3.1	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.2	3.1
216	9	3.0	2.4	3.8	3.3	3.4	4.4	3.3	3.4	3.4	3.5	3.2	3.1	3.1	3.2	3.1	3.1
228		3.1	2.4	3.3	3.3	3.6	3.4	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
240	10	3.3	2.2	4.4	3.4	3.9	5.2	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.2	3.1	3.1
252		3.2	2.8	2.9	3.4	3.5	3.2	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
264	11	3.2	2.3	4.2	3.4	3.8	5.1	3.3	3.4	3.5	3.5	3.2	3.1	3.1	3.2	3.1	3.1
276		3.1	2.6	3.2	3.3	3.6	3.4	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
288	12	3.2	2.5	3.9	3.4	3.5	4.7	3.3	3.4	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.0
300		3.1	2.5	3.0	3.3	3.4	3.1	3.3	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.0
312	13	3.0	2.4	3.8	3.3	3.4	4.5	3.3	3.4	3.4	3.5	3.2	3.1	3.1	3.1	3.1	3.1
324		3.2	2.5	3.3	3.4	3.5	3.5	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
336	14	3.0	2.6	2.5	3.5	2.8	2.9	3.4	3.4	3.4	3.5	3.2	3.1	3.1	3.1	3.1	3.0
348		3.0	2.3	2.4	3.4	2.7	2.8	3.4	3.3	3.5	3.4	3.2	3.1	3.1	3.1	3.1	3.0
360	15	3.1	1.9	3.4	3.4	3.2	4.4	3.3	3.3	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
372		3.1	2.3	2.2	3.2	2.8	2.5	3.3	3.3	3.4	3.5	3.2	3.1	3.1	3.1	3.1	3.0
384	16	3.3	2.5	3.2	3.5	2.9	3.8	3.3	3.4	3.5	3.4	3.1	3.1	3.1	3.1	3.1	3.1
396		3.0	2.5	2.3	3.3	2.8	2.4	3.3	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.0
408	17	3.1	2.3	3.6	3.4	3.1	3.9	3.3	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
420		3.0	1.8	2.4	3.2	2.8	2.4	3.3	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.1
432	18	2.7	2.1	4.2	3.2	3.5	5.2	3.2	3.3	3.5	3.4	3.2	3.1	3.1	3.1	3.2	3.1
444		2.7	2.4	3.4	3.3	3.6	4.1	3.2	3.4	3.5	3.5	3.2	3.1	3.2	3.1	3.1	3.1
456	19	2.5	2.1	3.9	3.1	3.4	4.7	3.3	3.4	3.5	3.5	3.2	3.1	3.1	3.2	3.2	3.1
468		2.5	2.4	3.3	3.2	3.5	3.6	3.2	3.4	3.5	3.5	3.2	3.1	3.2	3.1	3.1	3.1
480	20	2.5	2.2	3.8	3.2	3.4	4.4	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.2	3.2	3.1
492		3.6	2.5	4.6	3.5	4.0	6.0	3.2	3.4	3.5	3.5	3.2	3.1	3.1	3.1	3.1	3.0
504	21	3.2	2.7	3.1	3.4	3.4	3.7	3.2	3.4	3.4	3.4	3.2	3.1	3.1	3.3	3.2	3.3
516		3.3	2.4	4.4	3.4	3.7	5.3	3.1	3.4	3.4	3.5	3.3	3.2	3.2	3.2	3.2	3.2
528	22	3.3	2.8	3.2	3.5	3.5	3.5	3.2	3.4	3.4	3.5	3.2	3.2	3.1	3.2	3.2	3.3
540		3.2	2.7	3.8	3.5	3.5	4.6	3.0	3.4	3.4	3.5	3.3	3.2	3.2	3.3	3.2	3.2
552	23	2.9	1.9	4.6	3.2	3.9	5.8	3.2	3.4	3.4	3.5	3.2	3.2	3.2	3.2	3.2	3.2
564		2.5	2.6	3.0	3.3	3.3	3.5	3.1	3.4	3.4	3.5	3.3	3.2	3.2	3.2	3.2	3.2
576	24	2.6	2.1	4.2	3.2	3.7	5.0	3.2	3.4	3.4	3.5	3.2	3.2	3.2	3.2	3.3	3.1
Average over trial period		3.1	2.5	3.5	3.4	3.4	4.1	3.2	3.4	3.4	3.5	3.2	3.2	3.2	3.2	3.2	3.1
± standard deviation		2.4	0.9	1.1	0.5	0.6	1.6	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.3 ± 0.1											
Average of Air temperatures						3.3 ± 1.2											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.77 – 3.79 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.77: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Lapin cherries** (200g/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 28th February– 23rd March 2008

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	794	768	942	833				
2	200	698	719	837	561	12.1	6.4	11.1	32.7
3	200	512	594	765	439	35.5	22.7	18.8	47.3
4	200	365	433	536	225	54.0	43.6	43.1	73.0
5	200	125	345	394	171	84.3	55.1	58.2	79.5
6	200	80	259	287	126	89.9	66.3	69.5	84.9
7	200	35	200	227	81	95.6	74.0	75.9	90.3
8	200	17	94	70	42	97.9	87.8	92.6	95.0
9	200	1	39	43	6	99.9	94.9	95.4	99.3
10	200	0	11	19	1	100.0	98.6	98.0	99.9
11	200	0	4	9	0	100.0	99.5	99.0	100.0
12	200	0	1	2	0	100.0	99.9	99.8	100.0
13	200	0	0	2	0	100.0	100.0	99.8	100.0
14	200	0	1	1	0	100.0	99.9	99.9	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0
22	200	0	0	0	0	100.0	100.0	100.0	100.0
24	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.78 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Lapin cherries** (200g/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 28th February– 23rd March 2008

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	778	696	716	695				
2	200	643	649	662	457	17.4	6.8	7.5	34.2
3	200	373	544	586	390	52.1	21.8	18.2	43.9
4	200	211	367	500	271	72.9	47.3	30.2	61.0
5	200	96	310	405	233	87.7	55.5	43.4	66.5
6	200	54	179	321	131	93.1	74.3	55.2	81.2
7	200	26	177	243	48	96.7	74.6	66.1	93.1
8	200	7	136	184	17	99.1	80.5	74.3	97.6
9	200	3	67	124	6	99.6	90.4	82.7	99.1
10	200	0	25	46	1	100.0	96.4	93.6	99.9
11	200	0	16	38	0	100.0	97.7	94.7	100.0
12	200	0	11	13	0	100.0	98.4	98.2	100.0
13	200	0	3	8	0	100.0	99.6	98.9	100.0
14	200	0	1	2	0	100.0	99.9	99.7	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0
22	200	0	0	0	0	100.0	100.0	100.0	100.0
24	200	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.79 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Lapin cherries** (200g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 28th February– 23rd March 2008

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (200g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	200	835	762	863	764				
2	200	729	720	824	554	12.7	5.5	4.5	27.5
3	200	499	629	718	451	40.2	17.5	16.8	41.0
4	200	343	514	513	308	58.9	32.5	40.6	59.7
5	200	159	421	351	246	81.0	44.8	59.3	67.8
6	200	108	355	304	132	87.1	53.4	64.8	82.7
7	200	53	239	173	74	93.7	68.6	80.0	90.3
8	200	25	173	105	45	97.0	77.3	87.8	94.1
9	200	2	93	67	7	99.8	87.8	92.2	99.1
10	200	0	41	33	1	100.0	94.6	96.2	99.9
11	200	0	17	20	0	100.0	97.8	97.7	100.0
12	200	0	5	8	0	100.0	99.3	99.1	100.0
13	200	0	3	4	0	100.0	99.6	99.5	100.0
14	200	0	1	2	0	100.0	99.9	99.8	100.0
16	200	0	0	0	0	100.0	100.0	100.0	100.0
18	200	0	0	0	0	100.0	100.0	100.0	100.0
20	200	0	0	0	0	100.0	100.0	100.0	100.0
22	200	0	0	0	0	100.0	100.0	100.0	100.0
24	200	0	0	0	0	100.0	100.0	100.0	100.0

3.6.3 Peaches – Snow King

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.80. Cold treatment 12 hour summary records are given in tables 3.81- 3.83. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.84 – 3.86

Table 3.80 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Snow King		27.02.2007	27.02.2007		23.03.2007			26.02.2007
	1	08:33 am	15:33 pm	7.0	15:33 pm	# 3	KS0606016	14:56 pm
	2	09:04 am	15:04 pm	6.0	15:04 pm	# 4	KS0547009	15:10 pm
	3	09:34 am	14:34 pm	5.0	14:34 pm	# 5	KS0606017	15:10 am

Table 3.81: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.2	2.9	3.9	3.4	3.4	4.3	3.3	3.2	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
24	1	4.3	2.5	4.2	3.2	3.3	4.3	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1	3.1
36		4.3	2.4	4.8	3.4	3.6	4.3	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
48	2	4.4	2.5	4.7	3.5	3.5	4.4	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
60		4.3	2.6	4.4	3.7	3.5	4.4	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
72	3	4.4	2.8	3.7	3.3	3.4	4.3	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.0
84		4.3	2.8	3.4	3.0	3.3	4.2	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
96	4	4.3	3.0	3.1	2.8	3.1	4.2	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1	3.1
108		4.2	2.8	3.9	3.0	3.4	4.3	3.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1
120	5	4.4	2.8	3.6	3.0	3.3	4.3	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1	3.1
132		4.4	2.6	4.5	3.1	3.6	4.4	3.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1
144	6	4.4	2.7	4.2	3.1	3.4	4.3	3.3	3.2	3.2	3.2	3.2	3.1	3.2	3.1	3.2	3.1
156		4.3	2.6	4.3	3.3	3.5	4.2	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.2	3.1
168	7	4.1	2.6	4.0	3.2	3.3	4.2	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1	3.1
180		4.3	2.7	4.5	3.4	3.6	4.3	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
192	8	4.3	2.8	4.0	3.0	3.4	4.3	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.2	3.1
204		4.1	2.8	4.5	3.2	3.6	4.4	3.3	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.2	3.1
216	9	4.1	2.7	4.2	3.1	3.5	4.3	3.3	3.2	3.2	3.3	3.2	3.1	3.2	3.1	3.1	3.1
228		4.1	2.7	4.3	3.3	3.7	4.3	3.3	3.3	3.2	3.3	3.2	3.1	3.1	3.1	3.1	3.1
240	10	4.2	2.7	4.2	3.3	3.5	4.3	3.3	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
252		4.1	2.8	4.3	3.4	3.7	4.4	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
264	11	4.1	2.7	4.2	3.3	3.5	4.3	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
276		4.1	2.8	4.5	3.4	3.8	4.4	3.3	3.2	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
288	12	4.2	3.0	4.0	3.4	3.5	4.5	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
300		4.1	3.0	4.1	3.6	3.7	4.4	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
312	13	4.1	3.1	4.0	3.5	3.6	4.5	3.3	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
324		4.1	3.0	3.9	3.4	3.6	4.4	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
336	14	4.1	3.1	3.7	3.2	3.5	4.5	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
348		3.9	3.0	4.0	3.3	3.6	4.4	3.3	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
360	15	4.1	3.1	3.8	3.2	3.5	4.5	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1	3.1
372		4.0	2.7	4.7	3.2	3.8	4.5	3.3	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
384	16	4.0	2.7	4.6	3.3	3.8	4.6	3.3	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
396		4.1	2.8	5.2	3.9	4.0	4.7	3.3	3.3	3.2	3.3	3.2	3.1	3.1	3.1	3.1	3.1
408	17	4.2	3.1	4.7	3.8	3.8	4.8	3.3	3.3	3.2	3.3	3.2	3.1	3.1	3.1	3.1	3.1
420		4.1	3.0	4.6	3.8	3.8	4.6	3.3	3.2	3.3	3.3	3.2	3.1	3.1	3.1	3.1	3.1
432	18	3.9	3.0	4.1	3.5	3.5	4.5	3.3	3.3	3.2	3.3	3.2	3.1	3.1	3.1	3.1	3.1
444		4.1	3.1	4.0	3.5	3.6	4.5	3.3	3.2	3.2	3.3	3.2	3.1	3.1	3.1	3.1	3.1
456	19	4.0	3.0	3.8	3.4	3.5	4.5	3.3	3.3	3.2	3.3	3.2	3.1	3.1	3.1	3.1	3.1
468		4.1	3.1	3.8	3.4	3.5	4.5	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.0
480	20	4.3	3.3	3.6	3.5	3.4	4.6	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.1
492		4.1	3.2	3.8	3.4	3.5	4.5	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.0
504	21	4.2	3.2	4.1	3.7	3.5	4.6	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.0
516		4.1	3.0	3.7	3.4	3.5	4.3	3.3	3.2	3.1	3.2	3.2	3.1	3.1	3.1	3.1	3.0
528	22	4.4	3.3	3.4	3.4	3.3	4.6	3.2	3.2	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.0
540		4.4	3.2	4.0	3.6	3.5	4.6	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.0
552	23	4.2	3.4	3.0	3.3	3.2	4.5	3.3	3.2	3.2	3.2	3.2	3.1	3.2	3.1	3.1	3.1
564		4.2	3.0	4.0	3.6	3.5	4.5	3.2	3.2	3.2	3.2	3.2	3.1	3.1	3.0	3.1	3.0
576	24	4.0	3.2	3.2	3.2	3.2	4.4	3.3	3.1	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
Average over trial period		4.2	2.9	4.1	3.4	3.5	4.4	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
± standard deviation		0.8	0.4	1.0	0.4	0.4	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Average of Fruit temperatures						3.2 ± 0.0											
Average of Air temperatures						3.7 ± 0.5											

Table 3.82: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.4	2.7	3.7	3.4	3.9	3.4	3.3	3.0	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.3
24	1	3.6	2.7	3.7	3.7	4.2	3.5	3.3	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.3
36		3.9	2.9	4.2	4.0	4.6	3.7	3.3	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.3
48	2	3.8	2.7	4.1	4.0	4.6	3.5	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.1	3.3
60		3.6	2.8	3.9	3.9	4.1	3.7	3.3	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.3
72	3	3.6	2.9	3.8	3.7	3.9	3.7	3.2	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.3
84		3.3	2.8	3.6	3.2	3.7	3.6	3.3	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.1	3.3
96	4	3.4	2.7	3.2	3.2	3.6	3.5	3.2	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2
108		3.6	2.9	3.8	3.4	4.0	3.7	3.3	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.1	3.3
120	5	3.6	2.8	3.5	3.4	3.9	3.5	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.2
132		3.5	2.6	3.9	3.4	4.0	3.5	3.3	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.1	3.2
144	6	3.6	2.7	3.8	3.6	4.1	3.5	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.1	3.1	3.1
156		3.5	2.6	3.8	3.5	4.0	3.3	3.2	3.0	3.1	3.2	3.1	3.0	3.1	3.0	3.1	3.1
168	7	3.6	2.8	3.6	3.7	4.1	3.5	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.2
180		3.5	2.6	3.9	3.7	4.2	3.4	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.1	3.3
192	8	3.5	2.6	3.6	3.5	4.1	3.3	3.2	3.1	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.2
204		3.4	2.6	3.6	3.5	4.0	3.4	3.2	3.0	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
216	9	3.7	2.7	3.6	3.7	4.3	3.4	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
228		3.5	2.7	3.8	3.6	4.1	3.4	3.2	3.0	3.1	3.2	3.1	3.0	3.0	3.0	3.1	3.3
240	10	3.7	2.8	3.6	3.8	4.3	3.5	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
252		3.6	2.7	3.7	3.6	4.2	3.4	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
264	11	3.7	2.8	3.7	3.8	4.4	3.5	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.1	3.0	3.3
276		3.5	2.8	3.7	3.7	4.2	3.5	3.2	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.3
288	12	3.6	2.8	3.6	3.7	4.2	3.5	3.2	3.0	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
300		3.5	2.5	3.5	3.6	4.0	3.3	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
312	13	3.4	2.5	3.3	3.6	4.0	3.2	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
324		3.7	3.0	3.7	3.6	4.2	3.7	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
336	14	3.5	2.8	3.3	3.6	4.0	3.4	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.1	3.0	3.3
348		3.7	2.9	3.4	3.6	4.1	3.6	3.2	3.0	3.1	3.2	3.1	3.0	3.1	3.0	3.0	3.3
360	15	3.8	3.1	3.4	3.7	4.2	3.7	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
372		3.8	2.8	3.7	3.8	4.5	3.5	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
384	16	3.7	2.7	3.5	3.8	4.4	3.4	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
396		3.9	2.8	3.8	4.2	4.6	3.7	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
408	17	3.9	2.9	3.8	4.2	4.6	3.7	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
420		3.7	2.8	3.7	3.9	4.4	3.6	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
432	18	3.6	2.8	3.5	3.7	4.2	3.5	3.2	3.0	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
444		3.6	2.7	3.6	3.5	4.1	3.5	3.2	3.1	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.3
456	19	3.7	3.1	3.6	3.7	4.2	3.7	3.2	3.0	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
468		3.4	2.7	3.3	3.3	3.9	3.4	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.0	3.3
480	20	3.7	3.0	3.4	3.6	4.1	3.7	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.3
492		3.4	2.8	3.4	3.4	4.0	3.5	3.2	3.0	3.1	3.2	3.1	3.0	3.1	3.0	3.0	3.3
504	21	3.8	3.1	3.7	3.8	4.4	3.8	3.2	3.0	3.1	3.2	3.1	3.1	3.0	3.1	3.0	3.3
516		3.4	2.7	3.4	3.3	3.9	3.4	3.2	3.0	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
528	22	3.6	3.0	3.2	3.5	4.0	3.7	3.2	3.0	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.3
540		3.6	2.9	3.5	3.6	4.2	3.6	3.2	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.3
552	23	3.5	3.1	3.0	3.4	3.8	3.7	3.3	3.0	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.3
564		3.5	2.9	3.5	3.6	4.2	3.6	3.2	3.0	3.1	3.2	3.1	3.0	3.1	3.0	3.1	3.3
576	24	3.8	2.8	4.6	3.3	4.5	4.1	3.3	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.1
Average over trial period		3.6	2.8	3.6	3.6	4.1	3.5	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.3
± standard deviation		1.8	1.0	1.3	1.0	1.2	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Average of Fruit temperatures						3.1 ± 0.0											
Average of Air temperatures						3.5 ± 1.2											

Table 3.83: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.5	3.4	3.7	3.6	3.0	3.0	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
24	1	4.2	3.2	5.1	3.4	3.1	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
36		4.6	3.3	5.4	3.6	3.4	3.6	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
48	2	4.4	3.1	5.7	3.4	3.4	3.7	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
60		4.1	3.4	4.5	3.6	3.3	3.6	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
72	3	3.4	3.3	4.0	3.5	2.9	3.2	3.1	3.1	3.3	3.1	3.1	3.0	3.2	3.1	3.2	3.2
84		3.3	3.4	2.8	3.5	2.6	2.4	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
96	4	3.3	3.5	3.2	3.6	2.5	2.4	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
108		4.1	3.6	3.6	3.7	2.8	2.7	3.2	3.2	3.3	3.1	3.2	3.1	3.3	3.1	3.3	3.3
120	5	3.9	3.4	4.1	3.5	2.7	2.7	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
132		4.1	3.5	4.4	3.7	3.2	3.1	3.2	3.2	3.3	3.1	3.2	3.1	3.3	3.1	3.3	3.3
144	6	4.8	3.4	5.1	3.6	3.3	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.2	3.2
156		4.9	3.5	4.2	3.8	3.8	3.2	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.3
168	7	5.0	3.4	5.0	3.6	3.7	3.2	3.1	3.1	3.3	3.1	3.1	3.0	3.2	3.1	3.2	3.2
180		5.1	3.4	4.8	3.7	4.0	3.3	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
192	8	4.8	3.5	4.9	3.7	3.6	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
204		5.0	3.5	4.4	3.8	3.8	3.1	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
216	9	5.0	3.3	5.4	3.6	3.8	3.3	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
228		5.0	3.5	4.5	3.8	4.0	3.3	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
240	10	5.1	3.3	5.4	3.7	3.7	3.3	3.1	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
252		4.7	3.4	4.2	3.8	3.8	3.1	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
264	11	5.0	3.4	5.3	3.7	3.7	3.4	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.2	3.2
276		5.0	3.5	4.3	3.8	3.9	3.1	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
288	12	4.6	3.4	4.4	3.7	3.5	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
300		4.6	3.4	3.9	3.7	3.4	3.1	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
312	13	4.9	3.5	4.4	3.7	3.3	3.2	3.1	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
324		4.4	3.5	3.6	3.8	3.3	2.9	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
336	14	4.4	3.5	4.1	3.7	3.0	3.0	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
348		4.2	3.4	3.5	3.6	3.1	2.7	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
360	15	4.5	3.4	4.2	3.5	2.9	2.7	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.2	3.2
372		5.0	3.4	4.8	3.7	3.4	3.2	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
384	16	5.0	3.3	5.3	3.6	3.4	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.2	3.2
396		4.9	3.2	5.0	3.7	3.6	3.6	3.1	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
408	17	5.3	3.3	5.5	3.7	3.3	3.5	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.2	3.2
420		4.6	3.4	4.3	3.8	3.4	3.3	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
432	18	4.4	3.5	4.2	3.8	3.2	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.2	3.2
444		4.1	3.5	3.7	3.8	3.2	2.8	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
456	19	4.3	3.6	4.1	3.8	3.2	2.9	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
468		4.0	3.7	3.1	3.9	3.1	2.5	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
480	20	4.3	3.6	4.1	3.9	3.0	2.8	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
492		4.0	3.6	3.2	3.8	3.1	2.5	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
504	21	4.4	3.7	4.7	3.9	3.3	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
516		3.8	3.6	3.4	3.8	3.1	2.6	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
528	22	4.1	3.6	3.6	3.7	2.8	2.6	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
540		3.5	3.3	3.9	3.5	2.8	2.6	3.1	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.3	3.2
552	23	3.1	3.3	2.9	3.5	2.4	2.2	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
564		3.5	3.5	4.0	3.7	2.9	2.8	3.1	3.1	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
576	24	3.9	3.6	3.5	3.8	3.0	2.7	3.2	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
Average over trial period		4.4	3.4	4.3	3.7	3.3	3.0	3.1	3.2	3.3	3.1	3.1	3.1	3.3	3.1	3.3	3.2
± standard deviation		3.9	1.0	2.0	0.8	0.6	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						3.2 ± 0.0											
Average of Air temperatures						3.7 ± 1.7											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.84 – 3.86 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.84: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Snow King Peaches** (600g/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 27th February – 23rd March 2007

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1208	1056	1245	1262				
2	600	777	951	1072	899	35.7	9.9	13.9	28.8
3	600	622	707	862	650	48.5	33.0	30.8	48.5
4	600	473	520	511	533	60.8	50.8	59.0	57.8
5	600	189	414	394	467	84.4	60.8	68.4	63.0
6	600	116	211	281	225	90.4	80.0	77.4	82.2
7	600	81	139	158	108	93.3	86.8	87.3	91.4
8	600	16	71	109	51	98.7	93.3	91.2	96.0
9	600	9	44	70	21	99.3	95.8	94.4	98.3
10	600	0	29	46	11	100.0	97.3	96.3	99.1
11	600	0	18	33	5	100.0	98.3	97.3	99.6
12	600	0	7	13	0	100.0	99.3	99.0	100.0
13	600	0	2	6	0	100.0	99.8	99.5	100.0
14	600	0	1	2	0	100.0	99.9	99.8	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.85: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Snow King Peaches** (600g/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 27th February – 23rd March 2007

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1169	959	950	992				
2	600	760	762	811	801	35.0	20.5	14.6	19.3
3	600	648	763	658	667	44.6	20.4	30.7	32.8
4	600	374	490	531	377	68.0	48.9	44.1	62.0
5	600	231	308	382	283	80.2	67.9	59.8	71.5
6	600	135	183	355	167	88.5	80.9	62.6	83.2
7	600	66	190	247	111	94.4	80.2	74.0	88.8
8	600	23	79	144	85	98.0	91.8	84.8	91.4
9	600	6	41	69	32	99.5	95.7	92.7	96.8
10	600	0	26	31	15	100.0	97.3	96.7	98.5
11	600	0	12	21	1	100.0	98.7	97.8	99.9
12	600	0	3	7	0	100.0	99.7	99.3	100.0
13	600	0	1	0	0	100.0	99.9	100.0	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.86 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Snow King Peaches** (600g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 27th February – 23rd March 2007

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1199	933	877	852				
2	600	776	791	749	641	35.3	15.2	14.6	24.8
3	600	666	704	663	393	44.5	24.5	24.4	53.9
4	600	429	425	467	340	64.2	54.4	46.8	60.1
5	600	223	250	297	213	81.4	73.2	66.1	75.0
6	600	120	245	250	117	90.0	73.7	71.5	86.3
7	600	27	189	191	64	97.7	79.7	78.2	92.5
8	600	14	125	136	25	98.8	86.6	84.5	97.1
9	600	8	74	78	13	99.3	92.1	91.1	98.5
10	600	1	41	44	4	99.9	95.6	95.0	99.5
11	600	0	19	21	0	100.0	98.0	97.6	100.0
12	600	0	8	11	1	100.0	99.1	98.7	99.9
13	600	0	1	3	0	100.0	99.9	99.7	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

3.6.4 Peaches – Zee Lady

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.87. Cold treatment 12 hour summary records are given in tables 3.88- 3.90. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.91 – 3.93

Table 3.87 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Zee Lady		04.01.2008	04.01.2008		28.01.2008			03.01.2008
	1	08:30 am	15:30 pm	7.0	15: 30 pm	# 3	KS0606016	14:35 pm
	2	09:02 am	15:02 pm	6.0	15: 02 pm	# 4	KS0547009	14:43 pm
	3	09:30 am	15:30 pm	6.0	15:30 pm	# 5	KS0606017	14:41 pm

Table 3.88: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		2.9	2.7	2.9	3.3	2.8	3.0	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.1	3.0	3.1
24	1	2.9	2.8	2.9	3.3	2.9	3.0	3.2	3.2	3.0	3.1	3.1	3.1	3.0	3.2	3.0	3.1
36		2.9	2.8	2.8	3.2	2.8	2.9	3.2	3.2	3.0	3.1	3.1	3.1	3.1	3.2	3.1	3.1
48	2	2.9	2.7	2.9	3.3	2.9	2.9	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.2	3.0	3.1
60		2.9	2.7	2.9	3.3	2.9	2.9	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.2	3.0	3.1
72	3	3.1	2.8	2.9	3.5	2.9	3.0	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.2	3.0	3.1
84		3.2	2.8	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
96	4	3.2	2.9	3.0	3.4	3.0	3.0	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
108		3.2	2.9	3.1	3.4	3.1	3.1	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
120	5	3.2	2.9	3.0	3.5	3.0	3.1	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
132		3.2	2.8	3.0	3.4	3.0	3.0	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
144	6	3.2	2.8	2.9	3.4	3.0	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
156		3.2	2.9	3.0	3.5	3.1	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
168	7	3.2	2.7	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
180		3.2	2.7	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
192	8	3.1	2.8	2.9	3.3	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
204		3.2	2.8	2.9	3.3	2.9	3.0	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.2	3.2
216	9	3.2	2.8	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
228		3.1	2.7	2.8	3.3	2.8	2.9	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
240	10	3.2	2.9	3.0	3.3	3.0	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
252		3.2	2.9	3.0	3.4	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
264	11	3.2	2.9	3.0	3.3	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
276		3.1	2.7	2.8	3.3	2.8	2.8	3.2	3.2	3.0	3.1	3.2	3.2	3.1	3.3	3.1	3.2
288	12	3.2	2.9	3.1	3.4	3.0	3.0	3.3	3.3	3.1	3.2	3.2	3.3	3.2	3.4	3.2	3.2
300		3.0	2.8	3.0	3.3	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
312	13	3.1	2.8	2.9	3.4	2.9	3.0	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.2	3.0	3.1
324		3.1	2.7	2.9	3.4	2.9	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
336	14	3.2	2.9	3.0	3.4	3.0	3.1	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
348		3.2	2.9	3.0	3.4	3.0	3.1	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
360	15	3.2	2.9	3.1	3.5	3.1	3.1	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
372		3.2	2.8	3.0	3.4	3.0	3.0	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
384	16	3.2	2.8	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
396		3.2	2.9	3.0	3.5	3.0	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
408	17	3.2	2.8	2.9	3.4	3.0	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
420		3.1	2.7	2.8	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
432	18	3.2	2.8	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
444		3.1	2.8	2.9	3.3	2.9	3.0	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3	3.2	3.2
456	19	3.2	2.8	2.9	3.4	2.9	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
468		3.1	2.7	2.8	3.3	2.8	2.9	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
480	20	3.2	2.9	3.0	3.3	3.0	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
492		3.2	2.9	3.0	3.3	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
504	21	3.2	2.9	3.0	3.3	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
516		3.1	2.7	2.8	3.3	2.8	2.8	3.2	3.2	3.0	3.1	3.2	3.2	3.1	3.3	3.1	3.2
528	22	3.2	3.0	3.1	3.4	3.0	3.0	3.2	3.3	3.1	3.2	3.2	3.3	3.2	3.3	3.2	3.2
540		3.2	2.9	3.0	3.5	3.0	3.0	3.2	3.3	3.1	3.2	3.2	3.2	3.2	3.3	3.2	3.2
552	23	3.2	2.8	3.0	3.4	3.0	3.0	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
564		3.2	2.9	2.9	3.3	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
576	24	3.1	2.7	2.8	3.3	2.8	2.9	3.2	3.2	3.1	3.2	3.2	3.2	3.1	3.3	3.1	3.2
Average over trial period		3.1	2.8	2.9	3.4	2.9	3.0	3.2	3.2	3.0	3.2	3.2	3.2	3.1	3.3	3.1	3.2
± standard deviation		0.2	0.3	0.2	0.1	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0
Average of Fruit temperatures						3.2 ± 0.1											
Average of Air temperatures						3.0 ± 0.2											

Table 3.89: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.2	3.1	3.6	3.7	3.0	3.2	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.3
24	1	3.1	2.9	3.5	3.6	2.9	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
36		3.0	2.8	3.4	3.4	2.7	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
48	2	3.1	2.8	3.5	3.5	2.8	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
60		3.0	2.7	3.4	3.5	2.7	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
72	3	3.1	2.8	3.5	3.6	2.8	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.2	3.3
84		3.1	2.9	3.5	3.5	2.9	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.3
96	4	3.1	2.7	3.4	3.4	2.8	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
108		3.1	2.8	3.4	3.5	2.8	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
120	5	3.1	2.8	3.4	3.4	2.8	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.3
132		3.0	2.8	3.4	3.4	2.7	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.2	3.3
144	6	3.2	3.0	3.5	3.6	2.9	3.1	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.3
156		3.2	2.8	3.5	3.6	2.8	3.0	3.0	3.3	3.0	3.1	3.0	3.1	3.0	3.0	3.2	3.3
168	7	3.2	3.0	3.6	3.6	2.9	3.0	3.0	3.3	3.0	3.1	3.0	3.1	3.0	3.0	3.2	3.3
180		3.1	2.8	3.9	3.6	2.7	2.9	3.1	3.3	3.0	3.1	3.0	3.1	3.0	3.0	3.2	3.3
192	8	3.1	2.8	3.9	3.6	2.8	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.2	3.4
204		3.2	3.1	4.0	3.9	3.0	3.1	3.1	3.3	3.1	3.2	3.1	3.2	3.1	3.1	3.3	3.3
216	9	3.1	2.8	3.8	3.8	2.8	2.9	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
228		3.2	3.1	3.7	3.9	3.0	3.2	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
240	10	3.0	2.8	3.6	3.8	2.8	2.9	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
252		3.0	2.8	3.5	3.9	2.8	2.9	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.4
264	11	3.0	2.7	3.5	3.8	2.7	2.9	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
276		3.1	2.8	3.5	3.7	2.8	3.0	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
288	12	3.0	2.7	3.5	3.5	2.7	2.8	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
300		3.2	2.9	3.8	3.7	2.9	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.3
312	13	3.1	2.7	3.9	3.6	2.7	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.2	3.4
324		3.2	3.0	4.0	3.8	2.9	3.1	3.1	3.3	3.1	3.2	3.1	3.2	3.1	3.1	3.3	3.3
336	14	3.1	2.8	3.8	3.8	2.8	2.9	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
348		3.1	2.9	3.7	3.9	2.9	3.0	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
360	15	3.0	2.7	3.6	3.8	2.7	2.9	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
372		3.0	2.8	3.5	3.8	2.7	2.9	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.4
384	16	3.1	2.8	3.5	3.8	2.8	3.0	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
396		3.1	2.8	3.6	3.7	2.9	3.0	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
408	17	3.1	2.8	3.5	3.6	2.8	3.0	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
420		3.0	2.7	3.7	3.6	2.7	2.8	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.3
432	18	3.1	2.8	3.9	3.6	2.7	2.9	3.1	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.2	3.4
444		3.2	3.1	4.0	3.9	3.0	3.2	3.1	3.3	3.1	3.2	3.1	3.2	3.1	3.1	3.3	3.3
456	19	3.1	2.9	3.9	3.8	2.8	3.0	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
468		3.2	3.1	3.7	3.9	3.0	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
480	20	3.1	2.9	3.6	3.8	2.8	3.0	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
492		3.0	2.8	3.5	3.9	2.8	2.9	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.4
504	21	3.0	2.6	3.5	3.8	2.7	2.8	3.1	3.3	3.1	3.2	3.1	3.2	3.1	3.1	3.3	3.3
516		3.2	2.9	3.6	3.8	2.9	3.0	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
528	22	3.0	2.6	3.5	3.5	2.7	2.8	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.4
540		3.1	2.9	3.7	3.7	2.9	3.0	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.3
552	23	3.1	2.7	3.9	3.6	2.7	2.9	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
564		3.1	2.8	4.0	3.8	2.8	3.0	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
576	24	3.1	2.9	4.0	3.9	2.9	3.0	3.1	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.3	3.3
Average over trial period		3.1	2.8	3.6	3.7	2.8	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
± standard deviation		0.2	0.4	0.2	0.3	0.3	0.3	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0
Average of Fruit temperatures						3.2 ± 0.1											
Average of Air temperatures						3.2 ± 0.3											

Table 3.90: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.1	2.6	3.3	3.4	2.9	2.8	3.2	3.3	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.2
24	1	3.2	2.8	3.3	3.5	3.0	2.9	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
36		3.2	2.8	3.4	3.5	3.0	3.0	3.2	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.2
48	2	3.2	2.8	3.4	3.5	3.0	2.9	3.2	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.2
60		3.2	2.9	3.4	3.5	3.0	3.0	3.2	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.2
72	3	3.1	2.7	3.3	3.4	2.9	2.8	3.1	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.2
84		3.0	2.5	3.3	3.3	2.9	2.9	3.2	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.2
96	4	3.2	2.8	3.4	3.4	3.0	2.9	3.1	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.2
108		3.2	2.8	3.3	3.4	3.1	3.0	3.2	3.3	3.3	3.1	3.0	3.1	3.0	3.0	3.0	3.2
120	5	3.1	2.6	3.3	3.3	2.9	2.9	3.1	3.2	3.2	3.1	3.0	3.1	3.0	3.0	3.0	3.2
132		3.2	2.6	3.3	3.4	3.0	2.9	3.1	3.3	3.2	3.1	3.0	3.1	3.0	3.0	3.0	3.2
144	6	3.2	2.8	3.4	3.4	3.0	2.9	3.1	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.2
156		3.3	2.8	3.4	3.5	3.0	2.9	3.1	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.2
168	7	3.0	2.3	3.4	3.3	2.7	2.7	3.1	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.2
180		3.2	2.7	3.8	3.6	3.0	2.9	3.1	3.2	3.2	3.1	3.0	3.0	3.0	2.9	3.0	3.2
192	8	3.2	2.8	3.8	3.6	3.0	2.9	3.1	3.3	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.2
204		3.1	2.7	3.8	3.6	2.9	2.9	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
216	9	3.2	2.8	3.7	3.8	3.0	2.9	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
228		3.1	2.6	3.5	3.7	2.9	2.8	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
240	10	3.2	2.7	3.5	3.7	3.0	2.9	3.2	3.3	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.2
252		3.2	2.8	3.4	3.8	3.1	3.0	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
264	11	3.3	2.9	3.4	3.7	3.1	3.0	3.2	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.2
276		3.2	2.8	3.4	3.6	3.0	2.9	3.2	3.2	3.3	3.2	3.2	3.1	3.0	3.1	3.0	3.2
288	12	3.2	2.6	3.4	3.5	3.0	3.0	3.2	3.3	3.3	3.1	3.3	3.1	3.0	3.0	3.0	3.2
300		3.2	2.6	3.4	3.7	2.9	2.8	3.2	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.2
312	13	3.2	2.7	3.4	3.7	3.0	2.9	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.3
324		3.2	2.8	3.4	3.8	3.0	3.0	3.2	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.2
336	14	3.3	2.9	3.4	3.7	3.1	3.0	3.2	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.3
348		3.2	2.7	3.4	3.6	3.0	2.9	3.2	3.3	3.3	3.1	3.2	3.1	3.1	3.0	3.0	3.2
360	15	3.3	2.6	3.4	3.5	3.0	3.0	3.2	3.3	3.3	3.2	3.3	3.1	3.0	3.0	3.0	3.2
372		3.2	2.8	3.4	3.5	3.0	2.9	3.2	3.3	3.3	3.1	3.2	3.1	3.0	3.0	3.0	3.2
384	16	3.3	2.6	3.4	3.5	3.0	3.0	3.2	3.3	3.3	3.1	3.3	3.1	3.0	3.0	3.0	3.2
396		3.1	2.6	3.4	3.6	2.9	2.8	3.2	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.2
408	17	3.1	2.7	3.4	3.7	3.0	3.0	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.3
420		3.2	2.7	3.4	3.8	3.0	3.0	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
432	18	3.3	2.9	3.4	3.7	3.1	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.2
444		3.2	2.7	3.4	3.6	3.0	2.9	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.3
456	19	3.2	2.6	3.4	3.6	3.0	3.0	3.2	3.3	3.3	3.2	3.3	3.1	3.0	3.0	3.0	3.2
468		3.3	2.8	3.4	3.5	3.0	2.9	3.1	3.2	3.2	3.1	3.1	3.0	3.0	2.9	2.9	3.2
480	20	3.0	2.3	3.4	3.3	2.7	2.7	3.1	3.3	3.2	3.1	3.0	3.0	3.0	2.9	2.9	3.2
492		3.2	2.7	3.6	3.6	3.0	2.9	3.1	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.2
504	21	3.1	2.7	3.4	3.7	3.0	2.9	3.2	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2
516		3.2	2.7	3.4	3.8	3.0	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.2
528	22	3.2	2.9	3.4	3.8	3.1	3.0	3.2	3.3	3.2	3.2	3.0	3.1	3.0	3.0	3.0	3.2
540		3.2	2.7	3.3	3.6	3.0	2.9	3.2	3.2	3.3	3.2	3.1	3.1	3.0	3.1	3.0	3.3
552	23	3.4	2.8	3.5	3.6	3.2	3.0	3.2	3.2	3.3	3.2	3.3	3.1	3.1	3.0	3.0	3.2
564		3.3	2.7	3.5	3.5	3.0	2.9	3.1	3.2	3.2	3.1	3.1	3.0	3.0	2.9	3.0	3.2
576	24	3.2	2.6	3.3	3.4	2.9	2.9	3.1	3.1	3.2	3.1	3.0	3.0	3.0	2.9	3.0	3.1
Average over trial period		3.2	2.7	3.4	3.6	3.0	2.9	3.2	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.2
± standard deviation		0.3	0.4	0.2	0.2	0.3	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.1 ± 0.3											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.91 – 3.93 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.91: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Zee Lady Peaches** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 4th January – 28th January 2008

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1048	957	902	1010				
2	600	885	798	873	885	15.6	16.6	3.2	12.4
3	600	656	613	704	659	37.4	35.9	22.0	34.8
4	600	447	538	476	467	57.3	43.8	47.2	53.8
5	600	227	403	414	191	78.3	57.9	54.1	81.1
6	600	173	345	292	138	83.5	63.9	67.6	86.3
7	600	39	178	178	70	96.3	81.4	80.3	93.1
8	600	21	159	139	19	98.0	83.4	84.6	98.1
9	600	6	58	42	7	99.4	93.9	95.3	99.3
10	600	2	42	39	3	99.8	95.6	95.7	99.7
11	600	1	10	16	1	99.9	99.0	98.2	99.9
12	600	0	6	8	0	100.0	99.4	99.1	100.0
13	600	0	2	3	0	100.0	99.8	99.7	100.0
14	600	0	0	2	0	100.0	100.0	99.8	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.92 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Zee Lady Peaches** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 4th January – 28th January 2008

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	901	1067	1084	1016				
2	600	778	842	962	884	13.7	21.1	11.3	13.0
3	600	630	726	698	634	30.1	32.0	35.6	37.6
4	600	443	545	612	435	50.8	48.9	43.5	57.2
5	600	255	462	502	214	71.7	56.7	53.7	78.9
6	600	128	297	337	138	85.8	72.2	68.9	86.4
7	600	48	137	193	65	94.7	87.2	82.2	93.6
8	600	16	116	167	25	98.2	89.1	84.6	97.5
9	600	7	73	88	10	99.2	93.2	91.9	99.0
10	600	1	35	58	5	99.9	96.7	94.6	99.5
11	600	0	16	19	3	100.0	98.5	98.2	99.7
12	600	0	5	11	0	100.0	99.5	99.0	100.0
13	600	0	1	2	0	100.0	99.9	99.8	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.93 Mortality Tests of the Most Tolerant Stage of Medfly in infested **Zee Lady Peaches** (600g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 4th January – 28th January 2008

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1043	980	907	1020				
2	600	908	845	841	885	12.9	13.8	7.3	13.2
3	600	671	557	724	642	35.7	43.2	20.2	37.1
4	600	468	409	530	387	55.1	58.3	41.6	62.1
5	600	214	333	439	198	79.5	66.0	51.6	80.6
6	600	89	267	375	119	91.5	72.8	58.7	88.3
7	600	49	191	229	73	95.3	80.5	74.8	92.8
8	600	12	143	180	20	98.8	85.4	80.2	98.0
9	600	8	38	70	8	99.2	96.1	92.3	99.2
10	600	3	29	57	6	99.7	97.0	93.7	99.4
11	600	0	9	23	2	100.0	99.1	97.5	99.8
12	600	0	5	9	1	100.0	99.5	99.0	99.9
13	600	0	0	3	0	100.0	100.0	99.7	100.0
14	600	0	1	0	0	100.0	99.9	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

3.6.5 Nectarines – Arctic Snow

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.94. Cold treatment 12 hour summary records are given in tables 3.95- 3.97. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.98 – 3.100

Table 3.94 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / Arctic Snow		21.04.2007	21.04.2007		15.05.2007			20.04.2007
	1	07:20 am	14:20 pm	7.0	16:35 pm	# 3	KS0606016	13:14 pm
	2	07:48 am	14:48 pm	7.0	14:48 pm	# 4	KS0547009	13:06 am
	3	08:16 am	15:16 pm	7.0	15:16 pm	# 5	KS0606017	14:29 am

Table 3.95: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		2.4	1.0	2.4	2.6	2.6	2.4	2.8	3.0	2.9	3.1	3.0	3.0	3.0	3.0	2.9	2.9
24	1	2.6	0.8	3.8	3.0	2.8	3.0	2.9	3.1	3.0	3.2	3.0	3.0	3.1	3.1	2.9	3.0
36		2.4	1.3	2.5	2.7	2.6	2.5	2.9	3.1	2.9	3.2	3.0	3.1	3.1	3.1	2.9	3.0
48	2	2.8	0.4	4.8	3.2	2.9	3.4	3.0	3.1	3.0	3.2	3.0	3.1	3.1	3.1	2.9	3.0
60		2.5	0.6	3.1	2.8	2.7	2.6	3.0	3.2	3.0	3.3	3.1	3.2	3.1	3.1	2.9	3.0
72	3	2.8	0.1	5.3	3.3	3.0	3.5	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2	2.9	3.0
84		3.7	1.5	3.5	3.1	3.2	2.9	3.1	3.3	3.1	3.4	3.1	3.3	3.2	3.2	3.0	3.1
96	4	3.7	0.8	6.0	4.0	3.6	4.0	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2	2.9	3.0
108		3.6	1.4	3.4	3.2	3.2	2.9	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
120	5	3.7	0.9	5.2	4.0	3.4	3.7	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2	2.9	3.1
132		3.5	1.2	3.6	3.4	3.1	2.9	3.0	3.2	2.9	3.2	3.0	3.2	3.1	3.1	2.8	3.0
144	6	3.6	1.3	4.5	4.0	3.3	3.4	3.0	3.2	3.0	3.3	3.0	3.2	3.1	3.2	2.9	3.0
156		3.4	1.5	3.2	3.2	3.0	2.8	3.1	3.3	3.1	3.4	3.2	3.3	3.2	3.3	3.0	3.1
168	7	3.4	1.1	4.8	3.8	3.3	3.5	3.1	3.4	3.2	3.4	3.2	3.4	3.3	3.3	3.0	3.1
180		3.5	1.3	3.2	3.1	3.1	2.8	3.1	3.3	3.1	3.4	3.2	3.4	3.2	3.3	3.0	3.1
192	8	3.6	1.2	5.1	3.6	3.4	3.7	3.1	3.3	3.1	3.4	3.2	3.3	3.2	3.3	3.0	3.1
204		3.5	1.2	3.5	3.1	3.1	2.9	3.2	3.4	3.2	3.4	3.2	3.4	3.3	3.3	3.0	3.2
216	9	3.5	0.7	5.5	3.7	3.4	3.7	3.1	3.4	3.2	3.4	3.2	3.4	3.3	3.3	3.0	3.1
228		3.5	1.1	3.4	3.3	3.1	2.8	3.1	3.3	3.1	3.4	3.2	3.4	3.2	3.3	3.0	3.1
240	10	3.3	0.9	4.3	3.6	3.2	3.3	3.1	3.3	3.1	3.4	3.2	3.3	3.2	3.3	3.0	3.1
252		3.4	1.4	3.1	3.0	3.0	2.7	3.1	3.3	3.1	3.4	3.2	3.3	3.2	3.3	3.0	3.1
264	11	3.3	1.0	3.9	3.1	3.1	2.9	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
276		3.3	1.4	3.0	2.9	3.0	2.7	3.0	3.2	3.0	3.3	3.1	3.2	3.1	3.2	2.9	3.0
288	12	3.2	1.1	3.7	3.2	3.1	3.0	3.0	3.2	3.0	3.3	3.0	3.2	3.1	3.2	2.9	3.0
300		3.2	1.2	2.4	2.6	2.9	2.4	3.1	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
312	13	3.6	1.4	4.0	3.2	3.2	3.2	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
324		3.3	1.5	2.6	2.8	3.0	2.5	3.0	3.3	3.0	3.3	3.1	3.2	3.1	3.2	2.9	3.1
336	14	3.3	1.0	4.2	3.4	3.2	3.3	3.0	3.2	3.0	3.2	3.0	3.2	3.1	3.2	2.9	3.0
348		3.3	1.4	2.8	2.9	3.0	2.6	3.0	3.2	2.9	3.2	3.0	3.2	3.1	3.1	2.8	3.0
360	15	3.6	1.1	5.1	3.6	3.3	3.6	3.1	3.4	3.1	3.4	3.2	3.3	3.2	3.3	3.0	3.1
372		3.5	1.2	3.5	3.1	3.1	2.9	3.1	3.4	3.1	3.4	3.2	3.4	3.3	3.3	3.0	3.2
384	16	3.5	0.7	5.5	3.7	3.4	3.7	3.1	3.4	3.1	3.3	3.2	3.4	3.3	3.3	3.0	3.1
396		3.5	1.1	3.4	3.3	3.1	2.8	3.1	3.4	3.1	3.3	3.2	3.4	3.2	3.3	3.0	3.2
408	17	3.3	0.9	4.3	3.6	3.2	3.3	3.1	3.3	3.1	3.3	3.1	3.3	3.2	3.2	3.0	3.1
420		3.4	1.4	3.1	3.0	3.0	2.7	3.1	3.3	3.0	3.3	3.1	3.3	3.2	3.2	3.0	3.1
432	18	3.3	1.0	3.9	3.1	3.1	2.9	3.0	3.3	3.0	3.3	3.1	3.2	3.1	3.2	2.9	3.1
444		3.3	1.4	3.0	2.9	3.0	2.7	3.0	3.2	3.0	3.2	3.1	3.2	3.1	3.1	2.9	3.1
456	19	3.2	1.1	3.7	3.2	3.1	3.0	3.0	3.2	3.0	3.2	3.1	3.2	3.2	3.1	2.9	3.0
468		3.2	1.2	2.4	2.6	2.9	2.4	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
480	20	3.6	1.4	4.0	3.2	3.2	3.2	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
492		3.3	1.5	2.6	2.8	3.0	2.5	3.0	3.2	2.9	3.2	3.0	3.2	3.1	3.1	2.8	3.0
504	21	3.6	1.2	4.9	3.5	3.4	3.6	3.0	3.3	3.0	3.3	3.1	3.2	3.2	3.2	2.9	3.1
516		3.5	1.4	3.1	3.0	3.1	2.8	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
528	22	3.8	1.0	5.5	3.7	3.5	3.9	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
540		2.6	0.6	3.8	3.0	2.8	2.9	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
552	23	2.9	0.0	5.5	3.5	3.0	3.6	3.0	3.2	2.9	3.2	3.0	3.2	3.1	3.1	2.9	3.0
564		2.5	0.4	3.8	3.1	2.8	2.8	3.0	3.2	3.0	3.2	3.0	3.2	3.1	3.1	2.9	3.0
576	24	2.7	0.1	4.9	3.5	2.9	3.3	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
Average over trial period		3.3	1.1	3.9	3.2	3.1	3.1	3.0	3.3	3.0	3.3	3.1	3.3	3.2	3.2	2.9	3.1
± standard deviation		2.8	2.1	1.2	0.9	1.3	0.8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						2.9 ± 1.5											

Table 3.96: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.8	1.8	2.9	2.9	3.4	2.3	3.1	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0
24	1	3.1	1.8	3.5	3.8	4.3	2.5	3.1	3.0	3.1	3.0	3.1	3.1	3.1	3.1	3.0	3.0
36		2.8	1.8	3.0	2.9	3.5	2.4	3.1	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
48	2	3.4	1.8	3.9	4.2	4.9	2.5	3.1	2.9	3.0	2.9	3.1	3.1	3.1	3.1	3.0	3.0
60		3.4	2.1	3.6	3.4	4.1	2.7	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
72	3	4.1	2.1	4.7	4.8	5.7	3.0	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
84		3.6	2.2	3.8	3.6	4.4	2.9	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
96	4	4.4	2.4	5.1	5.2	6.1	3.2	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
108		3.6	2.0	3.8	3.6	4.3	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
120	5	3.9	2.0	4.5	4.9	5.6	2.9	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
132		3.6	2.1	3.8	3.7	4.5	2.9	3.2	3.0	3.2	3.1	3.2	3.2	3.2	3.2	3.1	3.1
144	6	3.8	2.0	4.2	4.5	5.3	2.8	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
156		3.5	2.3	3.6	3.5	4.3	2.9	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
168	7	3.9	1.9	4.4	4.7	5.4	2.9	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
180		3.5	2.4	3.7	3.5	4.3	2.9	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
192	8	4.0	2.1	4.5	4.6	5.4	3.0	3.2	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
204		3.6	2.2	3.8	3.6	4.4	2.9	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
216	9	3.8	1.8	4.5	4.7	5.5	2.8	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
228		3.5	2.1	3.8	3.6	4.4	2.7	3.2	3.0	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
240	10	3.8	2.0	4.3	4.4	5.2	2.8	3.2	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
252		3.5	2.2	3.6	3.4	4.2	2.8	3.1	3.0	3.1	3.0	3.2	3.1	3.2	3.2	3.1	3.1
264	11	3.8	2.2	4.1	4.2	5.0	3.0	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
276		3.5	2.1	3.6	3.4	4.2	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
288	12	3.7	2.2	3.9	4.1	4.8	2.9	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
300		3.4	2.3	3.4	3.1	3.9	2.8	3.1	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0
312	13	3.4	2.0	3.8	4.1	4.6	2.7	3.1	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
324		3.3	2.1	3.4	3.2	4.0	2.7	3.1	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0
336	14	3.7	2.1	4.1	4.4	5.0	2.9	3.1	3.0	3.0	3.0	3.1	3.1	3.2	3.1	3.0	3.0
348		3.4	2.0	3.5	3.3	4.1	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
360	15	3.6	2.1	3.7	3.7	4.5	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
372		3.6	2.1	3.8	3.9	4.6	2.9	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
384	16	3.5	2.3	3.6	3.4	4.2	2.9	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
396		3.3	2.0	3.6	3.9	4.3	2.7	3.0	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
408	17	3.4	2.1	3.7	3.4	4.2	2.7	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
420		3.6	2.1	3.8	4.1	4.7	2.8	3.1	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
432	18	3.5	2.1	3.7	3.5	4.4	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
444		3.6	2.1	3.6	3.6	4.4	2.8	3.1	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0
456	19	3.5	2.1	3.6	3.7	4.4	2.8	3.1	2.9	3.0	3.0	3.1	3.1	3.2	3.1	3.1	3.0
468		3.6	2.3	3.9	3.7	4.6	2.9	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
480	20	3.2	1.9	3.3	3.5	4.0	2.6	3.0	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
492		3.6	2.2	3.9	3.8	4.6	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
504	21	3.5	2.0	3.6	3.7	4.3	2.7	3.1	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
516		3.6	2.2	4.0	3.9	4.7	2.9	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
528	22	2.9	1.6	3.2	3.4	3.9	2.4	3.1	2.9	3.0	2.9	3.1	3.0	3.1	3.1	3.0	3.0
540		3.5	2.1	3.6	3.4	4.2	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
552	23	3.7	2.2	4.0	4.1	4.8	2.9	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.0
564		3.3	2.2	3.3	3.1	3.9	2.8	3.1	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0
576	24	3.4	1.8	3.8	4.0	4.6	2.6	3.1	2.9	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0
Average over trial period		3.5	2.1	3.8	3.8	4.5	2.8	3.1	3.0	3.1	3.0	3.1	3.1	3.2	3.1	3.1	3.1
± standard deviation		1.7	1.3	1.2	1.0	1.3	1.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.4 ± 1.3											

Table 3.97: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.9	2.3	1.5	2.7	2.1	1.1	3.0	3.4	3.2	3.0	3.0	3.0	3.1	3.3	3.2	3.4
24	1	3.1	2.3	4.7	2.8	3.5	3.4	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
36		2.0	2.2	1.7	2.7	2.2	1.3	2.9	3.3	3.1	2.9	3.0	3.0	3.1	3.2	3.1	3.4
48	2	4.0	2.3	6.4	2.9	4.3	4.4	2.9	3.3	3.1	2.9	3.0	3.0	3.0	3.2	3.1	3.4
60		2.5	2.3	2.8	2.8	2.8	1.9	2.9	3.3	3.1	2.9	3.0	3.0	3.1	3.2	3.1	3.4
72	3	4.6	2.3	7.4	3.0	5.1	5.0	2.9	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
84		2.8	2.2	3.4	2.8	3.3	2.3	2.9	3.3	3.1	2.9	3.0	3.0	3.1	3.2	3.2	3.4
96	4	5.2	2.3	8.0	3.0	5.5	5.6	2.9	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
108		2.6	2.2	2.9	2.7	3.1	2.3	2.9	3.3	3.1	2.9	3.0	3.0	3.1	3.2	3.2	3.4
120	5	4.3	2.2	7.0	3.0	5.0	5.0	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.5
132		2.8	2.3	3.5	2.8	3.1	2.6	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
144	6	3.7	2.3	6.0	3.0	4.3	4.3	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
156		2.4	2.2	2.9	2.7	2.8	2.2	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
168	7	4.1	2.3	6.4	2.9	4.4	4.6	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
180		2.5	2.3	2.9	2.8	2.9	2.0	2.9	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
192	8	4.4	2.5	6.5	3.2	4.6	4.8	2.9	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
204		3.3	2.4	3.7	2.9	3.3	2.5	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
216	9	4.9	2.4	7.3	3.2	5.1	5.2	3.0	3.3	3.2	3.0	3.0	3.1	3.1	3.3	3.2	3.5
228		3.5	2.4	3.7	3.0	3.3	2.7	3.0	3.3	3.2	3.0	3.0	3.1	3.1	3.3	3.2	3.4
240	10	4.0	2.4	5.7	3.1	4.3	4.2	3.0	3.3	3.2	3.0	3.1	3.1	3.1	3.3	3.2	3.4
252		3.3	2.5	3.1	3.0	3.0	2.3	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
264	11	3.7	2.3	5.1	3.0	3.9	3.5	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
276		3.0	2.4	2.9	2.9	2.8	2.0	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
288	12	3.6	2.4	4.7	3.0	3.7	3.5	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
300		2.7	2.5	1.9	2.9	2.4	1.5	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
312	13	3.6	2.5	5.0	3.1	3.7	3.8	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
324		2.8	2.6	2.3	3.0	2.5	1.8	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
336	14	3.8	2.4	5.5	3.1	4.0	4.1	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
348		3.0	2.5	2.6	2.9	2.7	1.9	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
360	15	4.6	2.6	6.8	3.3	5.0	5.0	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
372		3.4	2.5	3.6	3.0	3.3	2.8	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
384	16	4.0	2.5	6.1	3.1	4.4	4.5	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
396		3.0	2.6	3.1	3.0	3.0	2.4	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
408	17	4.3	2.5	6.4	3.2	4.6	4.9	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
420		3.2	2.5	3.1	3.0	3.1	2.2	2.9	3.3	3.1	2.9	3.0	3.0	3.1	3.2	3.2	3.4
432	18	4.1	2.3	6.3	2.9	4.4	4.5	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
444		2.9	2.4	3.7	2.9	3.2	2.5	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
456	19	4.5	2.2	7.1	3.0	4.9	4.9	3.0	3.4	3.2	3.0	3.0	3.1	3.1	3.3	3.2	3.5
468		2.9	2.2	3.6	2.8	3.1	2.6	3.0	3.3	3.2	3.0	3.0	3.1	3.1	3.3	3.2	3.4
480	20	3.6	2.2	5.5	2.9	4.1	3.9	3.0	3.3	3.2	3.0	3.1	3.1	3.1	3.3	3.2	3.4
492		2.7	2.5	1.9	2.9	2.4	1.5	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
504	21	3.6	2.5	5.0	3.1	3.7	3.8	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
516		2.8	2.6	2.3	3.0	2.5	1.8	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
528	22	4.0	2.5	5.9	3.2	4.2	4.5	3.0	3.3	3.1	3.0	3.0	3.1	3.1	3.2	3.2	3.4
540		2.9	2.5	2.4	2.9	2.7	1.7	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
552	23	4.6	2.5	7.0	3.3	4.9	5.2	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
564		3.3	2.5	3.6	3.0	3.4	2.8	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
576	24	4.0	2.5	6.0	3.1	4.3	4.5	3.0	3.3	3.2	3.0	3.0	3.0	3.1	3.2	3.2	3.4
Average over trial period		3.5	2.4	4.5	3.0	3.6	3.3	3.0	3.3	3.1	3.0	3.0	3.0	3.1	3.2	3.2	3.4
± standard deviation		1.6	0.6	2.2	0.6	1.1	1.7	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.4 ± 1.3											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.98 – 3.100 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.98: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Arctic Snow Nectarines** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 21st April – 15th May 2007

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	938	942	912	936				
2	600	735	904	887	826	21.6	4.0	2.7	11.8
3	600	573	847	783	621	38.9	10.1	14.1	33.7
4	600	375	625	644	386	60.0	33.7	29.4	58.8
5	600	266	333	463	285	71.6	64.6	49.2	69.6
6	600	121	246	365	159	87.1	73.9	60.0	83.0
7	600	52	134	246	60	94.5	85.8	73.0	93.6
8	600	26	110	139	28	97.2	88.3	84.8	97.0
9	600	10	44	74	19	98.9	95.3	91.9	98.0
10	600	0	35	58	12	100.0	96.3	93.6	98.7
11	600	0	9	29	4	100.0	99.0	96.8	99.6
12	600	0	4	9	0	100.0	99.6	99.0	100.0
13	600	0	1	3	0	100.0	99.9	99.7	100.0
14	600	0	1	2	0	100.0	99.9	99.8	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.99: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Arctic Snow Nectarines** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 21st April – 15th May 2007

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1021	981	874	889				
2	600	958	952	859	689	6.2	3.0	1.7	22.5
3	600	763	847	780	600	25.3	13.7	10.8	32.5
4	600	430	605	469	450	57.9	38.3	46.3	49.4
5	600	306	461	418	296	70.0	53.0	52.2	66.7
6	600	127	402	339	133	87.6	59.0	61.2	85.0
7	600	48	198	202	86	95.3	79.8	76.9	90.3
8	600	18	121	153	33	98.2	87.7	82.5	96.3
9	600	4	63	72	25	99.6	93.6	91.8	97.2
10	600	2	34	44	9	99.8	96.5	95.0	99.0
11	600	1	12	21	4	99.9	98.8	97.6	99.6
12	600	0	4	12	0	100.0	99.6	98.6	100.0
13	600	0	2	5	0	100.0	99.8	99.4	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.100: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Arctic Snow Nectarines** (600g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 21st April – 15th May 2007

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	787	841	951	922				
2	600	680	816	855	863	13.6	3.0	10.1	6.4
3	600	557	708	798	577	29.2	15.8	16.1	37.4
4	600	409	443	687	434	48.0	47.3	27.8	52.9
5	600	302	331	447	296	61.6	60.6	53.0	67.9
6	600	121	270	385	145	84.6	67.9	59.5	84.3
7	600	54	164	217	55	93.1	80.5	77.2	94.0
8	600	20	116	176	23	97.5	86.2	81.5	97.5
9	600	4	49	81	12	99.5	94.2	91.5	98.7
10	600	2	40	49	5	99.7	95.2	94.8	99.5
11	600	0	11	18	2	100.0	98.7	98.1	99.8
12	600	0	5	11	0	100.0	99.4	98.8	100.0
13	600	0	1	3	0	100.0	99.9	99.7	100.0
14	600	0	0	2	0	100.0	100.0	99.8	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

3.6.6 Nectarines – August Red

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.101. Cold treatment 12 hour summary records are given in tables 3.102- 3.104. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.105 – 3.107

Table 3.101 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / August Red		19.06.2008	19.06.2008		13.07.2008			18.06.2008
	1	07:26 am	14:26 pm	7.0	14: 26 pm	# 3	KS0606016	13:23 pm
	2	07:56 am	13: 56 pm	6.0	13: 56 pm	# 4	KS0547009	13:53 am
	3	08:26 am	14: 26 pm	6.0	14: 26 pm	# 5	KS0606017	13:57 am

Table 3.102: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.6	4.1	3.1	3.3	3.6	4.7	3.3	3.2	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.0
24	1	4.4	3.8	3.4	3.6	3.5	4.8	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
36		4.2	3.7	2.8	3.0	3.3	4.4	3.2	3.2	3.0	3.2	3.1	3.0	3.1	3.1	3.0	3.1
48	2	4.3	3.3	3.1	3.4	3.4	4.5	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
60		4.0	3.3	2.3	2.8	3.2	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
72	3	4.1	2.6	4.0	3.2	2.9	4.1	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
84		3.9	2.7	3.4	2.5	2.7	3.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
96	4	4.2	3.1	3.5	3.2	2.9	4.2	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.0
108		4.1	3.1	3.3	2.6	2.9	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.0
120	5	4.1	2.9	3.5	2.3	2.8	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
132		3.9	2.9	3.0	2.0	2.7	3.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
144	6	3.9	2.8	3.5	2.6	2.8	3.8	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
156		3.9	2.9	3.0	2.3	2.7	3.6	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
168	7	3.9	3.1	3.2	2.7	2.8	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
180		3.8	3.2	2.8	2.2	2.7	3.8	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.2
192	8	3.8	3.2	3.1	2.4	2.8	4.1	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
204		3.7	3.3	2.5	2.0	2.6	3.8	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
216	9	3.6	3.0	2.8	2.3	2.6	3.9	3.2	3.2	3.0	3.3	3.1	3.1	3.0	3.1	3.0	3.1
228		3.7	2.9	2.5	2.5	2.8	3.8	3.2	3.2	3.0	3.3	3.1	3.1	3.0	3.1	3.0	3.1
240	10	4.0	3.3	2.3	2.8	3.2	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
252		4.1	2.6	4.0	3.2	2.9	4.1	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
264	11	3.9	2.7	3.4	2.5	2.7	3.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
276		4.2	3.1	3.5	3.2	2.9	4.2	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
288	12	4.1	3.1	3.3	2.6	2.9	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
300		4.1	2.9	3.5	2.3	2.8	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
312	13	3.9	2.9	3.0	2.0	2.7	3.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
324		3.9	2.8	3.5	2.6	2.8	3.8	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
336	14	3.9	2.9	3.0	2.3	2.7	3.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
348		3.9	3.1	3.2	2.7	2.8	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.0	3.1
360	15	3.8	3.2	2.8	2.2	2.7	3.8	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
372		3.8	3.2	3.1	2.4	2.8	4.1	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
384	16	3.8	3.0	3.4	3.0	3.1	4.1	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
396		3.9	3.4	2.1	2.6	3.1	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
408	17	4.1	2.5	4.5	3.3	3.0	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
420		3.8	2.8	3.1	2.4	2.7	3.5	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
432	18	4.3	3.1	3.7	3.4	3.0	4.3	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
444		4.0	3.1	3.1	2.4	2.8	3.9	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
456	19	4.1	2.8	3.6	2.3	2.9	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
468		3.8	3.0	2.9	2.0	2.7	3.6	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.0	3.0	3.1
480	20	4.0	2.7	3.7	2.7	2.8	3.8	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.0	3.0	3.1
492		3.8	3.0	2.8	2.2	2.6	3.6	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.0	3.0	3.1
504	21	3.9	3.1	3.4	2.8	2.9	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
516		3.7	3.3	2.5	2.1	2.6	3.8	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
528	22	3.9	3.2	3.3	2.5	2.8	4.1	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
540		3.9	3.2	3.1	2.9	3.0	4.1	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.0	3.1
552	23	3.9	3.4	2.1	2.6	3.1	4.0	3.3	3.2	3.0	3.2	3.1	3.1	3.1	3.0	3.0	3.1
564		4.1	2.5	4.5	3.3	3.0	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.1	3.1
576	24	3.8	2.9	3.1	2.4	2.7	3.6	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.1
Average over trial period		4.0	3.1	3.2	2.7	2.9	4.0	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.1
± standard deviation		0.6	0.4	0.8	0.6	0.4	0.4	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.0											
Average of Air temperatures						3.3 ± 0.5											

Table 3.103: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.5	3.3	4.3	3.7	4.3	3.2	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
24	1	4.5	2.9	4.2	4.0	4.4	2.8	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
36		4.2	3.0	4.1	3.5	4.1	2.9	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
48	2	4.4	3.0	4.3	4.0	4.4	2.9	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
60		4.5	3.1	4.3	3.7	4.3	3.1	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
72	3	4.7	3.0	4.4	4.1	4.7	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.1
84		4.6	3.1	4.1	3.7	4.6	3.0	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
96	4	4.8	3.0	4.2	4.4	5.3	2.9	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
108		4.7	3.2	4.1	3.8	4.9	3.1	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
120	5	4.6	3.2	4.1	3.9	4.7	3.1	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
132		4.0	3.1	3.8	3.2	3.9	3.0	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
144	6	4.4	3.1	4.1	3.9	4.7	3.0	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
156		4.1	2.9	3.9	3.3	4.1	2.8	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
168	7	4.5	2.7	4.1	3.8	4.9	2.7	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
180		4.3	2.7	4.0	3.4	4.5	2.5	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.0	3.0
192	8	3.8	2.5	3.9	4.0	4.7	2.5	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.0
204		4.2	2.8	4.2	3.9	4.3	2.9	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
216	9	4.0	2.8	3.9	3.8	4.0	2.9	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.1
228		3.7	2.6	4.0	3.6	3.9	2.7	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
240	10	3.9	2.7	3.9	3.6	3.9	2.8	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
252		3.9	2.7	4.1	3.8	4.1	2.8	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
264	11	4.1	2.9	4.1	3.8	4.1	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.0	3.1
276		4.2	2.9	4.1	3.9	4.6	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.1
288	12	4.1	2.9	3.8	3.9	4.5	2.9	3.0	3.0	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
300		4.4	2.9	4.0	4.1	5.0	2.9	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.0
312	13	4.1	3.0	3.8	3.8	4.5	3.0	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
324		3.8	3.0	3.8	3.5	4.1	3.0	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
336	14	3.5	2.8	3.4	3.3	3.7	2.8	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
348		3.9	2.7	4.0	3.7	4.5	2.7	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
360	15	3.7	2.8	3.6	3.4	3.9	2.9	3.0	3.0	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
372		4.0	2.5	4.0	3.7	4.6	2.5	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
384	16	3.9	2.6	3.8	3.7	4.4	2.6	3.0	3.0	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
396		4.8	3.1	4.6	4.4	5.0	3.1	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.0
408	17	4.4	3.2	4.1	3.7	4.2	3.1	3.0	3.0	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
420		4.4	2.9	4.3	4.0	4.4	2.9	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.0
432	18	4.2	3.0	4.0	3.5	4.0	2.9	3.0	3.0	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
444		4.5	3.0	4.4	4.1	4.5	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.0
456	19	4.5	3.1	4.2	3.7	4.3	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.1	3.1
468		4.8	2.9	4.4	4.1	4.9	2.9	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
480	20	4.5	3.1	3.9	3.6	4.5	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
492		4.9	3.0	4.3	4.5	5.5	3.0	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
504	21	4.7	3.2	4.1	3.8	4.8	3.1	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
516		4.4	3.1	4.0	3.8	4.6	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.0	3.0
528	22	4.1	3.3	3.7	3.1	3.8	3.1	3.1	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
540		4.5	3.1	4.2	4.0	4.9	3.0	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.0	3.0
552	23	4.1	2.9	3.8	3.2	3.9	2.8	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
564		4.5	2.7	4.2	3.9	5.0	2.6	3.0	3.0	3.1	3.0	3.0	3.2	3.0	3.0	3.0	3.0
576	24	4.2	2.7	3.9	3.4	4.3	2.6	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.0
Average over trial period		4.3	2.9	4.1	3.8	4.5	2.9	3.0	3.1	3.1	3.0	3.0	3.2	3.1	3.0	3.1	3.1
± standard deviation		1.9	0.7	0.8	0.6	1.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.0											
Average of Air temperatures						3.7 ± 0.9											

Table 3.104: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.2	2.4	1.8	3.0	2.3	3.8	3.1	3.0	3.1	3.2	3.1	3.0	3.0	3.0	3.0	3.0
24	1	4.7	1.7	5.4	2.6	3.5	4.8	3.1	3.0	3.1	3.2	3.1	3.0	3.1	3.1	3.0	3.0
36		3.3	2.6	2.2	3.1	2.5	4.0	3.2	3.0	3.1	3.2	3.1	3.0	3.1	3.1	3.0	3.0
48	2	4.5	2.0	5.0	2.8	3.7	5.0	3.2	3.0	3.0	3.3	3.1	3.1	3.1	3.1	3.0	3.1
60		3.2	2.7	1.9	3.1	2.3	4.0	3.3	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.0	3.1
72	3	4.4	1.9	4.8	2.8	3.5	5.0	3.3	3.0	3.0	3.3	3.1	3.1	3.1	3.0	3.0	3.1
84		3.2	2.5	2.2	3.0	2.5	4.0	3.3	3.0	3.0	3.3	3.1	3.1	3.1	3.0	3.0	3.1
96	4	4.4	2.2	4.6	2.9	3.7	4.9	3.3	3.0	3.0	3.3	3.1	3.1	3.1	3.1	3.0	3.1
108		3.3	2.1	2.1	2.9	2.4	4.0	3.3	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.0	3.1
120	5	4.2	1.7	4.3	2.7	3.2	4.7	3.3	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.0	3.1
132		3.2	2.4	2.0	3.0	2.3	3.9	3.3	3.1	3.1	3.3	3.1	3.2	3.0	3.1	3.0	3.1
144	6	4.4	1.9	5.0	2.8	3.5	4.9	3.3	3.1	3.1	3.3	3.1	3.2	3.0	3.1	3.0	3.1
156		3.4	2.6	2.3	3.0	2.5	4.0	3.4	3.1	3.1	3.4	3.1	3.2	3.1	3.1	3.0	3.1
168	7	5.0	1.7	6.2	2.7	4.1	5.2	3.3	3.1	3.1	3.4	3.1	3.2	3.1	3.1	3.0	3.1
180		3.8	2.2	3.3	2.9	3.2	4.3	3.4	3.1	3.1	3.4	3.2	3.2	3.1	3.1	3.0	3.1
192	8	5.4	1.5	6.5	2.6	4.6	5.3	3.4	3.1	3.1	3.4	3.1	3.2	3.1	3.1	3.0	3.1
204		3.7	2.3	3.0	3.0	3.0	4.4	3.4	3.1	3.1	3.4	3.2	3.2	3.1	3.1	3.0	3.1
216	9	4.7	1.8	5.4	2.7	4.0	5.2	3.3	3.1	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
228		3.7	2.4	3.0	2.9	2.9	4.3	3.3	3.1	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
240	10	4.4	1.7	5.0	2.7	3.4	4.9	3.3	3.1	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
252		3.5	2.9	2.4	3.2	2.6	4.2	3.4	3.1	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
264	11	4.3	1.9	4.7	2.8	3.4	4.8	3.4	3.1	3.1	3.4	3.2	3.2	3.1	3.1	3.0	3.1
276		3.4	2.2	2.2	2.9	2.5	4.0	3.4	3.2	3.1	3.4	3.2	3.3	3.1	3.2	3.0	3.1
288	12	4.5	2.0	5.1	2.8	3.5	4.9	3.4	3.1	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
300		3.4	2.6	2.2	3.0	2.5	4.0	3.4	3.2	3.1	3.4	3.1	3.2	3.0	3.1	3.0	3.1
312	13	4.4	1.8	4.9	2.7	3.4	4.8	3.4	3.2	3.1	3.4	3.1	3.2	3.1	3.1	3.0	3.1
324		3.4	2.5	2.3	3.0	2.5	4.0	3.4	3.2	3.1	3.4	3.2	3.2	3.1	3.1	3.0	3.1
336	14	4.7	2.0	5.6	2.8	3.8	4.9	3.4	3.2	3.1	3.4	3.1	3.3	3.1	3.2	3.0	3.1
348		3.5	2.8	2.4	3.1	2.7	4.1	3.4	3.2	3.1	3.3	3.1	3.2	3.1	3.1	3.0	3.1
360	15	5.2	1.7	6.5	2.6	4.2	5.1	3.4	3.2	3.1	3.3	3.1	3.2	3.0	3.1	3.0	3.1
372		3.6	2.3	2.6	3.0	2.9	4.1	3.4	3.2	3.1	3.3	3.1	3.2	3.0	3.1	3.0	3.1
384	16	5.5	1.4	6.9	2.4	4.5	5.1	3.3	3.2	3.1	3.2	3.1	3.2	3.0	3.1	3.0	3.1
396		3.6	2.5	2.5	3.1	2.9	4.2	3.3	3.2	3.0	3.2	3.1	3.2	3.0	3.1	3.0	3.1
408	17	4.7	1.6	5.4	2.7	4.1	5.1	3.3	3.1	3.0	3.2	3.1	3.2	3.0	3.0	3.0	3.1
420		3.2	2.6	1.9	3.1	2.4	4.0	3.3	3.2	3.0	3.2	3.1	3.2	3.0	3.1	3.0	3.1
432	18	4.2	1.9	4.4	2.8	3.3	4.8	3.3	3.1	3.1	3.2	3.1	3.2	3.0	3.1	3.0	3.1
444		3.3	2.6	2.3	3.1	2.5	4.1	3.3	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
456	19	4.1	2.4	4.3	2.9	3.2	4.8	3.3	3.1	3.1	3.2	3.2	3.3	3.1	3.0	3.0	3.1
468		3.3	2.7	2.2	3.1	2.4	4.0	3.2	3.2	3.0	3.2	3.1	3.3	3.1	3.0	3.0	3.1
480	20	4.3	1.8	5.0	2.7	3.3	4.7	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.0	3.0	3.1
492		3.6	2.8	2.6	3.2	2.8	4.1	3.3	3.2	3.0	3.3	3.1	3.2	3.1	3.0	3.0	3.1
504	21	4.9	1.9	6.1	2.7	4.0	5.1	3.3	3.2	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
516		3.8	2.4	3.2	3.0	3.2	4.3	3.3	3.2	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
528	22	5.4	1.0	6.9	2.3	4.6	5.2	3.2	3.2	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
540		4.2	2.0	3.7	2.8	3.5	4.4	3.3	3.2	3.1	3.3	3.1	3.3	3.1	3.1	3.0	3.1
552	23	5.2	1.8	6.4	2.7	4.5	5.4	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.1	3.0	3.1
564		4.1	2.2	3.7	2.9	3.5	4.6	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.1	3.0	3.1
576	24	4.8	1.6	5.8	2.6	4.1	5.2	3.3	3.2	3.0	3.3	3.1	3.2	3.1	3.1	3.0	3.1
Average over trial period		4.1	2.1	4.0	2.9	3.2	4.5	3.3	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.0	3.1
± standard deviation		0.8	0.8	1.8	0.4	0.8	0.6	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.5 ± 0.9											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.105 – 3.107 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.105: Mortality Tests of the Most Tolerant Stage of Medfly in infested **August Red Nectarines** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 19th June – 13th July 2008

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1077	973	896	902				
2	600	963	887	849	882	10.6	8.8	5.2	2.2
3	600	777	820	822	645	27.9	15.7	8.3	28.5
4	600	413	593	712	529	61.7	39.1	20.5	41.4
5	600	238	389	519	330	77.9	60.0	42.1	63.4
6	600	129	225	347	151	88.0	76.9	61.3	83.3
7	600	46	168	219	75	95.7	82.7	75.6	91.7
8	600	26	87	143	25	97.6	91.1	84.0	97.2
9	600	6	44	68	6	99.4	95.5	92.4	99.3
10	600	0	26	38	0	100.0	97.3	95.8	100.0
11	600	0	8	14	0	100.0	99.2	98.4	100.0
12	600	0	4	9	0	100.0	99.6	99.0	100.0
13	600	0	0	3	0	100.0	100.0	99.7	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.106: Mortality Tests of the Most Tolerant Stage of Medfly in infested **August Red Nectarines** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 19th June – 13th July 2008

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	949	1050	1024	921				
2	600	799	911	895	861	15.8	13.2	12.6	6.5
3	600	711	816	857	626	25.1	22.3	16.3	32.0
4	600	367	606	596	363	61.3	42.3	41.8	60.6
5	600	225	381	407	228	76.3	63.7	60.3	75.2
6	600	122	243	256	122	87.1	76.9	75.0	86.8
7	600	76	160	177	59	92.0	84.8	82.7	93.6
8	600	33	102	125	39	96.5	90.3	87.8	95.8
9	600	4	48	78	7	99.6	95.4	92.4	99.2
10	600	0	30	45	2	100.0	97.1	95.6	99.8
11	600	0	10	12	1	100.0	99.0	98.8	99.9
12	600	0	6	4	0	100.0	99.4	99.6	100.0
13	600	0	3	1	0	100.0	99.7	99.9	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.107: Mortality Tests of the Most Tolerant Stage of Medfly in infested **August Red Nectarines** (600g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 19th June – 13th July 2008

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1107	932	1050	897				
2	600	903	818	1022	891	18.4	12.2	2.7	0.7
3	600	749	757	964	706	32.3	18.8	8.2	21.3
4	600	365	442	633	342	67.0	52.6	39.7	61.9
5	600	253	321	507	152	77.1	65.6	51.7	83.1
6	600	141	241	269	102	87.3	74.1	74.4	88.6
7	600	53	156	226	45	95.2	83.3	78.5	95.0
8	600	30	121	155	32	97.3	87.0	85.2	96.4
9	600	7	61	72	12	99.4	93.5	93.1	98.7
10	600	2	36	38	3	99.8	96.1	96.4	99.7
11	600	0	7	17	0	100.0	99.2	98.4	100.0
12	600	0	1	8	0	100.0	99.9	99.2	100.0
13	600	0	0	4	0	100.0	100.0	99.6	100.0
14	600	0	1	1	0	100.0	99.9	99.9	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

3.6.7 Plums – Angelino

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.108. Cold treatment 12 hour summary records are given in tables 3.109- 3.111. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.112 – 3.114

Table 3.108 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Angelino		13.06.2007	19.05.2007		07.07.2007			12.06.2007
	1	08:28 am	15:28 pm	7.0	15:28 pm	# 3	KS0606016	13:52 pm
	2	08:57 am	15:57 pm	7.0	15:57 pm	# 4	KS0547009	14:57 pm
	3	09:26 am	14:26 pm	5.0	14:26 pm	# 5	KS0606017	15:28 pm

Table 3.109: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.5	2.8	3.6	3.8	2.9	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
24	1	3.4	2.3	4.3	3.8	2.9	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
36		3.3	2.5	3.9	3.6	2.9	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
48	2	3.4	2.6	4.1	3.8	3.1	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
60		3.3	2.9	3.6	3.8	3.0	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
72	3	3.3	2.8	3.6	3.9	3.1	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
84		3.2	2.8	3.4	3.8	3.0	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
96	4	3.2	2.7	3.6	3.8	3.0	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
108		3.1	3.1	3.0	3.7	2.8	3.7	3.1	3.3	3.1	3.2	3.1	3.1	3.1	3.1	3.2	3.3
120	5	4.8	3.0	3.8	4.2	3.3	3.9	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
132		4.5	3.4	2.9	3.8	3.0	3.8	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
144	6	4.8	3.1	3.7	4.0	3.2	4.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
156		4.7	3.2	3.1	3.8	3.1	3.8	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
168	7	4.8	2.8	3.9	4.0	3.3	3.8	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
180		4.9	3.1	3.6	3.8	3.3	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
192	8	4.8	2.7	3.8	3.8	3.3	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
204		4.7	2.9	3.4	3.6	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
216	9	4.7	2.5	4.0	3.8	3.3	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
228		4.7	2.8	3.5	3.7	3.2	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
240	10	4.5	2.6	4.0	3.9	3.3	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
252		4.6	2.8	3.3	3.6	3.1	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
264	11	4.5	2.6	4.1	3.9	3.3	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
276		4.6	2.6	3.5	3.7	3.2	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
288	12	4.5	2.5	4.1	3.9	3.3	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
300		4.7	2.8	3.5	3.8	3.2	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
312	13	4.8	2.4	4.1	3.9	3.4	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
324		4.6	2.8	3.3	3.7	3.1	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
336	14	4.5	2.5	3.9	4.0	3.3	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
348		4.7	3.0	3.2	3.7	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
360	15	4.7	2.7	3.7	4.0	3.3	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
372		4.5	3.1	3.1	3.7	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
384	16	4.4	2.7	3.4	3.8	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
396		4.4	3.0	2.8	3.6	2.9	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
408	17	4.4	2.6	3.6	4.0	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
420		4.5	2.8	2.9	3.4	2.8	3.4	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.3
432	18	4.3	2.6	3.7	4.0	3.1	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
444		4.6	3.0	2.9	3.6	3.0	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
456	19	4.5	2.8	3.5	4.0	3.2	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
468		4.4	3.0	2.8	3.5	2.9	3.5	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
480	20	4.7	2.7	3.6	4.0	3.2	3.7	3.0	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.1	3.2
492		4.6	3.1	2.9	3.6	3.0	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
504	21	4.6	2.6	3.8	3.7	3.2	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
516		4.7	2.8	3.4	3.7	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
528	22	4.9	2.5	4.2	4.2	3.3	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
540		4.1	2.5	3.6	3.7	2.9	3.4	3.0	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.1	3.2
552	23	4.3	2.8	3.6	3.8	3.0	3.7	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
564		4.3	3.0	3.3	3.7	2.9	3.8	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
576	24	4.2	2.8	3.4	3.9	3.1	3.8	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.0	3.2	3.2
Average over trial period		4.3	2.8	3.5	3.8	3.1	3.6	3.1	3.3	3.1	3.1	3.0	3.1	3.1	3.1	3.2	3.2
± standard deviation		3.5	0.6	0.5	0.4	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.0											
Average of Air temperatures						3.5 ± 1.0											

Table 3.110: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.0	2.5	3.4	3.7	3.1	3.0	3.0	3.0	3.0	2.9	2.9	3.3	3.2	3.3	3.2	3.2
24	1	4.4	2.5	3.8	4.6	4.0	3.1	3.0	3.0	3.1	2.9	3.0	3.1	3.1	3.1	3.2	3.1
36		4.1	2.5	3.6	4.0	3.4	3.0	3.0	3.0	3.1	2.9	3.0	3.1	3.1	3.1	3.1	3.1
48	2	4.2	2.6	3.7	4.1	3.6	3.1	3.0	3.0	3.1	2.9	3.0	3.1	3.1	3.0	3.1	3.1
60		4.0	2.5	3.5	3.7	3.1	3.0	3.0	3.0	3.1	2.9	3.0	3.1	3.1	3.0	3.1	3.1
72	3	4.1	2.7	3.6	4.0	3.3	3.2	3.0	3.0	3.1	2.9	3.0	3.1	3.1	3.1	3.2	3.1
84		4.2	2.7	3.5	3.8	3.1	3.2	3.1	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.2
96	4	4.2	2.6	3.6	4.0	3.3	3.1	3.1	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.2
108		3.9	2.6	3.3	3.4	2.6	3.1	3.1	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.2
120	5	3.7	2.5	3.3	4.2	3.2	3.0	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.1
132		3.3	2.3	2.9	3.1	2.2	2.8	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.2	3.2	3.2
144	6	3.7	2.4	3.2	3.9	3.1	2.9	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.1
156		3.5	2.6	3.0	3.4	2.5	3.0	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.2
168	7	3.9	2.5	3.4	4.2	3.4	3.0	3.0	3.1	3.2	3.0	3.0	3.2	3.2	3.1	3.2	3.1
180		3.7	2.4	3.3	3.7	3.0	2.8	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.1
192	8	3.8	2.4	3.4	4.1	3.3	2.8	3.0	3.1	3.2	3.0	3.0	3.2	3.2	3.1	3.3	3.2
204		3.7	2.5	3.3	3.7	2.9	3.0	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.2	3.2	3.2
216	9	4.0	2.4	3.5	4.3	3.5	2.9	3.0	3.1	3.2	3.0	3.0	3.2	3.2	3.1	3.3	3.2
228		3.7	2.4	3.3	3.7	3.0	2.8	3.0	3.1	3.2	3.0	3.1	3.2	3.2	3.2	3.2	3.2
240	10	4.0	2.4	3.5	4.3	3.5	2.9	3.0	3.1	3.2	3.0	3.1	3.1	3.1	3.0	3.1	3.1
252		3.7	2.5	3.2	3.7	2.9	2.9	3.0	3.1	3.2	3.0	3.0	3.1	3.0	3.0	3.1	3.0
264	11	4.0	2.4	3.5	4.3	3.6	2.9	3.0	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0
276		3.7	2.5	3.3	3.8	3.0	2.9	3.0	3.1	3.2	3.0	3.0	3.1	3.0	3.0	3.1	3.0
288	12	4.0	2.4	3.5	4.3	3.5	2.8	3.0	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0
300		3.7	2.4	3.3	3.7	2.9	2.9	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.0
312	13	4.0	2.6	3.5	4.5	3.7	3.0	3.0	3.1	3.1	3.0	3.0	3.1	3.0	3.0	3.1	3.0
324		3.7	2.5	3.3	3.7	2.9	3.0	3.1	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.2	3.1
336	14	3.9	2.4	3.5	4.5	3.6	3.0	3.1	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.2	3.1
348		3.7	2.5	3.3	3.7	2.9	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.1	3.1	3.2	3.1
360	15	3.9	2.5	3.5	4.3	3.3	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.1	3.1	3.2	3.1
372		3.6	2.4	3.2	3.6	2.8	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.1
384	16	3.8	2.7	3.3	4.1	3.1	3.2	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.1
396		3.6	2.6	3.1	3.4	2.5	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.2
408	17	3.8	2.5	3.3	4.3	3.3	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.1
420		3.5	2.5	3.1	3.4	2.6	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.2
432	18	3.9	2.5	3.3	4.2	3.4	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.1	3.1
444		3.5	2.4	3.0	3.3	2.5	2.9	3.1	3.1	3.2	3.0	3.0	3.1	3.1	3.1	3.2	3.1
456	19	3.7	2.5	3.2	4.1	3.2	3.0	3.1	3.1	3.2	3.0	3.0	3.1	3.1	3.1	3.2	3.1
468		3.5	2.6	3.0	3.3	2.4	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.1
480	20	3.8	2.5	3.3	4.2	3.3	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.1
492		3.4	2.5	2.9	3.3	2.4	2.9	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.2	3.2	3.2
504	21	3.8	2.6	3.3	4.1	3.4	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.2
516		3.6	2.5	3.2	3.6	2.9	2.9	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.2	3.2	3.2
528	22	3.9	2.6	3.5	4.5	3.8	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.1
540		3.6	2.6	3.3	3.8	3.1	3.0	3.1	3.2	3.2	3.1	3.0	3.1	3.2	3.1	3.2	3.1
552	23	3.6	2.4	3.2	3.7	3.0	2.9	3.1	3.2	3.2	3.1	3.1	3.1	3.2	3.1	3.2	3.2
564		3.5	2.6	3.1	3.4	2.6	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.2
576	24	3.6	2.5	3.1	4.0	3.1	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.1	3.2	3.2
Average over trial period		3.8	2.5	3.3	3.9	3.1	3.0	3.0	3.1	3.2	3.0	3.1	3.2	3.1	3.1	3.2	3.1
± standard deviation		0.8	0.3	0.4	0.5	0.6	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.3 ± 0.5											

Table 3.111: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.2	2.6	5.0	3.1	5.1	3.8	3.0	3.2	3.1	3.1	3.0	3.1	3.0	3.0	3.1	3.1
24	1	3.4	2.3	7.1	3.0	5.6	4.6	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.1
36		3.3	2.6	5.7	3.1	5.5	4.1	3.1	3.2	3.1	3.2	3.0	3.1	3.1	3.1	3.1	3.1
48	2	3.4	2.6	6.3	3.2	5.6	4.3	3.1	3.2	3.1	3.2	3.0	3.1	3.1	3.1	3.1	3.1
60		3.1	2.7	5.1	3.1	5.1	3.8	3.2	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
72	3	3.1	2.6	5.6	3.2	5.2	4.1	3.2	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
84		3.2	2.9	5.0	3.3	5.0	3.9	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
96	4	3.3	2.8	5.6	3.3	5.2	4.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
108		3.1	3.2	3.9	3.4	4.6	3.5	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
120	5	3.7	2.7	6.4	3.4	5.1	4.8	3.2	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
132		3.3	2.9	3.7	3.2	4.5	3.3	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
144	6	3.6	2.6	5.9	3.3	5.1	4.3	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
156		3.4	2.7	4.3	3.2	4.8	3.5	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
168	7	3.8	2.7	6.8	3.4	5.5	4.8	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
180		3.4	2.7	5.4	3.2	5.3	3.9	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
192	8	3.6	2.4	6.5	3.1	5.5	4.4	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
204		3.5	2.7	5.3	3.2	5.3	4.0	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
216	9	3.7	2.5	7.0	3.2	5.7	4.8	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
228		3.5	2.5	5.4	3.1	5.4	3.9	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
240	10	3.7	2.6	7.0	3.3	5.7	4.8	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
252		3.3	2.4	5.1	3.0	5.2	3.7	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
264	11	3.7	2.4	7.1	3.2	5.7	4.7	3.2	3.2	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
276		3.5	2.5	5.4	3.1	5.4	3.9	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
288	12	3.5	2.4	6.8	3.1	5.7	4.6	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
300		3.4	2.6	5.2	3.2	5.3	4.0	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
312	13	3.6	2.4	7.1	3.2	5.7	4.8	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
324		3.4	2.4	5.0	3.0	5.2	3.8	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
336	14	3.6	2.3	6.7	3.1	5.6	4.7	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
348		3.2	2.5	4.6	3.0	5.0	3.6	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
360	15	3.4	2.5	6.1	3.2	5.3	4.5	3.2	3.3	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.2
372		3.4	2.9	4.6	3.3	4.9	3.8	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.2
384	16	3.4	2.8	5.6	3.3	5.0	4.4	3.1	3.2	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.1
396		3.2	2.8	4.0	3.2	4.6	3.5	3.1	3.2	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.1
408	17	3.4	2.6	6.1	3.3	5.1	4.8	3.1	3.2	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.2
420		3.3	2.9	4.2	3.3	4.7	3.6	3.1	3.2	3.1	3.1	3.0	3.1	3.0	3.1	3.1	3.1
432	18	3.7	2.6	6.4	3.3	5.1	4.7	3.1	3.2	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.2
444		3.4	2.7	4.0	3.0	4.3	3.3	3.1	3.2	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.1
456	19	3.6	2.4	5.9	2.9	4.4	4.3	3.1	3.2	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.1
468		3.3	2.7	3.8	3.0	4.1	3.2	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
480	20	3.6	2.4	6.5	3.0	4.5	4.4	3.2	3.3	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
492		3.4	2.8	4.0	3.1	4.3	3.4	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
504	21	3.9	2.4	6.5	3.0	4.7	4.4	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
516		3.6	2.4	5.1	2.9	4.6	3.7	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
528	22	3.8	2.2	7.3	3.0	5.1	4.7	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.2
540		3.5	2.3	5.6	2.9	4.9	3.9	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.2
552	23	3.5	2.6	5.5	3.1	4.7	4.0	3.1	3.3	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.2
564		3.3	2.9	4.3	3.2	4.4	3.5	3.2	3.3	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
576	24	3.5	2.3	6.4	3.0	4.8	4.3	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
Average over trial period		3.4	2.6	5.6	3.2	5.1	4.1	3.1	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.1	3.1
± standard deviation		0.6	0.6	1.4	0.4	0.5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						3.1 ± 0.0											
Average of Air temperatures						4.0 ± 0.7											

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.112 – 3.114 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.112: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Angelino Plums** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 13th June –7th July 2007

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1129	1176	1263	1461				
2	600	960	959	1220	1358	15.0	18.5	3.4	7.0
3	600	896	858	991	1083	20.6	27.0	21.5	25.9
4	600	576	703	735	858	49.0	40.2	41.8	41.3
5	600	376	565	558	610	66.7	52.0	55.8	58.2
6	600	192	430	426	435	83.0	63.4	66.3	70.2
7	600	97	302	306	233	91.4	74.3	75.8	84.1
8	600	46	240	240	133	95.9	79.6	81.0	90.9
9	600	19	126	130	49	98.3	89.3	89.7	96.6
10	600	2	90	92	24	99.8	92.3	92.7	98.4
11	600	0	31	54	12	100.0	97.4	95.7	99.2
12	600	0	11	20	0	100.0	99.1	98.4	100.0
13	600	0	3	4	0	100.0	99.7	99.7	100.0
14	600	0	0	1	0	100.0	100.0	99.9	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.113: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Angelino Plums** (600g/stage) at $3.0 \pm 0.5^{\circ}\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 13th June –7th July 2007

Exposure Period to $3.0 \pm 0.5^{\circ}\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1304	1266	1336	1289				
2	600	1060	1089	1024	1156	18.7	14.0	23.4	10.3
3	600	886	906	853	872	32.1	28.4	36.2	32.4
4	600	585	703	653	657	55.1	44.5	51.1	49.0
5	600	507	618	603	405	61.1	51.2	54.9	68.6
6	600	298	514	483	360	77.1	59.4	63.8	72.1
7	600	166	372	354	174	87.3	70.6	73.5	86.5
8	600	96	219	231	90	92.6	82.7	82.7	93.0
9	600	43	156	196	40	96.7	87.7	85.3	96.9
10	600	19	99	120	12	98.5	92.2	91.0	99.1
11	600	4	50	95	2	99.7	96.1	92.9	99.8
12	600	0	12	44	0	100.0	99.1	96.7	100.0
13	600	0	4	6	0	100.0	99.7	99.6	100.0
14	600	0	1	2	0	100.0	99.9	99.9	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.114: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Angelino Plums** (600g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 13th June –7th July 2007

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1066	1366	1480	1437				
2	600	970	1022	1396	1344	9.0	25.2	5.7	6.5
3	600	778	817	1095	1085	27.0	40.2	26.0	24.5
4	600	687	640	917	945	35.6	53.1	38.0	34.2
5	600	533	562	721	469	50.0	58.9	51.3	67.4
6	600	253	448	608	375	76.3	67.2	58.9	73.9
7	600	75	322	446	245	93.0	76.4	69.9	83.0
8	600	32	216	324	112	97.0	84.2	78.1	92.2
9	600	10	120	244	40	99.1	91.2	83.5	97.2
10	600	5	71	145	16	99.5	94.8	90.2	98.9
11	600	0	20	84	2	100.0	98.5	94.3	99.9
12	600	0	11	21	0	100.0	99.2	98.6	100.0
13	600	0	5	11	0	100.0	99.6	99.3	100.0
14	600	0	1	2	0	100.0	99.9	99.9	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

3.6.8 Plums – Tegan Blue

Records of cold treatment temperatures and insect mortality during each trial

Trial summary data are given in table 3.115. Cold treatment 12 hour summary records are given in tables 3.116- 3.118. The mortality data from cold exposure to a graded series of exposure periods from 2 to 24 days are given in tables 3.119 – 3.121

Table 3.115 Summary of the dates and times of the conduct of the Most Tolerant Stage trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Tegan Blue		22.04.2008	22.04.2008		16.05.2008			21.04.2008
	1	08:05 am	15:05 pm	7.0	15:05 pm	# 3	KS0606016	13:53 pm
	2	08:34 am	15:34 pm	7.0	15:34 pm	# 4	KS0547009	15:00 pm
	3	09:01 am	16:01 pm	7.0	16:01 pm	# 5	KS0606017	14:05 pm

Table 3.116: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		3.2	2.4	3.1	2.8	3.3	3.1	2.9	3.0	2.9	3.0	3.1	3.2	3.2	3.0	3.0	3.1
24	1	3.3	2.3	3.9	2.7	3.4	3.6	3.0	3.0	3.1	3.1	3.2	3.0	3.2	3.1	3.0	2.9
36		3.6	2.7	3.5	3.0	3.5	3.4	2.9	3.1	3.0	3.0	3.2	3.2	3.3	3.2	3.1	2.9
48	2	3.5	2.6	4.0	2.9	3.6	3.7	3.2	3.2	3.3	3.3	3.4	3.2	3.2	3.1	3.0	3.1
60		3.4	2.8	2.9	3.1	3.2	3.3	3.0	3.2	3.0	3.1	3.2	3.3	3.3	3.1	3.0	3.1
72	3	3.3	2.5	3.6	2.8	3.4	3.7	3.1	3.2	3.2	3.2	3.4	3.3	3.3	3.1	3.1	3.2
84		3.4	2.7	3.0	3.0	3.2	3.4	2.9	3.2	3.0	3.1	3.2	3.3	3.3	3.1	3.0	3.1
96	4	3.5	2.6	3.7	2.9	3.5	3.6	3.0	3.1	3.1	3.1	3.3	3.2	3.2	3.2	3.1	3.1
108		3.5	2.6	3.3	2.9	3.4	3.4	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.3	3.2	3.1
120	5	3.6	2.6	3.9	3.0	3.6	3.6	3.0	3.2	3.1	3.2	3.4	3.1	3.1	3.1	3.0	3.0
132		3.4	2.7	2.9	3.0	3.3	3.3	2.9	3.1	3.1	3.1	3.2	3.3	3.2	3.3	3.2	3.1
144	6	3.6	2.6	4.3	3.0	3.6	3.9	2.9	3.2	3.0	3.0	3.2	3.1	3.1	3.1	3.1	3.1
156		3.5	2.8	3.2	3.1	3.3	3.4	3.0	3.0	3.0	3.0	3.1	3.2	3.1	3.3	3.2	3.1
168	7	3.6	2.2	4.2	2.6	3.4	3.6	3.0	3.0	3.0	3.0	3.1	3.2	3.2	3.1	3.0	3.0
180		3.6	2.5	3.2	2.8	3.3	3.3	3.0	3.0	3.1	3.0	3.2	3.3	3.2	3.3	3.2	3.1
192	8	3.5	2.6	3.7	3.0	3.5	3.7	3.0	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.0
204		3.5	2.5	3.1	2.9	3.4	3.3	3.0	3.2	3.1	3.2	3.2	3.1	3.0	3.3	3.2	3.1
216	9	3.5	2.4	4.1	2.8	3.5	3.8	3.0	3.1	3.0	3.1	3.3	3.2	3.1	3.0	2.9	3.0
228		3.5	2.6	3.4	2.9	3.3	3.4	3.0	3.1	2.9	3.1	3.3	3.3	3.2	3.1	3.0	3.1
240	10	3.5	2.5	4.2	2.9	3.5	3.8	3.0	3.2	3.0	3.0	3.1	3.3	3.3	3.1	3.0	3.1
252		3.5	2.7	3.2	2.9	3.3	3.3	3.0	3.1	3.1	2.9	3.2	3.3	3.3	3.1	3.1	3.1
264	11	3.5	2.5	4.1	2.8	3.4	3.7	3.0	3.0	3.1	2.9	3.0	3.3	3.3	3.1	3.1	3.2
276		3.4	2.7	3.0	3.0	3.2	3.3	3.0	3.0	3.1	3.1	3.0	3.4	3.3	3.1	3.1	3.2
288	12	3.5	2.5	4.2	2.8	3.5	3.8	3.1	3.0	3.0	3.1	3.1	3.3	3.3	3.2	3.1	3.2
300		3.4	2.6	3.2	2.9	3.3	3.3	3.0	3.2	2.9	3.1	3.2	3.4	3.3	3.2	3.1	3.2
312	13	3.5	2.4	4.3	2.8	3.6	3.8	3.0	3.1	3.0	3.1	3.2	3.3	3.3	3.2	3.1	3.2
324		3.4	2.5	3.3	2.8	3.3	3.3	3.0	3.1	3.0	3.1	3.3	3.4	3.3	3.2	3.1	3.2
336	14	3.4	2.3	3.8	2.6	3.4	3.4	3.0	3.1	3.1	2.9	3.2	3.2	3.2	3.2	3.0	3.1
348		3.6	2.6	3.7	2.9	3.5	3.5	3.0	3.1	3.0	2.9	3.1	3.2	3.2	3.1	3.0	3.1
360	15	3.6	2.4	4.2	3.0	3.7	3.5	3.0	2.9	2.9	3.0	3.2	3.2	3.2	3.1	3.0	3.0
372		3.5	2.4	3.8	2.9	3.5	3.3	3.0	3.0	3.1	3.1	3.0	3.1	3.1	3.0	2.9	3.0
384	16	3.5	2.4	4.5	2.8	3.6	3.7	3.0	3.0	3.1	3.2	3.0	3.2	3.2	3.0	3.0	3.1
396		3.4	2.6	3.2	2.9	3.3	3.3	3.0	3.1	3.0	3.1	3.1	3.4	3.3	3.1	3.1	3.2
408	17	3.5	2.4	4.3	2.8	3.6	3.8	3.0	3.2	2.9	3.1	3.1	3.3	3.3	3.1	3.1	3.1
420		3.4	2.5	3.3	2.8	3.3	3.3	3.0	3.1	3.0	3.1	3.3	3.4	3.3	3.2	3.1	3.2
432	18	3.4	2.3	3.8	2.6	3.4	3.4	3.0	3.0	3.0	3.1	3.2	3.3	3.3	3.1	3.1	3.2
444		3.6	2.6	3.7	2.9	3.5	3.5	3.0	3.0	3.1	2.9	3.2	3.4	3.3	3.2	3.1	3.2
456	19	3.6	2.4	4.2	3.0	3.7	3.5	3.0	3.0	3.0	2.9	3.2	3.3	3.3	3.2	3.1	3.2
468		3.5	2.4	3.8	2.9	3.5	3.3	3.0	3.2	2.9	3.0	3.0	3.4	3.3	3.2	3.1	3.2
480	20	3.5	2.5	4.0	2.9	3.5	3.6	3.0	3.1	3.1	3.1	3.0	3.2	3.2	3.1	3.0	3.1
492		3.4	2.7	2.9	3.0	3.3	3.3	3.0	3.1	3.1	3.2	3.1	3.2	3.2	3.1	3.0	3.1
504	21	3.6	2.6	4.3	3.0	3.6	3.9	3.0	3.1	3.0	3.1	3.1	3.2	3.2	3.1	3.0	3.0
516		3.5	2.8	3.2	3.1	3.3	3.4	3.0	3.1	2.9	3.1	3.2	3.1	3.1	3.0	2.9	3.0
528	22	3.7	2.3	4.2	2.7	3.5	3.8	3.0	2.9	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.1
540		3.6	2.4	3.5	2.6	3.3	3.2	3.0	3.0	3.1	3.0	3.2	3.4	3.3	3.1	3.1	3.2
552	23	3.6	2.7	3.5	3.1	3.5	3.7	3.0	3.0	3.1	2.9	3.2	3.3	3.3	3.1	3.1	3.1
564		3.5	2.5	3.3	2.9	3.4	3.3	3.0	3.0	3.0	2.9	3.0	3.4	3.3	3.2	3.1	3.2
576	24	3.4	2.4	3.9	2.8	3.4	3.7	3.0	3.0	2.9	3.0	3.0	3.3	3.3	3.1	3.1	3.2
Average over trial period		3.5	2.5	3.7	2.9	3.4	3.5	3.0	3.1	3.0	3.1	3.2	3.3	3.2	3.1	3.1	3.1
± standard deviation		2.6	1.1	1.1	0.6	1.5	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.3 ± 1.2											

Table 3.117: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.3	2.7	3.6	3.0	3.4	2.7	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.1
24	1	3.7	2.9	4.2	3.5	4.4	2.8	3.0	3.1	3.1	3.1	3.1	3.0	2.9	2.9	3.0	3.0
36		3.4	2.7	3.8	2.9	3.6	2.7	3.0	3.1	3.1	3.1	3.1	2.9	2.9	2.9	3.0	2.9
48	2	3.6	2.7	4.1	3.4	4.2	2.8	3.1	3.2	3.1	3.1	3.1	2.9	2.9	2.9	3.0	2.9
60		3.2	2.7	3.4	2.8	3.3	2.8	3.1	3.2	3.1	3.1	3.1	2.9	2.9	2.9	3.0	2.9
72	3	3.5	2.8	3.9	3.3	4.1	2.9	3.1	3.2	3.1	3.1	3.1	2.9	2.8	2.8	2.9	2.9
84		3.2	2.7	3.5	2.9	3.4	2.7	3.0	3.1	3.1	3.0	3.1	3.0	2.9	2.9	3.0	3.0
96	4	3.8	2.9	4.2	3.5	4.3	3.1	3.2	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.1	3.1
108		3.6	2.9	3.9	3.3	3.9	3.0	3.2	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.2	3.2
120	5	3.9	3.0	4.3	3.6	4.4	3.1	3.2	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.2	3.2
132		3.5	3.0	3.6	3.1	3.5	3.1	3.2	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.2	3.2
144	6	4.0	2.9	4.5	3.7	4.9	3.1	3.1	3.2	3.2	3.1	3.2	3.2	3.1	3.1	3.2	3.2
156		3.4	2.9	3.7	3.1	3.6	2.9	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
168	7	4.0	2.8	4.2	3.7	4.8	2.7	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
180		3.6	2.8	3.7	3.2	3.7	2.7	3.0	3.1	3.0	3.0	3.0	3.1	3.0	2.9	3.1	3.0
192	8	4.1	2.9	4.2	3.6	4.2	2.8	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
204		3.7	2.9	3.8	3.2	3.6	2.8	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.1
216	9	4.0	2.8	4.2	3.7	4.4	2.8	3.0	3.1	3.0	3.0	3.0	3.0	2.9	2.9	3.1	3.0
228		3.7	2.9	3.8	3.2	3.7	2.9	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
240	10	3.9	2.8	4.2	3.5	4.3	2.8	3.0	3.1	3.0	3.0	3.0	3.0	2.9	2.9	3.1	3.0
252		3.4	2.9	3.6	3.1	3.5	2.9	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
264	11	3.9	2.9	4.2	3.6	4.3	2.9	3.0	3.1	3.0	3.0	3.0	3.1	3.0	2.9	3.1	3.0
276		3.3	2.8	3.5	3.0	3.4	2.8	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
288	12	3.9	2.8	4.2	3.6	4.4	2.8	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.0
300		3.4	3.0	3.6	3.1	3.4	3.0	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
312	13	3.8	2.8	4.2	3.6	4.4	2.8	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.0
324		3.5	3.0	3.6	3.1	3.5	3.0	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
336	14	4.2	3.0	4.2	3.5	4.2	3.0	3.1	3.2	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.2
348		4.1	3.0	4.1	3.4	4.0	3.0	3.1	3.2	3.2	3.1	3.2	3.2	3.2	3.2	3.2	3.2
360	15	4.3	2.9	4.4	3.5	4.3	2.8	3.1	3.2	3.1	3.1	3.1	3.3	3.2	3.2	3.3	3.2
372		4.2	3.0	4.2	3.4	4.0	3.0	3.1	3.2	3.2	3.1	3.2	3.3	3.2	3.2	3.2	3.2
384	16	3.9	2.7	4.3	3.5	4.4	2.7	3.1	3.2	3.2	3.1	3.1	3.2	3.1	3.1	3.2	3.2
396		3.4	3.0	3.6	3.1	3.4	3.0	3.1	3.2	3.2	3.1	3.1	3.2	3.1	3.1	3.2	3.2
408	17	3.8	2.8	4.2	3.6	4.4	2.8	3.1	3.2	3.2	3.1	3.1	3.2	3.1	3.1	3.2	3.1
420		3.5	3.0	3.6	3.1	3.5	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.1
432	18	4.2	3.0	4.2	3.5	4.2	3.0	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
444		4.1	3.0	4.1	3.4	4.0	3.0	3.0	3.1	3.0	3.0	3.0	3.1	3.0	2.9	3.1	3.0
456	19	4.3	2.9	4.4	3.5	4.3	2.8	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
468		4.2	3.0	4.2	3.4	4.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.1
480	20	3.9	2.7	4.3	3.5	4.4	2.7	3.0	3.1	3.0	3.0	3.0	3.1	3.0	3.0	3.1	3.1
492		3.4	3.0	3.6	3.1	3.4	3.0	3.1	3.2	3.2	3.1	3.2	3.2	3.0	3.1	3.2	3.2
504	21	3.8	2.8	4.2	3.6	4.4	2.8	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.1
516		3.5	3.0	3.6	3.1	3.5	3.0	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
528	22	4.3	3.0	4.2	3.6	4.2	3.0	3.0	3.1	3.0	3.0	3.0	3.1	3.0	2.9	3.1	3.0
540		4.1	3.0	4.1	3.4	4.0	3.0	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
552	23	4.3	2.9	4.3	3.5	4.3	2.9	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.1
564		4.2	2.9	4.2	3.4	4.0	2.9	3.0	3.1	3.1	3.0	3.1	3.1	3.0	3.0	3.1	3.1
576	24	4.0	2.8	4.2	3.6	4.4	2.8	3.1	3.2	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.2
Average over trial period		3.8	2.9	4.0	3.4	4.0	2.9	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.1	3.1
± standard deviation		0.4	0.3	0.4	0.3	0.5	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						3.5 ± 0.4											

Table 3.118: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.9	2.9	2.2	3.1	3.4	3.5	3.1	3.1	3.1	3.3	3.1	3.1	3.0	3.0	3.1	3.0
24	1	4.3	2.3	4.5	2.8	3.8	4.4	3.0	3.3	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0
36		3.8	2.7	2.6	3.0	3.4	3.6	3.0	3.2	3.0	3.1	3.0	3.0	3.2	3.3	3.3	3.2
48	2	4.0	2.2	4.2	2.8	3.7	4.4	3.3	3.5	3.3	3.2	3.3	3.0	3.0	3.0	3.0	3.2
60		3.7	3.1	1.8	3.3	3.2	3.4	3.1	3.3	3.1	3.4	3.1	2.9	3.2	3.1	3.2	3.2
72	3	3.9	2.1	4.0	2.8	3.4	4.2	3.3	3.5	3.3	3.3	3.3	2.9	2.9	3.0	3.0	3.1
84		3.7	2.7	2.2	3.1	3.2	3.5	3.0	3.2	3.0	3.3	3.0	2.9	3.0	3.0	3.0	3.0
96	4	4.1	2.5	3.8	3.0	3.6	4.1	3.1	3.3	3.1	3.1	3.1	3.0	3.1	3.1	3.1	3.0
108		3.8	2.5	2.7	2.9	3.3	3.7	3.0	3.1	3.1	3.1	3.0	3.1	3.0	3.0	3.0	3.2
120	5	4.2	2.1	4.1	2.8	3.6	4.1	3.1	3.4	3.1	3.1	3.2	3.0	3.0	3.0	3.0	3.0
132		3.6	2.8	1.8	3.1	3.1	3.3	3.1	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.0	3.0
144	6	4.5	2.1	5.3	2.8	3.7	4.6	3.0	3.4	3.1	3.3	3.0	3.1	3.0	3.0	3.1	3.0
156		3.6	2.5	2.0	2.9	3.2	3.4	3.0	3.0	3.0	3.1	3.0	2.9	3.0	3.1	3.0	3.1
168	7	4.7	1.7	5.3	2.6	3.9	4.6	3.0	3.3	3.1	3.1	3.0	3.0	3.2	3.1	3.1	3.1
180		4.1	2.8	2.7	3.1	3.5	3.8	3.0	3.0	3.1	3.1	3.1	2.9	3.0	3.2	3.1	3.1
192	8	4.4	2.2	4.4	2.8	3.7	4.7	3.1	3.3	3.2	3.1	3.1	3.1	3.3	3.2	3.3	3.1
204		4.1	2.9	2.6	3.1	3.4	3.8	3.2	3.1	3.1	3.2	3.1	3.1	3.0	3.1	3.1	3.3
216	9	4.7	2.3	4.8	2.9	3.8	4.9	3.1	3.3	3.2	3.2	3.2	3.0	3.3	3.2	3.3	3.2
228		4.0	2.7	2.6	3.0	3.3	3.7	3.1	3.1	3.2	3.2	3.2	3.1	3.0	3.1	3.0	3.3
240	10	4.7	2.4	4.7	2.9	3.6	4.7	3.2	3.4	3.2	3.4	3.1	3.1	3.2	3.2	3.3	3.2
252		3.9	2.9	2.2	3.1	3.2	3.6	3.0	3.2	3.1	3.2	3.1	2.9	3.1	3.1	3.1	3.3
264	11	4.5	2.3	4.6	2.7	3.5	4.5	3.0	3.4	3.2	3.2	3.1	3.0	3.2	3.2	3.3	3.1
276		3.8	3.0	1.9	3.2	3.1	3.5	3.0	3.3	3.0	3.3	3.0	2.9	3.0	3.1	3.2	3.3
288	12	4.8	2.3	4.8	2.9	3.7	4.7	3.1	3.4	3.2	3.2	3.1	3.1	3.1	3.2	3.2	3.3
300		3.8	2.9	2.0	3.1	3.2	3.5	3.0	3.2	3.1	3.3	3.1	3.0	3.0	3.0	3.1	3.3
312	13	4.7	2.1	5.0	2.7	3.7	4.8	3.0	3.4	3.1	3.1	3.1	3.0	3.0	3.0	3.3	3.2
324		3.9	2.9	2.3	3.2	3.3	3.6	3.0	3.3	3.1	3.3	3.0	3.1	3.0	3.1	3.0	3.2
336	14	4.5	2.7	4.0	3.0	3.7	4.3	3.2	3.3	3.1	3.1	3.0	3.1	3.0	3.0	3.3	3.4
348		4.2	2.6	3.3	2.9	3.5	3.9	3.1	3.2	3.0	3.2	3.0	3.0	3.1	3.0	3.0	3.2
360	15	4.5	2.3	4.5	2.8	3.8	4.4	3.0	3.4	3.1	3.2	3.0	3.0	3.0	3.0	3.3	3.4
372		4.4	2.7	3.5	3.0	3.6	4.0	3.0	3.3	3.2	3.1	3.2	2.9	3.2	3.0	3.2	3.1
384	16	4.1	2.1	4.4	2.8	3.8	4.4	3.2	3.4	3.2	3.2	3.2	3.1	3.1	3.1	3.2	3.3
396		3.7	3.1	1.8	3.3	3.2	3.4	3.0	3.3	3.1	3.1	3.1	3.0	3.2	3.0	3.1	3.1
408	17	3.9	2.1	4.0	2.8	3.4	4.2	3.0	3.3	3.1	3.1	3.0	3.1	3.1	3.3	3.2	3.4
420		3.7	2.7	2.2	3.1	3.2	3.5	3.1	3.2	3.2	3.3	3.0	3.1	3.0	3.1	3.1	3.2
432	18	4.1	2.5	3.8	3.0	3.6	4.1	3.2	3.3	3.1	3.1	3.0	3.0	3.0	3.3	3.2	3.3
444		3.8	2.5	2.7	2.9	3.3	3.7	3.2	3.4	3.1	3.3	3.1	3.0	3.0	3.0	3.1	3.2
456	19	4.2	2.1	4.1	2.8	3.6	4.1	3.1	3.4	3.1	3.3	3.1	3.0	3.0	3.2	3.2	3.3
468		3.6	2.8	1.8	3.1	3.1	3.3	3.1	3.3	3.2	3.2	3.3	2.9	3.1	3.1	3.2	3.2
480	20	4.5	2.1	4.5	2.8	3.7	4.6	3.1	3.4	3.1	3.3	3.0	3.0	3.0	3.2	3.2	3.3
492		3.6	2.5	2.0	2.9	3.2	3.4	3.1	3.2	3.0	3.3	3.1	3.0	3.2	3.2	3.1	3.2
504	21	4.7	1.9	5.3	2.6	3.9	4.6	3.1	3.3	3.1	3.1	3.0	3.1	3.0	3.1	3.2	3.3
516		4.1	2.8	2.7	3.1	3.5	3.8	3.2	3.2	3.1	3.2	3.3	3.1	3.3	3.1	3.3	3.1
528	22	4.4	2.2	4.6	2.7	3.7	4.8	3.1	3.3	3.1	3.2	3.1	3.0	3.0	3.1	3.0	3.2
540		4.2	2.8	2.9	3.1	3.5	3.8	3.1	3.2	3.1	3.1	3.0	3.0	3.1	2.9	3.3	3.3
552	23	4.6	2.4	4.4	2.9	3.5	4.6	3.1	3.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.3
564		4.2	2.9	2.6	3.2	3.4	3.7	3.1	3.3	3.2	3.1	3.2	2.9	3.1	3.1	3.3	3.2
576	24	4.4	2.6	4.2	2.8	3.4	4.4	3.1	3.5	3.1	3.1	3.2	3.0	3.0	3.0	3.2	3.2
Average over trial period		4.1	2.5	3.4	2.9	3.5	4.0	3.1	3.3	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2
± standard deviation		0.5	0.7	1.5	0.4	0.4	0.7	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2
Average of Fruit temperatures							3.1 ± 0.1										
Average of Air temperatures							3.4 ± 0.7										

Insect mortality to cold treatment temperatures during each trial

The data in these tables 3.119 – 3.121 show that complete mortality was achieved in all stages after 14 days cold exposure to $3.0 \pm 0.5^\circ\text{C}$. This data was used in the Probit analysis of LD_{50} and LD_{99} to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 3.119: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Tegan Blue Plums** (600g/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 1 : Cold Room # 3). Date of experiment : 22nd April – 16th May 2008

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	981	1148	1202	1133				
2	600	840	1002	1080	931	14.4	12.7	10.1	17.8
3	600	690	732	870	670	29.7	36.2	27.6	40.9
4	600	546	570	677	555	44.3	50.3	43.7	51.0
5	600	263	462	595	292	73.2	59.8	50.5	74.2
6	600	105	408	482	204	89.3	64.5	59.9	82.0
7	600	79	290	326	135	91.9	74.7	72.9	88.1
8	600	36	225	262	56	96.3	80.4	78.2	95.1
9	600	14	142	187	25	98.6	87.6	84.4	97.8
10	600	0	43	98	12	100.0	96.3	91.8	98.9
11	600	0	20	45	5	100.0	98.3	96.3	99.6
12	600	0	11	13	0	100.0	99.0	98.9	100.0
13	600	0	2	4	0	100.0	99.8	99.7	100.0
14	600	0	1	1	0	100.0	99.9	99.9	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.120: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Tegan Blue Plums** (600g/stage) at $3.0 \pm 0.5^\circ\text{C}$ (Replicate 2 : Cold Room # 4). Date of experiment : 22nd April – 16th May 2008

Exposure Period to $3.0 \pm 0.5^\circ\text{C}$ (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1102	1029	1065	1014				
2	600	963	909	952	893	12.6	11.7	10.6	11.9
3	600	696	789	746	663	36.8	23.3	30.0	34.6
4	600	527	542	614	481	52.2	47.3	42.3	52.6
5	600	318	465	433	334	71.1	54.8	59.3	67.1
6	600	185	397	394	219	83.2	61.4	63.0	78.4
7	600	54	315	327	91	95.1	69.4	69.3	91.0
8	600	23	219	244	42	97.9	78.7	77.1	95.9
9	600	10	101	160	24	99.1	90.2	85.0	97.6
10	600	4	45	98	12	99.6	95.6	90.8	98.8
11	600	0	15	30	1	100.0	98.5	97.2	99.9
12	600	0	5	11	0	100.0	99.5	99.0	100.0
13	600	0	4	3	0	100.0	99.6	99.7	100.0
14	600	0	0	0	0	100.0	100.0	100.0	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.121: Mortality Tests of the Most Tolerant Stage of Medfly in infested **Tegan Blue Plums** (600g/stage) at 3.0 ± 0.5 °C (Replicate 3 : Cold Room # 5). Date of experiment : 22nd April – 16th May 2008

Exposure Period to 3.0 ± 0.5 °C (days)	Weight of fruit infested per stage (600g)	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
		Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)	600	1279	1000	1209	1253				
2	600	946	904	1055	1119	26.0	9.6	12.7	10.7
3	600	612	703	926	878	52.2	29.7	23.4	29.9
4	600	419	587	678	551	67.2	41.3	43.9	56.0
5	600	287	420	516	375	77.6	58.0	57.3	70.1
6	600	124	317	428	263	90.3	68.3	64.6	79.0
7	600	72	230	281	133	94.4	77.0	76.8	89.4
8	600	34	174	190	45	97.3	82.6	84.3	96.4
9	600	9	86	127	30	99.3	91.4	89.5	97.6
10	600	0	54	84	12	100.0	94.6	93.1	99.0
11	600	0	32	43	1	100.0	96.8	96.4	99.9
12	600	0	7	10	0	100.0	99.3	99.2	100.0
13	600	0	2	4	0	100.0	99.8	99.7	100.0
14	600	0	0	1	0	100.0	100.0	99.9	100.0
16	600	0	0	0	0	100.0	100.0	100.0	100.0
18	600	0	0	0	0	100.0	100.0	100.0	100.0
20	600	0	0	0	0	100.0	100.0	100.0	100.0
22	600	0	0	0	0	100.0	100.0	100.0	100.0
24	600	0	0	0	0	100.0	100.0	100.0	100.0

Table 3.122: Comparison of the number of days exposure at $3.0 \pm 0.5^{\circ}\text{C}$ required to kill 50% (LD_{50}) and 99% (LD_{99}) of the four immature life stages of Mediterranean fruit fly (Medfly), *Ceratitis capitata* Wiedemann, in 8 stone fruit cultivars. The analysis is based on three replicate trials for each life stage.

Stone fruit Cultivar and Life stage treated	Days	95% confidence intervals		Days	95% confidence intervals	
	LD_{50}	<u>Lower</u>	<u>Upper</u>	LD_{99}	<u>Lower</u>	<u>Upper</u>
Cherries - Sweetheart						
Eggs	3.25	3.211	3.288	8.132	7.97	8.303
1 st instar larvae	3.988	3.929	4.046	14.57	14.23	14.93
2 nd instar larvae	3.972	3.922	4.022	13.07	12.81	13.35
3 rd instar larvae	3.235	3.193	3.277	9.369	9.177	9.573
Cherries- Lapin						
Eggs	3.31	3.272	3.348	9.046	8.879	9.222
1 st instar larvae	4.677	4.628	4.725	14.35	14.1	14.62
2 nd instar larvae	4.654	4.608	4.699	14.26	14.02	14.51
3 rd instar larvae	3.105	3.058	3.152	11.83	11.59	12.08
Peaches - Snow King						
Eggs	2.900	2.864	2.936	10.200	10.030	10.380
1 st instar larvae	3.919	3.877	3.960	13.100	12.880	13.340
2 nd instar larvae	4.012	3.970	4.054	14.260	14.020	14.520
3 rd instar larvae	3.290	3.250	3.329	11.820	11.610	12.040
Peaches - Zee Lady						
Eggs	3.532	3.497	3.566	9.611	9.456	9.773
1 st instar larvae	3.886	3.842	3.929	14.460	14.210	14.720
2 nd instar larvae	4.449	4.406	4.492	14.370	14.130	14.610
3 rd instar larvae	3.492	3.457	3.527	9.702	9.541	9.870
Nectarines - Arctic Snow						
Eggs	3.647	3.610	3.683	10.000	9.837	10.170
1 st instar larvae	4.658	4.618	4.699	12.430	12.240	12.630
2 nd instar larvae	4.903	4.859	4.946	14.000	13.780	14.230
3 rd instar larvae	3.662	3.624	3.701	10.690	10.510	10.890
Nectarines - August Red						
Eggs	3.510	3.476	3.543	9.593	9.442	9.751
1 st instar larvae	4.203	4.163	4.243	12.640	12.440	12.850
2 nd instar larvae	4.741	4.701	4.780	13.120	12.930	13.320
3 rd instar larvae	3.875	3.840	3.909	9.334	9.188	9.488
Plums - Angelino						
Eggs	4.511	4.464	4.558	11.396	11.267	11.529
1 st instar larvae	5.380	5.329	5.431	13.590	13.449	13.735
2 nd instar larvae	5.626	5.574	5.677	14.212	14.068	14.359
3 rd instar larvae	4.744	4.698	4.789	11.983	11.856	12.114
Plums – Tegan Blue						
Eggs	3.856	3.810	3.902	10.165	10.039	10.295
1 st instar larvae	5.197	5.140	5.254	13.701	13.541	13.867
2 nd instar larvae	5.419	5.362	5.477	14.287	14.125	14.455
3 rd instar larvae	4.194	4.145	4.242	11.056	10.923	11.193

3.6.9 ANALYSIS OF MORTALITY DATA FOR COLD EXPOSURE AT $3.0 \pm 0.5^{\circ}\text{C}$.

Most tolerant stage bio-assay data

The above bio-assay data obtained from the exposure of the four Medfly stages - eggs, 1st, 2nd, and 3rd instar larvae were subjected to probit regression analysis (Finney, 1972) and analysed using the Genstat Program (Anon 2006) to obtain the LD₅₀ and LD₉₉ values together with their 95% confidence limits. These are given in **Table 3.122**.

The results show that the 2nd instar is the most tolerant life stage at the LD₅₀ and at the LD₉₉ estimates for peaches, nectarines and plums while for cherries it is 1st instar. However, the difference between these 2 instars is small, and on the basis of these results it was decided that the large-scale trials should be done on both 1st and 2nd instar larvae. Therefore 3 replicated trials were conducted by exposing >10,000 individuals to $3.0 \pm 0.5^{\circ}\text{C}$ in each of three replicated trials (>30,000) in all 8 stone fruit cultivars. The results of these large-scale trials are given in **Section 4**.

3.6.10 SUMMARY OF COLD TREATMENT DATA FOR THE MOST TOLERANT STAGE TRIALS AT $3.0 \pm 0.5^{\circ}\text{C}$.

The records of the temperatures from the cold treatment trials for each replicate treatment summarised in the tables above show that the required temperatures of $3.0 \pm 0.5^{\circ}\text{C}$ was maintained throughout the trials.

3.7. SUMMARY AND CONCLUSIONS

The requirements of the international protocol for conduct of the most tolerant stage of Mediterranean fruit fly to cold treatment have been successfully achieved.

The results show that cold treatment for 16 days at $1.0 \pm 0.5^{\circ}\text{C}$ and 20 days at $3.0 \pm 0.5^{\circ}\text{C}$ will be required in large scale semi commercial trials to prove effectiveness against 1st and 2nd instars as the most tolerant stages to cold treatment in stone fruit cultivars.

4. COLD TREATMENTS – LARGE SCALE TRIALS AT 1°C and 3°C

4.1 PLAN OF THE TRIALS

The large-scale trials were conducted in the following manner:

1. All fruits were supplied directly from the farms in export cartons and were held in cold rooms #1 and #2 and in a refrigerated container as described in **Section 2** until required for the trials.
2. A life history study of Medfly (**Section 2**) was conducted at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh in each cultivar before each series of trials to determine the date when 1st and 2nd instar was most prevalent ($\geq 50\%$) as the stage to be tested.
3. The large-scale trials were conducted by infesting (**Section 2**) sufficient fruit of each cultivar to obtain more than 10,000 insects of 1st and 2nd instar in each replicate to be treated.
4. In each replicate, sufficient fruits were also infested for untreated controls and for dissection on day of treatment to verify numbers of live 1st and 2nd instars present at the time of the trial.
5. Each replicate of infested fruits was exposed to cold treatment in ventilated export cartons for either 16 days at $1.0 \pm 0.5^\circ\text{C}$ or 20 days at $3.0 \pm 0.5^\circ\text{C}$ and then incubated at $26 \pm 1^\circ\text{C}$ and 60 - 65% rh for 3 weeks for emergence of any survivors.
6. Untreated controls for each replicate treatment were incubated at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh for a further 3 weeks to obtain pupae. The number of pupae obtained from each untreated control was used to confirm the estimate of the number of live 1st and 2nd instars exposed to the treatment.
7. The cold treatment was considered successful if no survivors were obtained after the incubation period of the treated fruits.

4.2 PREPARATION OF THE TEST FRUITS

Fruit were infested as described in **Section 2**. The infested fruits were incubated in a controlled environment room at $26 \pm 1.0^\circ\text{C}$; 60 - 65% rh. Because 1st and 2nd instars were shown to be more tolerant to cold treatment, the required quantity of fruit were infested for these stages (1st instar days 3 & 4; and 2nd instar days 5 & 6) as shown below. Extra fruit were infested for dissection to determine the numbers present in each life stage on the day of treatment.

The infested fruits in each treatment replicate were incubated to the required development stage for testing. Selection of fruits for treatment and control was done at random. On the day of treatment the specified weight of fruit for each stage for treatment and control were separated. The control fruits were returned to the controlled environment room for development to pupation. Extra fruit were taken from each replicate trial for dissection to estimate the number treated in each life stage.

The specified weight of infested fruits for cold treatment (see below) were taken and placed on trays in the centre of ventilated export cartons (25 litre, 10kg) containing uninfested filler fruits and packed following standard export practice. The cartons were then stacked in the cold rooms in the standard arrangement for continuous air-cooling to begin the disinfestation trial (**Appendix 5**). Cartons containing each stage were labelled to allow recovery of infested fruits by stage after treatment.

4.3 LOADING DATA FOR LARGE SCALE COLD TREATMENTS: (cold rooms 3, 4, 5)

(1) Quantity of infested fruits used for each cultivar x2 temperatures:

Test Fruit & Cultivar	Test stage	Wt. / Rep Treated (kg)	Wt. / Rep Control (kg)	Total Wt. 3 Reps Treated (kg)	Total Wt. 3 Reps Control (kg)	Total Wt. Infested / stage (kg)	Total Wt. / fruit cultivar (kg)	Total Wt. / fruit cultivar x 2 temperatures (kg)
Cherry Sweetheart	1 st instar	10	5	30	15	45		
	2 nd instar	10	5	30	15	45	90	180
Cherry Lapin	1 st instar	10	5	30	15	45		
	2 nd instar	10	5	30	15	45	90	180
Peach Snow King	1 st instar	15	7.5	45	22.5	67.5		
	2 nd instar	15	7.5	45	22.5	67.5	135	270
Peach Zee Lady	1 st instar	15	7.5	45	22.5	67.5		
	2 nd instar	15	7.5	45	22.5	67.5	135	270
Nectarine Arctic Snow	1 st instar	15	7.5	45	22.5	67.5		
	2 nd instar	15	7.5	45	22.5	67.5	135	270
Nectarine August Red	1 st instar	15	7.5	45	22.5	67.5		
	2 nd instar	15	7.5	45	22.5	67.5	135	270
Plum Angelino	1 st instar	15	7.5	45	22.5	67.5		
	2 nd instar	15	7.5	45	22.5	67.5	135	270
Plum Tegan Blue	1 st instar	15	7.5	45	22.5	67.5		
	2 nd instar	15	7.5	45	22.5	67.5	135	270

(2) Loading of export cartons in cold rooms for each trial:

Number of cartons / layer = 8

Number of layers / pallet = 7

Numbers of pallets / cold room = 8

8 cartons / layer x 7 layers / pallet = 56 cartons / pallet

8 pallets / cold room replicate = 8 x 56 = 448 cartons / cold room

Total for 3 replicate cold rooms = 3 x 448 = 1,344 cartons

(3) Data on load factors in cold room for each trial:

No. of export cartons / replicate =	448 cartons
10 kg / carton x 448 cartons =	4,480 kg
Size of carton:	210mm (h) x 285mm (w) 430mm (l)
Volume of carton =	25.7 litres
Total volume of 448 cartons =	$448 \times 25.7 / 1000 = 11.5 \text{ m}^3$
Volume of cold room =	34 m^3
Load factor (weight) =	$4,480 / 34 = 131.76 \text{ kg / m}^3$
Load factor % (volume) =	$(11.5 \text{ m}^3 / 34) \times 100 = 33.82 \%$

4.4 TRIAL ARRANGEMENT

Each of the 3 replicated trials was set-up in a separate cold room, each measuring approximately 34 m³ (Cold Rooms #3, #4, #5). Each replicate trial consisted of 448 cartons each containing approximately 10 kg of fruit. The layout of the trials is shown in (**Appendix 5**). There were 8 pallets in each replicate cold room. Each pallet carried 56 cartons arranged as 8 cartons per layer and 7 layers high to bring the treated volume to 33.82 %. Thus there were 448 cartons in each replicate cold trial. This consisted of 4,480 kg of which 90kg were infested with 1st and 2nd instar larvae for cherries; and 135 kg for peaches, nectarines and plums. The infested fruits were placed in selected cartons so as to give representative treatment throughout the stacks in the cold room. However, each stage was assigned to a specific carton to avoid any chance of error.

Test fruit were exposed to cold treatment for the following specified periods:

- 16 days at $1.0 \pm 0.5^\circ\text{C}$
- 20 days at $3.0 \pm 0.5^\circ\text{C}$

After exposure to the cold treatment, the infested fruits were removed from the cartons and taken to the controlled environment room and placed in containers over sand to collect pupae.

Record of temperatures during the trials

Temperatures were recorded on a “Squirrel” (Grant Instruments, Cambridge, England) data logger with an accuracy of $\pm 0.01^\circ\text{C}$. A total of 16 thermistor probes were used, 6 to record air temperatures at various positions in the cold room, including the inlet and outlet air temperatures of the cooler. The fruit pulp temperatures were recorded by placing the probes in the core of uninfested fruit in 10 locations throughout the stack in each cold room so as to give representative data for the whole trial. Temperature recordings were automatically logged at 60-minute intervals throughout the trial.

4.5 RESULTS OF LARGE SCALE COLD TREATMENT TRIALS OF MEDFLY AT $1.0 \pm 0.5^{\circ}\text{C}$.

The trials at $1.0 \pm 0.5^{\circ}\text{C}$ were conducted from November 2008 to July 2010.

Data for each cultivar: life history of all stages in test fruits, cold treatment temperatures and mortality of 1st & 2nd instars of Medfly replicated 3 times is given under the respective fruit varieties treated.

4.5.1 Cherries - Sweetheart

Life history data

The life history data (table 4.1) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.1: **Sweetheart Cherries:** Incubation of immature stages of Medfly at $26 \pm 1^{\circ}\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	11/11/2008	100	0	0	0	100	eggs
1	12/11/2008	100	0	0	0	100	eggs
2	13/11/2008	100	0	0	0	100	eggs
3	14/11/2008	19	81	0	0	100	1st
4	15/11/2008	9	87	4	0	100	1st
5	16/11/2008	0	42	58	0	100	2nd
6	17/11/2008	0	41	59	0	100	2nd
7	18/11/2008	0	13	30	57	100	3rd
8	19/11/2008	0	5	20	75	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.2. Cold treatment 12 hour summary records are given in tables 4.3- 4.5. The mortality data from 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.6 – 4.7.

Table 4.2 Summary of the dates and times of the conduct of the Large Scale trials at $1.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Sweetheart		06.12.2008	08.12.2008		24.12.2008			05.12.2008
	1	07:04 am	10:04 am	51.0	10:04 am	# 3	KS0606016	12:13 pm
	2	07:32 am	10:32 am	51.0	10:32 am	# 4	KS0547009	14:02 pm
	3	08:04 am	11:04 am	51.0	11:04 am	# 5	KS0606017	14:32 pm

Table 4.3: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.6	1.8	3.2	0.4	2.8	1.2	1.5	1.2	1.4	1.5	1.5	1.3	1.1	1.1	1.2	1.1
24	1	1.4	1.9	2.2	0.5	2.1	1.1	1.3	1.1	1.3	1.4	1.3	1.1	1.0	1.0	1.1	1.0
36		1.3	1.9	1.8	0.5	1.8	1.0	1.2	1.0	1.1	1.3	1.1	1.0	0.9	0.9	1.0	0.9
48	2	1.6	1.9	2.9	0.6	2.4	1.4	1.1	1.0	1.1	1.2	1.1	0.9	1.0	0.9	1.0	0.9
60		1.5	1.8	3.0	0.4	2.7	1.1	1.0	0.9	1.0	1.1	1.0	1.0	1.0	0.9	1.0	0.9
72	3	1.4	1.9	2.1	0.6	2.0	1.2	1.0	0.9	1.0	1.1	1.0	1.0	0.9	0.9	1.0	0.9
84		1.3	1.9	1.8	0.6	1.7	1.1	1.0	0.9	0.9	1.1	0.9	0.9	1.0	0.9	1.0	0.9
96	4	1.5	1.9	2.9	0.5	2.4	1.2	1.0	0.9	1.0	1.1	0.9	1.0	1.0	0.9	1.0	0.9
108		1.7	1.7	3.1	0.6	2.6	1.3	1.0	0.9	0.9	1.1	0.9	0.9	1.0	0.9	1.0	1.0
120	5	1.4	1.7	2.1	0.4	2.0	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.9	0.9	1.0	1.0
132		1.2	1.8	1.9	0.3	1.9	0.8	1.0	0.9	0.9	1.0	0.9	0.9	1.0	0.9	0.9	1.0
144	6	1.3	1.7	2.7	0.4	2.1	1.1	1.0	0.9	0.9	1.1	0.9	0.9	1.0	0.9	1.0	1.0
156		1.2	1.5	3.0	-0.1	2.3	0.7	1.0	1.0	1.0	1.1	0.9	1.0	1.0	1.0	1.0	1.0
168	7	1.2	1.6	2.1	0.3	1.9	1.0	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1
180		1.1	1.7	1.9	0.2	1.7	0.8	1.2	1.0	1.1	1.2	1.1	1.0	1.0	1.0	1.1	1.0
192	8	1.1	1.6	2.5	0.2	1.9	0.8	1.2	1.1	1.2	1.2	1.1	1.1	1.0	1.1	1.1	1.1
204		1.2	1.5	2.9	0.0	2.3	0.8	1.2	1.1	1.1	1.3	1.1	1.1	1.0	1.1	1.1	1.1
216	9	1.0	1.5	2.0	0.1	1.8	0.7	1.3	1.1	1.2	1.3	1.2	1.1	1.1	1.2	1.2	1.1
228		1.3	1.6	2.0	0.4	1.8	1.0	1.3	1.2	1.2	1.3	1.2	1.2	1.1	1.2	1.2	1.1
240	10	1.2	1.6	2.6	0.0	2.0	0.7	1.3	1.2	1.3	1.3	1.2	1.2	1.1	1.2	1.2	1.2
252		1.5	1.6	3.0	0.3	2.4	1.0	1.3	1.2	1.2	1.3	1.2	1.2	1.1	1.2	1.2	1.1
264	11	1.1	1.6	2.0	0.2	1.7	0.8	1.3	1.2	1.3	1.3	1.3	1.2	1.2	1.2	1.3	1.2
276		1.1	1.6	1.8	0.3	1.7	0.8	1.4	1.2	1.2	1.3	1.3	1.2	1.2	1.2	1.2	1.2
288	12	1.2	1.6	2.6	0.4	2.0	1.0	1.4	1.2	1.3	1.3	1.3	1.2	1.2	1.2	1.3	1.2
300		1.2	1.5	2.8	0.2	2.2	0.9	1.4	1.2	1.2	1.3	1.3	1.2	1.1	1.2	1.2	1.2
312	13	1.1	1.6	2.0	0.3	1.8	0.8	1.4	1.2	1.2	1.4	1.3	1.2	1.1	1.2	1.2	1.2
324		1.1	1.6	1.8	0.3	1.6	0.8	1.4	1.2	1.3	1.4	1.3	1.2	1.2	1.3	1.3	1.2
336	14	1.1	1.6	2.4	0.3	1.8	0.9	1.4	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.3
348		1.3	1.5	2.8	0.3	2.2	1.0	1.4	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.3
360	15	1.2	1.6	2.0	0.3	1.8	0.9	1.4	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.3
372		1.3	1.7	2.0	0.5	1.8	1.0	1.4	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.3
384	16	1.3	1.7	2.6	0.4	2.0	1.0	1.4	1.3	1.3	1.4	1.3	1.3	1.2	1.3	1.3	1.3
Average over trial period		1.3	1.7	2.4	0.3	2.0	1.0	1.2	1.1	1.1	1.3	1.1	1.1	1.1	1.1	1.1	1.1
± standard deviation		0.5	0.2	0.6	0.5	0.5	0.6	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							1.1 ± 0.1										
Average of Air temperatures							1.5 ± 0.5										

Table 4.4: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.0	0.6	2.3	1.1	3.3	0.5	1.4	1.3	1.3	1.4	1.6	1.1	1.4	1.3	1.4	1.3
24	1	1.6	0.4	1.9	1.0	2.5	0.3	1.3	1.3	1.2	1.3	1.5	1.0	1.3	1.2	1.3	1.2
36		1.2	0.6	1.6	0.8	1.9	0.2	1.3	1.2	1.2	1.3	1.4	1.0	1.2	1.2	1.3	1.2
48	2	1.6	0.1	2.0	1.0	2.6	0.3	1.2	1.2	1.2	1.3	1.4	1.0	1.2	1.2	1.3	1.2
60		1.6	0.1	2.0	0.8	2.9	0.1	1.2	1.2	1.2	1.3	1.4	1.0	1.2	1.2	1.3	1.2
72	3	1.4	0.3	1.7	0.9	2.3	0.2	1.2	1.2	1.2	1.3	1.4	1.0	1.2	1.2	1.2	1.2
84		1.2	0.2	1.5	0.7	1.9	0.0	1.2	1.2	1.2	1.2	1.4	1.0	1.2	1.2	1.3	1.2
96	4	1.5	0.7	1.8	1.0	2.5	0.3	1.2	1.2	1.1	1.3	1.4	1.0	1.2	1.2	1.2	1.1
108		1.5	-0.1	1.9	0.7	2.8	0.0	1.2	1.1	1.2	1.2	1.4	1.0	1.2	1.2	1.2	1.1
120	5	1.3	0.0	1.7	0.7	2.3	0.0	1.2	1.2	1.2	1.3	1.4	1.0	1.2	1.2	1.2	1.1
132		1.3	0.4	1.6	0.8	2.1	0.1	1.2	1.1	1.2	1.3	1.3	0.9	1.2	1.2	1.2	1.2
144	6	1.4	0.1	1.8	0.8	2.4	0.0	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
156		1.7	0.2	2.0	0.9	3.0	0.3	1.2	1.1	1.1	1.2	1.4	1.0	1.2	1.1	1.2	1.1
168	7	1.3	0.1	1.7	0.7	2.3	0.0	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
180		1.2	0.5	1.5	0.8	1.9	0.1	1.2	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
192	8	1.2	0.2	1.6	0.7	2.1	0.1	1.1	1.1	1.1	1.2	1.3	1.0	1.1	1.2	1.2	1.1
204		1.5	0.1	1.8	0.7	2.8	0.2	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
216	9	1.2	0.0	1.5	0.7	2.2	0.1	1.2	1.1	1.1	1.2	1.4	1.0	1.2	1.2	1.2	1.1
228		1.1	0.4	1.5	0.7	1.9	0.2	1.2	1.1	1.1	1.2	1.3	1.0	1.1	1.2	1.2	1.1
240	10	1.3	0.4	1.6	0.8	2.2	0.2	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
252		1.6	0.6	1.9	1.1	2.8	0.5	1.2	1.1	1.1	1.2	1.3	0.9	1.2	1.1	1.2	1.1
264	11	1.3	0.6	1.5	0.8	2.1	0.1	1.1	1.1	1.1	1.2	1.3	1.0	1.1	1.2	1.2	1.1
276		1.3	0.4	1.6	0.8	1.9	0.1	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.1	1.2	1.1
288	12	1.3	-0.1	1.7	0.7	2.2	0.1	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
300		1.5	0.3	1.8	0.8	2.6	0.2	1.2	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
312	13	1.3	0.1	1.6	0.7	2.1	0.1	1.2	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
324		1.1	0.2	1.5	0.7	1.9	0.1	1.2	1.1	1.1	1.2	1.3	1.0	1.2	1.1	1.2	1.1
336	14	1.2	0.0	1.6	0.6	2.0	0.0	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
348		1.5	0.8	1.8	1.0	2.5	0.3	1.1	1.1	1.2	1.2	1.3	1.0	1.2	1.2	1.2	1.1
360	15	1.1	0.3	1.5	0.7	2.0	0.1	1.1	1.1	1.1	1.2	1.3	1.0	1.2	1.1	1.2	1.1
372		1.1	0.2	1.5	0.7	1.9	-0.1	1.2	1.1	1.1	1.2	1.3	1.0	1.2	1.1	1.2	1.1
384	16	1.0	0.4	1.2	0.7	1.6	0.1	0.9	0.8	0.8	0.9	1.0	0.7	0.9	0.9	0.9	0.8
Average over trial period		1.3	0.3	1.7	0.8	2.3	0.2	1.2	1.1	1.1	1.2	1.3	1.0	1.2	1.2	1.2	1.1
± standard deviation		0.4	0.9	0.3	0.4	0.5	0.4	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ± 0.1											
Average of Air temperatures						1.1 ± 0.5											

Table 4.5: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.1	0.4	2.3	1.6	4.0	1.4	1.4	1.5	1.1	1.0	1.4	1.5	1.4	1.0	1.2	1.1
24	1	1.9	0.5	2.0	1.4	3.2	1.3	1.4	1.5	1.1	1.0	1.4	1.4	1.4	1.0	1.2	1.1
36		1.6	0.2	1.6	1.0	2.6	1.0	1.3	1.4	1.0	1.0	1.3	1.4	1.4	1.0	1.1	1.0
48	2	1.8	0.0	1.9	1.2	3.3	1.1	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.1	1.1
60		2.0	0.2	2.2	1.4	3.7	1.3	1.3	1.4	1.0	1.0	1.3	1.3	1.3	0.9	1.0	1.0
72	3	1.7	0.8	1.8	1.3	3.0	1.2	1.3	1.3	1.0	1.0	1.3	1.3	1.3	0.9	1.1	1.1
84		1.6	0.5	1.6	1.1	2.6	1.1	1.2	1.3	1.0	0.9	1.2	1.3	1.3	0.9	1.0	1.0
96	4	1.8	0.6	2.0	1.4	3.2	1.3	1.3	1.3	1.0	0.9	1.3	1.3	1.3	0.9	1.0	1.1
108		1.9	0.2	2.2	1.3	3.6	1.2	1.2	1.3	1.0	0.9	1.3	1.4	1.3	0.9	1.0	1.0
120	5	1.7	0.3	1.8	1.3	3.0	1.2	1.3	1.3	1.0	1.0	1.2	1.4	1.3	1.0	1.0	1.1
132		1.7	0.7	1.8	1.3	2.8	1.2	1.2	1.3	1.0	0.9	1.2	1.3	1.3	0.9	1.0	1.0
144	6	1.7	0.1	1.9	1.2	3.0	1.1	1.2	1.3	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
156		1.8	-0.1	2.1	1.2	3.5	0.9	1.2	1.3	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
168	7	1.3	-0.5	1.5	0.7	2.7	0.6	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.1	1.1
180		1.2	-0.2	1.3	0.7	2.3	0.7	1.2	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.1	1.0
192	8	1.2	-0.2	1.4	0.8	2.7	0.7	1.3	1.3	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
204		1.5	-0.2	1.7	0.8	3.2	0.7	1.2	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.0
216	9	1.2	-0.2	1.3	0.7	2.6	0.6	1.2	1.3	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
228		1.1	-0.5	1.3	0.6	2.4	0.6	1.2	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.0
240	10	1.3	0.1	1.4	0.9	2.7	0.7	1.3	1.4	1.0	1.0	1.3	1.4	1.3	0.9	1.0	1.1
252		1.4	-0.3	1.7	0.8	3.1	0.7	1.2	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.0
264	11	1.1	0.0	1.2	0.7	2.5	0.6	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.0
276		1.1	-0.5	1.2	0.6	2.2	0.6	1.2	1.3	1.1	1.0	1.3	1.4	1.3	1.0	1.0	1.0
288	12	1.2	-0.1	1.3	0.7	2.6	0.7	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
300		1.3	-0.4	1.5	0.7	3.0	0.5	1.2	1.4	1.1	1.0	1.3	1.4	1.3	1.0	1.0	1.0
312	13	1.2	0.1	1.3	0.8	2.5	0.7	1.2	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.1	1.0
324		1.1	-0.1	1.2	0.7	2.2	0.6	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
336	14	1.1	0.0	1.2	0.8	2.4	0.7	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
348		1.2	-0.3	1.4	0.7	2.9	0.6	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
360	15	1.0	-0.2	1.1	0.5	2.3	0.5	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
372		1.1	0.3	1.2	0.9	2.3	0.8	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.0
384	16	1.3	0.0	1.4	0.9	2.6	0.8	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
Average over trial period		1.4	0.0	1.6	1.0	2.8	0.9	1.3	1.4	1.0	1.0	1.3	1.4	1.3	1.0	1.0	1.1
± standard deviation		0.5	0.9	0.5	0.5	0.5	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Average of Fruit temperatures						1.2 ± 0.0											
Average of Air temperatures						1.3 ± 0.6											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.6 & 4.7) show that, from the dissection data an estimated **543,200** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **123,608** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Sweetheart cherries and the treatment is suitable for disinfestation.

Table 4.6: Sweetheart cherries large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	108,100	100,800	103,300	312,200
day 6	3,000	2 nd instar	77,300	75,300	78,400	231,000
Total	6,000		185,400	176,100	181,700	543,200

Table 4.7: Sweetheart cherries large scale trials. Total number of pupae recovered from control fruits (5kg / replicate/ instar) and treated fruits (10kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:		30kg		Estimated number of Pupae in treated fruit infested as:		60kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar			1 st instar	2 nd instar		
			Total				Total	
1	12,704	8,147	20,851		25,408	16,294	41,702	0
2	10,038	8,975	19,013		20,076	17,950	38,026	0
3	12,598	9,342	21,940		25,196	18,684	43,880	0
Total	35,340	26,464	61,804		70,680	52,928	123,608	0

4.5.2 Cherries - Lapin

Life history data

The life history data (table 4.8) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.8: **Lapin Cherries:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	2/12/2009	100	0	0	0	100	eggs
1	3/12/2009	100	0	0	0	100	eggs
2	4/12/2009	100	0	0	0	100	eggs
3	5/12/2009	19	81	0	0	100	1st
4	6/12/2009	11	85	4	0	100	1st
5	7/12/2009	0	32	68	0	100	2nd
6	8/12/2009	0	23	77	0	100	2nd
7	9/12/2009	0	7	27	66	100	3rd
8	10/12/2009	0	0	20	80	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.9. Cold treatment 12 hour summary records are given in tables 4.10- 4.12. The mortality data from 16 days cold exposure to 1.0 ± 0.5 °C are given in tables 4.13 – 4.14.

Table 4.9 Summary of the dates and times of the conduct of the Large Scale trials at 1.0 ± 0.5 °C. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Lapin		14.01.2010	16.01.2010		01.02.2010			13.01.2010
	1	08:20 am	11:20 am	51.0	11:20 am	# 3	KS0606016	14:01 pm
	2	08:51 am	11:51 am	51.0	11:51 am	# 4	KS0547009	14:56 pm
	3	09:22 am	12:22 pm	51.0	12:22 pm	# 5	KS0606017	14:46 pm

Table 4.10: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		1.8	0.3	3.2	0.7	2.4	1.5	1.0	1.0	1.1	1.0	1.2	1.3	1.4	1.1	1.1	1.3
24	1	1.5	0.2	2.1	0.7	2.0	1.2	1.0	1.0	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.3
36		1.4	0.7	1.7	0.9	1.6	1.3	1.0	1.0	1.1	1.0	1.1	1.0	1.0	0.9	1.1	1.3
48	2	1.5	0.5	2.5	0.9	2.0	1.4	1.0	1.0	1.2	1.0	1.0	0.9	1.0	1.0	1.1	1.3
60		1.8	0.0	3.3	0.6	2.6	1.3	0.9	1.1	1.2	1.0	1.0	1.0	0.9	0.9	1.1	1.1
72	3	1.6	0.2	2.4	0.8	2.2	1.4	1.1	1.0	1.3	1.1	0.9	1.0	1.0	0.9	1.1	0.9
84		1.5	0.1	2.3	0.7	2.1	1.2	1.1	1.1	1.3	1.1	0.9	1.0	0.9	1.0	1.1	0.9
96	4	1.6	-0.2	2.9	0.6	2.3	1.2	1.0	1.1	1.3	1.1	1.0	1.0	0.9	1.0	1.1	1.0
108		2.0	0.3	3.7	0.7	2.9	1.5	0.9	1.1	1.3	1.0	1.1	1.1	0.9	1.0	1.1	1.1
120	5	1.7	0.2	2.5	0.8	2.2	1.3	1.0	1.0	1.2	1.0	1.1	1.1	1.0	1.0	1.2	1.2
132		1.6	0.4	2.2	0.8	2.0	1.3	0.9	1.1	1.2	1.0	1.1	1.1	1.0	1.1	1.2	1.2
144	6	1.6	0.2	2.5	0.8	2.1	1.3	1.0	1.1	1.2	1.0	1.1	1.1	1.0	1.1	1.2	1.3
156		1.6	0.1	2.7	0.6	2.3	1.2	0.9	1.0	1.2	1.0	1.0	1.1	1.0	1.0	1.2	1.3
168	7	1.5	0.2	2.3	0.7	2.1	1.2	1.0	1.1	1.2	1.0	1.1	1.0	1.0	1.0	1.2	1.3
180		1.5	0.2	2.1	0.7	2.0	1.2	1.0	1.1	1.3	1.0	1.0	1.0	1.0	1.0	1.2	1.4
192	8	1.6	0.5	2.6	0.8	2.1	1.4	1.0	1.1	1.2	1.0	1.1	1.0	1.0	1.0	1.3	1.4
204		1.6	-0.1	2.9	0.6	2.3	1.2	0.9	1.0	1.2	1.0	1.0	1.1	1.0	1.0	1.2	1.4
216	9	1.5	0.4	2.1	0.8	2.0	1.3	1.0	1.1	1.2	1.0	1.1	1.0	1.0	1.0	1.2	1.5
228		1.5	0.5	1.9	0.8	1.9	1.3	0.9	1.0	1.2	1.0	1.0	1.1	1.0	1.1	1.2	1.4
240	10	1.6	0.7	2.6	0.8	2.0	1.4	1.0	1.1	1.2	1.0	1.0	1.0	1.0	1.1	1.2	1.4
252		1.8	0.3	3.1	0.7	2.3	1.4	1.0	1.1	1.2	0.9	0.9	1.1	1.0	1.0	1.2	1.3
264	11	1.5	0.3	1.9	0.7	1.9	1.2	1.0	1.0	1.2	1.0	1.0	1.0	1.1	1.1	1.2	1.4
276		1.5	0.2	1.8	0.8	1.8	1.2	1.0	1.1	1.2	0.9	1.0	1.0	1.0	1.0	1.2	1.3
288	12	1.3	-0.2	2.1	0.4	1.8	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.4
300		1.4	-0.2	2.6	0.4	2.1	1.0	1.0	1.1	1.2	0.9	1.0	1.0	1.0	1.1	1.2	1.3
312	13	1.1	-0.2	1.7	0.3	1.6	0.8	1.1	1.0	1.2	1.0	1.0	1.0	1.0	1.0	1.2	1.4
324		1.1	0.0	1.5	0.4	1.4	0.8	1.0	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.2	1.3
336	14	1.0	-0.9	2.2	0.0	1.7	0.6	1.0	1.1	1.2	1.0	1.0	0.9	1.0	1.0	1.2	1.3
348		1.3	-0.5	2.7	0.2	2.1	0.8	1.0	1.1	1.2	0.9	1.0	1.1	0.9	1.0	1.2	1.3
360	15	1.2	-0.1	1.9	0.4	1.8	1.0	1.1	1.0	1.2	1.0	1.0	1.0	1.0	1.0	1.2	1.3
372		1.2	-0.1	1.8	0.4	1.7	0.9	1.0	1.1	1.2	1.0	1.0	1.1	1.0	1.0	1.2	1.2
384	16	1.5	0.3	2.4	0.6	1.9	1.2	1.0	1.0	1.2	1.0	1.0	1.0	0.9	1.0	1.2	1.3
Average over trial period		1.5	0.1	2.4	0.6	2.0	1.2	1.0	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.2	1.3
± standard deviation		0.4	1.0	0.6	0.4	0.4	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.3 ± 0.6											

Table 4.11: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.3	0.0	1.7	0.7	2.3	0.6	1.5	1.4	1.4	1.0	1.1	1.3	1.2	1.3	1.4	1.5
24	1	1.0	0.3	1.5	0.7	1.8	0.6	1.5	1.2	1.3	1.0	1.1	1.1	1.1	1.2	1.3	1.4
36		0.9	0.5	1.3	0.7	1.5	0.6	1.5	1.1	1.2	1.0	1.0	1.0	1.1	1.0	1.2	1.4
48	2	1.0	0.3	1.5	0.6	1.8	0.6	1.4	1.0	1.2	1.0	1.0	1.0	1.0	1.0	1.2	1.3
60		1.3	0.0	1.8	0.7	2.5	0.6	1.4	1.0	1.1	1.0	1.0	1.0	1.0	0.9	1.2	1.3
72	3	1.0	-0.1	1.6	0.5	2.0	0.4	1.4	1.0	1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.3
84		1.2	0.3	1.6	0.7	2.0	0.6	1.4	1.0	1.2	1.1	1.0	1.0	1.1	1.0	1.2	1.4
96	4	1.2	0.1	1.7	0.6	2.1	0.6	1.4	1.0	1.2	1.1	1.1	1.1	1.1	1.0	1.2	1.3
108		1.6	0.5	1.9	0.8	2.8	0.8	1.4	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.2	1.3
120	5	1.4	0.4	1.7	0.8	2.1	0.7	1.4	0.9	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.3
132		1.2	0.0	1.5	0.6	1.9	0.5	1.4	0.9	1.1	1.1	1.0	1.0	1.1	1.0	1.2	1.3
144	6	1.1	0.3	1.6	0.6	2.0	0.6	1.4	0.9	1.1	1.1	1.1	1.0	1.1	1.0	1.2	1.3
156		1.2	0.0	1.7	0.6	2.3	0.5	1.4	0.9	1.1	1.1	1.1	1.0	1.1	1.0	1.2	1.3
168	7	1.2	0.1	1.6	0.7	1.9	0.6	1.4	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.3
180		1.3	0.4	1.6	0.9	2.0	0.9	1.4	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.3
192	8	1.2	0.4	1.6	0.7	2.0	0.7	1.4	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.3
204		1.2	0.1	1.7	0.6	2.2	0.6	1.4	1.0	1.1	1.0	1.1	1.0	1.0	1.1	1.2	1.3
216	9	1.1	0.0	1.5	0.6	1.8	0.5	1.4	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.2	1.2
228		0.8	0.3	1.3	0.5	1.5	0.4	1.4	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.2	1.3
240	10	1.2	0.2	1.6	0.6	1.8	0.6	1.4	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.2
252		1.4	0.1	1.7	0.7	2.2	0.7	1.4	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.2	1.3
264	11	1.1	0.3	1.4	0.6	1.7	0.6	1.4	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.2	1.3
276		0.9	0.3	1.3	0.6	1.5	0.5	1.4	1.0	1.1	1.0	1.1	1.1	1.0	1.0	1.2	1.3
288	12	1.1	0.4	1.5	0.7	1.8	0.7	1.4	1.1	1.0	1.1	1.1	1.1	1.0	1.0	1.2	1.3
300		1.3	0.2	1.7	0.7	2.2	0.6	1.4	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.3
312	13	1.0	0.4	1.3	0.6	1.7	0.5	1.4	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.2
324		1.0	0.4	1.3	0.7	1.5	0.6	1.4	1.1	1.0	1.0	1.1	1.1	0.9	1.0	1.2	1.2
336	14	1.1	0.2	1.5	0.7	1.8	0.6	1.4	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.2	1.2
348		1.2	0.1	1.7	0.6	2.2	0.5	1.4	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.2	1.3
360	15	1.1	0.3	1.5	0.7	1.9	0.6	1.4	1.1	1.0	1.1	1.2	1.0	1.0	1.0	1.2	1.2
372		1.3	0.6	1.6	0.9	1.9	0.9	1.4	1.1	1.0	1.0	1.1	1.1	0.9	1.0	1.2	1.2
384	16	1.3	0.3	1.6	0.8	2.0	0.7	1.4	1.1	1.0	1.1	1.2	1.0	0.9	1.0	1.2	1.1
Average over trial period		1.2	0.2	1.6	0.7	2.0	0.6	1.4	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.3
± standard deviation		0.4	0.9	0.2	0.4	0.4	0.4	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.0 ± 0.4											

Table 4.12: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.1	-0.2	1.4	0.6	2.5	0.6	1.5	1.3	1.2	0.9	1.2	1.4	1.0	1.5	1.5	1.4
24	1	1.0	0.0	1.2	0.6	2.1	0.7	1.4	1.2	1.2	1.0	1.1	1.2	1.0	1.3	1.4	1.3
36		1.0	0.1	1.1	0.5	1.7	0.6	1.3	1.0	1.1	1.0	1.1	1.0	0.9	1.2	1.4	1.3
48	2	1.2	-0.1	1.3	0.7	2.2	0.7	1.3	1.0	1.1	1.0	1.1	1.0	1.0	1.2	1.3	1.3
60		1.3	-0.4	1.5	0.7	2.9	0.6	1.3	1.0	1.1	1.0	1.0	1.1	1.0	1.2	1.3	1.2
72	3	1.3	0.2	1.3	0.9	2.4	0.8	1.3	1.0	1.1	1.0	1.1	1.2	1.0	1.2	1.3	1.3
84		1.0	-0.3	1.2	0.5	2.2	0.5	1.3	1.0	1.1	1.0	1.1	1.1	1.0	1.2	1.4	1.2
96	4	1.1	-0.1	1.3	0.7	2.5	0.6	1.4	1.1	1.2	1.1	1.2	1.2	1.1	1.2	1.4	1.3
108		1.3	-0.4	1.6	0.7	3.1	0.6	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.4	1.3
120	5	1.1	-0.1	1.2	0.7	2.4	0.6	1.4	1.0	1.1	1.0	1.2	1.1	1.1	1.2	1.4	1.3
132		1.0	-0.1	1.1	0.6	2.2	0.5	1.3	1.0	1.1	1.0	1.1	1.0	1.0	1.2	1.4	1.2
144	6	1.2	0.0	1.4	0.8	2.5	0.7	1.4	1.0	1.1	1.0	1.1	1.1	1.1	1.2	1.4	1.3
156		1.2	-0.3	1.5	0.7	2.6	0.5	1.3	1.0	1.1	1.0	1.1	1.1	1.0	1.2	1.4	1.2
168	7	1.1	-0.1	1.2	0.6	2.2	0.6	1.4	1.0	1.1	1.1	1.2	1.1	1.1	1.2	1.4	1.3
180		1.1	0.0	1.1	0.6	2.1	0.6	1.4	1.0	1.1	1.0	1.2	1.0	1.1	1.3	1.4	1.3
192	8	1.1	0.0	1.2	0.6	2.2	0.6	1.4	1.0	1.1	1.0	1.2	1.0	1.1	1.3	1.4	1.3
204		1.2	-0.1	1.4	0.7	2.5	0.7	1.4	1.0	1.1	1.0	1.2	0.9	1.1	1.3	1.3	1.3
216	9	1.0	-0.6	1.1	0.4	2.1	0.5	1.4	1.0	1.1	1.0	1.2	1.0	1.1	1.3	1.4	1.3
228		0.9	-0.1	1.0	0.5	1.8	0.5	1.4	1.0	1.1	1.0	1.2	1.0	1.0	1.3	1.3	1.3
240	10	0.9	-0.3	1.1	0.5	2.0	0.5	1.4	1.0	1.1	1.0	1.2	1.1	1.1	1.3	1.4	1.3
252		1.1	0.1	1.3	0.7	2.4	0.7	1.4	1.0	1.1	1.0	1.2	1.0	1.0	1.3	1.3	1.3
264	11	1.1	0.1	1.1	0.6	2.0	0.6	1.4	1.0	1.1	1.0	1.2	1.0	1.1	1.3	1.4	1.3
276		1.1	0.1	1.1	0.6	1.7	0.6	1.4	1.0	1.1	1.0	1.2	1.0	1.1	1.3	1.3	1.3
288	12	1.0	-0.3	1.2	0.5	2.0	0.5	1.4	1.1	1.1	1.0	1.2	1.1	1.1	1.3	1.3	1.3
300		1.3	-0.1	1.4	0.7	2.5	0.7	1.4	1.1	1.1	1.0	1.2	1.0	1.1	1.3	1.3	1.3
312	13	1.0	-0.4	1.0	0.4	1.9	0.4	1.4	1.1	1.1	1.0	1.2	1.0	1.1	1.3	1.4	1.3
324		1.2	0.6	1.2	0.9	1.8	0.9	1.4	1.1	1.1	1.0	1.2	1.1	1.0	1.3	1.4	1.3
336	14	1.1	0.1	1.2	0.7	2.1	0.7	1.4	1.0	1.1	1.0	1.2	1.0	1.1	1.2	1.4	1.3
348		1.3	0.1	1.5	0.8	2.7	0.7	1.4	1.0	1.1	1.0	1.2	1.0	1.0	1.2	1.4	1.3
360	15	1.1	0.0	1.2	0.7	2.3	0.7	1.4	1.0	1.1	1.0	1.3	1.0	1.1	1.2	1.5	1.3
372		1.1	0.1	1.2	0.7	2.1	0.7	1.4	1.0	1.0	1.0	1.3	1.0	1.0	1.2	1.4	1.3
384	16	1.1	-0.2	1.3	0.6	2.3	0.6	1.4	1.0	1.1	1.0	1.3	1.0	1.1	1.2	1.5	1.3
Average over trial period		1.1	-0.1	1.2	0.6	2.2	0.6	1.4	1.0	1.1	1.0	1.2	1.0	1.0	1.2	1.4	1.3
± standard deviation		0.4	0.9	0.3	0.4	0.4	0.4	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
Average of Fruit temperatures						1.2 ± 0.1											
Average of Air temperatures						1.0 ± 0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.13 & 4.14) show that, from the dissection data an estimated **949,700** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **197,534** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Lapin Cherries and the treatment is suitable for disinfestation.

Table 4.13: Lapin cherries large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1st instar	178,400	150,000	161,700	490,100
day 6	3,000	2nd instar	145,600	155,100	158,900	459,600
Total	6,000		324,000	305,100	320,600	949,700

Table 4.14: Lapin cherries large scale trials. Total number of pupae recovered from control fruits (5kg / replicate/ instar) and treated fruits (10kg/ replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:		60kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	15,772	16,141	31,913		31,544	32,282	63,826	0
2	16,125	17,210	33,335		32,250	34,420	66,670	0
3	17,270	16,249	33,519		34,540	32,498	67,038	0
Total	49,167	49,600	98,767		98,334	99,200	197,534	0

4.5.3 Peaches – Snow King

Life history data

The life history data (table 4.15) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.15: **Snow King Peaches:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	8/1/2009	100	0	0	0	100	eggs
1	9/1/2009	100	0	0	0	100	eggs
2	10/1/2009	100	0	0	0	100	eggs
3	11/1/2009	19	81	0	0	100	1st
4	12/1/2009	10	91	0	0	100	1st
5	13/1/2009	0	28	72	0	100	2nd
6	14/1/2009	0	13	73	15	100	2nd
7	15/1/2009	0	0	27	73	100	3rd
8	16/1/2009	0	0	12	88	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.16. Cold treatment 12 hour summary records are given in tables 4.17- 4.19. The mortality data from 16 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$ are given in tables 4.20 – 4.21.

Table 4.16 Summary of the dates and times of the conduct of the Large Scale trials at $1.0 \pm 0.5^\circ\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Snow King		03.02.2009	05.02.2009		21.02.2009			02.02.2009
	1	07:22 am	10:22 am	51.0	10:22 am	# 3	KS0606016	14:02 pm
	2	07:54 am	10:54 am	51.0	10:54 am	# 4	KS0547009	14:39 pm
	3	08:23 am	11:23 am	51.0	11:23 am	# 5	KS0606017	13:25 am

Table 4.17: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		1.4	-0.3	2.2	0.6	2.3	1.1	1.4	1.4	1.4	1.4	1.5	1.5	1.3	1.4	1.4	1.3
24	1	1.4	-0.5	2.9	0.4	2.9	1.2	1.3	1.2	1.3	1.2	1.3	1.2	1.2	1.2	1.3	1.2
36		1.2	-0.3	2.2	0.3	2.3	0.9	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.2
48	2	1.2	-1.1	3.1	0.1	2.8	0.8	1.1	1.0	1.2	1.0	1.2	1.1	1.2	1.1	1.2	1.1
60		1.1	-0.7	2.1	0.2	2.2	0.8	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.1	1.2	1.2
72	3	1.4	-0.2	3.0	0.4	2.7	1.1	1.0	1.0	1.1	0.9	1.1	1.1	1.2	1.1	1.2	1.2
84		1.6	-0.1	2.4	0.6	2.4	1.2	1.0	1.1	1.0	0.9	1.0	1.1	1.2	1.1	1.2	1.2
96	4	1.4	-0.6	3.0	0.3	2.7	1.0	1.0	1.0	1.1	0.9	1.0	1.0	1.2	1.1	1.2	1.2
108		1.1	-0.5	2.1	0.2	2.2	0.8	1.0	1.0	1.0	0.9	1.0	1.1	1.2	1.1	1.2	1.2
120	5	1.2	-0.6	2.8	0.2	2.7	0.9	1.0	1.0	1.0	0.8	1.0	1.0	1.2	1.1	1.1	1.2
132		1.1	-0.5	2.0	0.3	2.1	0.8	1.0	1.0	1.0	0.8	1.0	1.0	1.1	1.1	1.2	1.2
144	6	1.2	-0.7	2.7	0.2	2.6	0.9	1.0	1.0	1.0	0.9	1.0	1.0	1.2	1.1	1.1	1.2
156		1.2	-0.2	2.1	0.4	2.2	1.0	1.1	1.0	1.0	0.9	1.0	1.0	1.2	1.1	1.2	1.2
168	7	1.2	-0.8	2.7	0.2	2.5	0.9	1.1	1.0	1.1	1.0	1.1	1.0	1.2	1.1	1.2	1.3
180		1.1	-0.4	2.1	0.3	2.1	0.8	1.2	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.2	1.3
192	8	1.4	-0.3	3.0	0.5	2.8	1.2	1.2	1.1	1.2	1.1	1.1	1.0	1.1	1.1	1.2	1.2
204		1.4	0.1	2.3	0.6	2.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.3
216	9	1.9	0.1	3.4	0.8	3.1	1.5	1.3	1.1	1.2	1.2	1.2	1.1	1.2	1.2	1.2	1.3
228		1.4	-0.3	2.3	0.5	2.3	1.1	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3
240	10	1.6	0.0	3.0	0.6	2.8	1.3	1.3	1.1	1.3	1.2	1.2	1.2	1.1	1.2	1.2	1.3
252		1.4	0.0	2.1	0.6	2.2	1.1	1.3	1.2	1.2	1.2	1.2	1.2	1.0	1.1	1.1	1.2
264	11	1.4	-0.1	2.4	0.6	2.4	1.2	1.3	1.2	1.3	1.2	1.3	1.2	1.0	1.1	1.1	1.1
276		1.3	0.2	1.8	0.7	1.9	1.1	1.4	1.1	1.2	1.3	1.3	1.2	1.1	1.1	1.2	1.2
288	12	1.5	0.2	2.6	0.8	2.4	1.3	1.4	1.1	1.3	1.3	1.3	1.2	1.0	1.1	1.1	1.2
300		1.3	0.4	1.9	0.8	2.0	1.2	1.4	1.1	1.2	1.3	1.3	1.2	1.1	1.1	1.2	1.2
312	13	1.5	0.2	2.6	0.7	2.6	1.3	1.4	1.1	1.2	1.3	1.3	1.2	1.0	1.1	1.1	1.2
324		1.5	0.6	2.1	0.9	2.3	1.4	1.4	1.1	1.3	1.4	1.3	1.2	1.0	1.1	1.1	1.2
336	14	1.6	0.4	2.9	0.8	2.8	1.4	1.4	1.1	1.3	1.4	1.3	1.2	1.0	1.1	1.1	1.2
348		1.7	0.3	2.4	0.8	2.5	1.3	1.4	1.2	1.3	1.4	1.3	1.3	1.1	1.2	1.2	1.3
360	15	1.9	0.1	3.0	0.9	2.8	1.5	1.4	1.2	1.3	1.4	1.3	1.3	1.1	1.2	1.2	1.3
372		1.6	0.6	2.4	0.9	2.5	1.4	1.4	1.2	1.3	1.4	1.3	1.3	1.1	1.2	1.2	1.3
384	16	1.6	0.0	3.0	0.6	2.8	1.3	1.4	1.2	1.3	1.4	1.3	1.3	1.1	1.2	1.2	1.3
Average over trial period		1.4	-0.2	2.5	0.5	2.5	1.1	1.2	1.1	1.2	1.1	1.2	1.2	1.1	1.2	1.2	1.2
± standard deviation		0.5	1.0	0.7	0.5	0.5	0.5	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							1.2 ± 0.1										
Average of Air temperatures							1.3 ± 0.6										

Table 4.18: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.0	0.6	1.7	0.9	2.9	1.1	1.4	1.3	1.3	1.4	1.5	1.1	1.4	1.4	1.4	1.3
24	1	1.9	0.4	1.7	0.8	2.7	1.0	1.3	1.3	1.2	1.3	1.4	1.0	1.3	1.3	1.4	1.2
36		1.9	0.6	1.7	0.9	3.0	1.1	1.2	1.2	1.2	1.3	1.3	1.0	1.3	1.2	1.3	1.2
48	2	1.8	0.7	1.6	0.9	2.7	1.1	1.2	1.2	1.1	1.3	1.2	1.0	1.2	1.2	1.3	1.1
60		1.8	0.1	1.6	0.6	2.9	0.8	1.2	1.1	1.1	1.2	1.2	1.0	1.2	1.2	1.2	1.1
72	3	1.7	0.3	1.5	0.6	2.4	0.8	1.2	1.1	1.1	1.2	1.2	1.0	1.2	1.2	1.2	1.1
84		1.9	0.2	1.6	0.7	2.8	1.0	1.2	1.1	1.1	1.2	1.1	1.0	1.2	1.2	1.2	1.1
96	4	1.7	-0.2	1.5	0.5	2.5	0.7	1.2	1.1	1.1	1.2	1.1	0.9	1.2	1.2	1.2	1.1
108		2.1	0.6	1.7	0.8	2.8	1.1	1.1	1.1	1.1	1.2	1.1	0.9	1.2	1.1	1.2	1.1
120	5	1.9	0.3	1.6	0.7	2.5	0.9	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
132		1.9	-0.1	1.6	0.5	2.7	0.8	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
144	6	1.7	0.3	1.4	0.6	2.3	0.8	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
156		1.8	-0.1	1.6	0.6	2.6	0.8	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
168	7	1.7	0.2	1.5	0.6	2.4	0.9	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
180		1.8	0.3	1.5	0.7	2.6	0.8	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
192	8	1.7	-0.2	1.5	0.5	2.5	0.7	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
204		1.8	0.5	1.5	0.8	2.6	1.0	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
216	9	1.7	0.2	1.5	0.6	2.4	0.8	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
228		1.9	0.4	1.6	0.7	2.7	0.9	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.1
240	10	2.0	0.5	1.6	0.9	2.6	1.1	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.0
252		1.9	0.3	1.6	0.7	2.7	0.9	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.0
264	11	1.5	-0.1	1.3	0.5	2.1	0.7	1.1	1.1	1.1	1.1	1.1	0.9	1.1	1.1	1.2	1.0
276		1.5	0.5	1.3	0.6	2.1	0.8	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.0
288	12	1.5	0.6	1.3	0.7	1.9	0.9	1.1	1.1	1.1	1.2	1.1	0.9	1.1	1.1	1.2	1.0
300		1.6	-0.1	1.4	0.5	2.1	0.7	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.1
312	13	1.4	0.1	1.3	0.5	1.8	0.7	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.1
324		1.7	0.5	1.5	0.8	2.2	1.0	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.1
336	14	1.6	0.5	1.4	0.7	2.1	0.9	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.1
348		1.7	0.4	1.5	0.7	2.5	0.9	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.1
360	15	1.9	0.4	1.6	0.7	2.4	1.0	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.0
372		2.0	0.6	1.6	0.8	2.5	1.0	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.0
384	16	1.8	0.4	1.5	0.8	2.6	1.0	1.1	1.1	1.1	1.2	1.1	1.0	1.1	1.1	1.2	1.0
Average over trial period		1.8	0.3	1.5	0.7	2.5	0.9	1.1	1.1	1.1	1.2	1.1	0.9	1.2	1.1	1.2	1.1
± standard deviation		0.4	0.8	0.3	0.4	0.6	0.4	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.3 ± 0.5											

Table 4.19: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.9	0.3	2.4	1.4	3.6	1.6	1.4	1.5	1.3	1.2	1.4	1.4	1.4	1.3	1.4	1.3
24	1	1.5	0.0	1.9	1.1	2.7	1.1	1.3	1.4	1.2	1.2	1.3	1.4	1.4	1.2	1.3	1.2
36		1.7	0.0	2.4	1.2	3.5	1.4	1.3	1.4	1.2	1.2	1.3	1.4	1.3	1.2	1.3	1.2
48	2	1.5	0.5	1.9	1.2	2.8	1.2	1.3	1.3	1.2	1.1	1.3	1.3	1.3	1.2	1.2	1.2
60		1.9	0.3	2.4	1.3	3.5	1.4	1.2	1.3	1.2	1.1	1.2	1.3	1.3	1.2	1.2	1.2
72	3	1.2	-0.6	1.6	0.7	2.5	0.8	1.2	1.3	1.1	1.1	1.2	1.3	1.3	1.1	1.2	1.2
84		1.4	-0.1	2.0	0.9	3.1	1.0	1.2	1.3	1.2	1.1	1.2	1.3	1.3	1.1	1.2	1.2
96	4	1.1	-0.2	1.5	0.7	2.5	0.8	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1	1.2	1.2
108		1.2	-0.5	1.8	0.7	3.0	0.8	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1	1.2	1.1
120	5	1.0	-0.2	1.4	0.7	2.3	0.8	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1	1.2	1.2
132		1.2	-0.7	1.7	0.7	2.9	0.9	1.2	1.3	1.2	1.1	1.2	1.3	1.2	1.1	1.2	1.2
144	6	0.9	-0.8	1.4	0.4	2.2	0.6	1.2	1.3	1.2	1.1	1.2	1.3	1.2	1.2	1.2	1.2
156		1.2	0.0	1.7	0.9	2.8	0.9	1.2	1.3	1.2	1.1	1.2	1.3	1.3	1.2	1.2	1.2
168	7	0.9	-0.7	1.4	0.5	2.3	0.6	1.2	1.3	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2
180		1.5	0.1	1.9	1.0	3.1	1.0	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.2
192	8	1.2	-0.6	1.5	0.6	2.4	0.8	1.2	1.3	1.2	1.2	1.2	1.4	1.3	1.2	1.2	1.2
204		1.3	-0.1	1.9	0.8	3.1	1.0	1.2	1.3	1.2	1.1	1.2	1.4	1.3	1.2	1.2	1.2
216	9	1.1	0.0	1.4	0.8	2.2	0.8	1.2	1.3	1.2	1.1	1.2	1.4	1.3	1.2	1.2	1.1
228		1.2	-0.2	1.9	0.8	3.1	1.0	1.2	1.3	1.2	1.1	1.2	1.3	1.3	1.2	1.2	1.1
240	10	1.0	0.4	1.3	0.8	2.2	0.8	1.2	1.3	1.2	1.1	1.2	1.3	1.3	1.2	1.2	1.1
252		1.1	-0.3	1.7	0.6	2.8	0.8	1.2	1.3	1.2	1.1	1.2	1.4	1.3	1.2	1.2	1.2
264	11	1.0	-0.1	1.3	0.7	2.1	0.7	1.2	1.3	1.2	1.2	1.2	1.4	1.3	1.2	1.2	1.2
276		1.0	-0.7	1.5	0.5	2.3	0.7	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.2
288	12	0.9	0.0	1.2	0.6	1.8	0.6	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.2
300		1.3	0.4	1.6	1.0	2.3	1.0	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.2
312	13	1.2	-0.1	1.3	0.7	1.9	0.7	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
324		1.1	-0.1	1.5	0.7	2.3	0.8	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
336	14	0.9	-0.1	1.3	0.6	2.0	0.6	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
348		1.2	-0.6	1.6	0.7	2.7	0.8	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
360	15	1.0	-0.2	1.4	0.7	2.3	0.7	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
372		1.0	-0.3	1.5	0.7	2.5	0.8	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
384	16	0.9	-0.3	1.4	0.5	2.2	0.6	1.2	1.3	1.2	1.2	1.3	1.4	1.3	1.2	1.2	1.1
Average over trial period		1.2	-0.2	1.6	0.8	2.6	0.9	1.2	1.3	1.2	1.1	1.3	1.3	1.3	1.2	1.2	1.2
± standard deviation		0.5	0.9	0.4	0.5	0.5	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Average of Fruit temperatures						1.2 ± 0.0											
Average of Air temperatures						1.2 ± 0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.20 & 4.21) show that, from the dissection data an estimated **452,900** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **111,336** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Snow King Peaches and the treatment is suitable for disinfestation.

Table 4.20: Snow King Peaches large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	93,400	83,100	78,900	255,400
day 6	3,000	2 nd instar	68,400	69,200	59,900	197,500
Total	6,000		161,800	152,300	138,800	452,900

Table 4.21: Snow King Peaches large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:			Estimated number of Pupae in treated fruit infested as:			Number of Survivors after cold treatment
	1 st instar	2 nd instar	45kg Total	1 st instar	2 nd instar	90kg Total	
1	13,700	6,320	20,020	27,400	12,640	40,040	0
2	11,510	5,772	17,282	23,020	11,544	34,564	0
3	12,115	6,251	18,366	24,230	12,502	36,732	0
Total	37,325	18,343	55,668	74,650	36,686	111,336	0

4.5.4 Peaches – Zee Lady

Life history data

The life history data (table 4.22) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.22: **Zee Lady Peaches:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	2/11/2009	100	0	0	0	100	eggs
1	3/11/2009	100	0	0	0	100	eggs
2	4/11/2009	100	0	0	0	100	eggs
3	5/11/2009	35	66	0	0	100	1st
4	6/11/2009	6	91	3	0	100	1st
5	7/11/2009	0	46	54	0	100	2nd
6	8/11/2009	0	4	77	19	100	2nd
7	9/11/2009	0	0	27	73	100	3rd
8	10/11/2009	0	4	13	83	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.23. Cold treatment 12 hour summary records are given in tables 4.24- 4.26. The mortality data from 16 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$ are given in tables 4.27 – 4.28.

Table 4.23 Summary of the dates and times of the conduct of the Large Scale trials at $1.0 \pm 0.5^\circ\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Zee Lady		25.11.2009	27.11.2009		13.12.2009			24.11.2009
	1	07:02 am	10:02 am	51.0	10:02 am	# 3	KS0606016	13:54 pm
	2	07:31 am	06:31 am	47.0	06:31 am	# 4	KS0547009	12:36 pm
	3	08:00 am	07:00 am	47.0	07:00 am	# 5	KS0606017	14:02 pm

Table 4.24: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.3	0.2	3.5	0.7	2.4	1.6	1.5	1.4	1.4	1.4	1.4	1.4	1.2	1.2	1.4	1.5
24	1	1.1	-0.3	3.6	0.3	2.2	1.3	1.4	1.4	1.3	1.3	1.4	1.3	1.1	1.1	1.3	1.4
36		1.1	-0.2	3.4	0.3	2.3	1.4	1.3	1.3	1.2	1.2	1.3	1.3	1.1	1.1	1.2	1.3
48	2	1.1	-0.4	3.6	0.4	1.9	1.4	1.3	1.2	1.2	1.2	1.3	1.2	1.1	1.0	1.2	1.3
60		1.0	-0.2	3.5	0.2	1.5	1.3	1.2	1.2	1.2	1.1	1.3	1.2	1.0	1.1	1.1	1.3
72	3	0.9	-0.2	3.4	0.2	1.5	1.2	1.2	1.2	1.1	1.2	1.3	1.2	1.1	1.0	1.1	1.3
84		1.1	-0.4	3.5	0.3	1.7	1.4	1.2	1.2	1.2	1.1	1.3	1.1	1.0	1.1	1.1	1.3
96	4	1.4	0.3	3.7	0.6	1.8	1.5	1.2	1.1	1.2	1.2	1.3	1.1	1.0	1.0	1.1	1.3
108		1.1	-0.6	3.4	0.1	1.7	1.7	1.2	1.1	1.2	1.2	1.3	1.1	1.0	1.0	1.0	1.3
120	5	1.1	-0.4	3.5	0.3	1.6	1.2	1.2	1.1	1.2	1.1	1.3	1.1	1.1	1.0	1.1	1.3
132		1.0	-0.3	3.3	0.2	1.6	1.4	1.3	1.2	1.3	1.2	1.3	1.2	1.2	1.1	1.1	1.3
144	6	0.9	-0.3	3.3	0.3	1.4	1.3	1.3	1.2	1.3	1.2	1.3	1.2	1.3	1.1	1.2	1.4
156		0.9	-0.4	3.2	0.1	1.4	1.4	1.3	1.2	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.4
168	7	1.0	-0.2	3.4	0.3	1.4	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.4
180		0.9	0.0	3.1	0.2	1.3	1.4	1.3	1.3	1.3	1.4	1.3	1.3	1.4	1.3	1.3	1.4
192	8	1.1	-0.2	3.6	0.4	1.5	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.4
204		1.3	0.3	3.4	0.6	1.6	1.7	1.3	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.4
216	9	1.4	0.6	3.7	0.8	1.7	1.6	1.3	1.3	1.4	1.3	1.3	1.3	1.3	1.4	1.4	1.4
228		1.5	0.5	3.6	0.7	1.7	2.0	1.3	1.3	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.4
240	10	1.3	0.1	3.7	0.5	1.5	1.6	1.3	1.3	1.4	1.3	1.3	1.4	1.3	1.4	1.4	1.4
252		1.2	-0.6	3.4	0.2	1.4	1.7	1.3	1.3	1.4	1.3	1.3	1.4	1.3	1.4	1.4	1.4
264	11	1.3	0.0	3.2	0.6	2.0	1.6	1.3	1.4	1.4	1.4	1.3	1.4	1.3	1.4	1.4	1.4
276		1.3	0.5	2.8	0.8	2.7	1.6	1.3	1.3	1.4	1.4	1.3	1.4	1.3	1.4	1.4	1.4
288	12	1.1	-0.6	3.1	0.3	2.6	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
300		1.1	0.2	2.9	0.4	2.6	1.6	1.3	1.4	1.5	1.3	1.3	1.4	1.3	1.4	1.4	1.3
312	13	1.3	0.4	3.0	0.7	2.7	1.3	1.3	1.4	1.4	1.3	1.4	1.4	1.3	1.4	1.4	1.3
324		1.1	-0.1	3.1	0.4	2.6	1.7	1.3	1.4	1.4	1.3	1.3	1.4	1.3	1.4	1.4	1.3
336	14	1.1	-0.3	3.2	0.4	2.6	1.4	1.4	1.5	1.5	1.3	1.3	1.4	1.3	1.4	1.4	1.3
348		1.4	0.1	3.5	0.7	2.8	1.8	1.3	1.4	1.4	1.3	1.3	1.4	1.3	1.4	1.4	1.3
360	15	1.6	0.7	3.7	0.9	2.9	1.7	1.3	1.4	1.4	1.3	1.3	1.4	1.3	1.4	1.4	1.4
372		1.5	-0.2	3.5	0.7	2.8	2.1	1.3	1.4	1.4	1.3	1.3	1.4	1.4	1.4	1.4	1.4
384	16	1.2	-0.6	3.7	0.3	2.5	1.6	1.3	1.4	1.4	1.4	1.3	1.4	1.3	1.4	1.4	1.4
Average over trial period		1.2	-0.1	3.4	0.4	2.0	1.5	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.3	1.4
± standard deviation		0.4	1.1	0.8	0.5	0.6	0.4	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.1
Average of Fruit temperatures						1.3 ± 0.1											
Average of Air temperatures						1.4 ± 0.6											

Table 4.25: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.7	-0.3	1.6	0.8	2.8	1.5	1.4	1.4	1.4	1.2	1.3	1.2	1.4	1.3	1.2	1.3
24	1	1.6	0.4	1.6	0.9	2.6	1.2	1.4	1.3	1.4	1.2	1.2	1.2	1.4	1.2	1.2	1.2
36		1.6	-0.4	1.6	0.7	2.7	1.3	1.3	1.3	1.4	1.2	1.2	1.3	1.4	1.2	1.2	1.2
48	2	1.5	-0.2	1.5	0.6	2.5	1.0	1.3	1.2	1.4	1.2	1.2	1.2	1.3	1.2	1.1	1.2
60		1.6	-0.1	1.5	0.8	2.8	1.2	1.3	1.3	1.4	1.3	1.2	1.2	1.3	1.2	1.2	1.2
72	3	1.4	0.3	1.3	0.8	2.3	0.8	1.3	1.2	1.3	1.2	1.2	1.2	1.3	1.2	1.1	1.1
84		1.5	0.2	1.4	0.8	2.6	1.0	1.2	1.3	1.4	1.2	1.2	1.2	1.3	1.2	1.1	1.2
96	4	1.4	0.1	1.4	0.8	2.4	0.8	1.3	1.3	1.4	1.2	1.1	1.2	1.3	1.1	1.1	1.1
108		1.6	0.7	1.5	0.9	2.5	0.9	1.2	1.2	1.4	1.2	1.1	1.2	1.3	1.2	1.2	1.1
120	5	1.8	0.4	1.6	1.0	2.4	0.8	1.3	1.2	1.3	1.2	1.1	1.2	1.3	1.1	1.2	1.1
132		1.7	0.2	1.5	0.9	2.6	1.0	1.2	1.2	1.3	1.2	1.1	1.2	1.3	1.1	1.2	1.2
144	6	1.4	0.0	1.4	0.8	2.2	0.6	1.2	1.2	1.3	1.2	1.1	1.2	1.3	1.1	1.1	1.2
156		1.4	0.4	1.4	0.8	2.4	0.8	1.2	1.2	1.3	1.1	1.2	1.2	1.4	1.2	1.2	1.2
168	7	1.4	0.0	1.4	0.7	2.3	0.7	1.2	1.2	1.3	1.1	1.2	1.2	1.3	1.1	1.1	1.1
180		1.5	0.3	1.5	0.9	2.5	0.8	1.2	1.2	1.3	1.1	1.2	1.2	1.3	1.1	1.1	1.2
192	8	1.4	0.3	1.4	0.8	2.4	0.7	1.2	1.2	1.3	1.1	1.2	1.2	1.3	1.1	1.1	1.1
204		1.4	-0.2	1.3	0.6	2.4	0.8	1.2	1.2	1.3	1.2	1.1	1.1	1.3	1.1	1.2	1.1
216	9	1.4	-0.1	1.3	0.6	2.3	0.6	1.2	1.2	1.3	1.1	1.2	1.1	1.3	1.1	1.1	1.1
228		1.5	0.1	1.5	0.8	2.5	0.9	1.2	1.2	1.2	1.1	1.1	1.2	1.3	1.1	1.1	1.2
240	10	1.7	0.6	1.5	0.9	2.4	0.8	1.2	1.2	1.3	1.1	1.2	1.1	1.3	1.1	1.1	1.1
252		1.7	0.2	1.5	0.9	2.5	0.9	1.2	1.1	1.2	1.1	1.1	1.2	1.3	1.1	1.1	1.1
264	11	1.3	0.1	1.2	0.7	2.0	0.4	1.2	1.2	1.2	1.1	1.1	1.2	1.3	1.1	1.1	1.1
276		1.2	-0.2	1.1	0.6	1.9	0.3	1.1	1.2	1.3	1.2	1.2	1.2	1.3	1.1	1.2	1.1
288	12	1.1	0.0	1.1	0.6	1.8	0.1	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.1	1.2	1.1
300		1.3	0.5	1.3	0.8	2.0	0.3	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.1	1.2	1.2
312	13	1.3	0.3	1.2	0.7	1.8	0.2	1.1	1.2	1.3	1.1	1.1	1.2	1.3	1.1	1.1	1.2
324		1.3	0.1	1.3	0.6	2.1	0.4	1.1	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.1	1.2
336	14	1.3	0.0	1.2	0.6	2.0	0.3	1.1	1.1	1.2	1.3	1.1	1.1	1.2	1.3	1.1	1.1
348		1.5	0.2	1.4	0.8	2.4	0.4	1.1	1.1	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1
360	15	1.5	0.6	1.4	0.9	2.2	0.4	1.1	1.1	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1
372		1.7	0.2	1.4	0.8	2.3	0.4	1.1	1.1	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1
384	16	1.7	0.3	1.4	0.9	2.4	0.5	1.1	1.1	1.2	1.3	1.1	1.1	1.2	1.3	1.2	1.1
Average over trial period		1.5	0.2	1.4	0.8	2.3	0.7	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.2	1.1	1.1
± standard deviation		0.4	0.8	0.3	0.4	0.5	0.5	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0
Average of Fruit temperatures							1.2 ± 0.1										
Average of Air temperatures							1.1 ± 0.5										

Table 4.26: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.7	0.4	2.2	1.3	3.1	1.4	1.4	1.1	1.2	1.3	1.5	1.2	1.2	1.4	1.3	1.2
24	1	1.8	1.0	2.1	1.6	2.9	1.5	1.4	1.1	1.1	1.2	1.4	1.1	1.1	1.3	1.3	1.1
36		1.8	0.6	2.3	1.5	3.2	1.5	1.4	1.0	1.2	1.2	1.4	1.1	1.1	1.3	1.3	1.1
48	2	1.6	0.2	2.0	1.3	2.8	1.2	1.5	1.0	1.1	1.2	1.3	1.1	1.1	1.3	1.2	1.1
60		1.7	0.5	2.1	1.3	3.1	1.1	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
72	3	1.6	0.1	1.8	1.2	2.7	1.1	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
84		1.5	-0.5	1.9	0.8	2.9	0.8	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
96	4	1.4	-0.2	1.7	1.0	2.6	1.0	1.4	0.9	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
108		1.2	-0.1	1.7	0.8	2.7	0.8	1.4	0.9	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
120	5	1.2	0.0	1.5	1.0	2.4	0.9	1.4	0.9	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
132		1.3	0.1	1.7	1.0	2.7	0.9	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
144	6	1.2	0.4	1.5	1.1	2.3	0.9	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
156		1.2	0.0	1.6	0.8	2.6	0.8	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.2
168	7	1.3	0.3	1.6	1.2	2.4	1.0	1.4	1.0	1.1	1.1	1.3	1.2	1.1	1.3	1.2	1.2
180		1.4	0.2	1.7	1.1	2.7	0.9	1.4	1.0	1.1	1.1	1.3	1.1	1.2	1.3	1.2	1.1
192	8	1.5	-0.1	1.8	1.0	2.6	1.0	1.4	1.0	1.2	1.2	1.3	1.2	1.1	1.3	1.2	1.1
204		1.4	-0.3	1.7	0.8	2.7	0.9	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.3	1.2	1.1
216	9	1.1	-0.1	1.5	0.8	2.4	0.8	1.4	1.0	1.2	1.1	1.3	1.1	1.1	1.3	1.2	1.1
228		1.3	-0.3	1.7	0.8	2.7	0.8	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
240	10	1.0	-0.4	1.4	0.6	2.3	0.6	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
252		1.2	-0.2	1.6	0.9	2.5	0.9	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
264	11	1.1	0.2	1.4	1.0	2.2	0.9	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
276		1.2	0.3	1.4	1.0	2.1	0.9	1.4	1.0	1.1	1.1	1.3	1.1	1.1	1.2	1.2	1.1
288	12	1.0	0.4	1.3	0.9	1.8	0.8	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
300		1.2	0.2	1.5	0.9	2.1	0.8	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
312	13	1.3	0.4	1.5	1.0	2.0	0.9	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
324		1.3	0.0	1.6	0.9	2.3	0.9	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
336	14	1.1	-0.5	1.4	0.7	2.1	0.7	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
348		1.3	0.3	1.6	1.0	2.6	0.9	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
360	15	1.1	-0.2	1.4	0.8	2.3	0.8	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
372		1.2	-0.1	1.5	0.9	2.4	0.9	1.4	1.0	1.2	1.2	1.3	1.1	1.1	1.2	1.2	1.1
384	16	1.2	-0.3	1.6	0.9	2.4	0.9	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
Average over trial period		1.3	0.1	1.7	1.0	2.5	0.9	1.4	1.0	1.1	1.2	1.3	1.1	1.1	1.2	1.2	1.1
± standard deviation		0.4	0.9	0.4	0.5	0.5	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						1.2 ± 0.0											
Average of Air temperatures						1.3 ± 0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.27 & 4.28) show that, from the dissection data an estimated **515,200** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **138,068** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Zee Lady Peaches and the treatment is suitable for disinfestation.

Table 4.27: Zee Lady Peaches large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	95,700	99,600	92,600	287,900
day 6	3,000	2 nd instar	78,600	70,200	78,500	227,300
Total	6,000		174,300	169,800	171,100	515,200

Table 4.28: Zee Lady Peaches large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:		45kg		Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar			1 st instar	2 nd instar		
			Total				Total	
1	13,357	10,887	24,244		26,714	21,774	48,488	0
2	13,490	9,075	22,565		26,980	18,150	45,130	0
3	12,980	9,245	22,225		25,960	18,490	44,450	0
Total	39,827	29,207	69,034		79,654	58,414	138,068	0

4.5.5 Nectarines – Arctic Snow

Life history data

The life history data (table 4.29) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.29: **Arctic Snow Nectarines:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	12/02/2009	100	0	0	0	100	eggs
1	13/02/2009	100	0	0	0	100	eggs
2	14/02/2009	100	0	0	0	100	eggs
3	15/02/2009	16	84	0	0	100	1st
4	16/02/2009	0	87	13	0	100	1st
5	17/02/2009	0	17	83	0	100	2nd
6	18/02/2009	0	0	92	8	100	2nd
7	19/02/2009	0	0	35	65	100	3rd
8	20/02/2009	0	0	9	91	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.30. Cold treatment 12 hour summary records are given in tables 4.31- 4.33. The mortality data from 16 days cold exposure to 1.0 ± 0.5 °C are given in tables 4.34 – 4.35.

Table 4.30 Summary of the dates and times of the conduct of the Large Scale trials at 1.0 ± 0.5 °C. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / Arctic Snow		26.03.2009	28.03.2009		13.04.2009			25.03.2009
	1	07:32 am	10:32 am	51.0	10:32 am	# 3	KS0606016	14:22 pm
	2	08:04 am	11:04 am	51.0	11:04 am	# 4	KS0547009	14:04 pm
	3	08:32 am	11:32 am	51.0	11:32 am	# 5	KS0606017	15:12 pm

Table 4.31: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.0	0.2	2.9	0.8	2.5	1.0	1.0	1.3	1.0	1.0	1.2	1.3	1.5	1.3	1.0	1.3
24	1	1.7	0.0	2.4	0.6	2.2	0.7	1.1	1.3	1.1	1.0	1.2	1.1	1.3	1.0	1.0	1.2
36		1.8	-0.1	3.0	0.6	2.5	0.8	1.2	1.4	1.1	1.0	1.1	1.0	1.3	1.0	1.0	1.2
48	2	1.5	0.0	2.2	0.6	1.9	0.7	1.2	1.2	1.1	0.9	1.1	1.0	1.2	1.0	1.1	1.2
60		1.7	-0.3	2.8	0.5	2.3	0.7	1.1	1.4	1.2	0.9	1.0	0.9	1.2	1.0	1.1	1.1
72	3	1.6	0.4	2.3	0.8	2.0	0.9	1.2	1.3	1.2	0.9	1.0	1.0	1.1	1.0	1.1	0.9
84		1.6	0.1	2.5	0.7	2.1	0.9	1.2	1.4	1.2	1.0	1.0	1.0	1.1	1.0	1.0	0.9
96	4	1.5	0.3	2.1	0.8	1.9	0.9	1.2	1.3	1.2	1.0	1.1	1.1	1.1	1.0	1.0	1.0
108		1.6	0.0	2.5	0.6	2.0	0.8	1.1	1.3	1.2	1.0	1.1	1.1	1.2	1.0	1.1	1.1
120	5	1.5	0.3	1.9	0.8	1.7	0.9	1.1	1.3	1.2	1.1	1.2	1.2	1.2	1.0	1.1	1.2
132		1.6	-0.2	2.6	0.6	2.1	0.8	1.0	1.4	1.2	1.0	1.1	1.1	1.3	1.1	1.1	1.1
144	6	1.9	0.7	2.3	1.0	2.1	1.2	1.0	1.3	1.2	1.1	1.2	1.2	1.3	1.2	1.2	1.2
156		1.8	0.1	2.6	0.8	2.2	0.9	1.0	1.3	1.2	1.0	1.1	1.1	1.3	1.2	1.1	1.2
168	7	1.5	0.2	2.0	0.7	1.8	0.8	1.0	1.3	1.2	1.0	1.1	1.1	1.3	1.2	1.2	1.3
180		1.7	0.4	2.6	0.8	2.1	1.0	1.0	1.3	1.2	1.0	1.1	1.0	1.3	1.2	1.2	1.3
192	8	1.4	0.2	1.9	0.8	1.7	0.8	1.0	1.4	1.2	1.1	1.2	1.1	1.3	1.2	1.2	1.4
204		1.6	0.0	2.6	0.7	2.1	0.8	1.0	1.2	1.2	1.0	1.1	1.0	1.3	1.2	1.2	1.4
216	9	1.5	0.2	2.0	0.7	1.8	0.8	1.0	1.4	1.2	1.1	1.2	1.1	1.3	1.2	1.2	1.4
228		1.6	0.2	2.5	0.7	2.1	0.9	1.0	1.3	1.2	1.0	1.1	1.0	1.3	1.2	1.2	1.3
240	10	1.6	0.6	2.1	0.9	1.8	1.0	1.0	1.4	1.2	1.1	1.1	1.1	1.3	1.2	1.2	1.3
252		1.6	0.1	2.6	0.7	2.1	0.9	0.9	1.3	1.1	1.0	1.1	1.0	1.3	1.2	1.2	1.3
264	11	1.4	-0.2	2.1	0.6	1.8	0.7	1.0	1.3	1.1	1.0	1.1	1.1	1.3	1.3	1.2	1.3
276		1.8	0.2	2.8	0.8	2.2	1.1	0.9	1.3	1.1	1.0	1.1	1.0	1.3	1.3	1.2	1.3
288	12	2.0	0.6	2.3	1.0	2.2	1.2	1.0	1.3	1.1	1.0	1.1	1.1	1.2	1.2	1.2	1.4
300		1.8	0.0	3.0	0.7	2.4	0.9	1.0	1.3	1.2	1.0	1.1	1.0	1.3	1.2	1.1	1.3
312	13	1.5	-0.1	2.2	0.6	1.9	0.7	1.0	1.2	1.1	1.0	1.1	1.1	1.2	1.2	1.2	1.3
324		1.7	-0.3	2.8	0.5	2.3	0.7	1.0	1.3	1.2	1.0	1.1	1.0	1.3	1.2	1.1	1.2
336	14	1.6	0.4	2.3	0.8	2.0	0.9	1.0	1.3	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.3
348		1.6	0.1	2.5	0.7	2.1	0.9	1.0	1.4	1.1	1.0	1.1	1.0	1.2	1.2	1.1	1.2
360	15	1.5	0.3	2.1	0.8	1.9	0.9	1.1	1.2	1.2	1.1	1.1	1.0	1.2	1.2	1.2	1.2
372		1.7	-0.4	2.9	0.6	2.2	0.7	1.1	1.3	1.1	1.0	1.1	1.1	1.2	1.2	1.1	1.2
384	16	1.6	0.1	2.4	0.7	2.1	0.8	1.1	1.3	1.2	1.0	1.1	1.0	1.2	1.2	1.1	1.2
Average over trial period		1.6	0.1	2.4	0.7	2.1	0.9	1.1	1.3	1.2	1.0	1.1	1.1	1.3	1.2	1.1	1.2
± standard deviation		0.4	0.8	0.5	0.3	0.3	0.4	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.3 ± 0.4											

Table 4.32: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		1.9	0.3	1.4	0.6	2.2	1.0	1.5	1.4	1.3	1.0	1.0	1.2	1.2	1.3	1.4	1.4
24	1	1.8	0.2	1.4	0.6	2.1	1.0	1.3	1.2	1.2	1.0	1.0	1.1	1.1	1.1	1.3	1.3
36		1.7	0.2	1.3	0.5	2.0	0.9	1.3	1.1	1.2	1.0	1.0	1.0	1.0	1.0	1.2	1.3
48	2	2.0	0.6	1.6	0.7	2.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.3
60		2.1	0.8	1.6	0.8	2.2	1.2	1.2	1.0	1.1	1.0	0.9	1.0	1.0	0.9	1.1	1.2
72	3	1.8	0.4	1.4	0.6	2.0	1.0	1.2	1.0	1.1	1.0	1.0	1.0	1.0	0.9	1.1	1.3
84		1.9	0.5	1.5	0.7	2.1	1.1	1.3	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.3
96	4	1.9	0.6	1.5	0.7	2.0	1.1	1.3	1.0	1.2	1.1	1.0	1.0	1.1	1.0	1.2	1.3
108		1.9	0.3	1.6	0.6	2.3	1.0	1.2	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.2	1.2
120	5	2.0	0.5	1.6	0.7	2.3	1.2	1.2	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.2
132		2.0	0.6	1.6	0.7	2.5	1.1	1.2	1.0	1.1	1.0	1.0	1.0	1.0	0.9	1.1	1.2
144	6	1.9	0.4	1.5	0.7	2.3	1.1	1.2	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.2
156		1.8	0.3	1.5	0.5	2.2	0.9	1.2	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.2
168	7	1.8	0.2	1.4	0.5	2.1	0.9	1.2	1.0	1.1	1.1	1.0	1.1	1.1	1.0	1.2	1.2
180		2.1	1.1	1.6	0.9	2.2	1.3	1.3	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.1	1.2
192	8	2.0	0.4	1.5	0.6	2.1	1.1	1.3	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.2
204		1.8	0.2	1.4	0.5	1.9	0.9	1.3	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.2
216	9	1.8	0.4	1.4	0.6	1.9	1.0	1.2	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.1	1.2
228		1.7	0.6	1.4	0.7	1.9	1.1	1.2	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
240	10	1.8	0.5	1.4	0.6	2.1	1.0	1.2	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.2
252		1.7	0.7	1.4	0.7	1.8	1.1	1.3	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
264	11	1.8	0.7	1.4	0.8	1.9	1.1	1.3	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.2	1.2
276		1.7	0.6	1.4	0.7	1.8	1.0	1.3	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
288	12	1.7	0.4	1.3	0.6	1.8	1.0	1.2	1.1	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.2
300		1.7	0.4	1.3	0.6	1.8	1.0	1.2	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
312	13	2.1	1.0	1.5	0.9	2.1	1.3	1.2	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
324		2.1	0.7	1.6	0.8	2.1	1.2	1.3	1.1	0.9	1.0	1.1	1.0	0.9	1.0	1.1	1.2
336	14	1.8	0.6	1.4	0.7	2.0	1.1	1.2	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.2	1.2
348		1.8	0.5	1.4	0.6	1.9	1.0	1.3	1.1	0.9	1.0	1.1	1.0	0.9	1.0	1.1	1.2
360	15	1.7	0.5	1.4	0.6	1.9	1.0	1.3	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
372		1.8	0.3	1.4	0.6	1.9	1.0	1.3	1.1	0.9	1.0	1.1	1.0	0.9	1.0	1.1	1.1
384	16	1.9	0.6	1.5	0.8	2.1	1.2	1.2	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.2
Average over trial period		1.9	0.5	1.5	0.7	2.1	1.1	1.3	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.2
± standard deviation		0.4	0.8	0.2	0.4	0.4	0.4	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.3 ± 0.4											

Table 4.33: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.8	0.0	1.7	0.8	2.0	0.9	1.4	1.4	1.2	1.0	1.1	1.3	1.1	1.5	1.5	1.4
24	1	1.6	0.6	1.5	1.0	1.6	1.0	1.3	1.3	1.1	1.1	1.0	1.2	1.1	1.3	1.4	1.3
36		1.7	0.4	1.5	1.0	1.8	1.1	1.3	1.1	1.1	1.0	1.0	1.0	1.1	1.2	1.4	1.2
48	2	1.5	0.0	1.4	0.7	1.6	0.8	1.3	1.1	1.1	1.1	1.0	1.0	1.1	1.2	1.4	1.2
60		1.7	0.4	1.6	1.1	1.8	1.1	1.3	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.3	1.2
72	3	1.9	0.4	1.6	1.0	1.5	1.0	1.3	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.4	1.2
84		1.9	0.1	1.7	1.0	1.8	1.1	1.3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.4	1.2
96	4	1.7	0.6	1.5	1.1	1.5	1.1	1.3	1.2	1.1	1.2	1.1	1.2	1.2	1.2	1.4	1.3
108		1.8	0.0	1.7	0.9	2.1	1.1	1.3	1.2	1.1	1.1	1.1	1.1	1.2	1.2	1.4	1.2
120	5	1.7	0.0	1.6	0.8	1.9	1.0	1.3	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.4	1.2
132		2.0	0.8	1.8	1.2	2.3	1.3	1.3	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.4	1.2
144	6	1.8	0.7	1.6	1.2	1.9	1.2	1.3	1.1	1.1	1.1	1.1	1.0	1.2	1.1	1.4	1.2
156		1.7	0.2	1.6	0.9	2.0	1.0	1.3	1.1	1.1	1.1	1.1	1.0	1.1	1.1	1.4	1.2
168	7	1.6	0.0	1.5	0.8	1.7	0.9	1.3	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.4	1.2
180		1.7	0.4	1.5	1.0	1.9	1.1	1.3	1.1	1.1	1.1	1.1	1.0	1.2	1.2	1.4	1.2
192	8	1.9	1.0	1.7	1.2	1.8	1.2	1.3	1.2	1.1	1.1	1.1	1.0	1.2	1.2	1.4	1.3
204		2.0	0.6	1.7	1.2	1.9	1.2	1.3	1.1	1.0	1.1	1.2	0.9	1.2	1.2	1.4	1.3
216	9	1.6	0.4	1.4	0.9	1.5	1.1	1.4	1.2	1.1	1.1	1.2	0.9	1.2	1.2	1.4	1.3
228		1.7	0.7	1.5	1.1	1.7	1.1	1.4	1.2	1.0	1.1	1.1	0.9	1.1	1.2	1.4	1.2
240	10	1.7	0.6	1.5	1.0	1.8	1.1	1.4	1.2	1.1	1.1	1.1	1.0	1.2	1.2	1.4	1.2
252		1.7	1.0	1.5	1.3	1.8	1.2	1.3	1.1	1.0	1.1	1.2	1.0	1.2	1.2	1.4	1.2
264	11	1.5	0.6	1.4	0.9	1.5	1.0	1.4	1.2	1.0	1.1	1.2	1.0	1.2	1.2	1.4	1.3
276		1.6	0.3	1.5	0.9	1.7	1.0	1.3	1.2	1.0	1.1	1.2	1.0	1.2	1.2	1.3	1.2
288	12	1.5	0.4	1.4	0.9	1.3	1.0	1.4	1.2	1.1	1.1	1.1	1.0	1.2	1.2	1.4	1.3
300		1.6	0.4	1.5	0.9	1.7	1.0	1.4	1.2	1.0	1.1	1.1	0.9	1.2	1.2	1.4	1.2
312	13	2.1	1.2	1.7	1.3	1.8	1.3	1.4	1.2	1.0	1.1	1.1	1.0	1.2	1.2	1.4	1.2
324		2.0	0.6	1.7	1.1	2.0	1.2	1.4	1.2	1.0	1.0	1.2	1.0	1.1	1.2	1.4	1.2
336	14	1.6	0.4	1.5	0.9	1.7	1.0	1.4	1.2	1.0	1.1	1.2	1.0	1.2	1.2	1.5	1.2
348		1.7	0.7	1.5	1.1	1.9	1.1	1.3	1.1	1.0	1.0	1.2	0.9	1.1	1.2	1.5	1.2
360	15	1.6	0.4	1.4	0.9	1.6	1.0	1.3	1.1	1.0	1.1	1.2	0.9	1.2	1.2	1.5	1.3
372		1.7	0.6	1.5	1.1	1.9	1.1	1.3	1.1	1.0	1.0	1.2	0.9	1.1	1.2	1.5	1.3
384	16	1.6	0.3	1.5	0.9	1.8	1.0	1.3	1.1	1.0	1.1	1.2	0.9	1.2	1.2	1.5	1.3
Average over trial period		1.7	0.5	1.6	1.0	1.8	1.1	1.3	1.2	1.1	1.1	1.1	1.0	1.2	1.2	1.4	1.2
± standard deviation		0.4	0.9	0.3	0.4	0.4	0.3	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0
Average of Fruit temperatures						1.2 ± 0.1											
Average of Air temperatures						1.3 ± 0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.34 & 4.35) show that, from the dissection data an estimated **404,100** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **115,430** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Arctic Snow Nectarines and the treatment is suitable for disinfestation.

Table 4.34: Arctic Snow Nectarines large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	97,300	103,900	70,500	271,700
day 6	3,000	2 nd instar	45,300	43,200	43,900	132,400
Total	6,000		142,600	147,100	114,400	404,100

Table 4.35: Arctic Snow Nectarines large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	12,744	7,221	19,965		25,488	14,442	39,930	0
2	13,512	6,137	19,649		27,024	12,274	39,298	0
3	11,249	6,852	18,101		22,498	13,704	36,202	0
Total	37,505	20,210	57,715		75,010	40,420	115,430	0

4.5.6 Nectarines – August Red

Life history data

The life history data (table 4.36) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.36: **August Red Nectarines:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	20/03/2010	100	0	0	0	100	eggs
1	21/03/2010	100	0	0	0	100	eggs
2	22/03/2010	100	0	0	0	100	eggs
3	23/03/2010	29	71	0	0	100	1st
4	24/03/2010	9	86	5	0	100	1st
5	25/03/2010	0	14	86	0	100	2nd
6	26/03/2010	0	14	70	16	100	2nd
7	27/03/2010	0	0	35	65	100	3rd
8	28/03/2010	0	0	17	83	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.37. Cold treatment 12 hour summary records are given in tables 4.38- 4.40. The mortality data from 16 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$ are given in tables 4.41 – 4.42.

Table 4.37 Summary of the dates and times of the conduct of the Large Scale trials at $1.0 \pm 0.5^\circ\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / August Red		24.04.2010	26.04.2010		12.05.2010			23.04.2010
	1	07:49 am	10:49 am	51.0	10:49 am	# 3	KS0606016	13:49 pm
	2	08:18 am	11:18 am	51.0	11:18 am	# 4	KS0547009	14:16 pm
	3	08:50 am	11:50 am	51.0	11:50 am	# 5	KS0606017	15:32 pm

Table 4.38: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.2	-0.2	2.0	0.6	1.9	1.0	1.4	0.9	1.0	1.4	1.5	1.2	1.5	1.1	1.0	1.0
24	1	1.4	-0.1	2.3	0.8	2.1	0.9	1.2	1.1	1.0	1.1	1.4	1.3	1.2	1.0	1.1	1.0
36		1.4	0.1	2.1	0.8	2.0	1.0	1.0	1.1	1.0	1.0	1.1	1.3	1.0	1.0	1.2	1.0
48	2	1.0	-0.5	2.1	0.4	1.5	0.5	0.9	1.0	1.0	0.9	1.0	1.2	0.9	1.0	1.2	1.0
60		1.2	-0.1	1.8	0.6	1.6	0.5	1.0	1.0	1.0	0.9	1.0	1.2	1.0	0.9	1.1	1.0
72	3	1.4	0.1	2.0	0.6	1.6	0.6	1.0	1.1	1.1	1.0	1.1	1.2	1.0	0.9	1.2	1.1
84		1.8	0.6	2.1	0.8	2.0	1.0	1.1	1.1	1.1	1.0	1.1	1.2	1.1	1.0	1.2	1.0
96	4	1.5	0.2	2.2	0.6	1.9	0.7	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.1
108		1.6	0.2	2.3	0.6	2.0	0.8	1.1	1.0	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.1
120	5	1.5	0.1	2.4	0.6	1.9	0.7	1.1	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.2	1.2
132		1.5	0.1	2.3	0.6	2.0	0.7	1.1	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.2	1.2
144	6	1.5	0.5	2.3	0.7	1.8	0.9	1.1	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.2	1.2
156		1.5	0.4	2.2	0.7	2.0	0.9	1.1	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.2	1.2
168	7	1.4	0.4	2.2	0.6	1.8	0.8	1.1	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.2	1.2
180		1.5	0.1	2.2	0.5	2.0	0.7	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.2
192	8	1.5	0.2	2.4	0.6	2.0	0.8	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.2
204		1.6	0.1	2.4	0.6	2.1	0.8	1.0	1.0	1.1	0.9	1.0	1.0	1.0	1.0	1.2	1.1
216	9	2.0	0.5	2.8	1.0	2.3	1.2	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.1
228		1.7	0.2	2.4	0.7	2.1	0.9	1.0	1.0	1.1	0.9	1.0	1.1	1.0	1.0	1.2	1.1
240	10	1.6	-0.5	2.6	0.5	2.1	0.6	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.1
252		1.6	0.0	2.5	0.6	2.1	0.8	1.0	1.0	1.1	1.0	1.0	1.0	1.0	0.9	1.1	1.1
264	11	1.5	-0.2	2.5	0.5	2.0	0.7	1.0	0.9	1.1	1.0	1.0	1.0	1.0	0.9	1.2	1.1
276		1.6	0.1	2.5	0.6	2.1	0.8	1.0	1.0	1.1	1.0	1.0	1.0	1.0	0.9	1.2	1.1
288	12	1.4	0.1	2.4	0.6	1.9	0.8	1.0	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.1
300		1.5	0.0	2.2	0.6	1.9	0.8	1.0	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.2	1.2
312	13	1.6	0.1	2.6	0.6	2.1	0.8	1.0	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.2	1.2
324		1.6	0.0	2.5	0.6	2.2	0.8	1.0	1.0	1.2	1.0	1.0	1.0	1.0	0.9	1.2	1.1
336	14	1.5	0.1	2.2	0.6	2.0	0.8	1.1	1.0	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.1
348		1.8	0.5	2.2	0.9	2.0	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.1	1.0	1.2	1.2
360	15	1.7	0.2	2.5	0.6	2.0	0.8	1.1	1.1	1.1	1.0	1.0	1.2	1.1	1.0	1.2	1.2
372		1.5	-0.1	2.1	0.5	1.9	0.7	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.2
384	16	1.5	0.3	2.3	0.7	1.8	0.9	1.1	1.0	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.2
Average over trial period		1.5	0.1	2.3	0.6	2.0	0.8	1.1	1.0	1.1	1.0	1.0	1.1	1.1	1.0	1.2	1.1
± standard deviation		0.4	0.7	0.5	0.3	0.3	0.4	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.2 ± 0.4											

Table 4.39: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.7	0.2	1.3	0.5	1.9	0.9	1.4	1.4	1.5	1.1	1.2	1.4	1.2	1.5	1.4	1.5
24	1	1.6	0.4	1.2	0.5	1.7	0.9	1.4	1.3	1.3	1.1	1.1	1.3	1.2	1.3	1.2	1.4
36		1.6	0.1	1.2	0.3	1.8	0.8	1.3	1.2	1.3	1.1	1.0	1.2	1.1	1.2	1.2	1.3
48	2	1.6	0.6	1.2	0.5	1.6	0.9	1.3	1.2	1.3	1.1	1.0	1.2	1.1	1.2	1.1	1.2
60		2.0	0.5	1.4	0.6	1.9	1.1	1.3	1.2	1.2	1.1	1.0	1.2	1.1	1.1	1.1	1.2
72	3	1.7	0.3	1.2	0.5	1.6	0.9	1.3	1.2	1.2	1.1	1.1	1.2	1.1	1.1	1.1	1.2
84		1.8	0.1	1.4	0.4	1.9	0.9	1.3	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.2
96	4	1.7	0.2	1.3	0.5	1.6	1.0	1.3	1.2	1.3	1.2	1.1	1.2	1.1	1.1	1.1	1.2
108		1.7	0.0	1.4	0.4	1.9	1.0	1.3	1.2	1.2	1.2	1.1	1.2	1.0	1.0	1.1	1.1
120	5	1.6	-0.1	1.3	0.4	1.6	0.9	1.3	1.2	1.2	1.2	1.1	1.2	1.0	1.0	1.1	1.1
132		1.8	0.1	1.4	0.5	2.0	1.0	1.3	1.1	1.2	1.2	1.0	1.2	0.9	1.0	1.0	1.1
144	6	1.7	0.3	1.4	0.6	1.7	1.1	1.3	1.1	1.2	1.2	1.1	1.2	1.0	1.0	1.0	1.1
156		1.8	0.2	1.4	0.5	1.9	1.1	1.3	1.1	1.2	1.2	1.0	1.2	1.0	1.0	1.0	1.1
168	7	1.7	0.4	1.4	0.6	1.7	1.1	1.3	1.1	1.2	1.2	1.1	1.2	1.0	1.0	1.0	1.1
180		2.1	0.5	1.5	0.7	2.1	1.2	1.3	1.1	1.2	1.2	1.0	1.2	1.0	1.0	1.0	1.1
192	8	1.9	-0.1	1.5	0.4	1.9	1.0	1.3	1.1	1.2	1.2	1.0	1.2	1.0	1.0	1.0	1.1
204		2.0	0.4	1.5	0.6	2.2	1.1	1.3	1.1	1.2	1.2	1.0	1.2	1.0	1.0	1.0	1.1
216	9	1.8	0.2	1.3	0.5	1.9	0.9	1.3	1.1	1.2	1.2	1.1	1.2	1.1	1.0	1.0	1.1
228		1.8	0.3	1.4	0.5	2.1	1.0	1.3	1.1	1.1	1.1	1.0	1.1	1.0	1.0	1.0	1.1
240	10	1.8	0.3	1.3	0.5	1.9	0.9	1.3	1.1	1.2	1.2	1.1	1.2	1.1	1.0	1.0	1.1
252		1.9	0.4	1.4	0.5	2.3	1.0	1.3	1.1	1.1	1.1	1.0	1.1	1.0	1.0	1.0	1.1
264	11	1.8	0.4	1.4	0.6	2.0	1.0	1.3	1.1	1.1	1.2	1.1	1.2	1.1	1.0	1.0	1.1
276		1.9	0.5	1.4	0.6	2.3	1.0	1.3	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.1
288	12	1.8	0.4	1.3	0.6	2.0	0.9	1.3	1.1	1.1	1.2	1.1	1.2	1.1	1.0	1.0	1.1
300		1.9	0.7	1.4	0.7	2.1	1.1	1.4	1.1	1.1	1.2	1.1	1.2	1.1	1.1	1.1	1.1
312	13	2.3	1.0	1.6	0.8	2.2	1.2	1.3	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.1	1.2
324		2.3	0.7	1.6	0.8	2.4	1.1	1.3	1.1	1.1	1.1	1.0	1.1	1.1	1.0	1.0	1.1
336	14	1.9	0.5	1.4	0.6	2.1	0.9	1.3	1.1	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.1
348		1.8	0.7	1.3	0.6	1.9	0.9	1.4	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.2
360	15	1.8	0.6	1.3	0.6	2.0	0.9	1.4	1.2	1.2	1.3	1.1	1.2	1.2	1.1	1.1	1.2
372		1.9	0.6	1.3	0.6	2.1	0.9	1.4	1.2	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.2
384	16	1.8	0.8	1.3	0.7	1.8	0.9	1.4	1.2	1.2	1.3	1.2	1.2	1.2	1.1	1.2	1.3
Average over trial period		1.8	0.4	1.4	0.6	1.9	1.0	1.3	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.2
± standard deviation		0.4	0.7	0.2	0.4	0.4	0.4	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ± 0.1											
Average of Air temperatures						1.2 ± 0.4											

Table 4.40: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.5	0.1	1.4	0.7	2.5	0.8	1.5	1.1	1.4	1.1	1.2	1.5	1.1	1.2	1.4	1.5
24	1	1.3	0.2	1.2	0.6	2.0	0.8	1.3	1.0	1.2	1.1	1.1	1.4	1.1	1.1	1.2	1.5
36		1.5	0.2	1.4	0.7	2.3	0.9	1.2	0.9	1.1	1.1	1.0	1.4	1.0	1.0	1.1	1.5
48	2	1.7	0.3	1.4	0.8	1.9	1.0	1.2	0.9	1.1	1.1	1.0	1.4	1.1	1.0	1.0	1.4
60		1.6	0.0	1.4	0.6	2.2	0.9	1.2	0.9	1.1	1.1	1.0	1.3	1.1	1.0	1.0	1.4
72	3	1.3	0.4	1.2	0.8	1.8	0.9	1.2	0.9	1.1	1.2	1.0	1.4	1.1	1.0	1.0	1.4
84		1.5	0.2	1.4	0.7	2.3	1.0	1.2	0.9	1.1	1.2	1.1	1.4	1.1	1.0	1.0	1.4
96	4	1.4	0.5	1.3	0.8	1.9	1.0	1.2	1.0	1.1	1.3	1.1	1.4	1.2	1.0	1.0	1.4
108		1.7	0.4	1.5	0.9	2.5	1.1	1.2	1.0	1.1	1.2	1.1	1.4	1.2	1.0	1.0	1.4
120	5	1.5	0.9	1.4	1.1	2.1	1.1	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
132		1.6	0.1	1.5	0.7	2.7	1.0	1.2	1.0	1.1	1.2	1.1	1.4	1.1	1.0	1.1	1.4
144	6	1.5	0.5	1.3	0.8	2.1	0.9	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
156		1.8	0.5	1.6	1.0	2.7	1.2	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
168	7	2.0	0.7	1.6	0.9	2.3	1.1	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
180		2.0	0.2	1.7	0.9	2.8	1.1	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
192	8	1.6	0.8	1.4	1.0	2.3	1.1	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
204		1.8	0.8	1.6	1.1	2.9	1.2	1.2	1.0	1.1	1.2	1.1	1.4	1.1	1.0	1.1	1.4
216	9	1.5	0.5	1.4	0.9	2.3	1.0	1.2	1.0	1.1	1.2	1.1	1.4	1.2	1.0	1.1	1.4
228		1.8	0.3	1.6	0.8	2.8	1.2	1.2	0.9	1.1	1.1	1.1	1.4	1.1	1.0	1.0	1.4
240	10	1.6	0.6	1.4	0.9	2.2	1.1	1.2	1.0	1.1	1.2	1.1	1.4	1.2	1.0	1.1	1.4
252		1.8	0.2	1.7	0.8	2.8	1.2	1.2	0.9	1.1	1.1	1.1	1.4	1.1	1.0	1.0	1.4
264	11	1.6	0.3	1.4	0.9	2.4	1.1	1.2	1.0	1.1	1.2	1.1	1.4	1.1	1.0	1.0	1.3
276		1.8	0.4	1.7	0.9	2.9	1.2	1.2	1.0	1.0	1.1	1.1	1.4	1.1	1.0	1.0	1.4
288	12	2.0	1.1	1.6	1.2	2.5	1.3	1.2	1.0	1.0	1.2	1.1	1.4	1.2	1.0	1.1	1.4
300		1.9	0.1	1.7	0.8	2.7	1.1	1.2	1.0	1.1	1.2	1.1	1.4	1.1	1.0	1.1	1.4
312	13	1.6	0.0	1.5	0.7	2.4	1.0	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
324		1.8	0.5	1.6	0.9	3.0	1.2	1.2	1.0	1.0	1.2	1.1	1.4	1.2	1.0	1.1	1.4
336	14	1.6	0.3	1.5	0.8	2.5	1.1	1.2	1.0	1.0	1.2	1.2	1.5	1.2	1.0	1.1	1.4
348		1.6	0.6	1.4	0.9	2.4	1.1	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
360	15	1.5	0.5	1.4	0.9	2.3	1.0	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
372		1.6	0.5	1.5	0.9	2.6	1.1	1.2	1.0	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
384	16	1.5	0.6	1.4	0.9	2.1	1.0	1.2	1.1	1.1	1.2	1.2	1.4	1.2	1.0	1.1	1.4
Average over trial period		1.6	0.4	1.5	0.9	2.4	1.1	1.2	1.0	1.1	1.2	1.1	1.4	1.2	1.0	1.1	1.4
± standard deviation		0.4	0.8	0.3	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0
Average of Fruit temperatures						1.2 ± 0.1											
Average of Air temperatures						1.3 ± 0.4											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.41 & 4.42) show that, from the dissection data an estimated **270,600** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **114,452** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in August Red Nectarines and the treatment is suitable for disinfestation.

Table 4.41: August Red Nectarines large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	45,900	50,500	57,500	153,900
day 6	3,000	2 nd instar	32,700	35,800	48,200	116,700
Total	6,000		78,600	86,300	105,700	270,600

Table 4.42: August Red Nectarines large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:		45kg		Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar			1 st instar	2 nd instar		
			Total				Total	
1	9,531	8,825	18,356		19,062	17,650	36,712	0
2	9,111	9,737	18,848		18,222	19,474	37,696	0
3	10,947	9,075	20,022		21,894	18,150	40,044	0
Total	29,589	27,637	57,226		59,178	55,274	114,452	0

4.5.7 Plums – Angelino

Life history data

The life history data (table 4.43) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.43: **Angelino Plums:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	22/4/2009	100	0	0	0	100	eggs
1	23/4/2009	100	0	0	0	100	eggs
2	24/4/2009	100	0	0	0	100	eggs
3	25/4/2009	5	95	0	0	100	1st
4	26/4/2009	3	97	0	0	100	1st
5	27/4/2009	0	21	79	0	100	2nd
6	28/4/2009	0	20	80	0	100	2nd
7	29/4/2009	0	4	19	77	100	3rd
8	30/4/2009	0	0	17	83	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.44. Cold treatment 12 hour summary records are given in tables 4.45- 4.47. The mortality data from 16 days cold exposure to $1.0 \pm 0.5^\circ\text{C}$ are given in tables 4.48 – 4.49.

Table 4.44 Summary of the dates and times of the conduct of the Large Scale trials at $1.0 \pm 0.5^\circ\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $1.0 \pm 0.5^\circ\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Angelino		15.05.2009	17.05.2009		02.06.2009			14.05.2009
	1	08:10 am	07:10 am	47.0	07:10 am	# 3	KS0606016	14:23 pm
	2	08:40 am	10:40 am	50.0	10:40 am	# 4	KS0547009	15:00 pm
	3	09:11 am	06:11 am	45.0	06:11 am	# 5	KS0606017	16:11 pm

Table 4.45: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.7	-0.3	3.7	0.7	2.8	1.3	1.4	1.5	1.3	1.4	1.4	1.2	1.2	1.4	1.1	1.4
24	1	1.7	0.3	3.5	0.9	2.7	1.4	1.3	1.4	1.3	1.3	1.4	1.1	1.2	1.3	1.0	1.3
36		1.8	0.3	3.8	0.9	2.9	1.5	1.2	1.4	1.2	1.3	1.3	1.1	1.1	1.2	1.0	1.2
48	2	1.6	-0.2	3.2	0.7	2.5	1.2	1.2	1.3	1.1	1.2	1.3	1.0	1.0	1.2	1.0	1.1
60		1.8	0.3	3.3	0.9	2.7	1.5	1.1	1.3	1.1	1.2	1.2	1.0	1.0	1.1	0.9	1.1
72	3	2.0	0.3	3.4	1.0	2.7	1.6	1.1	1.3	1.1	1.1	1.2	1.0	1.0	1.1	0.9	1.0
84		1.8	-0.6	3.4	0.6	2.6	1.2	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
96	4	1.6	0.2	3.1	0.8	2.3	1.3	1.0	1.3	1.1	1.1	1.2	0.9	0.9	1.0	0.9	1.0
108		1.6	-0.1	3.2	0.7	2.4	1.2	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
120	5	1.5	0.4	2.8	0.8	2.2	1.3	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
132		1.3	-0.4	2.8	0.4	2.2	0.9	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
144	6	1.3	-0.2	2.7	0.5	2.0	1.0	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
156		1.3	-0.5	3.1	0.4	2.4	0.9	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	0.9	1.0
168	7	1.1	-1.0	3.0	0.1	2.1	0.7	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	0.9	1.0
180		1.3	-0.1	3.0	0.3	2.3	0.9	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	0.9	1.0
192	8	1.4	-0.2	3.0	0.5	2.2	1.1	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
204		1.7	0.4	3.3	0.7	2.5	1.3	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	0.9	1.0
216	9	1.5	-0.3	3.0	0.5	2.3	1.0	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
228		1.4	-0.1	2.8	0.5	2.2	1.0	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	0.9	1.0
240	10	1.2	-0.4	2.8	0.3	2.0	0.9	1.0	1.3	1.1	1.0	1.2	1.0	0.9	1.0	0.9	1.0
252		1.3	-0.3	2.8	0.4	2.2	0.9	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	0.9	1.0
264	11	1.2	0.1	2.7	0.5	1.9	1.0	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
276		1.3	-0.2	2.9	0.5	2.2	1.0	1.0	1.3	1.0	1.1	1.2	1.0	0.9	1.0	1.0	1.0
288	12	1.2	-0.4	2.7	0.4	2.0	0.9	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
300		1.1	-0.4	2.4	0.3	1.9	0.8	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
312	13	1.1	-0.4	2.5	0.3	1.8	0.7	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
324		1.1	-0.3	2.4	0.3	1.9	0.8	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
336	14	1.3	0.1	2.5	0.4	1.8	0.9	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
348		1.5	-0.5	2.8	0.4	2.2	1.0	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
360	15	1.3	0.3	2.6	0.7	1.8	1.1	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
372		1.2	-0.3	2.6	0.4	2.0	0.9	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
384	16	1.2	0.1	2.4	0.5	1.7	0.9	1.0	1.3	1.0	1.0	1.2	1.0	0.9	1.0	0.9	1.0
Average over trial period		1.4	-0.1	2.9	0.5	2.2	1.1	1.0	1.3	1.1	1.1	1.2	1.0	0.9	1.0	0.9	1.0
± standard deviation		0.4	0.9	0.8	0.4	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.3 ± 0.6											

Table 4.46: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.7	-0.1	1.7	0.5	2.6	0.8	1.4	1.4	1.5	1.5	1.5	1.5	1.4	1.4	1.5	1.4
24	1	1.7	0.2	1.6	0.6	2.5	0.8	1.4	1.4	1.5	1.4	1.5	1.4	1.3	1.4	1.5	1.3
36		1.8	0.2	1.6	0.6	2.8	0.9	1.3	1.4	1.4	1.4	1.4	1.4	1.2	1.3	1.4	1.2
48	2	1.6	0.2	1.4	0.5	2.3	0.8	1.3	1.3	1.4	1.4	1.4	1.4	1.2	1.3	1.4	1.2
60		1.6	0.1	1.5	0.6	2.5	0.8	1.3	1.3	1.4	1.4	1.4	1.3	1.2	1.3	1.4	1.2
72	3	1.7	0.7	1.5	0.8	2.3	1.0	1.2	1.3	1.4	1.3	1.3	1.3	1.2	1.3	1.4	1.2
84		1.5	-0.1	1.5	0.4	2.2	0.7	1.2	1.3	1.3	1.3	1.3	1.3	1.1	1.3	1.3	1.2
96	4	1.5	0.1	1.4	0.5	2.0	0.7	1.2	1.2	1.3	1.3	1.3	1.3	1.1	1.2	1.3	1.2
108		1.8	0.4	1.5	0.6	2.3	0.8	1.1	1.2	1.3	1.3	1.2	1.3	1.1	1.2	1.3	1.1
120	5	1.6	0.4	1.4	0.7	2.0	0.9	1.1	1.2	1.3	1.3	1.2	1.3	1.1	1.2	1.3	1.1
132		1.5	0.2	1.4	0.5	2.2	0.7	1.1	1.2	1.3	1.3	1.2	1.3	1.1	1.2	1.3	1.1
144	6	1.5	0.5	1.3	0.6	2.0	0.9	1.1	1.2	1.3	1.3	1.2	1.2	1.1	1.2	1.3	1.1
156		1.6	0.0	1.5	0.5	2.4	0.7	1.1	1.2	1.3	1.3	1.2	1.2	1.1	1.2	1.3	1.1
168	7	1.5	0.5	1.4	0.6	2.2	0.8	1.1	1.2	1.3	1.2	1.2	1.2	1.1	1.2	1.3	1.1
180		1.6	-0.3	1.5	0.4	2.5	0.6	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
192	8	1.5	0.2	1.3	0.5	2.3	0.7	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
204		1.5	0.0	1.4	0.5	2.5	0.7	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
216	9	1.4	0.0	1.3	0.3	2.2	0.6	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
228		1.7	0.6	1.4	0.7	2.3	0.9	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
240	10	1.8	0.3	1.5	0.6	2.2	0.9	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
252		1.6	-0.1	1.5	0.5	2.2	0.7	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.1
264	11	1.4	-0.1	1.3	0.4	2.0	0.6	1.1	1.2	1.2	1.2	1.2	1.3	1.1	1.1	1.3	1.1
276		1.6	0.4	1.4	0.6	2.3	0.8	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.3	1.1
288	12	1.4	-0.1	1.3	0.4	2.0	0.6	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
300		1.3	0.2	1.2	0.4	1.9	0.6	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
312	13	1.3	-0.3	1.2	0.3	1.8	0.6	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
324		1.5	0.7	1.3	0.8	1.9	1.0	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
336	14	1.3	0.1	1.2	0.4	1.7	0.6	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
348		1.4	0.3	1.3	0.5	2.0	0.8	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
360	15	1.7	1.1	1.4	0.8	1.9	1.0	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
372		1.7	0.3	1.4	0.5	2.0	0.8	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
384	16	1.5	0.4	1.2	0.6	1.8	0.8	1.1	1.1	1.2	1.2	1.1	1.3	1.0	1.1	1.2	1.1
Average over trial period		1.6	0.2	1.4	0.5	2.2	0.8	1.1	1.2	1.3	1.2	1.2	1.3	1.1	1.2	1.3	1.2
± standard deviation		0.4	0.8	0.3	0.4	0.5	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1
Average of Fruit temperatures						1.2 ± 0.1											
Average of Air temperatures						1.1 ± 0.4											

Table 4.47: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.2	-0.1	1.6	0.8	2.6	0.9	1.3	1.2	1.3	1.2	1.2	1.0	1.3	1.2	1.1	1.4
24	1	1.1	0.0	1.5	0.8	2.5	0.9	1.2	1.2	1.2	1.2	1.2	1.0	1.3	1.1	1.1	1.3
36		1.1	-0.6	1.7	0.6	2.7	0.8	1.2	1.2	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
48	2	1.3	0.2	1.6	0.9	2.5	0.9	1.2	1.1	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
60		1.4	0.0	1.7	0.8	2.5	0.9	1.2	1.1	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
72	3	1.1	-0.3	1.5	0.6	2.3	0.7	1.2	1.1	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
84		1.0	-0.3	1.5	0.6	2.3	0.7	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.1	1.0	1.2
96	4	0.9	-0.4	1.3	0.5	2.0	0.7	1.1	1.1	1.1	1.1	1.1	1.0	1.2	1.0	1.0	1.2
108		1.0	-0.2	1.4	0.6	2.1	0.7	1.2	1.1	1.1	1.1	1.2	1.0	1.2	1.0	1.0	1.2
120	5	0.8	-0.2	1.3	0.5	1.9	0.6	1.2	1.1	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
132		1.0	-0.4	1.4	0.6	2.2	0.7	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.0	1.2
144	6	1.1	0.1	1.4	0.9	2.1	0.9	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.0	1.2
156		1.2	0.1	1.6	0.8	2.5	0.9	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.0	1.2
168	7	1.2	0.2	1.6	0.9	2.4	0.9	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
180		1.5	-0.1	1.9	0.9	2.8	1.0	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
192	8	1.3	-0.2	1.7	0.8	2.6	0.9	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
204		1.2	0.1	1.7	0.8	2.7	0.9	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
216	9	1.2	-0.5	1.6	0.7	2.5	0.8	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
228		1.2	0.1	1.5	0.8	2.4	0.9	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.0	1.2
240	10	1.0	-0.1	1.5	0.7	2.2	0.8	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
252		1.0	-0.1	1.5	0.6	2.3	0.7	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
264	11	1.0	0.0	1.4	0.7	2.1	0.7	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
276		1.0	-0.1	1.5	0.6	2.4	0.8	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
288	12	1.0	0.2	1.4	0.7	2.2	0.8	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.2
300		1.3	0.2	1.5	0.9	2.2	0.9	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.0	1.2
312	13	1.2	0.1	1.5	0.8	2.1	0.9	1.2	1.2	1.2	1.2	1.2	1.0	1.2	1.1	1.0	1.2
324		1.1	0.1	1.4	0.7	2.0	0.8	1.2	1.2	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
336	14	1.0	-0.1	1.3	0.6	1.8	0.7	1.2	1.2	1.2	1.2	1.2	1.0	1.3	1.1	1.0	1.2
348		1.1	0.3	1.4	0.8	2.1	0.8	1.2	1.2	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
360	15	0.9	0.0	1.3	0.6	1.8	0.7	1.2	1.2	1.2	1.2	1.2	1.0	1.2	1.1	1.0	1.2
372		1.0	-0.2	1.4	0.6	2.0	0.7	1.2	1.2	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
384	16	0.9	0.3	1.2	0.7	1.7	0.7	1.2	1.2	1.1	1.1	1.2	1.0	1.2	1.1	1.0	1.2
Average over trial period		1.1	-0.1	1.5	0.7	2.3	0.8	1.2	1.2	1.2	1.1	1.2	1.0	1.2	1.1	1.0	1.2
± standard deviation		0.4	0.9	0.3	0.4	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						1.1 ± 0.0											
Average of Air temperatures						1.1 ± 0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.48 & 4.49) show that, from the dissection data an estimated **675,400** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **160,366** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Angelino Plums and the treatment is suitable for disinfestation.

Table 4.48: Angelino Plums large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	188,400	107,900	127,100	423,400
day 6	3,000	2 nd instar	117,200	65,300	69,700	252,200
Total	6,000		305,600	173,200	196,800	675,600

Table 4.49: Angelino Plums large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	16,412	12,993	29,405		32,824	25,986	58,810	0
2	14,311	11,121	25,432		28,622	22,242	50,864	0
3	15,332	10,014	25,346		30,664	20,028	50,692	0
Total	46,055	34,128	80,183		92,110	68,256	160,366	0

4.5.8 Plums – Tegan Blue

Life history data

The life history data (table 4.50) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. The 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 4.50: Tegan Blue Plums: Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for Large Scale trials at 1°C and 3°C cold treatment and for methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	11/02/2010	100	0	0	0	100	eggs
1	12/02/2010	100	0	0	0	100	eggs
2	13/02/2010	100	0	0	0	100	eggs
3	14/02/2010	21	79	0	0	100	1st
4	15/02/2010	8	80	12	0	100	1st
5	16/02/2010	0	47	53	0	100	2nd
6	17/02/2010	0	4	85	11	100	2nd
7	18/02/2010	0	2	40	58	100	3rd
8	19/02/2010	0	1	32	67	100	3rd

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.51. Cold treatment 12 hour summary records are given in tables 4.52- 4.54. The mortality data from 16 days cold exposure to 1.0 ± 0.5 °C are given in tables 4.55 – 4.56.

Table 4.51 Summary of the dates and times of the conduct of the Large Scale trials at 1.0 ± 0.5 °C. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 1.5°C.

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach 1.0 ± 0.5 °C	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Tegan Blue		05.03.2010	07.03.2010		23.03.2010			04.03.2010
	1	07:36 am	08:36 am	49.0	08:36 am	# 3	KS0606016	14:11 pm
	2	08:07 am	09:07 am	49.0	09:07 am	# 4	KS0547009	14:10 pm
	3	08:39 am	09:39 am	49.0	09:39 am	# 5	KS0606017	15:27 pm

Table 4.52: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		1.7	0.2	3.3	0.8	2.3	1.9	1.5	1.3	1.2	1.4	1.3	1.2	1.1	1.2	1.2	1.4
24	1	1.7	-0.2	3.4	0.5	2.2	1.9	1.4	1.3	1.1	1.4	1.2	1.1	1.0	1.1	1.1	1.4
36		1.9	0.2	3.6	0.6	2.3	2.0	1.4	1.2	1.1	1.4	1.2	1.1	0.9	1.1	1.1	1.4
48	2	1.7	-0.1	3.0	0.5	2.2	1.7	1.3	1.2	1.0	1.3	1.1	1.0	0.9	1.0	1.1	1.4
60		1.7	0.4	2.9	0.8	2.4	1.7	1.3	1.1	1.0	1.3	1.1	1.0	0.9	1.1	1.0	1.4
72	3	1.6	0.1	3.1	0.7	2.3	1.7	1.3	1.2	1.0	1.3	1.1	1.0	0.9	1.0	1.0	1.4
84		1.6	0.3	2.9	0.7	2.3	1.6	1.3	1.1	1.0	1.3	1.0	1.1	0.9	1.1	1.1	1.4
96	4	1.5	0.1	2.9	0.7	2.2	1.6	1.2	1.2	1.0	1.3	1.0	1.0	0.9	1.0	1.0	1.3
108		1.5	0.6	2.7	0.8	2.3	1.6	1.3	1.2	1.0	1.3	1.0	1.0	0.9	1.0	1.0	1.3
120	5	1.4	0.0	2.5	0.7	2.2	1.5	1.2	1.1	1.0	1.3	1.0	1.0	0.9	1.0	1.0	1.3
132		1.3	0.0	2.4	0.4	2.0	1.3	1.2	1.1	1.0	1.3	1.1	1.0	0.9	1.0	1.0	1.3
144	6	1.1	-0.6	2.5	0.2	1.8	1.3	1.2	1.1	1.0	1.3	1.1	1.0	0.9	1.0	1.0	1.3
156		1.4	-0.1	2.8	0.4	2.0	1.5	1.2	1.1	1.1	1.3	1.0	1.0	1.0	1.0	1.0	1.3
168	7	1.5	0.6	2.9	0.7	2.2	1.6	1.2	1.1	1.1	1.3	1.0	1.0	1.0	1.0	1.0	1.3
180		1.5	-0.2	2.9	0.3	2.0	1.5	1.2	1.2	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
192	8	1.3	-0.5	2.8	0.1	1.9	1.3	1.2	1.2	1.1	1.3	1.0	1.0	1.0	1.0	1.0	1.3
204		1.3	-0.7	2.7	0.1	1.9	1.3	1.2	1.2	1.1	1.3	1.1	1.0	0.9	1.0	1.0	1.3
216	9	1.2	-0.5	2.5	0.1	1.9	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
228		1.2	-0.2	2.4	0.3	2.0	1.2	1.2	1.1	1.1	1.3	1.1	1.0	0.9	1.0	1.0	1.3
240	10	1.1	-0.4	2.5	0.1	1.8	1.2	1.2	1.1	1.1	1.3	1.0	1.0	1.0	1.0	1.0	1.3
252		1.2	-0.2	2.4	0.3	2.0	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
264	11	1.2	0.0	2.5	0.5	2.1	1.4	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
276		1.1	-0.4	2.5	0.1	1.8	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
288	12	1.2	0.1	2.4	0.4	2.1	1.3	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
300		1.4	0.5	2.1	0.6	2.1	1.3	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
312	13	1.3	-0.2	2.4	0.4	1.9	1.3	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
324		1.2	0.0	2.1	0.4	1.9	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
336	14	1.0	-0.6	2.1	0.0	1.6	1.0	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
348		1.2	0.1	2.3	0.4	1.9	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.1	1.3
360	15	1.1	0.1	2.2	0.4	1.8	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
372		1.1	-0.3	2.2	0.3	1.8	1.2	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
384	16	1.0	0.1	2.1	0.3	1.7	1.1	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
Average over trial period		1.3	-0.1	2.6	0.4	2.0	1.4	1.2	1.1	1.1	1.3	1.0	1.0	0.9	1.0	1.0	1.3
± standard deviation		0.4	1.0	0.9	0.5	0.4	0.4	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1
Average of Fruit temperatures						1.1 ± 0.1											
Average of Air temperatures						1.3 ± 0.6											

Table 4.53: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.5	-0.4	1.5	0.6	2.5	0.8	1.5	1.5	1.4	1.5	1.4	1.5	1.5	1.5	1.5	1.4
24	1	1.4	0.0	1.5	0.7	2.3	0.8	1.4	1.4	1.2	1.3	1.4	1.4	1.5	1.4	1.3	1.3
36		1.4	-0.1	1.5	0.7	2.5	0.8	1.4	1.3	1.1	1.2	1.4	1.4	1.2	1.4	1.3	1.3
48	2	1.3	0.0	1.3	0.6	2.2	0.7	1.3	1.3	1.2	1.2	1.4	1.4	1.1	1.4	1.2	1.2
60		1.4	0.0	1.4	0.7	2.3	0.8	1.3	1.3	1.1	1.2	1.4	1.3	1.1	1.4	1.2	1.3
72	3	1.3	0.5	1.4	0.9	2.2	0.9	1.3	1.3	1.1	1.2	1.4	1.3	1.0	1.3	1.2	1.2
84		1.3	-0.3	1.4	0.6	2.2	0.6	1.2	1.3	1.1	1.2	1.3	1.3	1.0	1.4	1.2	1.2
96	4	1.3	-0.2	1.3	0.6	1.9	0.7	1.2	1.3	1.1	1.1	1.3	1.3	1.0	1.3	1.1	1.2
108		1.5	0.3	1.3	0.6	2.1	0.7	1.2	1.2	1.1	1.1	1.3	1.3	1.0	1.4	1.2	1.2
120	5	1.3	0.4	1.3	0.8	1.9	0.8	1.2	1.2	1.0	1.1	1.2	1.3	1.0	1.3	1.1	1.1
132		1.3	0.0	1.2	0.6	2.1	0.6	1.2	1.2	1.1	1.1	1.2	1.3	1.0	1.4	1.1	1.2
144	6	1.2	0.3	1.2	0.7	1.9	0.7	1.1	1.2	1.0	1.1	1.3	1.3	1.0	1.3	1.1	1.1
156		1.3	-0.1	1.3	0.6	2.3	0.6	1.2	1.2	1.0	1.1	1.2	1.3	1.0	1.3	1.1	1.2
168	7	1.2	0.3	1.3	0.7	2.1	0.7	1.1	1.2	1.0	1.0	1.2	1.3	1.0	1.3	1.1	1.1
180		1.3	-0.3	1.3	0.5	2.3	0.6	1.2	1.2	1.0	1.0	1.2	1.3	1.0	1.3	1.1	1.2
192	8	1.2	0.0	1.2	0.5	2.2	0.6	1.2	1.2	1.0	1.0	1.2	1.3	1.0	1.3	1.1	1.2
204		1.2	-0.1	1.3	0.5	2.3	0.6	1.2	1.3	1.0	1.0	1.2	1.3	1.0	1.3	1.1	1.2
216	9	1.1	-0.4	1.2	0.4	2.1	0.4	1.2	1.2	1.0	1.0	1.2	1.3	1.1	1.3	1.1	1.2
228		1.3	0.5	1.3	0.7	2.1	0.7	1.2	1.2	1.0	1.0	1.2	1.3	1.1	1.3	1.0	1.2
240	10	1.5	0.2	1.4	0.7	2.1	0.8	1.1	1.2	1.0	1.1	1.2	1.2	1.0	1.2	1.0	1.1
252		1.4	-0.2	1.4	0.6	2.1	0.7	1.1	1.3	1.0	1.0	1.2	1.3	1.0	1.2	1.0	1.2
264	11	1.2	-0.2	1.2	0.5	1.9	0.6	1.1	1.3	1.0	1.0	1.2	1.3	1.0	1.2	1.0	1.1
276		1.2	0.2	1.3	0.7	2.2	0.7	1.1	1.3	1.0	1.1	1.2	1.3	1.0	1.2	1.0	1.1
288	12	1.2	-0.3	1.2	0.5	1.9	0.6	1.1	1.3	1.0	1.1	1.2	1.2	1.0	1.2	1.0	1.1
300		1.1	0.1	1.1	0.5	1.8	0.5	1.1	1.2	1.1	1.1	1.2	1.2	1.0	1.2	1.0	1.1
312	13	1.2	-0.4	1.1	0.5	1.8	0.6	1.0	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.1	1.1
324		1.2	0.6	1.2	0.8	1.8	0.8	1.0	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.1	1.1
336	14	1.1	-0.1	1.1	0.5	1.6	0.6	1.1	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.1	1.1
348		1.1	0.1	1.1	0.6	1.9	0.6	1.1	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.0	1.1
360	15	1.3	0.8	1.2	0.8	1.8	0.9	1.1	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.1	1.1
372		1.4	0.1	1.3	0.7	1.9	0.7	1.1	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.0	1.1
384	16	1.2	0.2	1.2	0.8	1.7	0.8	1.1	1.3	1.0	1.1	1.1	1.2	1.0	1.2	1.0	1.1
Average over trial period		1.3	0.0	1.3	0.6	2.1	0.7	1.2	1.3	1.1	1.1	1.2	1.3	1.1	1.3	1.1	1.2
± standard deviation		0.4	0.8	0.2	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							1.2 ± 0.1										
Average of Air temperatures							1.0 ± 0.4										

Table 5.54: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 1.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		1.3	0.1	1.6	1.0	2.4	0.9	1.2	1.1	1.3	1.4	1.0	1.2	1.3	1.2	1.2	1.4
24	1	1.2	0.2	1.6	1.0	2.5	0.9	1.2	1.0	1.3	1.3	1.0	1.2	1.3	1.2	1.1	1.3
36		1.2	-0.1	1.7	0.9	2.5	0.9	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.3
48	2	1.3	0.2	1.7	1.0	2.5	0.9	1.1	1.0	1.3	1.2	1.0	1.1	1.2	1.2	1.1	1.3
60		1.4	-0.1	1.7	0.9	2.4	0.9	1.1	1.0	1.2	1.2	1.0	1.1	1.3	1.1	1.1	1.3
72	3	1.2	-0.1	1.6	0.9	2.3	0.9	1.1	1.0	1.2	1.2	0.9	1.1	1.2	1.1	1.1	1.3
84		1.2	-0.3	1.6	0.8	2.2	0.8	1.1	1.0	1.3	1.1	1.0	1.1	1.2	1.1	1.1	1.3
96	4	1.1	0.0	1.5	0.8	2.0	0.8	1.1	1.0	1.2	1.1	1.0	1.1	1.3	1.1	1.2	1.3
108		1.2	-0.1	1.5	0.8	2.0	0.8	1.1	1.0	1.3	1.2	1.0	1.1	1.3	1.2	1.2	1.3
120	5	1.0	-0.2	1.4	0.7	2.0	0.7	1.1	1.0	1.3	1.2	1.0	1.1	1.3	1.2	1.2	1.3
132		1.1	-0.3	1.4	0.8	2.1	0.8	1.2	1.0	1.3	1.2	1.0	1.1	1.3	1.2	1.2	1.4
144	6	1.2	0.4	1.6	1.1	2.1	1.0	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
156		1.3	0.4	1.6	1.0	2.3	0.9	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
168	7	1.3	0.2	1.7	1.1	2.4	1.0	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
180		1.6	0.0	1.9	1.0	2.6	1.0	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
192	8	1.4	0.0	1.8	1.0	2.6	0.9	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
204		1.4	0.3	1.7	1.0	2.6	1.0	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
216	9	1.3	-0.2	1.6	0.9	2.5	0.9	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
228		1.3	0.4	1.6	1.1	2.3	0.9	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
240	10	1.2	0.0	1.6	0.9	2.3	0.8	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
252		1.1	0.0	1.5	0.7	2.1	0.7	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
264	11	1.2	0.1	1.5	0.9	2.2	0.9	1.2	1.0	1.4	1.2	1.0	1.2	1.3	1.2	1.2	1.4
276		1.1	-0.1	1.5	0.8	2.2	0.7	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
288	12	1.2	0.2	1.5	0.9	2.2	0.9	1.2	1.1	1.4	1.2	1.0	1.2	1.3	1.2	1.2	1.4
300		1.4	0.7	1.6	1.1	2.1	1.0	1.2	1.1	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
312	13	1.3	0.2	1.5	1.0	2.0	0.9	1.1	1.1	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
324		1.2	0.3	1.5	0.9	1.9	0.9	1.2	1.1	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
336	14	1.1	-0.1	1.4	0.8	1.9	0.8	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.3
348		1.2	0.5	1.5	1.0	2.0	0.9	1.1	1.0	1.3	1.2	1.0	1.1	1.3	1.2	1.2	1.3
360	15	1.1	0.0	1.4	0.8	1.8	0.8	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.3
372		1.1	-0.1	1.4	0.7	1.9	0.8	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
384	16	1.1	0.5	1.4	1.0	1.9	1.0	1.2	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.4
Average over trial period		1.2	0.1	1.6	0.9	2.2	0.9	1.1	1.0	1.3	1.2	1.0	1.2	1.3	1.2	1.2	1.3
± standard deviation		0.4	0.9	0.3	0.5	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average of Fruit temperatures						1.2 ± 0.0											
Average of Air temperatures						1.1 ± 0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.55 & 4.56) show that, from the dissection data an estimated **776,800** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **175,316** Medfly were exposed to cold treatment. There were no survivors after 16 days cold exposure to $1.0 \pm 0.5^{\circ}\text{C}$ in Tegan Blue Plums and the treatment is suitable for disinfestation.

Table 4.55: Tegan Blue Plums large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 1°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	144,000	158,500	139,400	441,900
day 6	3,000	2 nd instar	100,700	119,600	114,600	334,900
Total	6,000		244,700	278,100	254,000	776,800

Table 4.56: Tegan Blue Plums large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $1.0 \pm 0.5^{\circ}\text{C}$ for 16 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:			Estimated number of Pupae in treated fruit infested as:			Number of Survivors after cold treatment
	1 st instar	2 nd instar	45kg Total	1 st instar	2 nd instar	90kg Total	
1	17,233	12,442	29,675	34,466	24,884	59,350	0
2	16,825	12,461	29,286	33,650	24,922	58,572	0
3	17,452	11,245	28,697	34,904	22,490	57,394	0
Total	51,510	36,148	87,658	103,020	72,296	175,316	0

4.5.9 ANALYSIS OF THE DATA FOR COLD EXPOSURE AT $1.0 \pm 0.5^{\circ}\text{C}$.

The data shows that the required temperature of and $1.0 \pm 0.5^{\circ}\text{C}$ was maintained throughout the trials. In every replicate more than 10,000 pupae were treated in every fruit variety tested. The records of mortality show that more than 100,000 insects were successfully disinfested by the cold treatments.

The requirements of the international protocols of China, Korea, Japan, USA, NZ and other countries have been satisfied for the conduct of the large scale trials for the disinfestation of 2 varieties each of cherries, peaches, nectarines and plums against 1st and 2nd instars of Mediterranean fruit fly at 1°C .

4.6 RESULTS OF LARGE SCALE COLD TREATMENT TRIALS OF MEDFLY AT $3.0 \pm 0.5^{\circ}\text{C}$.

The trials at $3.0 \pm 0.5^{\circ}\text{C}$ were conducted from November 2008 to July 2010.

Data for each cultivar: cold treatment temperatures and mortality of 1st & 2nd instars of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits is the same as for the large scale 1°C trials since fruit from the same harvested batch was used for large scale 3°C trials.

4.6.1 Cherries - Sweetheart

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.57. Cold treatment 12 hour summary records are given in tables 4.58- 4.60. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.61 – 4.62.

Table 4.57 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Sweetheart		08.01.2009	10.01.2009		30.01.2009			07.01.2009
	1	08:27 am	09:27 am	49.0	09:27 am	# 3	KS0606016	13:58 pm
	2	08:58 am	19:58 pm	59.0	19:58 pm	# 4	KS0547009	15:56 pm
	3	09:27 am	20:27 pm	59.0	20:27 pm	# 5	KS0606017	14:35 pm

Table 4.58: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.8	2.7	2.9	3.1	2.8	2.9	3.5	3.5	3.6	3.5	3.5	3.6	3.5	3.5	3.5	3.3
24	1	3.0	3.0	3.0	3.2	2.9	3.0	3.3	3.3	3.3	3.3	3.3	3.4	3.3	3.3	3.3	3.2
36		2.8	2.8	2.9	3.1	2.8	2.9	3.3	3.3	3.3	3.2	3.3	3.3	3.3	3.3	3.2	3.2
48	2	2.8	2.7	2.9	3.1	2.7	2.9	3.2	3.2	3.2	3.2	3.2	3.3	3.3	3.3	3.2	3.1
60		2.8	2.7	2.9	3.1	2.7	2.8	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.1
72	3	2.9	2.7	3.0	3.3	2.8	2.9	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1
84		2.9	2.8	3.0	3.2	2.8	2.9	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1
96	4	2.7	2.6	2.9	3.1	2.7	2.8	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1
108		2.9	2.8	3.0	3.1	2.8	2.9	3.2	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1
120	5	2.8	2.7	2.9	3.1	2.7	2.8	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1
132		2.9	2.9	3.0	3.2	2.9	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
144	6	2.9	2.9	3.0	3.2	2.8	2.9	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
156		2.8	2.7	2.9	3.2	2.7	2.8	3.1	3.1	3.1	3.1	3.1	3.2	3.1	3.2	3.1	3.1
168	7	2.8	2.7	2.9	3.2	2.7	2.8	3.1	3.1	3.0	3.1	3.1	3.2	3.1	3.2	3.1	3.1
180		2.7	2.7	2.8	3.1	2.7	2.8	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.2	3.1	3.1
192	8	2.8	2.8	2.8	3.1	2.7	2.8	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
204		2.9	3.0	2.9	3.2	2.8	2.9	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
216	9	2.8	2.8	2.9	3.1	2.7	2.8	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
228		2.8	2.9	2.9	3.1	2.7	2.8	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
240	10	3.0	3.1	3.0	3.2	2.9	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
252		2.9	3.0	3.0	3.2	2.8	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
264	11	2.8	2.9	2.9	3.1	2.7	2.8	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
276		2.9	3.0	2.9	3.2	2.8	2.9	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
288	12	2.8	2.8	2.9	3.1	2.7	2.9	3.1	3.0	3.0	3.1	3.2	3.2	3.2	3.2	3.1	3.1
300		2.9	3.1	3.0	3.1	2.8	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
312	13	2.9	3.1	3.0	3.2	2.8	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
324		2.9	3.0	2.9	3.1	2.8	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.1	3.1
336	14	3.0	3.1	3.0	3.2	2.9	3.0	3.1	3.0	3.0	3.1	3.2	3.2	3.2	3.2	3.1	3.1
348		2.7	2.8	2.8	3.0	2.6	2.8	3.1	3.1	3.1	3.1	3.2	3.2	3.1	3.2	3.1	3.1
360	15	2.9	3.0	3.0	3.2	2.8	2.9	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.2	3.1	3.0
372		2.7	2.8	2.8	3.1	2.6	2.8	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.1	3.1	3.1
384	16	2.8	2.9	2.9	3.1	2.7	2.8	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.1	3.1	3.1
396		2.8	2.9	2.9	3.1	2.7	2.8	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.2	3.1	3.1
408	17	2.9	3.0	3.0	3.2	2.8	2.9	3.1	3.0	3.0	3.1	3.2	3.2	3.1	3.2	3.1	3.1
420		2.9	3.0	3.0	3.2	2.8	2.9	3.1	3.0	3.0	3.1	3.2	3.2	3.2	3.2	3.1	3.1
432	18	3.0	3.1	3.0	3.2	2.9	3.0	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.2	3.1	3.1
444		2.8	2.9	2.9	3.2	2.7	2.8	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.2	3.1	3.1
456	19	2.9	3.0	2.9	3.2	2.8	2.9	3.1	3.0	3.0	3.1	3.1	3.2	3.1	3.1	3.1	3.2
468		2.7	2.3	3.2	2.6	2.6	2.6	3.1	3.1	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
480	20	1.8	0.7	2.2	0.9	1.6	1.3	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
Average over trial period		2.8	2.8	2.9	3.1	2.7	2.9	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.1	3.1
± standard deviation		0.3	0.5	0.2	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						2.9 ± 0.3											

Table 4.59: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.9	2.7	3.1	3.4	2.6	2.8	3.5	3.8	4.0	3.5	3.4	3.7	3.8	3.6	3.6	3.8
24	1	2.9	2.7	3.1	3.3	2.6	2.8	3.3	3.5	3.6	3.4	3.2	3.4	3.5	3.3	3.4	3.5
36		2.8	2.7	3.1	3.3	2.6	2.8	3.2	3.4	3.5	3.3	3.2	3.3	3.3	3.3	3.4	3.4
48	2	2.9	2.7	3.2	3.4	2.6	2.8	3.2	3.3	3.4	3.2	3.1	3.3	3.3	3.2	3.3	3.3
60		2.9	2.8	3.1	3.4	2.7	2.9	3.2	3.3	3.3	3.2	3.1	3.2	3.2	3.2	3.3	3.2
72	3	2.8	2.6	3.1	3.4	2.5	2.7	3.1	3.2	3.3	3.2	3.1	3.2	3.2	3.1	3.3	3.2
84		2.9	2.7	3.2	3.4	2.6	2.8	3.1	3.2	3.3	3.2	3.0	3.2	3.2	3.1	3.2	3.2
96	4	2.8	2.7	3.1	3.3	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.2	3.2	3.1	3.2	3.2
108		2.8	2.7	3.1	3.3	2.6	2.8	3.1	3.2	3.2	3.2	3.0	3.2	3.2	3.1	3.2	3.2
120	5	2.8	2.6	3.1	3.3	2.5	2.7	3.1	3.2	3.2	3.1	3.0	3.2	3.2	3.1	3.2	3.2
132		2.9	2.7	3.1	3.4	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.2	3.2	3.1	3.2	3.2
144	6	2.8	2.6	3.1	3.4	2.5	2.7	3.1	3.2	3.2	3.1	3.0	3.2	3.1	3.1	3.2	3.1
156		2.8	2.6	3.2	3.5	2.5	2.7	3.1	3.2	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
168	7	2.8	2.6	3.2	3.5	2.5	2.7	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
180		3.0	2.8	3.2	3.5	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
192	8	2.9	2.7	3.2	3.3	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
204		2.8	2.7	3.1	3.3	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
216	9	2.8	2.6	3.1	3.2	2.5	2.7	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
228		2.8	2.7	3.0	3.3	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.2	3.1	3.1	3.2	3.1
240	10	3.0	2.9	3.1	3.3	2.7	2.9	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
252		2.8	2.7	3.1	3.3	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.2	3.1	3.1	3.2	3.1
264	11	2.9	2.8	3.1	3.3	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.2	3.1	3.1	3.2	3.1
276		2.8	2.6	3.1	3.4	2.6	2.7	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
288	12	2.8	2.6	3.1	3.3	2.5	2.7	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
300		3.0	2.9	3.2	3.5	2.7	2.9	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
312	13	2.8	2.7	3.1	3.2	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
324		2.9	2.8	3.1	3.4	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
336	14	2.9	2.7	3.1	3.3	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
348		2.9	2.8	3.1	3.4	2.7	2.9	3.1	3.2	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
360	15	2.9	2.8	3.2	3.4	2.6	2.9	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
372		2.8	2.6	3.1	3.5	2.5	2.7	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
384	16	2.9	2.7	3.2	3.5	2.6	2.8	3.1	3.1	3.2	3.1	2.9	3.1	3.1	3.0	3.1	3.1
396		2.9	2.8	3.2	3.5	2.6	2.8	3.1	3.1	3.2	3.1	2.9	3.1	3.1	3.0	3.1	3.1
408	17	2.8	2.6	3.1	3.4	2.5	2.7	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
420		2.9	2.7	3.2	3.4	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
432	18	2.9	2.7	3.2	3.4	2.6	2.8	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.2	3.1
444		3.0	2.9	3.2	3.6	2.7	2.9	3.1	3.1	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.1
456	19	2.9	2.7	3.2	3.4	2.6	2.7	3.1	3.1	3.2	3.1	2.9	3.1	3.1	3.0	3.1	3.1
468		2.7	1.8	3.5	2.5	2.4	2.5	3.1	3.2	3.1	3.1	3.0	3.1	3.0	3.1	3.1	3.1
480	20	1.8	0.7	2.2	0.9	1.6	1.3	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
Average over trial period		2.9	2.7	3.1	3.3	2.6	2.8	3.1	3.2	3.2	3.1	3.0	3.2	3.2	3.1	3.2	3.2
± standard deviation		0.3	0.4	0.1	0.4	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ± 0.1											
Average of Air temperatures						2.9 ± 0.3											

Table 4.60: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Sweetheart cherries in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.9	2.4	3.0	3.3	2.7	2.5	3.7	3.6	3.6	3.8	3.6	3.8	3.5	3.6	3.7	3.8
24	1	2.9	2.5	3.0	3.2	2.8	2.6	3.5	3.4	3.3	3.5	3.4	3.5	3.3	3.3	3.4	3.5
36		3.1	2.7	3.1	3.4	2.9	2.8	3.3	3.3	3.3	3.4	3.3	3.3	3.2	3.3	3.3	3.4
48	2	3.0	2.5	3.1	3.3	2.8	2.6	3.3	3.2	3.2	3.3	3.2	3.2	3.1	3.1	3.2	3.3
60		3.0	2.6	3.1	3.4	2.8	2.7	3.3	3.1	3.1	3.3	3.2	3.2	3.1	3.2	3.2	3.3
72	3	3.1	2.6	3.2	3.5	2.9	2.7	3.3	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1	3.3
84		3.1	2.6	3.2	3.4	2.8	2.7	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.2
96	4	3.0	2.5	3.1	3.2	2.8	2.6	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
108		3.1	2.7	3.2	3.4	2.9	2.8	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.2
120	5	3.1	2.7	3.1	3.3	2.9	2.8	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.2
132		3.1	2.7	3.2	3.5	2.9	2.7	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.2
144	6	3.1	2.7	3.2	3.4	2.9	2.8	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1	3.2
156		3.1	2.6	3.2	3.5	2.8	2.7	3.2	3.1	3.0	3.2	3.1	3.1	3.1	3.0	3.1	3.2
168	7	3.1	2.6	3.2	3.5	2.8	2.6	3.1	3.0	3.0	3.2	3.1	3.1	3.0	3.0	3.1	3.1
180		3.0	2.5	3.1	3.4	2.8	2.6	3.1	3.1	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.1
192	8	3.1	2.6	3.2	3.3	2.8	2.7	3.2	3.0	3.1	3.2	3.1	3.1	3.0	3.0	3.1	3.2
204		3.1	2.6	3.1	3.4	2.9	2.8	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.2
216	9	3.0	2.5	3.0	3.1	2.8	2.6	3.2	3.1	3.0	3.2	3.1	3.1	3.1	3.1	3.0	3.2
228		3.0	2.7	3.1	3.4	2.9	2.8	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.2
240	10	3.1	2.9	3.2	3.3	3.0	2.9	3.2	3.1	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.2
252		2.9	2.6	3.0	3.3	2.8	2.7	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.2
264	11	3.1	2.7	3.1	3.3	2.9	2.7	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.2
276		3.0	2.6	3.1	3.4	2.8	2.7	3.2	3.1	3.0	3.2	3.0	3.1	3.1	3.0	3.1	3.2
288	12	3.0	2.6	3.1	3.2	2.8	2.7	3.2	3.1	3.0	3.2	3.1	3.1	3.0	3.0	3.1	3.2
300		2.9	2.5	3.0	3.3	2.7	2.5	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.2
312	13	3.2	2.8	3.2	3.3	3.0	2.9	3.2	3.1	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.2
324		2.9	2.5	2.9	3.3	2.7	2.6	3.2	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1	3.2
336	14	3.0	2.6	3.1	3.2	2.8	2.7	3.2	3.1	3.0	3.2	3.1	3.1	3.1	3.0	3.1	3.2
348		2.9	2.5	3.0	3.4	2.8	2.6	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.2
360	15	3.0	2.5	3.0	3.3	2.8	2.5	3.2	3.1	3.1	3.3	3.1	3.2	3.1	3.0	3.1	3.2
372		3.1	2.7	3.1	3.6	2.9	2.8	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.0	3.1	3.2
384	16	3.1	2.6	3.2	3.5	2.9	2.8	3.2	3.1	3.0	3.3	3.0	3.1	3.1	3.0	3.1	3.2
396		3.0	2.5	3.1	3.4	2.7	2.6	3.2	3.1	3.1	3.3	3.0	3.1	3.1	3.0	3.1	3.2
408	17	3.1	2.6	3.2	3.4	2.9	2.8	3.2	3.1	3.0	3.3	3.0	3.1	3.1	3.0	3.1	3.2
420		3.0	2.5	3.1	3.4	2.8	2.6	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.0	3.1	3.2
432	18	3.1	2.6	3.2	3.4	2.8	2.7	3.2	3.1	3.0	3.3	3.1	3.1	3.1	3.0	3.1	3.2
444		2.9	2.4	3.0	3.5	2.7	2.5	3.2	3.1	3.1	3.3	3.1	3.1	3.1	3.0	3.1	3.2
456	19	3.2	2.7	3.2	3.5	3.0	2.8	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.0	3.1	3.2
468		2.7	1.7	3.5	2.3	2.5	2.4	3.1	3.2	3.1	3.2	3.1	3.2	3.0	3.1	3.0	3.2
480	20	1.9	0.7	2.2	0.9	1.7	1.3	3.1	3.3	3.0	3.2	3.1	3.2	3.0	3.1	3.0	3.3
Average over trial period		3.0	2.6	3.1	3.3	2.8	2.7	3.2	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1	3.2
± standard deviation		0.3	0.4	0.2	0.4	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ± 0.1											
Average of Air temperatures						2.9 ± 0.3											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.61 & 4.62) show that, from the dissection data an estimated **493,400** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **134,832** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Sweetheart Cherries and the treatment is suitable for disinfestation.

Table 4.61: Sweetheart cherries large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	94,100	99,800	88,000	281,900
day 6	3,000	2 nd instar	65,900	77,400	68,200	211,500
Total	6,000		160,000	177,200	156,200	493,400

Table 4.62: Sweetheart cherries large scale trials. Total number of pupae recovered from control fruits (5kg / replicate/ instar) and treated fruits (10kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:		30kg		Estimated number of Pupae in treated fruit infested as:		60kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar			1 st instar	2 nd instar		
1	11,247	9,885	21,132		22,494	19,770	42,264	0
2	12,792	10,016	22,808		25,584	20,032	45,616	0
3	12,449	11,027	23,476		24,898	22,054	46,952	0
Total	36,488	30,928	67,416		72,976	61,856	134,832	0

4.6.2 Cherries - Lapin

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.63. Cold treatment 12 hour summary records are given in tables 4.64- 4.66. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.67 – 4.68.

Table 4.63 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Cherries / Lapin		06.02.2010	08.02.2010		28.02.2010			05.02.2010
	1	08:55 am	09:55 am	49.0	09:55 am	# 3	KS0606016	14:15 pm
	2	09:23 am	10:23 am	49.0	10:23 am	# 4	KS0547009	15:07 am
	3	09:52 am	10:52 am	49.0	10:52 am	# 5	KS0606017	16:30 pm

Table 4.64: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		2.1	0.5	3.0	1.0	1.9	1.7	3.4	3.4	3.3	3.5	3.3	3.4	3.3	3.3	3.3	3.4
24	1	1.7	0.6	2.0	0.8	1.6	1.2	3.1	3.3	3.0	3.2	3.1	3.2	3.0	3.1	3.0	3.3
36		2.1	0.7	3.0	0.8	1.7	1.8	3.1	3.2	3.0	3.1	3.1	3.2	3.0	3.1	3.0	3.2
48	2	1.9	0.7	2.3	0.9	1.7	1.3	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
60		2.2	0.7	3.2	0.9	1.9	1.9	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
72	3	1.8	0.7	2.4	0.9	1.7	1.3	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
84		2.4	0.8	3.8	1.0	2.0	2.0	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
96	4	2.0	0.7	2.8	1.0	1.8	1.5	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
108		2.2	0.8	2.9	1.1	1.9	1.8	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
120	5	1.9	0.6	2.2	0.8	1.7	1.3	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
132		2.0	0.7	2.5	0.9	1.7	1.5	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
144	6	1.8	0.7	1.9	0.8	1.5	1.2	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
156		2.2	0.7	2.9	1.0	1.8	1.8	3.1	3.2	2.9	3.1	3.0	3.1	3.0	3.1	3.0	3.2
168	7	1.7	0.8	1.8	0.9	1.5	1.2	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
180		2.3	0.8	3.2	1.0	1.9	1.9	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
192	8	1.8	0.7	2.1	0.9	1.6	1.3	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
204		2.4	0.8	3.4	1.2	2.0	2.0	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
216	9	2.0	0.7	2.6	1.0	1.8	1.5	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
228		2.4	0.7	3.7	1.1	2.0	2.0	3.1	3.2	2.9	3.1	3.0	3.1	3.0	3.1	3.0	3.2
240	10	1.8	0.7	2.2	0.9	1.6	1.2	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
252		2.4	0.8	3.2	1.1	2.0	1.9	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
264	11	2.0	0.7	2.4	0.9	1.8	1.4	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
276		2.5	0.7	3.9	1.1	2.1	2.1	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
288	12	2.0	0.7	2.7	1.0	1.8	1.4	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
300		2.5	0.8	3.9	1.2	2.1	2.1	3.1	3.2	2.9	3.1	3.0	3.1	3.0	3.1	3.0	3.2
312	13	2.0	0.7	2.6	1.0	1.8	1.4	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
324		2.4	0.6	3.6	1.0	2.0	2.0	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
336	14	2.0	0.7	2.7	1.0	1.9	1.5	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
348		2.5	0.7	4.0	1.2	2.1	2.1	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
360	15	1.9	0.7	2.5	1.0	1.8	1.4	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
372		2.4	0.7	3.8	1.1	2.0	2.0	3.1	3.2	2.9	3.1	3.0	3.1	3.0	3.1	3.0	3.2
384	16	2.1	0.6	2.8	1.0	1.9	1.5	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
396		2.4	0.7	3.2	1.2	2.1	1.9	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
408	17	1.9	0.7	2.3	0.9	1.7	1.3	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
420		2.2	0.7	2.8	1.0	1.9	1.7	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
432	18	1.9	0.7	2.2	0.8	1.7	1.3	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
444		2.3	0.7	3.1	1.1	2.0	1.8	3.1	3.2	2.9	3.1	3.0	3.1	3.0	3.1	3.0	3.2
456	19	2.0	0.7	2.4	0.9	1.7	1.4	3.1	3.2	3.0	3.1	3.0	3.1	3.0	3.1	3.0	3.2
468		2.4	0.7	3.5	1.1	2.0	1.9	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
480	20	1.8	0.7	2.2	0.9	1.6	1.3	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
Average over trial period		2.1	0.7	2.8	1.0	1.8	1.6	3.1	3.2	3.0	3.1	3.0	3.2	3.0	3.1	3.0	3.2
± standard deviation		0.5	0.1	0.9	0.2	0.3	0.4	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.0
Average of Fruit temperatures						3.1 ±0.1											
Average of Air temperatures						1.7 ±0.4											

Table 4.65: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.0	2.5	3.2	3.4	2.8	2.7	3.7	3.4	3.2	3.6	3.5	3.5	3.5	3.5	3.5	3.6
24	1	2.9	2.4	3.0	3.3	2.7	2.5	3.4	3.2	3.1	3.4	3.4	3.3	3.3	3.4	3.3	3.3
36		3.0	2.6	3.2	3.4	2.8	2.7	3.4	3.1	3.0	3.4	3.3	3.2	3.2	3.3	3.3	3.2
48	2	2.9	2.5	3.1	3.3	2.7	2.6	3.4	3.0	3.0	3.3	3.3	3.2	3.3	3.2	3.2	3.1
60		3.0	2.6	3.1	3.3	2.8	2.6	3.4	3.0	3.0	3.3	3.3	3.2	3.2	3.2	3.2	3.1
72	3	3.0	2.6	3.1	3.4	2.8	2.7	3.3	3.0	2.9	3.3	3.3	3.2	3.2	3.1	3.1	3.1
84		3.1	2.7	3.2	3.5	2.9	2.8	3.3	3.0	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.1
96	4	3.0	2.5	3.1	3.3	2.8	2.5	3.3	3.0	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.0
108		3.1	2.7	3.2	3.3	2.9	2.8	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
120	5	2.9	2.4	3.1	3.3	2.7	2.5	3.3	2.9	3.0	3.3	3.2	3.2	3.2	3.2	3.1	3.1
132		3.1	2.6	3.2	3.4	2.8	2.7	3.3	2.9	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.1
144	6	3.0	2.5	3.1	3.3	2.8	2.6	3.3	3.0	3.2	3.3	3.3	3.2	3.2	3.1	3.1	3.1
156		3.0	2.6	3.1	3.4	2.8	2.7	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.1
168	7	3.0	2.6	3.1	3.4	2.8	2.7	3.3	2.9	3.1	3.3	3.3	3.1	3.2	3.1	3.1	3.1
180		3.1	2.7	3.2	3.5	2.9	2.8	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.0
192	8	2.9	2.5	3.1	3.2	2.7	2.5	3.3	3.0	3.2	3.3	3.3	3.2	3.2	3.1	3.1	3.1
204		3.1	2.7	3.2	3.3	2.9	2.8	3.3	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1
216	9	2.9	2.4	3.0	3.3	2.7	2.5	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
228		3.0	2.6	3.1	3.4	2.8	2.7	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
240	10	3.0	2.5	3.1	3.3	2.8	2.6	3.3	2.9	3.1	3.3	3.2	3.2	3.2	3.2	3.1	3.1
252		3.0	2.6	3.1	3.3	2.8	2.7	3.3	2.9	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.1
264	11	3.0	2.6	3.1	3.4	2.8	2.6	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.0
276		3.1	2.7	3.2	3.5	2.9	2.8	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.1
288	12	2.9	2.4	3.0	3.3	2.7	2.5	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
300		3.1	2.7	3.1	3.3	2.9	2.8	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
312	13	3.0	2.5	3.1	3.3	2.7	2.5	3.3	2.9	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
324		3.0	2.6	3.1	3.3	2.8	2.7	3.3	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1
336	14	3.0	2.6	3.1	3.4	2.8	2.7	3.3	3.0	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.1
348		3.1	2.7	3.2	3.5	2.9	2.8	3.3	3.0	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
360	15	2.9	2.4	3.0	3.2	2.7	2.5	3.3	3.0	3.2	3.3	3.3	3.2	3.2	3.1	3.1	3.1
372		3.0	2.6	3.1	3.3	2.9	2.8	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.1
384	16	3.0	2.5	3.1	3.3	2.7	2.6	3.3	3.0	3.1	3.3	3.2	3.1	3.2	3.1	3.1	3.1
396		3.0	2.6	3.1	3.3	2.8	2.7	3.3	2.9	3.2	3.3	3.3	3.2	3.2	3.1	3.1	3.0
408	17	3.0	2.5	3.1	3.4	2.8	2.7	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.1
420		3.1	2.7	3.2	3.5	2.9	2.8	3.3	2.9	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1
432	18	3.0	2.5	3.1	3.3	2.7	2.5	3.3	3.0	3.1	3.3	3.2	3.2	3.2	3.1	3.1	3.0
444		3.1	2.7	3.1	3.2	2.9	2.8	3.3	3.0	3.2	3.3	3.3	3.2	3.2	3.1	3.1	3.0
456	19	3.0	2.6	3.1	3.4	2.9	2.7	3.3	3.0	3.2	3.3	3.3	3.2	3.2	3.1	3.1	3.0
468		2.9	2.4	3.0	3.2	2.7	2.5	3.3	3.0	3.2	3.3	3.2	3.2	3.2	3.1	3.1	3.1
480	20	3.0	2.6	3.1	3.4	2.8	2.7	3.3	3.0	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.0
Average over trial period		3.0	2.6	3.1	3.3	2.8	2.7	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.1
± standard deviation		0.2	0.3	0.2	0.2	0.2	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ± 0.1											
Average of Air temperatures						2.9 ± 0.2											

Table 4.66: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Lapin cherries in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.0	2.7	4.5	3.6	5.8	3.5	3.5	3.5	3.5	3.5	3.1	3.5	3.5	3.6	3.6	3.5
24	1	3.9	2.2	4.1	3.3	5.2	3.3	3.3	3.3	3.1	3.2	3.1	3.3	3.2	3.3	3.3	3.3
36		4.0	2.6	4.5	3.5	5.8	3.4	3.2	3.3	3.0	3.2	3.0	3.3	3.2	3.3	3.3	3.3
48	2	3.8	2.4	4.1	3.3	5.2	3.2	3.2	3.2	2.9	3.2	3.0	3.3	3.1	3.2	3.2	3.2
60		4.0	2.5	4.6	3.5	5.9	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
72	3	3.8	2.8	4.1	3.4	5.3	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
84		3.9	2.5	4.5	3.4	5.9	3.4	3.2	3.2	2.9	3.2	3.0	3.3	3.1	3.2	3.2	3.2
96	4	3.8	2.9	4.2	3.5	5.4	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
108		4.0	2.3	4.7	3.4	6.0	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
120	5	3.9	3.0	4.3	3.6	5.5	3.5	3.2	3.2	2.9	3.2	3.0	3.3	3.1	3.2	3.2	3.2
132		4.0	2.7	4.5	3.5	5.7	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
144	6	4.0	3.0	4.1	3.6	5.0	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
156		4.0	2.9	4.4	3.6	5.6	3.5	3.2	3.2	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2
168	7	3.6	2.6	3.9	3.2	4.9	3.2	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
180		3.9	2.5	4.5	3.4	5.7	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
192	8	3.7	2.7	3.9	3.3	4.9	3.2	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
204		3.8	2.7	4.3	3.5	5.4	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
216	9	3.6	3.0	3.7	3.3	4.6	3.2	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
228		3.7	2.7	4.1	3.4	5.1	3.3	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
240	10	3.6	3.0	3.7	3.4	4.6	3.3	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
252		3.9	2.9	4.3	3.6	5.4	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
264	11	3.6	2.3	3.8	3.1	4.6	3.1	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
276		3.7	2.6	4.1	3.3	5.2	3.3	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
288	12	3.6	3.0	3.7	3.4	4.6	3.3	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
300		4.0	2.6	4.7	3.6	6.0	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
312	13	3.9	3.0	4.2	3.6	5.4	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
324		4.2	3.0	4.7	3.7	5.8	3.6	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
336	14	3.8	2.7	4.0	3.4	4.9	3.3	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
348		4.0	2.9	4.4	3.6	5.6	3.5	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
360	15	3.6	2.6	3.9	3.2	4.9	3.2	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
372		3.9	2.5	4.5	3.4	5.7	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
384	16	3.7	2.7	3.9	3.3	4.9	3.2	3.2	3.2	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2
396		3.8	2.7	4.3	3.5	5.4	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
408	17	3.6	3.0	3.7	3.3	4.6	3.2	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
420		3.7	2.7	4.1	3.4	5.1	3.3	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
432	18	3.7	3.3	3.9	3.6	4.7	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
444		3.8	2.7	4.2	3.4	5.3	3.4	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
456	19	3.6	2.2	3.8	3.1	4.7	3.0	3.2	3.2	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2
468		4.2	2.8	4.7	3.7	5.9	3.6	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
480	20	3.8	2.2	4.0	3.2	5.1	3.2	3.2	3.2	2.9	3.1	3.0	3.3	3.1	3.2	3.2	3.2
Average over trial period		3.8	2.7	4.2	3.4	5.3	3.4	3.2	3.2	3.0	3.2	3.0	3.3	3.1	3.2	3.2	3.2
± standard deviation		0.4	0.8	0.4	0.4	0.6	0.4	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ±0.1											
Average of Air temperatures						3.8 ±0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.67 & 4.68) show that, from the dissection data an estimated **1,028,200** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **204,062** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Lapin Cherries and the treatment is suitable for disinfestation.

Table 4.67: Lapin cherries large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	180,800	182,600	202,200	565,600
day 6	3,000	2 nd instar	151,600	161,300	149,700	462,600
Total	6,000		332,400	343,900	351,900	1,028,200

Table 4.68: Lapin cherries large scale trials. Total number of pupae recovered from control fruits (5kg / replicate/ instar) and treated fruits (10kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:			Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	16,117	17,318	33,435		32,234	34,636	66,870	0
2	17,204	17,948	35,152		34,408	35,896	70,304	0
3	16,895	16,549	33,444		33,790	33,098	66,888	0
Total	50,216	51,815	102,031		100,432	103,630	204,062	0

4.6.3 Peaches – Snow King

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.69. Cold treatment 12 hour summary records are given in tables 4.70- 4.72. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.73 – 4.74.

Table 4.69 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Snow King		26.02.2009	28.02.2009		20.03.2009			25.02.2009
	1	07:07 am	04:07 am	45.0	04:07 am	# 3	KS0606016	13:55 pm
	2	07:36 am	12:36 pm	53.0	12:36 pm	# 4	KS0547009	14:15 pm
	3	08:04 am	08:04 am	48.0	08:04 am	# 5	KS0606017	14:38 am

Table 4.70: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.1	1.6	3.8	2.2	3.5	2.3	3.4	3.2	3.3	3.0	3.2	3.3	3.1	3.2	3.4	3.4
24	1	3.1	1.5	3.3	2.3	3.4	2.3	3.2	3.0	3.1	3.0	3.0	3.1	3.0	3.0	3.3	3.1
36		3.2	1.6	4.0	2.3	3.7	2.4	3.1	2.9	2.9	3.0	2.8	3.0	2.9	3.0	3.1	2.9
48	2	3.5	2.2	3.7	2.6	3.8	2.7	3.1	3.0	2.8	3.1	2.9	3.1	3.1	3.0	3.1	2.9
60		3.5	1.9	3.8	2.6	3.7	2.7	3.2	3.1	2.9	3.1	3.0	3.1	3.1	3.0	3.2	2.9
72	3	3.1	2.3	3.2	2.5	3.3	2.6	3.2	3.1	3.0	3.2	3.0	3.1	3.0	3.1	3.2	3.0
84		3.2	2.0	3.6	2.5	3.6	2.6	3.2	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.2	3.0
96	4	3.1	2.2	3.3	2.5	3.4	2.6	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2	3.1
108		3.2	1.9	3.7	2.4	3.6	2.5	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2	3.1
120	5	3.2	2.5	3.5	2.6	3.5	2.8	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2	3.1
132		3.2	2.5	3.7	2.6	3.7	2.7	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2	3.1
144	6	3.1	2.1	3.3	2.5	3.4	2.5	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.2	3.1
156		3.3	2.2	3.9	2.6	3.7	2.7	3.2	3.1	3.0	3.1	3.0	3.1	2.9	3.1	3.1	3.1
168	7	3.2	1.7	3.4	2.5	3.7	2.4	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.1	3.1
180		3.6	1.8	4.2	2.6	4.0	2.7	3.2	3.1	3.0	3.1	3.0	3.1	2.9	3.1	3.1	3.0
192	8	3.4	2.2	3.5	2.7	3.7	2.7	3.2	3.1	3.0	3.1	3.0	3.1	2.9	3.1	3.1	3.0
204		3.4	2.0	4.0	2.5	3.9	2.6	3.2	3.1	3.0	3.1	3.0	3.1	2.9	3.1	3.1	3.0
216	9	3.2	2.0	3.4	2.5	3.5	2.5	3.2	3.1	2.9	3.1	3.0	3.1	2.9	3.1	3.1	3.0
228		3.4	1.8	3.8	2.5	3.8	2.6	3.2	3.1	3.0	3.1	3.0	3.1	2.9	3.1	3.1	3.0
240	10	3.2	2.5	3.4	2.7	3.7	2.7	3.2	3.1	3.0	3.1	3.0	3.1	3.0	3.1	3.1	3.0
252		3.4	2.3	4.0	2.7	3.8	2.8	3.2	3.1	3.0	3.2	3.0	3.1	3.0	3.1	3.1	3.1
264	11	3.1	2.2	3.3	2.5	3.4	2.5	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.0	3.2	3.1
276		3.3	2.2	3.9	2.5	3.7	2.7	3.3	3.2	3.1	3.2	3.1	3.1	3.0	3.1	3.2	3.1
288	12	3.3	1.9	3.5	2.6	3.5	2.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.2	3.1
300		3.4	1.9	4.1	2.5	3.8	2.6	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.1	3.1
312	13	3.2	2.3	3.4	2.7	3.4	2.8	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.2	3.1
324		3.6	2.3	4.1	2.6	4.0	2.8	3.3	3.2	3.1	3.2	3.1	3.1	3.0	3.1	3.1	3.1
336	14	3.4	2.2	3.5	2.6	3.5	2.7	3.3	3.2	3.0	3.2	3.1	3.1	3.0	3.1	3.2	3.1
348		3.5	1.5	4.1	2.5	3.9	2.5	3.3	3.2	3.1	3.2	3.1	3.1	3.0	3.1	3.0	3.1
360	15	3.3	2.2	3.4	2.6	3.4	2.7	3.3	3.2	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
372		3.5	1.5	4.1	2.5	3.9	2.6	3.3	3.3	3.1	3.3	3.2	3.2	3.2	3.1	3.1	3.1
384	16	3.3	2.1	3.4	2.6	3.6	2.7	3.3	3.3	3.1	3.3	3.2	3.3	3.2	3.1	3.2	3.1
396		3.5	2.1	4.0	2.6	4.0	2.6	3.3	3.3	3.1	3.2	3.1	3.3	3.2	3.0	3.1	3.1
408	17	3.3	2.2	3.4	2.6	3.7	2.6	3.3	3.3	3.1	3.2	3.2	3.3	3.2	3.0	3.1	3.1
420		3.2	2.4	3.3	2.6	3.4	2.6	3.3	3.3	3.1	3.2	3.1	3.3	3.2	3.0	3.1	3.1
432	18	3.4	2.4	3.9	2.7	3.9	2.7	3.3	3.3	3.1	3.2	3.1	3.4	3.2	3.0	3.1	3.1
444		3.2	2.1	3.3	2.6	3.4	2.5	3.3	3.3	3.1	3.2	3.1	3.2	3.2	3.1	3.2	3.2
456	19	3.4	2.4	3.6	2.7	3.8	2.7	3.3	3.4	3.1	3.2	3.1	3.1	3.2	3.1	3.1	3.1
468		3.3	2.4	3.5	2.7	3.6	2.7	3.3	3.3	3.1	3.2	3.1	3.0	3.2	3.0	3.1	3.1
480	20	3.7	2.7	4.1	2.8	4.1	2.9	3.3	3.3	3.1	3.3	3.2	3.1	3.2	3.0	3.1	3.1
Average over trial period		3.3	2.1	3.7	2.6	3.7	2.6	3.2	3.2	3.0	3.2	3.0	3.1	3.0	3.1	3.1	3.1
± standard deviation		0.3	0.8	0.5	0.3	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Average of Fruit temperatures						3.1 ±0.1											
Average of Air temperatures						3.0 ±0.4											

Table 4.71: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.4	2.2	3.0	2.4	3.5	2.7	3.8	3.5	3.5	3.5	3.7	3.4	3.5	3.3	3.4	3.4
24	1	3.2	2.4	2.9	2.3	3.1	2.6	3.4	3.3	3.2	3.3	3.3	3.3	3.3	3.1	3.2	3.1
36		3.4	2.2	3.0	2.3	3.5	2.6	3.3	3.1	3.1	3.1	3.1	3.0	3.2	3.0	2.9	3.0
48	2	3.2	2.3	2.9	2.3	3.2	2.6	3.2	3.1	3.0	3.1	3.2	3.0	3.1	3.0	2.9	3.0
60		3.4	2.1	3.0	2.2	3.5	2.6	3.2	3.2	3.0	3.1	3.2	3.1	3.2	3.0	3.0	3.1
72	3	3.4	2.1	2.9	2.1	3.2	2.5	3.2	3.2	3.0	3.1	3.2	3.1	3.2	3.0	3.0	3.1
84		3.5	2.3	3.1	2.3	3.5	2.6	3.2	3.2	3.0	3.2	3.2	3.1	3.2	3.1	3.0	3.1
96	4	3.2	1.7	3.1	1.9	3.1	2.3	3.2	3.2	3.0	3.2	3.2	3.2	3.2	3.1	3.0	3.0
108		3.4	2.3	3.2	2.3	3.5	2.6	3.2	3.2	3.0	3.2	3.2	3.1	3.2	3.1	3.0	3.1
120	5	3.5	1.9	3.0	2.0	3.3	2.4	3.2	3.2	3.0	3.2	3.2	3.1	3.2	3.1	3.0	3.0
132		3.5	2.2	3.1	2.3	3.5	2.6	3.2	3.2	3.0	3.2	3.2	3.1	3.2	3.1	3.0	3.1
144	6	3.2	1.9	2.9	2.1	3.1	2.4	3.2	3.2	3.0	3.2	3.2	3.1	3.2	3.1	3.0	3.1
156		3.3	1.7	3.3	2.1	3.4	2.4	3.2	3.2	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.1
168	7	3.2	2.3	2.9	2.3	3.1	2.6	3.2	3.2	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.1
180		3.4	2.1	3.0	2.3	3.5	2.6	3.2	3.3	3.1	3.3	3.3	3.2	3.3	3.1	3.1	3.1
192	8	3.2	2.2	2.9	2.2	3.0	2.5	3.3	3.2	3.1	3.3	3.3	3.2	3.2	3.1	3.1	3.2
204		3.3	1.9	3.0	2.2	3.4	2.5	3.3	3.3	3.1	3.2	3.3	3.2	3.3	3.1	3.1	3.2
216	9	3.2	2.0	2.9	2.2	3.2	2.5	3.2	3.2	3.0	3.2	3.2	3.2	3.2	3.1	3.0	3.2
228		3.3	2.0	2.9	2.1	3.5	2.5	3.2	3.3	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.2
240	10	3.3	2.5	2.9	2.4	3.2	2.7	3.3	3.2	3.0	3.2	3.2	3.2	3.2	3.2	3.1	3.2
252		3.4	2.0	3.0	2.2	3.4	2.6	3.3	3.2	3.0	3.2	3.2	3.3	3.3	3.1	3.1	3.1
264	11	3.5	2.4	3.0	2.4	3.3	2.7	3.2	3.2	3.0	3.2	3.2	3.2	3.2	3.1	3.0	3.1
276		3.5	2.5	3.0	2.4	3.5	2.7	3.2	3.3	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.2
288	12	3.2	1.8	2.9	2.1	3.0	2.4	3.3	3.3	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.2
300		3.4	2.2	3.0	2.3	3.5	2.6	3.3	3.3	3.0	3.2	3.2	3.2	3.3	3.2	3.1	3.2
312	13	3.3	1.9	2.9	2.1	3.1	2.4	3.3	3.2	3.0	3.2	3.2	3.2	3.3	3.2	3.1	3.2
324		3.3	1.7	3.2	2.0	3.4	2.4	3.3	3.3	3.1	3.2	3.2	3.3	3.3	3.1	3.1	3.2
336	14	3.2	2.3	2.9	2.3	3.1	2.6	3.3	3.3	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.2
348		3.4	2.1	3.0	2.3	3.5	2.6	3.3	3.3	3.1	3.2	3.2	3.2	3.3	3.1	3.1	3.2
360	15	3.2	2.1	2.8	2.2	3.0	2.5	3.3	3.3	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.2
372		3.3	1.9	2.9	2.2	3.3	2.5	3.3	3.3	3.0	3.2	3.3	3.2	3.2	3.1	3.1	3.2
384	16	3.2	2.0	2.9	2.2	3.1	2.5	3.3	3.3	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.2
396		3.3	1.9	3.0	2.1	3.4	2.5	3.3	3.3	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
408	17	3.3	2.5	2.9	2.4	3.2	2.7	3.3	3.3	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.2
420		3.4	1.9	3.0	2.2	3.4	2.6	3.3	3.3	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.2
432	18	3.5	2.3	3.0	2.3	3.3	2.6	3.2	3.3	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.1
444		3.5	2.4	3.0	2.4	3.5	2.7	3.3	3.3	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.1
456	19	3.1	1.9	2.8	2.1	3.0	2.4	3.3	3.3	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.1
468		3.4	2.2	3.0	2.3	3.5	2.6	3.3	3.3	3.1	3.2	3.2	3.2	3.2	3.2	3.1	3.1
480	20	3.1	1.8	2.9	2.0	3.0	2.4	3.3	3.3	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.1
Average over trial period		3.3	2.1	3.0	2.2	3.3	2.6	3.3	3.3	3.0	3.2	3.2	3.2	3.2	3.1	3.1	3.1
± standard deviation		0.3	0.8	0.2	0.5	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							3.2 ±0.1										
Average of Air temperatures							2.7 ±0.4										

Table 4.72: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Snow King Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.0	1.9	3.0	2.4	3.6	2.5	3.4	3.3	3.5	3.1	3.4	3.3	3.2	3.2	3.5	3.4
24	1	3.2	2.3	3.1	2.7	3.8	2.8	3.2	3.1	3.3	3.0	3.1	3.1	3.0	3.0	3.3	3.2
36		3.1	1.8	3.0	2.4	3.7	2.6	3.0	2.9	3.0	3.0	3.1	3.0	3.0	3.0	3.1	3.0
48	2	3.3	2.1	3.2	2.6	3.9	2.8	2.9	2.9	2.9	3.0	3.2	3.0	3.0	3.0	3.1	3.0
60		3.1	2.1	3.1	2.6	3.6	2.7	3.0	3.0	3.0	3.1	3.3	3.1	3.1	3.0	3.1	3.1
72	3	3.3	2.8	3.2	2.9	3.6	2.8	3.0	3.1	3.0	3.1	3.3	3.1	3.2	3.1	3.1	3.1
84		3.2	2.0	3.2	2.6	3.5	2.7	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.2
96	4	3.2	2.0	3.1	2.5	3.6	2.6	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
108		3.2	2.6	3.1	2.8	3.7	2.8	3.1	3.2	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.2
120	5	3.2	2.5	3.2	2.8	3.8	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
132		3.2	2.4	3.2	2.7	3.7	2.8	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1
144	6	3.1	1.9	3.1	2.5	3.6	2.6	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
156		3.2	2.3	3.2	2.7	3.7	2.8	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.2
168	7	3.2	1.8	3.3	2.5	3.7	2.7	3.1	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1
180		3.2	2.4	3.2	2.6	3.7	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
192	8	3.3	2.4	3.3	2.7	3.8	2.8	3.1	3.1	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.1
204		3.5	2.5	3.4	2.8	3.8	2.9	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
216	9	3.3	1.9	3.2	2.5	3.8	2.7	3.1	3.1	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.1
228		3.2	2.2	3.2	2.6	3.8	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
240	10	3.1	2.2	3.3	2.6	3.6	2.7	3.1	3.1	3.0	3.1	3.2	3.1	3.1	3.1	3.1	3.1
252		3.2	2.5	3.2	2.7	3.6	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
264	11	3.1	2.3	3.1	2.6	3.6	2.7	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
276		3.2	2.7	3.1	2.9	3.7	2.9	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
288	12	3.2	2.3	3.1	2.7	3.7	2.7	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
300		3.3	2.5	3.2	2.8	3.8	2.9	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
312	13	3.2	2.6	3.1	2.8	3.7	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1
324		3.2	2.2	3.1	2.6	3.7	2.7	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1
336	14	3.3	2.7	3.2	2.9	3.8	2.9	3.1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1
348		3.4	2.4	3.2	2.6	3.8	2.8	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
360	15	3.3	2.3	3.2	2.7	3.7	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1
372		3.2	2.0	3.1	2.5	3.7	2.7	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
384	16	3.2	2.3	3.1	2.6	3.7	2.7	3.1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1
396		3.2	2.7	3.1	2.8	3.8	2.9	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1
408	17	3.2	2.3	3.2	2.7	3.7	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.1	3.1	3.1	3.1
420		3.2	2.7	3.2	2.8	3.8	2.9	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
432	18	3.2	2.3	3.1	2.7	3.6	2.8	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1
444		3.2	2.1	3.1	2.6	3.7	2.7	3.2	3.2	3.2	3.2	3.3	3.2	3.2	3.1	3.1	3.1
456	19	3.1	2.3	3.0	2.6	3.5	2.7	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1
468		3.2	2.4	3.1	2.7	3.8	2.8	3.1	3.2	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.1
480	20	3.1	2.3	3.0	2.6	3.5	2.7	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1
Average over trial period		3.2	2.3	3.2	2.7	3.7	2.8	3.1	3.1	3.1	3.1	3.3	3.1	3.2	3.1	3.1	3.1
± standard deviation		0.3	0.8	0.2	0.4	0.3	0.3	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1
Average of Fruit temperatures							3.1 ±0.1										
Average of Air temperatures							3.0 ±0.4										

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.73 & 4.74) show that, from the dissection data an estimated **427,600** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **116,460** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Snow King Peaches and the treatment is suitable for disinfestation.

Table 4.73: Snow King Peaches large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	84,500	77,800	77,200	239,500
day 6	3,000	2 nd instar	75,200	58,300	54,600	188,100
Total	6,000		159,700	136,100	131,800	427,600

Table 4.74: Snow King Peaches large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:			Estimated number of Pupae in treated fruit infested as:			Number of Survivors after cold treatment
	1 st instar	2 nd instar	45kg Total	1 st instar	2 nd instar	90kg Total	
1	11,248	8,225	19,473	22,496	16,450	38,946	0
2	10,942	7,872	18,814	21,884	15,744	37,628	0
3	11,124	8,819	19,943	22,248	17,638	39,886	0
Total	33,314	24,916	58,230	66,628	49,832	116,460	0

4.6.4 Peaches – Zee Lady

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.75. Cold treatment 12 hour summary records are given in tables 4.76 - 4.78. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.79 – 4.80.

Table 4.75 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Peaches / Zee Lady		18.12.2009	20.12.2009		09.01.2010			17.12.2009
	1	07:46 am	12:46 pm	53.0	12:46 pm	# 3	KS0606016	12:56 pm
	2	08:15 am	09:15 am	49.0	09:15 am	# 4	KS0547009	13:53 pm
	3	08:47 am	07:47 am	47.0	07:47 am	# 5	KS0606017	15:20 pm

Table 4.76: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.3	2.2	4.0	2.7	3.6	2.7	3.3	3.5	3.6	3.2	3.4	3.5	3.6	3.2	3.6	3.6
24	1	3.4	2.2	3.6	2.6	3.7	2.5	3.2	3.2	3.3	3.1	3.1	3.3	3.4	3.1	3.3	3.4
36		3.5	1.7	3.8	2.6	3.7	2.6	3.2	3.0	3.1	3.1	3.0	3.2	3.2	3.0	3.1	3.2
48	2	3.1	1.7	3.8	2.5	3.6	2.6	3.2	3.0	3.0	3.0	3.1	3.1	3.1	3.0	3.0	3.2
60		3.0	1.8	3.6	2.4	3.3	2.5	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.2	3.1	3.2
72	3	2.9	1.7	3.4	2.3	3.2	2.3	3.3	3.2	3.1	3.1	3.1	3.2	3.2	3.2	3.0	3.2
84		2.9	2.2	3.4	2.5	3.1	2.6	3.2	3.2	3.1	3.2	3.0	3.2	3.2	3.3	3.0	3.3
96	4	3.1	2.4	3.5	2.6	3.3	2.7	3.3	3.3	3.1	3.3	3.1	3.2	3.3	3.1	2.9	3.3
108		3.0	2.2	3.5	2.6	3.2	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.2	3.3	3.0	3.3
120	5	3.2	2.6	3.5	2.8	3.3	2.9	3.2	3.3	3.1	3.3	3.1	3.2	3.3	3.2	2.9	3.3
132		3.2	2.6	3.7	2.8	3.2	3.0	3.2	3.3	3.2	3.3	3.0	3.2	3.2	3.2	3.0	3.3
144	6	3.0	2.2	3.5	2.5	3.2	2.6	3.2	3.2	3.2	3.3	3.0	3.2	3.2	3.1	2.9	3.3
156		3.0	2.1	3.5	2.6	3.1	2.7	3.2	3.2	3.1	3.3	3.0	3.2	3.2	3.2	2.9	3.3
168	7	3.0	2.0	3.4	2.5	3.3	2.6	3.2	3.2	3.1	3.3	3.0	3.2	3.2	3.1	2.9	3.3
180		3.1	2.3	3.8	2.7	3.3	2.8	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.2	2.9	3.2
192	8	3.2	2.2	3.7	2.7	3.5	2.8	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	2.9	3.2
204		3.2	2.3	3.8	2.7	3.4	2.8	3.2	3.2	3.1	3.2	3.0	3.1	3.1	3.2	2.9	3.2
216	9	3.2	2.3	3.7	2.7	3.5	2.8	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	2.9	3.2
228		3.3	2.4	4.0	2.7	3.5	2.8	3.2	3.2	3.1	3.2	3.0	3.1	3.1	3.2	2.9	3.2
240	10	3.3	1.9	3.8	2.6	3.6	2.7	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1	3.0	3.2
252		3.1	1.9	3.9	2.5	3.4	2.6	3.2	3.1	3.1	3.2	3.0	3.1	3.1	3.1	3.1	3.2
264	11	3.2	2.0	3.7	2.6	3.5	2.7	3.2	3.1	3.1	3.2	3.0	3.1	3.1	3.1	3.1	3.2
276		3.1	2.4	3.9	2.7	3.4	2.8	3.2	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.2
288	12	3.1	2.1	3.8	2.6	3.5	2.7	3.4	3.1	3.1	3.2	3.2	3.1	3.1	3.2	3.2	3.2
300		3.2	2.6	3.8	2.8	3.4	2.9	3.4	3.3	3.1	3.2	3.2	3.2	3.1	3.4	3.2	3.2
312	13	3.2	2.2	3.7	2.7	3.5	2.8	3.4	3.3	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2
324		3.1	2.0	3.9	2.6	3.4	2.7	3.4	3.4	3.3	3.4	3.2	3.3	3.3	3.4	3.1	3.3
336	14	3.4	2.4	3.9	2.9	3.6	3.0	3.5	3.4	3.3	3.5	3.3	3.4	3.3	3.4	3.1	3.4
348		3.3	2.5	4.0	2.8	3.5	2.9	3.4	3.4	3.4	3.4	3.2	3.4	3.3	3.5	3.1	3.4
360	15	3.5	2.7	3.9	2.9	3.7	3.0	3.4	3.4	3.4	3.5	3.2	3.4	3.4	3.3	3.1	3.4
372		3.4	2.2	3.9	2.8	3.5	2.9	3.3	3.4	3.4	3.5	3.2	3.3	3.4	3.4	3.1	3.5
384	16	3.2	1.9	3.7	2.7	3.5	2.7	3.4	3.3	3.3	3.5	3.2	3.3	3.4	3.3	3.1	3.4
396		3.1	2.1	3.7	2.6	3.3	2.7	3.3	3.4	3.3	3.4	3.2	3.3	3.3	3.4	3.1	3.4
408	17	3.1	2.0	3.5	2.6	3.4	2.7	3.4	3.3	3.3	3.4	3.2	3.3	3.3	3.3	3.1	3.4
420		3.1	2.2	3.8	2.6	3.2	2.7	3.3	3.4	3.3	3.4	3.2	3.3	3.3	3.4	3.1	3.4
432	18	3.2	2.7	3.6	2.8	3.4	3.0	3.4	3.3	3.3	3.4	3.2	3.3	3.3	3.3	3.1	3.4
444		3.1	1.7	3.9	2.6	3.3	2.6	3.3	3.4	3.3	3.4	3.2	3.3	3.3	3.4	3.1	3.4
456	19	3.2	2.3	3.5	2.8	3.4	2.8	3.3	3.3	3.3	3.4	3.2	3.3	3.4	3.3	3.1	3.4
468		3.2	2.5	3.9	2.8	3.2	2.9	3.3	3.3	3.3	3.4	3.2	3.3	3.3	3.4	3.1	3.4
480	20	3.2	2.4	3.4	2.8	3.3	2.9	3.3	3.3	3.3	3.4	3.1	3.3	3.3	3.3	3.1	3.4
Average over trial period		3.2	2.2	3.7	2.7	3.4	2.7	3.3	3.2	3.2	3.3	3.1	3.2	3.2	3.2	3.1	3.3
± standard deviation		0.4	0.9	0.5	0.3	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ±0.1											
Average of Air temperatures						3.0 ±0.5											

Table 4.77: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit:** Zee Lady Peaches in Cold Room #4 (Rep 2)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.4	2.4	4.1	3.1	5.3	3.3	3.4	3.5	3.6	3.4	3.6	3.5	3.4	3.3	3.5	3.5
24	1	4.1	2.8	3.8	3.1	4.5	3.2	3.1	3.2	3.4	3.4	3.2	3.1	3.2	3.3	3.3	3.3
36		4.4	2.6	4.2	3.1	5.4	3.3	3.0	3.3	3.4	3.4	3.1	3.1	3.1	3.3	3.2	3.3
48	2	4.1	2.5	3.9	3.0	4.5	3.1	3.0	3.3	3.4	3.4	3.1	3.1	3.2	3.3	3.2	3.3
60		4.6	2.7	4.3	3.2	5.6	3.4	3.0	3.3	3.4	3.4	3.1	3.1	3.2	3.3	3.2	3.3
72	3	4.4	2.4	4.0	3.0	4.7	3.1	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.4	3.2	3.3
84		4.7	2.5	4.3	3.2	5.6	3.3	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
96	4	4.3	2.7	4.0	3.2	4.8	3.3	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
108		4.6	2.7	4.3	3.2	5.8	3.4	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
120	5	4.3	2.6	4.0	3.1	4.9	3.2	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
132		4.4	2.7	4.1	3.2	5.3	3.3	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
144	6	4.0	2.9	3.8	3.1	4.3	3.2	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
156		4.3	2.7	4.1	3.1	5.1	3.3	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
168	7	4.1	2.9	3.8	3.1	4.4	3.3	3.0	3.3	3.4	3.4	3.0	3.2	3.2	3.3	3.2	3.3
180		4.3	2.6	4.1	3.1	5.3	3.3	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.4	3.2	3.3
192	8	4.1	2.5	3.8	3.0	4.4	3.1	3.0	3.3	3.4	3.4	3.0	3.1	3.2	3.3	3.2	3.3
204		4.5	2.7	4.1	3.2	5.0	3.3	3.0	3.4	3.4	3.4	3.0	3.1	3.2	3.4	3.2	3.3
216	9	4.0	2.9	3.7	3.1	4.1	3.2	3.0	3.4	3.4	3.4	3.0	3.1	3.3	3.4	3.2	3.3
228		4.2	2.6	4.0	3.1	4.8	3.3	3.0	3.4	3.5	3.4	3.0	3.1	3.3	3.4	3.2	3.3
240	10	4.0	2.9	3.7	3.1	4.2	3.3	3.0	3.4	3.4	3.4	3.0	3.1	3.3	3.4	3.3	3.4
252		4.2	2.7	4.0	3.1	4.8	3.2	3.0	3.4	3.4	3.4	3.0	3.1	3.3	3.4	3.3	3.3
264	11	4.0	3.0	3.8	3.1	4.2	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
276		4.0	2.6	3.8	3.0	4.3	3.1	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
288	12	4.4	2.4	4.0	3.0	4.6	3.1	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
300		4.7	2.6	4.3	3.2	5.7	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
312	13	4.3	2.7	4.0	3.2	4.7	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
324		4.6	2.6	4.3	3.2	5.8	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
336	14	4.3	2.6	4.0	3.1	4.9	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
348		4.3	2.8	4.1	3.2	5.3	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
360	15	4.0	2.9	3.8	3.1	4.3	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
372		4.3	2.7	4.1	3.1	5.1	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
384	16	4.1	2.9	3.8	3.1	4.4	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
396		4.3	2.6	4.1	3.1	5.3	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
408	17	4.1	2.5	3.8	3.0	4.4	3.1	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
420		4.5	2.7	4.1	3.2	5.0	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
432	18	4.0	3.0	3.7	3.1	4.1	3.2	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
444		4.2	2.6	4.0	3.1	4.8	3.2	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
456	19	4.0	3.0	3.8	3.2	4.2	3.3	3.0	3.4	3.4	3.4	3.0	3.1	3.3	3.4	3.3	3.3
468		4.2	2.6	3.9	3.1	4.8	3.2	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
480	20	4.0	3.0	3.8	3.1	4.2	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.3	3.3
Average over trial period		4.3	2.7	4.0	3.1	4.8	3.3	3.0	3.4	3.4	3.4	3.0	3.2	3.3	3.4	3.2	3.3
± standard deviation		0.3	0.7	0.3	0.3	0.6	0.3	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0
Average of Fruit temperatures							3.3 ±0.1										
Average of Air temperatures							3.7 ±0.4										

Table 4.78: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Zee Lady Peaches in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.2	2.6	3.9	3.2	4.3	3.3	3.2	3.4	3.5	3.1	3.4	3.4	3.5	3.2	3.5	3.4
24	1	4.2	2.7	4.0	3.3	4.3	3.3	3.2	3.3	3.3	3.2	3.3	3.2	3.3	3.1	3.3	3.3
36		4.1	2.6	3.9	3.1	4.3	3.3	3.2	3.3	3.2	3.2	3.3	3.2	3.2	3.2	3.1	3.2
48	2	4.3	2.7	4.1	3.4	4.5	3.4	3.2	3.3	3.2	3.2	3.3	3.2	3.2	3.1	3.0	3.2
60		3.9	2.4	3.7	2.7	4.0	3.1	3.2	3.3	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.2
72	3	4.0	2.5	3.7	3.0	4.1	3.2	3.2	3.3	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.2
84		3.9	2.7	3.6	2.8	3.8	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.2	3.0	3.2
96	4	4.1	2.5	3.6	3.1	4.1	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
108		4.0	2.7	3.7	2.9	4.0	3.3	3.2	3.3	3.3	3.1	3.3	3.1	3.2	3.1	3.0	3.2
120	5	4.1	2.7	3.8	3.2	4.2	3.3	3.1	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
132		4.1	2.6	3.6	3.0	4.0	3.2	3.2	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.0	3.1
144	6	4.2	2.7	3.8	3.3	4.3	3.3	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
156		3.9	2.4	3.4	2.7	3.7	3.1	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
168	7	4.2	2.7	3.8	3.3	4.2	3.3	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
180		3.9	2.7	3.6	2.8	3.9	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
192	8	4.1	2.4	3.6	3.1	4.1	3.1	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
204		4.0	2.6	3.5	2.8	3.8	3.1	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
216	9	4.0	2.4	3.7	3.1	4.2	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
228		4.0	2.7	3.8	2.9	4.0	3.1	3.3	3.4	3.3	3.2	3.4	3.1	3.2	3.1	3.0	3.2
240	10	4.0	2.7	3.6	2.7	3.9	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
252		3.9	2.6	3.5	2.7	3.7	3.1	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
264	11	4.0	2.6	3.7	3.1	4.1	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.1	3.1	3.0	3.1
276		3.9	2.6	3.5	2.7	3.7	3.1	3.2	3.3	3.2	3.1	3.3	3.1	3.1	3.2	3.0	3.1
288	12	4.1	2.7	3.8	3.0	4.2	3.3	3.2	3.3	3.3	3.1	3.3	3.1	3.2	3.1	3.0	3.2
300		3.9	2.6	3.5	2.7	3.8	3.0	3.1	3.3	3.2	3.1	3.2	3.1	3.2	3.1	3.0	3.2
312	13	4.0	2.5	3.9	3.0	4.3	3.2	3.1	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
324		4.0	2.6	3.6	2.7	3.9	3.1	3.1	3.3	3.2	3.1	3.2	3.1	3.1	3.1	3.0	3.1
336	14	4.1	2.6	3.9	3.2	4.3	3.2	3.1	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.0	3.1
348		4.0	2.6	3.8	2.9	4.0	3.2	3.1	3.3	3.2	3.1	3.2	3.1	3.1	3.1	3.0	3.1
360	15	4.1	2.6	4.0	3.2	4.4	3.2	3.1	3.1	3.2	3.0	3.2	3.1	3.1	3.2	3.0	3.1
372		3.9	2.6	3.7	2.8	4.0	3.2	3.1	3.1	3.2	3.0	3.3	3.1	3.1	3.2	3.0	3.1
384	16	4.1	2.5	4.0	3.2	4.5	3.3	3.1	3.1	3.2	3.0	3.3	3.1	3.2	3.2	3.0	3.2
396		3.9	2.5	3.6	2.7	3.9	3.2	3.1	3.1	3.2	3.0	3.3	3.0	3.2	3.2	3.0	3.2
408	17	4.0	2.5	3.7	3.1	4.2	3.2	3.1	3.2	3.2	3.1	3.3	3.1	3.2	3.1	3.1	3.2
420		3.9	2.7	3.6	2.9	3.9	3.2	3.2	3.3	3.2	3.1	3.3	3.0	3.2	3.1	3.0	3.2
432	18	4.1	2.5	3.7	3.1	4.2	3.2	3.1	3.3	3.2	3.2	3.3	3.1	3.1	3.1	3.1	3.1
444		3.9	2.6	3.7	2.8	3.9	3.2	3.2	3.3	3.2	3.1	3.3	3.0	3.1	3.1	3.1	3.1
456	19	4.2	2.8	3.9	3.3	4.4	3.3	3.2	3.3	3.2	3.2	3.3	3.1	3.1	3.1	3.1	3.1
468		4.1	2.6	3.6	2.9	4.0	3.1	3.2	3.3	3.2	3.1	3.3	3.1	3.1	3.1	3.1	3.1
480	20	4.2	2.7	3.9	3.4	4.4	3.2	3.2	3.3	3.2	3.2	3.3	3.1	3.1	3.1	3.1	3.1
Average over trial period		4.0	2.6	3.7	3.0	4.1	3.2	3.2	3.3	3.3	3.1	3.3	3.1	3.2	3.1	3.0	3.2
± standard deviation		0.6	0.8	0.8	0.6	0.6	0.5	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1
Average of Fruit temperatures							3.2 ±0.1										
Average of Air temperatures							3.4 ±0.6										

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.79 & 4.80) show that, from the dissection data an estimated **477,500** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **134,712** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Zee Lady Peaches and the treatment is suitable for disinfestation.

Table 4.79: Zee Lady Peaches large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	83,500	91,900	87,400	262,800
day 6	3,000	2 nd instar	74,600	69,800	70,300	214,700
Total	6,000		158,100	161,700	157,700	477,500

Table 4.80: Zee Lady Peaches large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	11,458	12,046	23,504		22,916	24,092	47,008	0
2	10,249	10,725	20,974		20,498	21,450	41,948	0
3	11,428	11,450	22,878		22,856	22,900	45,756	0
Total	33,135	34,221	67,356		66,270	68,442	134,712	0

4.6.5 Nectarines – Arctic Snow

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.81. Cold treatment 12 hour summary records are given in tables 4.82 - 4.84. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.85 – 4.86.

Table 4.81 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / Arctic Snow		18.04.2009	20.04.2009		10.05.2009			17.04.2009
	1	07:02 am	11:02 am	52.0	11:02 am	# 3	KS0606016	12:57 pm
	2	07:34 am	05:34 am	46.0	05:34 am	# 4	KS0547009	13:46 pm
	3	08:03 am	11:03 am	51.0	11:03 am	# 5	KS0606017	14:45 pm

Table 4.82: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.4	2.3	4.4	2.6	3.9	2.8	3.5	3.3	3.5	3.0	3.2	3.3	3.2	3.1	3.2	3.6
24	1	3.2	1.6	3.8	2.3	3.5	2.5	3.1	3.0	3.1	3.0	2.9	3.2	2.9	2.9	2.9	3.3
36		3.7	2.3	4.6	2.7	4.2	3.0	3.1	2.9	3.0	3.0	2.9	3.1	2.9	3.0	2.8	3.2
48	2	3.4	2.1	4.0	2.6	3.7	2.8	3.2	3.0	3.0	3.1	3.1	3.2	3.0	3.0	2.9	3.2
60		3.6	2.3	4.8	2.7	4.3	3.0	3.2	3.0	3.0	3.0	3.0	3.2	3.0	3.0	2.9	3.2
72	3	3.4	2.0	4.1	2.6	3.8	2.7	3.3	3.0	3.0	3.0	3.1	3.2	3.0	3.0	2.9	3.2
84		3.5	1.8	4.8	2.4	4.3	2.7	3.2	3.0	3.0	3.0	3.0	3.2	3.0	3.0	2.9	3.2
96	4	3.3	1.8	4.1	2.4	3.9	2.6	3.3	3.0	3.0	3.0	3.0	3.2	3.0	3.0	2.9	3.2
108		3.8	2.2	5.1	2.7	4.6	3.0	3.2	3.0	2.9	3.0	3.0	3.2	3.0	2.9	2.8	3.2
120	5	3.5	1.9	4.4	2.6	4.1	2.8	3.3	3.0	2.9	3.0	3.0	3.2	2.9	2.9	2.8	3.1
132		3.8	2.2	5.3	2.7	4.8	3.1	3.3	2.9	2.9	3.0	3.0	3.2	2.9	2.9	2.8	3.1
144	6	3.7	2.0	4.6	2.7	4.2	2.9	3.4	3.0	2.9	3.0	3.0	3.2	2.9	2.9	2.8	3.1
156		3.8	2.0	5.1	2.7	4.6	3.0	3.3	2.9	2.9	3.0	3.0	3.2	2.9	2.9	2.8	3.1
168	7	3.6	2.1	4.4	2.6	4.1	2.9	3.4	3.0	3.0	3.1	3.1	3.3	2.9	3.0	2.9	3.1
180		4.1	2.6	5.3	3.0	4.8	3.3	3.4	3.0	3.0	3.0	3.1	3.3	3.0	2.9	2.9	3.1
192	8	3.7	2.1	4.6	2.7	4.3	2.9	3.4	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.1
204		3.8	2.0	5.2	2.7	4.7	3.0	3.4	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.1
216	9	3.5	2.1	4.3	2.6	4.0	2.8	3.4	3.1	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.1
228		3.8	1.7	5.0	2.6	4.5	2.9	3.4	3.0	3.0	3.0	3.1	3.3	3.0	3.0	2.9	3.2
240	10	3.5	2.0	4.4	2.7	4.1	2.8	3.4	3.1	3.0	3.1	3.1	3.4	3.0	3.0	2.9	3.2
252		3.9	2.4	5.1	2.9	4.6	3.2	3.4	3.0	3.0	3.0	3.0	3.3	3.0	3.0	2.9	3.2
264	11	3.6	2.3	4.5	2.8	4.2	3.0	3.4	3.1	3.0	3.1	3.1	3.4	3.0	3.0	2.9	3.2
276		3.7	1.8	5.1	2.5	4.6	2.8	3.4	3.1	3.0	3.0	3.0	3.4	3.0	2.9	2.9	3.2
288	12	3.5	2.2	4.3	2.6	4.0	2.8	3.4	3.1	3.0	3.1	3.1	3.4	3.0	3.0	2.9	3.2
300		3.8	1.9	5.1	2.6	4.6	2.9	3.4	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.2
312	13	3.8	2.4	4.5	2.8	4.2	3.1	3.4	3.1	3.0	3.1	3.1	3.4	3.0	3.0	2.9	3.2
324		4.0	2.0	5.2	2.8	4.7	3.0	3.4	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.2
336	14	3.6	2.2	4.4	2.8	4.1	3.0	3.5	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.2
348		3.8	2.2	5.2	2.7	4.7	3.0	3.4	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.2
360	15	3.6	2.2	4.5	2.7	4.2	2.9	3.5	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.2
372		3.7	1.8	5.1	2.5	4.6	2.8	3.4	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.2
384	16	3.6	2.2	4.4	2.7	4.1	2.9	3.5	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.2
396		3.8	2.0	5.1	2.8	4.6	3.0	3.5	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.3
408	17	3.5	2.0	4.4	2.6	4.1	2.8	3.5	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.3
420		3.9	2.5	5.2	2.9	4.7	3.2	3.5	3.0	3.0	3.0	3.0	3.3	3.0	2.9	2.9	3.3
432	18	3.6	2.4	4.3	2.8	4.0	3.0	3.5	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.3
444		3.7	2.1	4.7	2.6	4.3	2.9	3.5	3.0	3.0	3.1	3.1	3.3	3.0	3.0	2.9	3.3
456	19	3.7	2.4	4.2	2.8	3.9	3.0	3.5	3.1	3.1	3.2	3.1	3.4	3.0	3.1	3.0	3.3
468		3.6	2.3	4.6	2.7	4.2	2.9	3.5	3.1	3.1	3.1	3.1	3.4	3.1	3.0	3.0	3.4
480	20	3.6	2.4	4.3	2.9	4.0	3.1	3.5	3.1	3.1	3.2	3.1	3.4	3.1	3.1	3.0	3.4
Average over trial period		3.7	2.1	4.7	2.7	4.3	2.9	3.4	3.0	3.0	3.0	3.1	3.3	3.0	3.0	2.9	3.2
± standard deviation		0.4	0.7	0.5	0.3	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ±0.1											
Average of Air temperatures						3.4 ±0.4											

Table 4.83: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Arctic Snow Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.0	2.6	3.6	2.6	3.8	2.9	3.4	3.3	3.5	3.0	3.2	3.1	3.2	3.1	3.4	3.3
24	1	3.6	2.2	3.4	2.3	3.6	2.6	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
36		3.7	2.4	3.6	2.5	3.8	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9
48	2	3.8	2.7	3.6	2.7	3.9	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	2.9	2.9	2.9
60		3.9	2.5	3.8	2.7	4.2	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.0
72	3	3.7	2.4	3.6	2.5	4.0	2.8	3.0	3.0	3.0	3.1	3.1	3.0	3.1	3.0	2.9	3.0
84		3.9	2.1	3.8	2.4	4.1	2.8	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	2.9	3.0
96	4	3.9	2.3	3.7	2.5	3.9	2.9	3.0	2.9	3.0	3.0	3.1	3.0	3.0	2.9	2.9	3.0
108		4.1	2.4	4.0	2.6	4.3	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	2.9	3.0
120	5	4.0	2.5	3.9	2.7	4.2	3.0	3.0	2.9	2.9	3.0	3.1	3.0	3.0	2.9	2.9	2.9
132		4.3	2.4	4.2	2.7	4.5	3.1	3.0	2.9	2.9	3.1	3.1	3.0	3.0	3.0	2.9	2.9
144	6	4.5	2.9	4.2	3.0	4.5	3.3	3.0	2.9	2.9	3.1	3.1	3.0	3.0	3.0	2.9	3.0
156		4.3	2.5	4.1	2.7	4.5	3.1	3.1	2.9	2.9	3.1	3.1	3.0	3.0	3.0	2.9	3.0
168	7	4.0	2.4	3.9	2.6	4.2	2.9	3.1	2.9	3.0	3.1	3.1	3.0	3.0	3.0	2.9	3.0
180		4.1	2.1	4.1	2.5	4.4	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	2.9	3.0
192	8	4.1	2.9	3.9	2.9	4.3	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	2.9	3.0
204		4.3	2.1	4.2	2.6	4.8	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
216	9	4.0	2.4	3.8	2.6	4.4	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
228		4.2	2.8	4.1	3.0	4.7	3.3	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.0
240	10	3.9	2.1	3.8	2.4	4.1	2.8	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
252		4.1	2.4	4.0	2.6	4.3	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
264	11	4.2	2.8	4.0	2.9	4.2	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
276		4.7	2.3	4.3	2.8	4.7	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
288	12	4.1	2.0	4.0	2.5	4.2	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
300		4.2	2.7	4.1	2.8	4.4	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.1	3.0
312	13	4.0	2.6	3.9	2.7	4.2	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.1	3.0
324		4.1	2.2	4.0	2.5	4.3	2.8	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1
336	14	4.0	2.1	3.8	2.5	4.1	2.8	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.0
348		4.3	2.2	4.2	2.7	4.5	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1
360	15	4.0	2.2	3.9	2.5	4.2	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.0
372		4.2	2.8	4.1	2.8	4.4	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.1
384	16	4.0	2.4	3.9	2.6	4.1	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.1
396		4.5	2.6	4.2	2.8	4.6	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.1
408	17	4.1	2.5	3.9	2.6	4.1	2.9	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.1
420		4.4	2.4	4.3	2.7	4.6	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0	3.1
432	18	4.0	2.5	3.9	2.7	4.0	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	2.9	3.1
444		4.0	2.3	3.9	2.6	4.1	2.9	3.2	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.0	3.1
456	19	3.8	2.6	3.6	2.7	3.7	3.0	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.0	3.2
468		3.9	2.2	3.8	2.5	4.0	2.9	3.2	3.1	3.1	3.2	3.1	3.2	3.1	3.1	3.0	3.2
480	20	3.8	2.7	3.6	2.7	3.7	3.0	3.2	3.1	3.1	3.2	3.2	3.2	3.1	3.1	3.0	3.2
Average over trial period		4.1	2.4	3.9	2.6	4.2	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.0	3.0	3.0
± standard deviation		0.4	0.7	0.3	0.4	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Average of Fruit temperatures						3.0 ±0.1											
Average of Air temperatures						3.4 ±0.5											

Table 4.84: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit:** Arctic Snow Nectarines in Cold Room #5 (Rep 3))

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.1	2.4	3.0	2.5	3.9	2.6	3.4	3.3	3.5	3.1	3.3	3.4	3.2	3.1	3.6	3.4
24	1	3.2	2.3	3.1	2.7	4.2	2.7	3.2	3.1	3.3	3.1	3.1	3.1	3.0	3.0	3.3	3.2
36		3.5	2.4	3.3	2.7	4.1	2.9	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.1	3.1
48	2	3.4	1.8	3.3	2.5	4.2	2.8	3.1	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.1	3.1
60		3.2	1.6	3.1	2.3	4.0	2.7	3.0	3.0	3.0	3.1	3.0	3.0	3.0	2.9	3.0	3.0
72	3	3.4	1.9	3.5	2.5	4.4	2.9	3.0	3.0	3.0	3.1	3.0	3.0	3.0	2.9	3.0	3.0
84		3.3	1.7	3.2	2.4	4.1	2.8	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.9	2.9	3.0
96	4	3.5	1.9	3.6	2.5	4.6	2.9	3.0	3.0	2.9	3.1	3.2	2.9	3.1	3.0	3.0	3.1
108		3.4	2.0	3.4	2.6	4.2	3.0	3.1	3.1	3.0	3.1	3.1	3.1	3.0	3.2	3.1	3.1
120	5	3.5	2.0	3.6	2.6	4.5	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.0
132		3.5	2.9	3.3	2.9	4.4	2.9	3.0	3.0	3.1	3.1	3.1	3.2	3.0	3.1	3.0	3.0
144	6	4.6	3.4	4.3	4.0	5.8	4.1	2.9	2.9	3.0	3.0	3.1	3.2	3.0	3.0	3.1	3.0
156		3.6	2.1	3.6	2.8	4.6	3.0	2.9	2.9	3.0	3.0	3.1	3.2	3.0	3.0	3.0	3.0
168	7	3.5	2.1	3.5	2.7	4.5	3.0	2.9	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.1	3.0
180		3.5	2.2	3.5	2.7	4.4	3.0	2.9	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.1	3.0
192	8	3.9	1.9	3.8	2.8	4.8	3.2	2.9	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.2	3.0
204		3.5	1.9	3.5	2.6	4.4	3.0	2.9	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.2	3.0
216	9	3.4	2.0	3.5	2.6	4.4	3.0	2.9	3.0	3.0	3.0	3.1	3.2	3.0	2.9	3.2	3.0
228		3.5	1.8	3.5	2.6	4.4	3.0	2.9	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.2	3.0
240	10	3.5	2.1	3.5	2.7	4.4	3.0	3.0	3.0	2.9	3.0	3.1	3.1	3.0	2.9	3.2	3.0
252		3.4	1.7	3.5	2.4	4.3	2.9	3.0	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.2	3.0
264	11	3.4	1.8	3.5	2.5	4.4	3.0	3.0	3.0	3.0	3.0	3.1	3.2	3.0	2.9	3.2	3.0
276		3.5	1.8	3.6	2.6	4.4	3.0	3.0	3.0	3.1	3.0	3.1	3.2	3.0	3.0	3.2	3.0
288	12	3.4	1.8	3.5	2.6	4.4	3.0	3.0	3.1	3.1	3.1	3.1	3.2	3.1	3.0	3.2	3.1
300		3.5	1.9	3.6	2.6	4.4	3.0	3.0	3.1	3.1	3.0	3.1	3.2	3.1	3.0	3.2	3.0
312	13	3.9	2.2	3.7	2.9	4.7	3.3	3.0	3.1	3.0	3.1	3.1	3.1	3.1	3.0	3.1	3.0
324		3.5	2.4	3.6	2.8	4.4	3.0	3.0	3.1	3.0	3.0	3.0	3.1	3.0	3.1	3.1	3.0
336	14	3.6	2.2	3.6	2.7	4.7	3.2	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.0	3.1	3.0
348		3.5	2.1	3.5	2.7	4.4	3.0	2.9	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.1	3.0
360	15	3.4	2.1	3.4	2.6	4.2	3.0	2.9	3.0	2.9	3.0	3.0	3.2	3.0	3.0	3.1	3.0
372		3.3	2.4	3.3	2.7	3.9	2.9	2.9	3.1	3.0	3.0	3.1	3.2	3.0	3.0	3.2	3.0
384	16	3.2	2.1	3.2	2.5	4.0	2.9	2.9	3.1	3.0	3.0	3.1	3.2	3.1	3.0	3.2	3.0
396		3.2	2.2	3.2	2.5	3.8	2.7	2.9	3.1	3.1	3.0	3.1	3.2	3.1	3.0	3.2	3.0
408	17	3.4	2.1	3.5	2.7	4.1	3.0	2.9	3.1	3.1	3.0	3.1	3.2	3.1	2.9	3.2	3.0
420		3.4	2.2	3.4	2.7	4.1	2.9	2.9	3.1	3.1	3.1	3.1	3.2	3.0	3.0	3.2	3.0
432	18	3.9	2.4	3.7	2.9	4.6	3.2	3.0	3.1	3.0	3.0	3.0	3.2	3.1	2.9	3.2	3.0
444		3.7	1.8	3.9	2.6	4.7	3.2	2.9	3.1	3.0	3.1	3.0	3.2	3.0	3.0	3.2	3.0
456	19	3.4	1.8	3.5	2.6	4.5	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.0	2.9	3.2	3.0
468		3.2	2.3	3.2	2.7	3.9	2.8	3.0	3.0	3.0	3.0	3.1	3.2	3.1	3.0	3.1	3.0
480	20	3.3	2.1	3.3	2.6	4.0	2.9	3.0	3.0	2.9	3.0	3.1	3.2	3.1	2.9	3.1	3.0
Average over trial period		3.5	2.1	3.5	2.7	4.4	3.0	3.0	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.1	3.0
± standard deviation		0.5	0.9	0.4	0.5	0.5	0.4	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.0 ±0.1											
Average of Air temperatures						3.2 ±0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.85 & 4.86) show that, from the dissection data an estimated **423,500** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **128,878** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Arctic Snow Nectarines and the treatment is suitable for disinfestation.

Table 4.85: Arctic Snow Nectarines large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	92,900	97,600	66,900	257,400
day 6	3,000	2 nd instar	49,000	61,400	55,700	166,100
Total	6,000		141,900	159,000	122,600	423,500

Table 4.86: Arctic Snow Nectarines large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	11,756	9,894	21,650		23,512	19,788	43,300	0
2	12,590	8,945	21,535		25,180	17,890	43,070	0
3	12,490	8,764	21,254		24,980	17,528	42,508	0
Total	36,836	27,603	64,439		73,672	55,206	128,878	0

4.6.6 Nectarines – August Red

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.87. Cold treatment 12 hour summary records are given in tables 4.88 - 4.90. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.91 – 4.92.

Table 4.87 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Nectarines / August Red		20.05.2010	22.05.2010		11.06.2010			19.05.2010
	1	08:21 am	15:21 pm	55.0	15:21 pm	# 3	KS0606016	14:40 pm
	2	08:50 am	07:50 am	47.0	07:50 am	# 4	KS0547009	15:20 pm
	3	09:20 am	06:20 am	45.0	06:20 am	# 5	KS0606017	16:11 pm

Table 4.88: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.3	2.3	4.2	2.8	3.7	2.9	3.6	3.4	3.9	3.1	3.9	3.0	3.4	3.2	3.2	3.7
24	1	3.1	2.3	3.3	2.7	3.2	2.8	3.4	3.4	3.5	2.9	3.4	2.9	3.1	3.0	3.0	3.5
36		3.1	2.3	4.0	2.6	3.4	2.8	3.3	3.3	3.4	2.9	3.2	2.9	3.0	2.9	3.1	3.3
48	2	3.0	2.6	3.2	2.7	3.1	2.8	3.3	3.3	3.3	2.9	3.1	2.9	2.9	2.9	3.1	3.3
60		3.3	2.4	3.9	2.7	3.5	2.8	3.3	3.4	3.3	2.9	3.0	2.9	3.0	2.9	3.1	3.4
72	3	3.2	2.6	3.4	2.7	3.3	2.9	3.3	3.4	3.3	2.9	3.0	3.0	3.0	2.9	3.1	3.4
84		3.2	2.0	4.1	2.6	3.5	2.7	3.3	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.1	3.4
96	4	3.0	1.6	3.5	2.4	3.3	2.5	3.3	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.1	3.3
108		3.0	1.9	3.6	2.5	3.3	2.5	3.3	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.1	3.4
120	5	3.1	2.0	3.4	2.4	3.2	2.5	3.3	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.1	3.3
132		3.1	1.8	3.6	2.5	3.3	2.5	3.3	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.1	3.4
144	6	3.2	2.5	3.5	2.8	3.3	2.9	3.3	3.4	3.3	3.0	3.0	3.0	3.0	2.9	3.1	3.4
156		3.2	2.1	3.7	2.7	3.4	2.7	3.3	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.2	3.4
168	7	3.2	2.8	3.4	2.9	3.2	3.0	3.3	3.4	3.3	3.0	3.1	3.1	3.0	3.0	3.2	3.4
180		3.1	2.3	3.9	2.7	3.4	2.8	3.3	3.5	3.4	3.1	3.1	3.1	3.1	3.0	3.2	3.4
192	8	3.0	2.4	3.3	2.7	3.1	2.8	3.4	3.4	3.4	3.0	3.1	3.1	3.0	3.0	3.2	3.5
204		3.4	2.5	3.9	2.8	3.6	3.0	3.4	3.5	3.4	3.0	3.1	3.1	3.1	3.0	3.2	3.5
216	9	3.2	2.6	3.4	2.7	3.3	2.9	3.3	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.1	3.5
228		3.2	1.9	4.0	2.6	3.5	2.7	3.3	3.4	3.3	3.0	3.1	3.1	3.0	3.0	3.2	3.5
240	10	3.1	2.0	3.6	2.6	3.4	2.6	3.3	3.3	3.3	3.0	3.0	3.1	3.0	3.1	3.2	3.5
252		3.2	2.2	3.9	2.7	3.5	2.8	3.4	3.4	3.3	3.0	3.0	3.2	3.1	3.0	3.2	3.4
264	11	3.1	2.2	3.6	2.6	3.3	2.7	3.3	3.3	3.3	3.0	3.0	3.1	3.0	3.0	3.1	3.4
276		3.1	1.8	4.0	2.5	3.5	2.6	3.3	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.2	3.5
288	12	3.1	2.3	3.6	2.7	3.4	2.8	3.4	3.4	3.3	3.0	3.1	3.1	3.0	3.0	3.2	3.5
300		3.1	1.9	4.0	2.5	3.5	2.7	3.4	3.4	3.3	3.0	3.0	3.1	3.1	3.1	3.2	3.5
312	13	3.2	2.5	3.6	2.7	3.4	2.8	3.4	3.3	3.3	3.0	3.0	3.1	3.1	3.1	3.2	3.5
324		3.1	1.9	4.0	2.5	3.5	2.6	3.4	3.4	3.4	3.0	3.0	3.2	3.1	3.0	3.2	3.5
336	14	3.3	2.6	3.7	2.7	3.5	2.9	3.4	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.2	3.5
348		3.3	1.9	4.0	2.6	3.6	2.7	3.4	3.4	3.4	3.0	3.0	3.1	3.1	3.0	3.2	3.5
360	15	3.2	2.3	3.6	2.7	3.4	2.8	3.4	3.4	3.4	3.0	3.0	3.1	3.0	3.0	3.2	3.5
372		3.4	2.3	4.3	2.8	3.7	3.0	3.4	3.4	3.3	3.0	3.1	3.1	3.0	3.0	3.2	3.5
384	16	3.4	2.3	3.7	2.9	3.5	3.0	3.4	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.2	3.5
396		3.4	2.4	4.2	2.9	3.6	3.0	3.4	3.4	3.4	3.1	3.1	3.1	3.0	3.0	3.2	3.4
408	17	3.3	2.5	3.7	2.9	3.4	3.0	3.4	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.2	3.5
420		3.4	2.7	4.1	3.0	3.6	3.1	3.4	3.4	3.4	3.0	3.0	3.1	3.0	3.0	3.2	3.5
432	18	3.2	2.3	3.6	2.7	3.3	2.8	3.3	3.4	3.3	3.0	3.0	3.1	3.0	3.0	3.2	3.4
444		3.2	2.1	3.8	2.6	3.4	2.8	3.4	3.4	3.4	3.0	3.0	3.1	3.0	3.0	3.2	3.4
456	19	3.2	2.6	3.5	2.8	3.3	2.9	3.4	3.4	3.4	3.0	3.0	3.1	3.0	3.0	3.2	3.4
468		3.5	2.7	4.0	2.9	3.6	3.1	3.4	3.4	3.4	3.0	3.0	3.1	3.0	3.1	3.2	3.4
480	20	3.2	2.2	3.6	2.7	3.3	2.8	3.4	3.4	3.4	3.0	3.0	3.1	3.0	3.0	3.2	3.4
Average over trial period		3.2	2.3	3.7	2.7	3.4	2.8	3.4	3.4	3.4	3.0	3.1	3.1	3.0	3.0	3.2	3.4
± standard deviation		0.3	0.8	0.4	0.3	0.2	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							3.2 ±0.1										
Average of Air temperatures							3.0 ±0.4										

Table 4.89: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.8	1.8	3.3	2.2	4.4	2.7	3.4	3.3	3.5	3.0	3.3	3.4	3.2	3.1	3.5	3.4
24	1	3.6	1.9	3.2	2.2	4.0	2.6	3.2	3.0	3.2	3.0	3.0	3.1	3.0	3.0	3.3	3.2
36		3.8	2.5	3.3	2.5	4.4	2.9	3.0	2.9	3.0	3.0	2.9	3.0	2.9	2.9	3.0	3.1
48	2	3.6	1.9	3.2	2.3	3.9	2.7	2.9	2.8	2.9	3.0	2.9	3.0	2.9	2.9	2.9	3.1
60		3.7	2.3	3.3	2.5	4.0	2.9	3.0	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2
72	3	3.6	2.5	3.3	2.6	3.8	2.9	3.0	2.9	3.0	3.0	3.0	3.0	3.0	3.0	2.9	3.2
84		3.8	2.7	3.4	2.8	4.0	3.1	3.1	2.9	3.0	3.0	3.0	3.1	3.0	2.9	3.0	3.3
96	4	3.7	2.6	3.3	2.7	3.9	3.0	3.1	2.9	3.1	2.9	2.9	3.1	3.0	2.8	3.0	3.3
108		4.1	2.6	3.5	2.7	4.5	3.2	3.1	2.9	3.1	2.9	2.9	3.1	3.0	2.8	3.0	3.3
120	5	3.8	2.3	3.3	2.5	3.9	2.9	3.1	2.9	3.0	2.9	2.9	3.1	3.0	2.8	3.0	3.3
132		3.8	2.4	3.4	2.6	4.2	3.0	3.1	2.9	3.1	3.0	3.0	3.1	3.0	2.9	3.0	3.3
144	6	3.7	2.8	3.4	2.8	3.8	3.0	3.2	3.0	3.1	3.1	2.9	3.1	3.0	2.9	3.1	3.4
156		3.9	2.5	3.5	2.7	4.3	3.1	3.2	3.0	3.1	3.0	2.9	3.2	3.1	2.9	3.1	3.4
168	7	3.7	2.2	3.4	2.5	3.9	2.9	3.2	3.0	3.1	3.0	2.9	3.2	3.0	2.9	3.1	3.4
180		4.0	2.7	3.6	2.8	4.3	3.2	3.2	3.0	3.1	3.1	2.9	3.2	3.1	2.9	3.1	3.4
192	8	3.8	2.6	3.5	2.7	4.0	3.0	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
204		4.0	2.7	3.6	2.8	4.5	3.2	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
216	9	3.8	2.4	3.5	2.7	4.1	3.0	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
228		4.2	3.0	3.8	3.0	4.7	3.4	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
240	10	4.3	2.9	3.8	2.9	4.5	3.3	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
252		4.3	2.1	3.8	2.6	4.9	3.1	3.2	3.0	3.2	3.1	2.9	3.2	3.1	3.0	3.1	3.4
264	11	3.9	2.5	3.5	2.7	4.2	3.1	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
276		4.1	2.9	3.6	3.0	4.5	3.3	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
288	12	3.9	2.8	3.5	2.9	4.0	3.2	3.3	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.5
300		3.9	2.0	3.6	2.5	4.5	2.9	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.2	3.5
312	13	3.7	2.1	3.4	2.4	4.0	2.8	3.2	3.0	3.2	3.0	2.9	3.2	3.1	2.9	3.1	3.4
324		3.8	2.8	3.5	2.8	4.1	3.2	3.2	3.0	3.2	3.0	2.9	3.2	3.1	2.9	3.1	3.4
336	14	3.6	2.4	3.3	2.5	3.6	2.8	3.2	3.0	3.2	3.1	2.9	3.2	3.1	3.0	3.1	3.4
348		3.7	2.3	3.3	2.5	3.8	2.9	3.2	3.1	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
360	15	3.6	2.6	3.3	2.6	3.5	3.0	3.3	3.1	3.2	3.1	3.0	3.2	3.2	3.0	3.1	3.5
372		3.9	2.5	3.5	2.6	4.0	3.0	3.3	3.1	3.3	3.1	3.0	3.2	3.2	3.0	3.1	3.4
384	16	3.7	2.7	3.3	2.7	3.6	3.0	3.3	3.1	3.2	3.1	3.0	3.2	3.2	3.0	3.1	3.4
396		3.8	2.2	3.5	2.5	4.2	3.0	3.2	3.1	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
408	17	3.8	2.7	3.4	2.8	3.8	3.1	3.2	3.0	3.2	3.1	2.9	3.2	3.1	3.0	3.1	3.4
420		4.0	2.5	3.6	2.7	4.5	3.1	3.2	3.0	3.2	3.0	2.9	3.2	3.1	3.0	3.1	3.4
432	18	3.9	2.5	3.5	2.7	4.1	3.1	3.2	2.9	3.2	3.0	2.9	3.1	3.1	3.0	3.1	3.4
444		4.0	2.5	3.6	2.7	4.6	3.1	3.2	3.0	3.2	3.1	2.9	3.1	3.1	3.0	3.1	3.4
456	19	3.9	2.5	3.5	2.8	4.0	3.1	3.2	3.0	3.2	3.2	3.0	3.2	3.1	3.1	3.1	3.4
468		3.8	2.0	3.5	2.5	4.1	2.9	3.3	3.1	3.3	3.2	3.0	3.2	3.1	3.1	3.2	3.5
480	20	3.7	3.1	3.4	3.0	3.6	3.2	3.3	3.1	3.3	3.2	3.1	3.2	3.1	3.1	3.2	3.5
Average over trial period		3.8	2.5	3.5	2.6	4.1	3.0	3.2	3.0	3.2	3.1	3.0	3.2	3.1	3.0	3.1	3.4
± standard deviation		0.3	0.8	0.2	0.5	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							3.1 ±0.1										
Average of Air temperatures							3.3 ±0.4										

Table 4.90: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: August Red Nectarines in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.7	2.3	3.5	2.9	4.7	2.9	3.3	3.4	3.4	3.0	3.3	3.4	3.1	3.2	3.5	3.3
24	1	3.5	2.2	3.4	2.7	4.5	2.8	3.1	3.1	3.2	3.0	3.1	3.2	3.0	3.0	3.3	3.2
36		3.6	2.2	3.5	2.8	4.7	2.9	3.0	3.0	3.0	3.0	3.1	3.0	2.9	3.0	3.1	3.1
48	2	3.5	2.5	3.4	2.8	4.4	2.8	2.9	3.0	2.9	3.0	3.1	3.0	3.0	3.0	3.1	3.0
60		3.5	2.4	3.4	2.8	4.3	2.8	3.0	2.9	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.0
72	3	3.7	2.4	3.5	2.9	4.3	2.9	3.1	3.0	3.1	3.0	3.1	3.2	3.1	3.1	3.3	2.9
84		3.8	1.9	3.5	2.8	4.4	2.9	3.2	3.0	3.1	2.9	3.1	3.3	3.1	3.0	3.4	2.9
96	4	3.7	2.2	3.5	2.9	4.5	2.9	3.2	3.0	3.1	2.9	3.1	3.3	3.1	3.0	3.3	2.9
108		3.6	2.3	3.5	2.9	4.5	3.0	3.2	3.1	3.1	2.9	3.1	3.3	3.1	3.0	3.3	2.9
120	5	3.6	2.6	3.5	2.9	4.3	2.9	3.2	3.0	3.1	2.9	3.0	3.2	3.0	3.0	3.3	2.9
132		3.6	2.5	3.5	3.0	4.4	3.0	3.2	3.1	3.0	2.9	3.1	3.3	3.1	3.0	3.4	2.9
144	6	3.6	2.5	3.5	3.0	4.2	3.0	3.2	3.1	3.0	2.9	3.1	3.3	3.0	3.1	3.4	3.0
156		3.7	2.3	3.6	3.0	4.5	3.0	3.3	3.2	3.1	2.9	3.1	3.4	3.0	3.1	3.4	3.0
168	7	3.6	2.2	3.5	2.8	4.3	2.9	3.3	3.1	3.1	2.9	3.0	3.3	2.9	3.1	3.4	3.0
180		3.7	2.1	3.6	2.8	4.5	3.0	3.3	3.2	3.1	2.9	3.1	3.4	3.0	3.1	3.4	3.0
192	8	3.8	2.8	3.7	3.2	4.5	3.2	3.3	3.1	3.1	2.9	3.1	3.4	3.0	3.1	3.5	3.0
204		4.1	2.6	3.9	3.2	4.8	3.3	3.3	3.2	3.1	3.0	3.1	3.4	3.0	3.2	3.5	3.1
216	9	3.8	2.6	3.7	3.0	4.6	3.1	3.3	3.2	3.1	2.9	3.1	3.4	3.0	3.2	3.5	3.1
228		3.9	2.5	3.8	3.0	4.9	3.1	3.4	3.2	3.1	3.0	3.1	3.4	3.0	3.2	3.5	3.1
240	10	3.9	2.5	3.8	3.0	4.8	3.1	3.3	3.1	3.1	2.9	3.1	3.3	2.9	3.1	3.5	3.0
252		4.0	2.3	3.9	3.0	5.1	3.2	3.3	3.1	3.1	2.9	3.1	3.3	2.9	3.2	3.5	3.0
264	11	3.8	2.4	3.7	3.0	4.7	3.0	3.3	3.1	3.1	2.9	3.1	3.3	2.9	3.1	3.5	3.0
276		3.8	2.5	3.7	3.0	4.6	3.1	3.3	3.2	3.1	3.0	3.1	3.4	3.0	3.2	3.5	3.1
288	12	3.7	2.5	3.6	3.0	4.4	3.0	3.3	3.2	3.1	3.0	3.1	3.4	3.0	3.2	3.5	3.1
300		3.7	2.5	3.7	3.0	4.6	3.0	3.4	3.3	3.2	3.0	3.1	3.5	3.0	3.2	3.5	3.1
312	13	3.7	2.3	3.6	2.9	4.5	2.9	3.3	3.2	3.1	2.9	3.0	3.4	2.9	3.1	3.5	3.0
324		4.0	2.7	3.7	3.2	4.7	3.2	3.3	3.2	3.1	2.9	3.1	3.4	3.0	3.1	3.5	3.0
336	14	3.6	2.4	3.4	2.8	4.1	2.8	3.3	3.3	3.1	2.9	3.1	3.5	3.0	3.2	3.5	3.0
348		3.5	2.7	3.4	3.0	4.2	2.9	3.4	3.3	3.2	3.0	3.1	3.5	3.0	3.2	3.5	3.1
360	15	3.3	2.1	3.3	2.7	3.9	2.7	3.4	3.3	3.2	3.0	3.1	3.5	3.0	3.2	3.4	3.0
372		3.5	2.2	3.4	2.8	4.1	2.9	3.3	3.3	3.2	2.9	3.1	3.5	3.0	3.2	3.4	3.0
384	16	3.4	2.4	3.3	2.8	3.9	2.8	3.3	3.3	3.1	2.9	3.0	3.4	2.9	3.1	3.3	3.0
396		3.6	2.4	3.5	2.9	4.3	2.9	3.3	3.3	3.2	2.9	3.1	3.4	2.9	3.1	3.3	3.0
408	17	3.5	2.2	3.4	2.8	4.1	2.8	3.3	3.3	3.1	2.9	3.0	3.4	2.9	3.1	3.2	2.9
420		3.7	2.1	3.6	2.8	4.5	2.9	3.3	3.3	3.2	2.9	3.0	3.4	2.9	3.1	3.2	2.9
432	18	3.7	2.5	3.5	3.0	4.5	3.0	3.2	3.2	3.1	2.9	3.0	3.3	2.9	3.0	3.1	2.9
444		4.1	2.9	3.9	3.2	5.0	3.3	3.3	3.2	3.1	2.9	3.0	3.3	2.9	3.1	3.2	2.9
456	19	3.7	2.5	3.6	3.0	4.4	3.0	3.3	3.2	3.2	3.0	3.1	3.3	2.9	3.1	3.2	3.0
468		3.6	2.4	3.5	2.9	4.3	2.9	3.3	3.3	3.2	3.0	3.1	3.4	3.0	3.1	3.2	3.0
480	20	3.4	2.5	3.3	2.9	3.8	2.8	3.4	3.4	3.3	3.1	3.1	3.5	3.1	3.2	3.2	3.1
Average over trial period		3.7	2.4	3.6	2.9	4.5	3.0	3.3	3.2	3.1	2.9	3.1	3.3	3.0	3.1	3.4	3.0
± standard deviation		0.4	0.8	0.3	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.1 ±0.1											
Average of Air temperatures						3.3 ±0.4											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.91 & 4.92) show that, from the dissection data an estimated **325,000** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **125,520** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in August Red Nectarines and the treatment is suitable for disinfestation.

Table 4.91: August Red Nectarines large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	59,300	61,400	59,500	180,200
day 6	3,000	2 nd instar	42,000	51,200	51,600	144,800
Total	6,000		101,300	112,600	111,100	325,000

Table 4.92: August Red Nectarines large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:		45kg		Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar			1 st instar	2 nd instar		
			Total				Total	
1	10,112	11,875	21,987		20,224	23,750	43,974	0
2	9,245	10,982	20,227		18,490	21,964	40,454	0
3	10,986	9,560	20,546		21,972	19,120	41,092	0
Total	30,343	32,417	62,760		60,686	64,834	125,520	0

4.6.7 Plums – Angelino

Cold treatment records are given in tables 4.99 – 4.103.

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.93. Cold treatment 12 hour summary records are given in tables 4.94 - 4.96. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.97 – 4.98.

Table 4.93 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Angelino		10.06.2009	12.06.2009		02.07.2009			09.06.2009
	1	08:23 am	09:23 am	49.0	09:23 am	# 3	KS0606016	14:56 pm
	2	08:51 am	09:51 am	49.0	09:51 am	# 4	KS0547009	15:10 pm
	3	09:19 am	07:19 am	46.0	07:19 am	# 5	KS0606017	14:44 pm

Table 4.94: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.9	1.9	5.5	3.0	4.9	3.2	3.2	3.4	3.5	3.1	3.5	3.5	3.5	3.2	3.6	3.5
24	1	3.7	2.0	4.9	3.0	4.5	3.1	3.2	3.3	3.4	3.2	3.5	3.5	3.3	3.1	3.3	3.5
36		4.0	2.0	5.8	3.1	5.1	3.4	3.2	3.3	3.3	3.1	3.5	3.5	3.3	3.2	3.3	3.5
48	2	3.7	2.1	4.9	3.0	4.5	3.2	3.2	3.3	3.3	3.1	3.5	3.4	3.3	3.2	3.3	3.5
60		4.0	2.2	5.9	3.1	5.2	3.4	3.3	3.3	3.4	3.1	3.2	3.3	3.3	3.2	3.3	3.3
72	3	3.9	2.7	5.1	3.2	4.7	3.4	3.2	3.3	3.3	3.1	3.1	3.3	3.3	3.2	3.2	3.4
84		4.5	2.5	6.6	3.3	5.4	3.7	3.2	3.3	3.2	3.1	3.1	3.3	3.2	3.1	3.2	3.3
96	4	4.0	2.4	5.6	3.1	4.7	3.4	3.2	3.3	3.1	3.1	3.1	3.3	3.2	3.1	3.2	3.4
108		4.3	2.2	6.6	3.2	5.4	3.6	3.1	3.2	3.1	3.0	3.1	3.3	3.2	3.2	3.2	3.3
120	5	3.9	2.2	5.6	3.0	4.7	3.3	3.0	3.2	3.1	3.0	3.1	3.3	3.2	3.1	3.2	3.4
132		4.1	2.4	6.2	3.1	5.0	3.5	3.1	3.2	3.1	3.0	3.1	3.3	3.2	3.2	3.2	3.3
144	6	3.7	2.2	5.1	3.0	4.3	3.2	3.1	3.2	3.1	3.0	3.1	3.3	3.2	3.2	3.2	3.3
156		4.0	2.1	5.9	3.0	4.9	3.4	3.2	3.2	3.2	3.0	3.1	3.2	3.2	3.1	3.2	3.2
168	7	3.7	2.3	5.0	3.0	4.4	3.2	3.2	3.3	3.2	3.1	3.0	3.1	3.1	3.2	3.1	3.2
180		3.8	2.1	5.7	2.9	4.9	3.2	3.3	3.4	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.1
192	8	3.6	2.3	4.6	2.9	4.2	3.1	3.2	3.4	3.0	3.1	3.0	3.1	3.0	3.1	3.1	3.2
204		3.8	2.1	5.2	2.9	4.6	3.2	3.2	3.2	3.0	3.1	3.0	3.1	3.0	3.0	3.1	3.1
216	9	3.7	2.4	4.4	3.0	4.1	3.1	3.3	3.2	3.0	3.1	3.0	3.2	3.1	3.1	3.1	3.2
228		3.8	2.1	5.2	2.9	4.6	3.2	3.2	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.2	3.1
240	10	3.6	2.1	4.6	2.9	4.2	3.1	3.2	3.2	3.1	3.0	3.1	3.2	3.1	3.1	3.2	3.2
252		3.8	2.0	5.4	2.9	4.7	3.2	3.2	3.2	3.2	3.0	3.0	3.1	3.1	3.0	3.1	3.2
264	11	3.6	2.3	4.7	3.0	4.2	3.1	3.3	3.3	3.2	3.0	3.1	3.2	3.1	3.0	3.1	3.1
276		3.8	1.9	5.4	2.9	4.8	3.1	3.3	3.3	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.2
288	12	3.7	2.4	4.4	3.0	4.1	3.1	3.3	3.4	3.0	3.1	3.0	3.2	3.1	3.1	3.1	3.2
300		3.8	2.3	5.2	2.9	4.7	3.2	3.2	3.2	3.0	3.1	3.0	3.1	3.0	3.0	3.1	3.1
312	13	3.5	2.4	4.3	2.9	4.0	3.1	3.3	3.2	3.0	3.1	3.0	3.2	3.1	3.1	3.1	3.2
324		3.7	2.3	5.1	2.9	4.6	3.2	3.2	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.2	3.2
336	14	3.7	2.9	4.7	3.1	4.2	3.4	3.2	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.2	3.2
348		3.9	2.2	5.4	3.0	4.7	3.2	3.2	3.2	3.2	3.0	3.0	3.1	3.1	3.0	3.1	3.2
360	15	3.7	1.9	4.6	2.9	4.2	3.0	3.3	3.3	3.1	3.0	3.1	3.2	3.1	3.0	3.1	3.1
372		3.9	2.0	5.5	3.0	4.9	3.2	3.3	3.3	3.2	3.1	3.0	3.1	3.1	3.0	3.1	3.2
384	16	3.5	2.4	4.3	2.9	4.0	3.1	3.3	3.4	3.0	3.1	3.0	3.2	3.1	3.1	3.1	3.2
396		3.8	2.1	5.2	2.9	4.6	3.1	3.2	3.2	3.0	3.1	3.0	3.1	3.0	3.0	3.1	3.1
408	17	3.5	2.5	4.3	2.9	4.0	3.1	3.3	3.2	3.0	3.1	3.0	3.2	3.1	3.1	3.1	3.2
420		3.7	2.2	5.1	2.9	4.5	3.1	3.2	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.2	3.2
432	18	3.7	2.9	4.7	3.1	4.2	3.4	3.2	3.2	3.1	3.0	3.1	3.1	3.1	3.1	3.2	3.2
444		3.9	2.2	5.4	3.0	4.7	3.2	3.2	3.2	3.2	3.0	3.0	3.1	3.1	3.0	3.1	3.2
456	19	3.7	1.9	4.6	2.9	4.2	3.0	3.3	3.3	3.1	3.0	3.1	3.2	3.1	3.0	3.1	3.1
468		3.9	2.0	5.5	3.0	4.9	3.2	3.3	3.3	3.2	3.1	3.0	3.1	3.1	3.0	3.1	3.2
480	20	3.5	2.4	4.3	2.9	4.0	3.1	3.3	3.4	3.0	3.1	3.0	3.2	3.1	3.1	3.1	3.2
Average over trial period		3.8	2.2	5.2	3.0	4.6	3.2	3.2	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.2	3.2
± standard deviation		0.3	0.9	0.7	0.3	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.2 ±0.1											
Average of Air temperatures						3.7 ±0.5											

Table 4.95: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		4.4	2.4	4.1	3.1	5.3	3.3	3.3	3.4	3.6	3.2	3.3	3.3	3.5	3.2	3.5	3.5
24	1	4.1	2.7	3.8	3.1	4.5	3.2	3.2	3.3	3.4	3.2	3.2	3.1	3.3	3.1	3.3	3.3
36		4.4	2.6	4.2	3.1	5.4	3.3	3.2	3.3	3.3	3.2	3.2	3.1	3.2	3.2	3.1	3.2
48	2	4.1	2.5	3.9	3.0	4.5	3.1	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1	3.2
60		4.6	2.6	4.3	3.2	5.7	3.4	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.2	3.1	3.2
72	3	4.4	2.4	4.0	3.0	4.6	3.1	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
84		4.7	2.6	4.3	3.2	5.7	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.2	3.1	3.2
96	4	4.3	2.7	4.0	3.2	4.7	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
108		4.6	2.6	4.3	3.2	5.8	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.2	3.1	3.2
120	5	4.3	2.6	4.0	3.1	4.9	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
132		4.3	2.8	4.1	3.2	5.3	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
144	6	4.0	3.0	3.8	3.1	4.3	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
156		4.3	2.7	4.1	3.2	5.1	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
168	7	4.1	2.9	3.8	3.1	4.4	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
180		4.3	2.5	4.1	3.1	5.2	3.2	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
192	8	4.1	2.6	3.8	3.0	4.4	3.1	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
204		4.4	2.7	4.1	3.2	5.0	3.3	3.2	3.4	3.3	3.3	3.3	3.1	3.2	3.1	3.0	3.1
216	9	4.0	3.0	3.7	3.1	4.1	3.3	3.3	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.2
228		4.2	2.6	4.0	3.1	4.8	3.2	3.3	3.4	3.3	3.3	3.3	3.1	3.2	3.1	3.0	3.2
240	10	4.0	3.0	3.8	3.2	4.2	3.3	3.3	3.4	3.4	3.3	3.3	3.1	3.2	3.1	3.1	3.2
252		4.2	2.6	3.9	3.1	4.8	3.2	3.3	3.4	3.3	3.3	3.3	3.1	3.2	3.1	3.1	3.2
264	11	4.0	3.0	3.8	3.1	4.2	3.3	3.3	3.4	3.4	3.3	3.3	3.1	3.2	3.1	3.0	3.2
276		4.3	2.6	4.0	3.1	4.8	3.3	3.3	3.4	3.3	3.3	3.2	3.1	3.2	3.2	3.0	3.2
288	12	4.0	3.0	3.8	3.2	4.2	3.3	3.3	3.4	3.3	3.3	3.2	3.2	3.3	3.2	3.1	3.2
300		4.3	2.7	4.1	3.1	5.2	3.3	3.2	3.3	3.3	3.2	3.2	3.1	3.2	3.1	3.1	3.2
312	13	4.0	2.9	3.8	3.1	4.3	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1	3.2
324		4.3	2.7	4.1	3.1	5.1	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1	3.1
336	14	4.1	2.9	3.8	3.1	4.4	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.0	3.1
348		4.3	2.6	4.1	3.1	5.3	3.3	3.2	3.3	3.3	3.2	3.2	3.1	3.2	3.1	3.0	3.1
360	15	4.1	2.5	3.8	3.0	4.4	3.1	3.2	3.2	3.3	3.2	3.2	3.1	3.2	3.2	3.1	3.1
372		4.5	2.7	4.1	3.2	5.0	3.3	3.2	3.2	3.3	3.1	3.2	3.1	3.2	3.2	3.0	3.2
384	16	4.0	2.9	3.7	3.1	4.1	3.2	3.2	3.2	3.3	3.2	3.2	3.1	3.3	3.2	3.1	3.2
396		4.2	2.6	4.0	3.1	4.8	3.3	3.2	3.2	3.3	3.2	3.2	3.1	3.3	3.2	3.1	3.2
408	17	4.0	2.9	3.7	3.1	4.2	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.3	3.1	3.1	3.3
420		4.2	2.7	4.0	3.1	4.8	3.2	3.2	3.4	3.3	3.3	3.2	3.1	3.3	3.1	3.1	3.2
432	18	4.0	3.0	3.8	3.1	4.2	3.3	3.2	3.3	3.3	3.3	3.3	3.1	3.2	3.1	3.1	3.2
444		4.2	2.7	4.0	3.1	4.8	3.3	3.3	3.4	3.3	3.3	3.2	3.1	3.2	3.2	3.1	3.2
456	19	4.0	2.8	3.8	3.0	4.5	3.2	3.3	3.4	3.3	3.3	3.3	3.1	3.2	3.1	3.1	3.2
468		4.3	2.6	4.0	3.1	5.1	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1	3.2
480	20	4.0	2.9	3.8	3.1	4.3	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1	3.2
Average over trial period		4.2	2.7	4.0	3.1	4.8	3.3	3.2	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1	3.2
± standard deviation		0.3	0.7	0.2	0.3	0.6	0.3	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1
Average of Fruit temperatures							3.2 ±0.1										
Average of Air temperatures							3.7 ±0.4										

Table 4.96: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Angelino Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.9	2.6	4.5	3.5	5.8	3.4	3.2	3.3	3.5	3.1	3.4	3.4	3.4	3.2	3.5	3.4
24	1	3.7	2.9	4.0	3.4	5.0	3.3	3.2	3.3	3.3	3.2	3.3	3.2	3.3	3.2	3.3	3.3
36		4.0	2.6	4.6	3.5	5.8	3.4	3.2	3.3	3.2	3.2	3.3	3.2	3.2	3.2	3.1	3.2
48	2	3.8	3.0	4.0	3.5	5.1	3.4	3.2	3.3	3.2	3.2	3.3	3.2	3.2	3.2	3.0	3.2
60		4.0	2.3	4.7	3.5	6.0	3.5	3.2	3.3	3.3	3.2	3.3	3.2	3.2	3.2	3.0	3.2
72	3	4.0	2.8	4.2	3.5	5.3	3.4	3.2	3.3	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.2
84		4.2	2.2	4.7	3.5	6.1	3.5	3.2	3.3	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.2
96	4	3.8	2.2	4.1	3.2	5.3	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
108		4.1	2.5	4.9	3.5	6.2	3.5	3.2	3.3	3.3	3.1	3.3	3.1	3.2	3.1	3.0	3.1
120	5	3.7	2.1	4.2	3.2	5.3	3.1	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
132		3.8	2.3	4.5	3.3	5.6	3.3	3.2	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.0	3.2
144	6	3.5	2.5	3.8	3.2	4.8	3.1	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
156		3.9	2.8	4.4	3.5	5.5	3.4	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
168	7	3.6	2.6	3.9	3.3	4.9	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
180		3.9	2.7	4.5	3.5	5.6	3.5	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
192	8	3.8	2.7	4.0	3.4	4.9	3.3	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
204		4.0	2.6	4.4	3.4	5.4	3.4	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
216	9	3.6	2.7	3.8	3.3	4.6	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.2
228		3.8	2.7	4.2	3.4	5.2	3.3	3.3	3.3	3.3	3.2	3.4	3.2	3.2	3.2	3.0	3.2
240	10	3.6	3.1	3.8	3.4	4.7	3.3	3.2	3.3	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.2
252		3.8	2.3	4.2	3.3	5.3	3.3	3.2	3.3	3.3	3.2	3.3	3.2	3.2	3.1	3.0	3.1
264	11	3.6	2.5	3.7	3.2	4.6	3.1	3.2	3.3	3.3	3.1	3.3	3.1	3.2	3.1	3.0	3.2
276		3.8	2.7	4.2	3.4	5.2	3.3	3.2	3.3	3.2	3.1	3.3	3.2	3.2	3.2	3.0	3.2
288	12	3.6	3.6	3.8	3.4	4.7	3.3	3.1	3.3	3.3	3.1	3.3	3.2	3.2	3.1	3.0	3.2
300		4.1	2.7	4.8	3.5	5.8	3.4	3.2	3.3	3.3	3.1	3.3	3.1	3.2	3.1	3.0	3.2
312	13	3.8	2.2	4.1	3.2	5.3	3.2	3.2	3.3	3.2	3.2	3.2	3.1	3.2	3.1	3.0	3.2
324		4.1	2.5	4.8	3.6	6.2	3.5	3.2	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.0	3.1
336	14	4.2	2.2	4.7	3.5	6.1	3.4	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.0	3.1
348		3.9	2.2	4.2	3.3	5.5	3.3	3.2	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.0	3.1
360	15	4.2	2.5	5.1	3.6	6.4	3.6	3.1	3.1	3.3	3.0	3.3	3.1	3.2	3.1	3.0	3.1
372		4.2	2.2	4.9	3.5	6.2	3.4	3.1	3.1	3.2	3.0	3.3	3.1	3.2	3.2	3.0	3.1
384	16	3.8	2.2	4.2	3.3	5.4	3.2	3.1	3.2	3.2	3.1	3.3	3.1	3.2	3.2	3.0	3.2
396		4.1	2.4	4.8	3.5	6.1	3.5	3.1	3.2	3.2	3.1	3.3	3.1	3.2	3.2	3.0	3.2
408	17	3.8	3.2	4.3	3.5	5.1	3.4	3.1	3.2	3.2	3.1	3.3	3.2	3.3	3.1	3.1	3.2
420		4.0	2.6	4.5	3.5	5.8	3.4	3.2	3.3	3.2	3.2	3.3	3.1	3.2	3.1	3.0	3.2
432	18	3.6	3.7	4.0	3.4	4.8	3.2	3.1	3.3	3.2	3.1	3.3	3.1	3.2	3.1	3.1	3.1
444		4.2	2.2	4.8	3.5	6.0	3.4	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.1	3.1
456	19	3.7	3.0	4.1	3.3	5.0	3.2	3.2	3.3	3.2	3.2	3.3	3.1	3.2	3.1	3.1	3.1
468		4.1	2.5	4.8	3.5	5.9	3.4	3.2	3.3	3.3	3.2	3.3	3.1	3.2	3.1	3.1	3.1
480	20	3.8	2.2	4.1	3.3	5.3	3.2	3.2	3.3	3.3	3.2	3.3	3.1	3.1	3.1	3.1	3.1
Average over trial period		3.9	2.6	4.3	3.4	5.4	3.3	3.2	3.3	3.3	3.1	3.3	3.2	3.2	3.1	3.0	3.2
± standard deviation		0.4	0.9	0.5	0.4	0.6	0.3	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
Average of Fruit temperatures						3.2 ±0.1											
Average of Air temperatures						3.8 ±0.5											

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.97 & 4.98) show that, from the dissection data an estimated **745,900** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **164,366** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Angelino Plums and the treatment is suitable for disinfestation.

Table 4.97: Angelino Plums large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	151,900	139,900	130,800	422,600
day 6	3,000	2 nd instar	135,400	89,400	98,500	323,300
Total	6,000		287,300	229,300	229,300	745,900

Table 4.98: Angelino Plums large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:				Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar	Total		1 st instar	2 nd instar	Total	
1	16,412	12,993	29,405		32,824	25,986	58,810	0
2	14,311	11,121	25,432		28,622	22,242	50,864	0
3	15,332	12,014	27,346		30,664	24,028	54,692	0
Total	46,055	36,128	82,183		92,110	72,256	164,366	0

4.6.8 Plums – Tegan Blue

Records of cold treatment temperatures during each trial

Trial summary data are given in table 4.99. Cold treatment 12 hour summary records are given in tables 4.100 - 4.102. The mortality data from 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ are given in tables 4.103 – 4.104.

Table 4.99 Summary of the dates and times of the conduct of the Large Scale trials at $3.0 \pm 0.5^{\circ}\text{C}$. The treatment begins when the majority of the temperature probes in the fruit have reached the treatment temperature of 3.5°C .

Fruit / variety	Rep.	Start date / time of Trial	Date / Time to reach $3.0 \pm 0.5^{\circ}\text{C}$	Hours to cool down	End date / time of Trial	Cold Room No.	Logger Serial No.	Calibration: Before trial Date / time
Plums / Tegan Blue		27.03.2010	29.03.2010		18.04.2010			26.03.2010
	1	08:40 am	19:40 pm	59.0	19:40 pm	# 3	KS0606016	15:17 pm
	2	09:09 am	16:09 pm	55.0	16:09 pm	# 4	KS0547009	15:47 pm
	3	09:38 am	17:38 pm	56.0	17:38 pm	# 5	KS0606017	15:05 pm

Table 4.100: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #3 (Rep 1)**)

Hours	Days	Air	Air	Air	Air	Air	Air	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit	Fruit
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
12		3.0	2.0	3.9	2.3	3.5	2.5	3.7	3.7	3.8	3.3	3.8	3.7	3.8	3.6	3.7	3.5
24	1	2.9	1.8	3.3	2.1	3.1	2.3	3.4	3.4	3.5	3.1	3.5	3.3	3.4	3.3	3.3	3.2
36		3.4	2.0	4.1	2.4	3.7	2.7	3.2	3.3	3.3	3.1	3.4	3.2	3.2	3.2	3.2	3.1
48	2	3.0	1.9	3.5	2.3	3.3	2.5	3.2	3.3	3.3	3.1	3.3	3.1	3.1	3.1	3.1	3.0
60		3.2	1.9	3.9	2.4	3.6	2.6	3.2	3.3	3.3	3.1	3.3	3.2	3.1	3.2	3.1	3.0
72	3	3.1	2.2	3.5	2.5	3.4	2.6	3.3	3.3	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1
84		3.2	2.1	3.9	2.5	3.6	2.7	3.3	3.4	3.4	3.2	3.3	3.2	3.1	3.2	3.1	3.1
96	4	3.0	2.1	3.5	2.4	3.3	2.6	3.3	3.4	3.4	3.2	3.3	3.2	3.1	3.2	3.1	3.1
108		3.1	2.1	3.9	2.4	3.6	2.6	3.3	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
120	5	3.2	2.7	3.6	2.8	3.4	2.9	3.3	3.4	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1
132		3.1	1.8	3.9	2.3	3.6	2.5	3.3	3.4	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1
144	6	3.0	2.4	3.5	2.5	3.3	2.7	3.3	3.4	3.3	3.2	3.3	3.2	3.1	3.2	3.1	3.1
156		3.3	2.2	4.1	2.6	3.8	2.8	3.3	3.4	3.3	3.3	3.3	3.2	3.1	3.2	3.1	3.1
168	7	3.6	2.7	3.8	2.9	3.7	3.1	3.3	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
180		3.3	2.0	4.1	2.5	3.8	2.7	3.4	3.4	3.4	3.3	3.4	3.2	3.2	3.2	3.1	3.2
192	8	3.3	2.5	3.7	2.7	3.5	2.9	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
204		3.3	1.8	4.2	2.4	3.9	2.6	3.4	3.4	3.4	3.3	3.3	3.2	3.2	3.2	3.1	3.2
216	9	3.3	2.7	3.7	2.9	3.6	3.0	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
228		3.3	2.0	4.1	2.5	3.8	2.8	3.4	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
240	10	3.3	2.7	3.6	2.9	3.4	3.0	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
252		3.4	1.9	4.3	2.5	3.9	2.7	3.4	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
264	11	3.2	2.1	3.7	2.5	3.5	2.7	3.4	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.1
276		3.4	2.2	4.1	2.7	3.8	2.9	3.4	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
288	12	3.4	2.8	3.7	2.9	3.5	3.1	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
300		3.6	2.4	4.3	2.7	4.0	3.0	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
312	13	3.3	2.2	3.7	2.6	3.5	2.7	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
324		3.3	2.3	4.0	2.6	3.7	2.8	3.4	3.5	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
336	14	3.2	2.4	3.6	2.6	3.5	2.8	3.4	3.5	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
348		3.3	2.4	4.0	2.7	3.7	2.9	3.4	3.5	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
360	15	3.2	2.6	3.6	2.8	3.4	2.9	3.4	3.5	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
372		3.2	2.0	3.9	2.4	3.6	2.7	3.4	3.5	3.4	3.3	3.4	3.2	3.2	3.2	3.1	3.2
384	16	3.3	2.4	3.6	2.8	3.5	2.9	3.4	3.5	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
396		3.4	2.1	4.1	2.6	3.8	2.8	3.4	3.5	3.4	3.3	3.4	3.2	3.2	3.2	3.1	3.2
408	17	3.2	2.7	3.6	2.8	3.4	2.9	3.4	3.5	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
420		3.3	2.4	4.0	2.7	3.7	2.9	3.4	3.5	3.4	3.3	3.4	3.2	3.2	3.2	3.1	3.2
432	18	3.4	2.6	3.7	2.7	3.6	2.9	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
444		3.4	2.2	4.1	2.6	3.8	2.8	3.4	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
456	19	3.2	2.4	3.6	2.6	3.5	2.8	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
468		3.3	1.9	4.1	2.4	3.8	2.7	3.4	3.4	3.4	3.3	3.3	3.2	3.1	3.2	3.1	3.2
480	20	3.3	2.7	3.6	2.8	3.4	3.0	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
Average over trial period		3.3	2.2	3.8	2.6	3.6	2.8	3.4	3.4	3.4	3.3	3.4	3.2	3.1	3.2	3.1	3.2
± standard deviation		0.3	0.8	0.3	0.4	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures						3.3 ±0.1											
Average of Air temperatures						3.0 ±0.4											

Table 4.101: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #4 (Rep 2)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.5	2.1	2.9	2.3	3.7	2.6	3.6	3.3	3.5	3.6	3.8	3.6	3.1	3.5	3.3	3.4
24	1	3.1	1.7	2.7	1.9	3.2	2.2	3.3	3.2	3.3	3.3	3.4	3.3	2.9	3.3	3.1	3.2
36		3.4	2.1	2.9	2.2	3.6	2.5	3.2	3.1	3.2	3.3	3.3	3.2	2.9	3.3	3.1	3.1
48	2	3.4	2.6	2.9	2.6	3.4	2.8	3.2	3.1	3.1	3.2	3.2	3.2	2.9	3.3	3.0	3.0
60		3.5	2.1	3.0	2.2	3.6	2.5	3.2	3.1	3.2	3.3	3.2	3.2	2.9	3.2	3.1	3.0
72	3	3.4	2.4	2.9	2.4	3.4	2.7	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.2	3.1	3.1
84		3.4	1.9	2.9	2.1	3.6	2.4	3.2	3.2	3.2	3.3	3.2	3.2	3.0	3.2	3.1	3.1
96	4	3.5	2.1	3.0	2.2	3.4	2.5	3.2	3.2	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1
108		3.7	2.2	3.1	2.3	3.7	2.6	3.2	3.2	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1
120	5	3.5	2.4	3.0	2.5	3.5	2.8	3.2	3.2	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1
132		3.5	2.1	3.0	2.2	3.6	2.6	3.2	3.2	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1
144	6	3.4	2.5	3.0	2.5	3.4	2.7	3.2	3.2	3.2	3.2	3.1	3.2	3.0	3.2	3.1	3.1
156		3.6	2.3	3.1	2.4	3.7	2.7	3.2	3.2	3.2	3.3	3.1	3.2	3.0	3.2	3.1	3.1
168	7	3.4	2.3	3.0	2.4	3.4	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.1	3.1
180		3.6	2.4	3.1	2.5	3.8	2.8	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
192	8	3.5	2.3	3.0	2.4	3.5	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.1
204		3.6	2.1	3.1	2.3	3.9	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
216	9	3.5	2.6	3.1	2.6	3.5	2.9	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.1
228		3.8	2.3	3.2	2.4	4.0	2.8	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.1
240	10	3.7	2.2	3.1	2.4	3.5	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.1
252		3.8	2.1	3.2	2.4	4.1	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
264	11	3.5	2.2	3.0	2.3	3.5	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.1	3.1
276		3.6	2.4	3.1	2.4	3.8	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.1
288	12	3.4	2.4	2.9	2.4	3.3	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
300		3.6	2.2	3.1	2.3	3.8	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
312	13	3.5	2.8	3.1	2.7	3.4	2.9	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
324		3.6	2.2	3.1	2.3	3.7	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
336	14	3.4	2.2	3.0	2.3	3.4	2.6	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.1
348		3.7	2.7	3.1	2.6	3.7	2.9	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
360	15	3.8	2.6	3.2	2.6	3.6	2.9	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
372		3.6	2.3	3.1	2.4	3.7	2.7	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
384	16	3.5	2.2	3.0	2.3	3.4	2.6	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
396		3.6	2.1	3.1	2.3	3.8	2.7	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
408	17	3.4	2.2	3.0	2.3	3.4	2.6	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
420		3.6	2.1	3.1	2.3	3.7	2.6	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
432	18	3.4	2.7	3.0	2.5	3.4	2.8	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
444		3.6	2.6	3.1	2.6	3.8	2.9	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
456	19	3.4	2.5	3.0	2.5	3.4	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
468		3.6	2.2	3.1	2.4	3.8	2.7	3.2	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.2	3.2
480	20	3.5	2.2	3.0	2.3	3.4	2.6	3.3	3.3	3.2	3.3	3.1	3.2	3.0	3.2	3.1	3.2
Average over trial period		3.5	2.3	3.0	2.4	3.6	2.7	3.2	3.2	3.2	3.3	3.1	3.2	3.0	3.2	3.1	3.1
± standard deviation		0.3	0.8	0.2	0.5	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1
Average of Fruit temperatures							3.2 ±0.1										
Average of Air temperatures							2.9 ±0.4										

Table 4.102: 12 hour average temperatures taken over the trial period when majority of fruit sensor probes achieved temperature at 3.5°C. (Data corrected using calibration records before trial. **Test Fruit: Tegan Blue Plums in Cold Room #5 (Rep 3)**)

Hours	Days	Air P1	Air P2	Air P3	Air P4	Air P5	Air P6	Fruit P7	Fruit P8	Fruit P9	Fruit P10	Fruit P11	Fruit P12	Fruit P13	Fruit P14	Fruit P15	Fruit P16
12		3.0	1.9	2.9	2.3	3.8	2.5	3.8	3.4	3.5	3.4	3.5	3.6	3.6	3.6	3.8	3.8
24	1	2.8	1.8	2.7	2.2	3.4	2.3	3.4	3.2	3.2	3.1	3.3	3.2	3.4	3.4	3.5	3.4
36		2.9	2.0	2.8	2.4	3.8	2.5	3.2	3.1	3.1	3.0	3.2	3.2	3.3	3.3	3.3	3.2
48	2	2.8	2.1	2.7	2.4	3.5	2.4	3.0	3.0	3.0	2.9	3.2	3.1	3.3	3.3	3.1	3.1
60		3.0	2.0	2.9	2.5	3.8	2.5	3.0	3.0	3.0	2.9	3.2	3.1	3.3	3.3	3.1	3.1
72	3	2.9	1.8	2.8	2.3	3.5	2.4	3.0	3.0	3.0	2.9	3.2	3.1	3.3	3.3	3.1	3.0
84		3.3	2.3	3.1	2.7	3.9	2.7	3.0	3.0	3.0	2.9	3.2	3.1	3.2	3.3	3.1	3.1
96	4	3.1	2.6	2.9	2.8	3.5	2.7	3.0	3.0	3.0	2.9	3.2	3.1	3.2	3.3	3.1	3.0
108		3.1	2.2	2.9	2.6	3.8	2.6	3.1	3.0	3.0	2.9	3.2	3.1	3.2	3.3	3.1	3.1
120	5	2.9	1.9	2.8	2.3	3.4	2.4	3.0	3.0	3.0	2.9	3.2	3.1	3.2	3.3	3.1	3.0
132		3.0	2.3	2.9	2.6	3.7	2.6	3.1	3.0	3.0	2.9	3.2	3.1	3.2	3.3	3.1	3.0
144	6	2.9	2.2	2.9	2.5	3.5	2.5	3.0	3.0	3.0	2.9	3.2	3.1	3.2	3.3	3.0	3.0
156		3.1	2.1	3.0	2.5	3.9	2.6	3.1	3.0	3.0	2.9	3.3	3.1	3.2	3.3	3.1	3.0
168	7	2.9	1.8	2.9	2.4	3.5	2.4	3.0	3.1	3.0	2.9	3.3	3.1	3.2	3.3	3.1	3.0
180		3.1	1.6	3.0	2.4	3.9	2.5	3.1	3.1	3.1	3.0	3.3	3.1	3.2	3.3	3.1	3.1
192	8	3.1	2.1	3.0	2.6	3.6	2.7	3.1	3.1	3.1	2.9	3.2	3.1	3.2	3.3	3.1	3.1
204		3.5	2.1	3.2	2.7	4.2	2.8	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.3	3.1	3.1
216	9	3.1	2.4	3.0	2.7	3.7	2.7	3.0	3.1	3.0	2.9	3.2	3.1	3.2	3.3	3.1	3.0
228		3.1	2.1	3.1	2.5	4.0	2.6	3.1	3.1	3.1	2.9	3.2	3.1	3.2	3.4	3.1	3.0
240	10	3.0	2.0	2.9	2.5	3.5	2.5	3.0	3.1	3.0	2.9	3.2	3.0	3.2	3.3	3.1	3.0
252		3.3	2.0	3.1	2.6	4.3	2.8	3.1	3.1	3.1	2.9	3.2	3.1	3.2	3.4	3.1	3.0
264	11	3.0	1.9	2.9	2.5	3.7	2.5	3.0	3.1	3.0	2.9	3.2	3.1	3.2	3.4	3.1	3.0
276		3.2	1.6	3.1	2.5	4.1	2.6	3.0	3.1	3.0	2.9	3.2	3.1	3.2	3.4	3.1	3.0
288	12	2.9	2.1	2.9	2.5	3.5	2.5	3.0	3.1	3.0	2.9	3.2	3.1	3.2	3.4	3.1	3.0
300		3.2	1.9	3.1	2.6	4.1	2.7	3.0	3.1	3.1	2.9	3.2	3.1	3.2	3.4	3.1	3.0
312	13	3.0	2.1	2.9	2.5	3.6	2.5	3.0	3.1	3.0	2.9	3.2	3.1	3.2	3.4	3.1	3.0
324		3.5	2.3	3.2	2.8	4.2	2.9	3.1	3.1	3.1	2.9	3.2	3.1	3.2	3.4	3.1	3.0
336	14	3.2	2.0	3.0	2.6	3.7	2.6	3.0	3.1	3.0	2.9	3.2	3.1	3.3	3.4	3.1	3.0
348		3.1	2.1	3.0	2.6	3.9	2.6	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.0
360	15	3.0	1.9	2.9	2.5	3.5	2.5	3.1	3.1	3.1	3.0	3.2	3.1	3.3	3.4	3.1	3.0
372		3.1	2.2	3.0	2.6	3.9	2.7	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.1
384	16	3.0	2.4	2.9	2.6	3.5	2.6	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.0
396		3.1	2.2	3.0	2.6	3.9	2.6	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.0
408	17	3.0	2.3	2.9	2.6	3.5	2.5	3.1	3.1	3.1	2.9	3.2	3.1	3.2	3.3	3.1	3.0
420		3.1	2.0	3.0	2.5	3.9	2.6	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.0
432	18	3.0	2.1	2.9	2.5	3.6	2.5	3.1	3.1	3.1	2.9	3.2	3.1	3.2	3.4	3.1	3.0
444		3.3	2.5	3.1	2.8	4.0	2.8	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.0
456	19	3.2	2.4	3.0	2.7	3.6	2.6	3.1	3.1	3.1	2.9	3.2	3.0	3.2	3.3	3.1	3.0
468		3.3	2.1	3.1	2.6	4.1	2.8	3.1	3.1	3.1	3.0	3.2	3.1	3.2	3.4	3.1	3.0
480	20	3.0	2.3	2.9	2.6	3.5	2.5	3.0	3.1	3.1	2.9	3.2	3.1	3.3	3.4	3.1	3.0
Average over trial period		3.1	2.1	3.0	2.5	3.7	2.6	3.1	3.1	3.1	2.9	3.2	3.1	3.3	3.3	3.1	3.1
± standard deviation		0.3	0.8	0.2	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average of Fruit temperatures							3.1 ±0.1										
Average of Air temperatures							2.8 ±0.4										

Insect mortality to cold treatment temperatures during each trial

The results (tables 4.103 & 4.104) show that, from the dissection data an estimated **799,200** 1st & 2nd instar Medfly were exposed to cold treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that **158,704** Medfly were exposed to cold treatment. There were no survivors after 20 days cold exposure to $3.0 \pm 0.5^{\circ}\text{C}$ in Tegan Blue Plums and the treatment is suitable for disinfestation.

Table 4.103: Tegan Blue Plums large scale trials. Estimated number of live insects found in infested fruits on the day of placement in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Days after infestation	Number of infested fruits treated (total of 3 replicates)	Stage treated	Estimate of total larvae treated at 3°C			Total live insects treated
			Rep 1	Rep 2	Rep 3	
day 3	3,000	1 st instar	148,300	133,600	153,500	435,400
day 6	3,000	2 nd instar	128,500	110,500	124,800	363,800
Total	6,000		276,800	244,100	278,300	799,200

Table 4.104: Tegan Blue Plums large scale trials. Total number of pupae recovered from control fruits (7.5kg / replicate/ instar) and treated fruits (15kg / replicate/ instar) in cold treatment at $3.0 \pm 0.5^{\circ}\text{C}$ for 20 days.

Cold treatment Replicate	Pupae obtained in (untreated) control fruit infested as:		45kg		Estimated number of Pupae in treated fruit infested as:		90kg	Number of Survivors after cold treatment
	1 st instar	2 nd instar			1 st instar	2 nd instar		
			Total				Total	
1	15,229	11,498	26,727		30,458	22,996	53,454	0
2	14,942	11,348	26,290		29,884	22,696	52,580	0
3	14,748	11,587	26,335		29,496	23,174	52,670	0
Total	44,919	34,433	79,352		89,838	68,866	158,704	0

4.6.9 ANALYSIS OF THE DATA FOR COLD EXPOSURE AT $3.0 \pm 0.5^{\circ}\text{C}$.

The data shows that the required temperature of $3.0 \pm 0.5^{\circ}\text{C}$ was maintained throughout the trials. In every replicate more than 10,000 pupae were treated in every fruit variety tested. The records of mortality show that more than 100,000 insects were successfully disinfested by the cold treatments.

The requirements of the international protocols of China, Korea, Japan, USA, NZ and other countries have been satisfied for the conduct of the large scale trials for the disinfestation of 2 varieties each of cherries, peaches, nectarines and plums against 1st and 2nd instars of Mediterranean fruit fly at 3°C .

4.7 SUMMARY AND CONCLUSIONS

The data shows that the required temperature of $1.0 \pm 0.5^{\circ}\text{C}$ and $3.0 \pm 0.5^{\circ}\text{C}$ was maintained throughout the trials. In every replicate more than 10,000 pupae were treated in every fruit variety tested. The records of mortality show that more than 100,000 insects were successfully disinfested by the cold treatments.

The requirements of the international protocols of China, Korea, Japan, USA, NZ and other countries have been satisfied for the conduct of the large scale trials for the disinfestation of 2 varieties each of cherries, peaches, nectarines and plums against 1st and 2nd instars of Mediterranean fruit fly at 1°C and 3°C .

This work provides the scientific basis for 1°C and 3°C cold disinfestation of Mediterranean fruit fly for the export of Australian cherries, peaches, nectarines and plums to Korea, Japan, USA, NZ and other countries.

4.8 DISCUSSION

In the most tolerant stage trials complete mortality was achieved following 12 days exposure to the cold treatment in all stages at $1.0 \pm 0.5^{\circ}\text{C}$ and 16 days at $3.0 \pm 0.5^{\circ}\text{C}$ in all 8 cultivars of Australian cherries, peaches, nectarines and plums. In the probit analysis the 2nd instar was found to be the most tolerant stage in all cultivars tested at the LD₅₀ estimate, but at the LD₉₅ estimate, there was over-lap between 1st and 2nd instars.

Therefore taking all the information into consideration, it was decided that the large-scale trials should include testing all immature life stage of Mediterranean fruit fly to $2.0 \pm 0.5^{\circ}\text{C}$ and $3.0 \pm 0.5^{\circ}\text{C}$ in each of three replicated trials in each cultivar of stone fruit. More than 10,000 individuals were exposed in each replicate trial and no survivors were found.

The trials showed that in all 8 cultivars of Australian cherries, peaches, nectarines and plums. the treatment of $1.0 \pm 0.5^{\circ}\text{C}$ was very effective in controlling all stages of the Mediterranean fruit fly after an exposure period of 16 days. Similarly, the trials demonstrated that the treatment of $3.0 \pm 0.5^{\circ}\text{C}$ was very effective in controlling all stages of the Mediterranean fruit fly after an exposure period of 20 days.

5. FUMIGATION TREATMENTS – MOST TOLERANT STAGE TRIALS

5.1 MOST TOLERANT LIFE STAGE TRIALS OF METHYL BROMIDE FUMIGATION AT 6°C and 11°C.

PLAN OF THE TRIALS

The trials were conducted in the following manner:

1. All fruit was received directly from the farms were held in cold rooms #1 or #2 as described in **Section 2** until required for the trials.
2. A life history study of Medfly (**Section 2**) was conducted before each series of trials for each cultivar to determine the rate of development of immature stages to be tested.
3. From the life history data obtained, the date when eggs had reached $\geq 50\%$ development and when 1st, 2nd and 3rd instars were $\geq 50\%$ in test fruit was recorded. Incubation of all stages was carried out at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh.
4. The most tolerant life stage trials were conducted by infesting sufficient fruit (including controls) to contain more than 200 insects for each dose in each replicate test of each life-stage. The trials required exposure of all stages to 12 dose x time treatments in each series of trials at $6.0 \pm 0.5^\circ\text{C}$, and at $11.0 \pm 0.5^\circ\text{C}$ in specially designed controlled temperature fumigation rooms.
5. The dose mortality data obtained from these trials were subjected to probit analysis to compare LD₅₀ and LD₉₉ values for each life-stage in each cultivar and determine the most tolerant stage.
6. From this analysis, the methyl bromide dosage (g.h.m^{-3}) required at 6°C and 11°C for control of the most tolerant stage was determined for the large-scale trials.
7. It was then possible to determine a combination of doses and exposure periods to be tested on a large scale at each temperature, within dose x time cumulative requirements that best suited industry in practice and minimised bromine residues in fruit.

5.2.1 INFESTATION OF FRUIT FOR THE TRIALS

Fruits were infested with Medfly in the same manner as for the cold treatment trials (**Section 3**). A separate team of staff worked on the fumigation trials which were conducted in parallel with the cold treatment tests. Thus the life history data of Medfly in test fruits was common for both cold treatment and fumigation work since the test fruits were from the same harvested batch.

Number of replicates, treatments and stages:

The total amount of fruit infested for each cultivar and treatment exposure periods for each trial at 6°C and 11°C is given below. There were 12 treatments including untreated controls at each temperature.

CHERRIES

A total of 28.8 kg fruit was infested for each cultivar at each temperature as follows:

Wt. of fruit / replicate = 200g

No. of treatments = 12

No. of life stages = 4

No. of replicates = 3

PEACHES, NECTARINES AND PLUMS

A total of 86.4 kg fruit was infested for each cultivar at each temperature as follows:

Wt. of fruit / replicate = 600g

No. of treatments = 12

No. of life stages = 4

No. of replicates = 3

Calculation of weight (kg) of fruit required to be infested for each trial:

Fruit	Variety	6°C trial (kg)	11°C trial (kg)	Total for both trials (kg)	No. of fruit in 10 kg	No. of fruit in both trials
Cherries	Sweetheart	28.8	28.8	57.6	1,250	7,200
	Lapin	28.8	28.8	57.6	1,250	7,200
Peaches	Snow King	86.4	86.4	172.8	65	1,123
	Zee Lady	86.4	86.4	172.8	65	1,123
Nectarines	Arctic Snow	86.4	86.4	172.8	75	1,296
	August Red	86.4	86.4	172.8	75	1,296
Plums	Angelino	86.4	86.4	172.8	100	1,728
	Tegan Blue	86.4	86.4	172.8	100	1,728
	Total infested fruit all trials	576 kg	576 kg	1,152 kg		22,694

6°C: The experiments consisted of 12 treatments including the untreated control.

11°C: The experiments consisted of 12 treatments including the untreated control.

5.2.2 CONDUCT OF MOST TOLERANT STAGE EXPERIMENTS

Most tolerant stage trials were conducted to determine mortality at $6.0 \pm 0.5^\circ\text{C}$, and at $11.0 \pm 0.5^\circ\text{C}$ in specially designed controlled temperature rooms. Tests were done in individually calibrated glass desiccators (by measuring the volume of water held) of 6.6 – 7.1 L each containing a magnetic stirrer rod in the base; the lid fitted with a self sealing septum. Preliminary fumigations were done at 6 and 11°C to estimate the best dose response range. Subsequently, a range of concentrations usually 11 doses were used for exposure periods ranging from 2 to 4 hours. A minimum of 3 replicate trials to obtain a concentration x time product spanning a mortality range between 10 and >95% was done to obtain a good estimate of LD₅₀ and LD₉₉ by probit regression methods (Finney 1972) with additional doses to achieve 99% mortality and at least two further doses to obtain 100% mortality.

Cherries (200 g), peaches, nectarines, plums (600 g) were selected at random from the infested batch for each replicated treatment and placed 2 polystyrene trays. These trays was then placed in a large labelled plastic box, having a 10 mm layer of sterilised sand to permit emerging larvae to drop into the sand for pupation. The box containing the infested fruit was covered with Terylene voile to allow air exchange and sealed in place with a plastic lid having a large aperture in the centre.

The fruit were held at $26 \pm 1^\circ\text{C}$ for the period of time required for the fruit flies to develop to the stage required for the experiment. Each exposure therefore consisted of 3 replicated boxes (600 g cherries, 1,800 g peaches, nectarines, plums) for each stage. Since four stages were tested at each dose, infested fruit (2,400 g cherries, 7,200 g peaches, nectarines, plums) were exposed to each dose. The total number of treatment doses and fruits exposed are shown above.

Each desiccator was placed on a magnetic stirrer which was run continuously for the duration of each trial. 100% pure methyl bromide (BOC Gases) was injected as liquid through the septum of the desiccator using a gas tight 500 μl syringe into a petri dish placed above infested fruit and allowed to volatilize. Before fumigation, the calculated volume of air to be displaced from the desiccator was removed using a 5ml gas tight syringe. Methyl bromide samples were taken using a 5ml gas tight syringe, 10 minutes after volatilisation was complete and subsequently at 30 minute intervals throughout the length of the specified treatment period and analysed on a Varian 3400 Gas Chromatograph (GC) using a Flame Ionisation Detector (FID) with a Poropak Q packed column (operating temperatures: column 165°C ; injector 150°C ; detector 280°C).

Two controlled temperature fumigation rooms were set at 6°C or 11°C to enable several replicate Methyl Bromide tests to be conducted at either or both temperatures at the same time. These facilities are described in **Section 2**.

After exposure to the specified fumigation treatment, the fruits were removed from the desiccators and placed in the large labelled plastic box and returned to the controlled environment room containing the control fruits for collection of surviving stages as pupae (**Appendix 4**). The number of pupae emerging at each dose was compared with the number from the untreated controls to obtain the percentage responding to the treatment. The criterion for survival was the formation of an apparently normal puparium.

Record of temperatures during the trials

Temperatures were recorded on a “Squirrel” (Grant Instruments, Cambridge, England) data logger with an accuracy of $\pm 0.01^\circ\text{C}$. Six thermistor probes were used, 3 to record air temperatures and 3 to record fruit temperatures. Temperature recordings were automatically logged at 10-minute intervals throughout the trial.

5.2.3 STATISTICAL ANALYSIS

The data obtained from a series of exposure dose x periods concentration x time product (g.h.m^{-3}) at 6°C and 11°C of the four stages: eggs, 1st, 2nd and 3rd instar were subjected to probit analysis (Finney 1971). The data were analysed using the GenStat package (GenStat 2008). The probit model uses a generalised linear procedure, assuming a binomial distribution for the number of responses and a probit link function between the number of responses and the logarithm (\log_{10}) of the dose. Tests on data using the logit link function and the complementary log-log function did not significantly reduce the residual deviance and the probit link function was retained in analysis. Comparative analysis using the concentration x time sum (Maindonald et al. 2001) using the logit or the complementary log-log transformations did not give a better estimate. Therefore a logistic curve was fitted using probit transformation to give the best fit to converge and obtain the variance-covariance matrix for the analysis of variance table. The Fieller procedure was used to calculate the fitting process for the estimates at LD_{50} and LD_{99} and of the lower and upper fiducial limits.

5.3 RESULTS OF MOST TOLERANT LIFE STAGE METHYL BROMIDE TREATMENT TRIALS OF MEDFLY AT 6°C.

The fumigation trials at were conducted from November 2006 to July 2008 over the same period of the cold treatment trials reported in **Section 3**.

Life history data: The data used for test fruits is the same as for the 1°C trials since the same batch of harvested fruit was used for fumigation trials which were run in parallel.

Data for each cultivar: cold treatment temperatures and insect mortality of the four life stages of Medfly replicated 3 times are given under the respective fruit varieties treated.

5.3.1 Cherries - Sweetheart

Data in tables 5.1 – 5.3 show that complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.1: Mortality Tests of the Most Tolerant Stage of Medfly in infested Sweetheart cherries at 6.0 ± 0.5 °C (Replicate 1). 200g fruit/test. Date of experimental series: 04-12-2006 - 31-1-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			236	240	255	231				
20	2	40	208	191	214	199	12.0	20.4	16.1	14.0
24	2	48	183	155	173	158	22.3	35.4	32.1	31.7
28	2	56	142	117	127	118	39.6	51.2	50.3	48.8
36	2	72	98	65	65	76	58.6	73.1	74.5	67.2
44	2	88	72	35	36	47	69.6	85.3	86.0	79.7
52	2	104	34	3	2	13	85.8	98.5	99.1	94.4
40	3	120	5	0	0	0	98.1	100.0	100.0	100.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.2: Mortality Tests of the Most Tolerant Stage of Medfly in infested Sweetheart cherries at 6.0 ± 0.5 °C (Replicate 2). 200g fruit / test. Date of experimental series: 04-12-2006 - 31-1-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			264	258	280	274				
20	2	40	237	213	229	238	10.3	17.3	18.3	13.3
24	2	48	209	158	169	199	20.7	38.7	39.6	27.3
28	2	56	181	118	126	168	31.4	54.4	55.2	38.8
36	2	72	151	83	104	140	42.8	67.7	62.7	48.8
44	2	88	111	55	64	95	57.8	78.8	77.0	65.3
52	2	104	31	25	35	62	88.3	90.3	87.6	77.3
40	3	120	8	0	0	0	97.0	100.0	100.0	100.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.3: Mortality Tests of the Most Tolerant Stage of Medfly in infested Sweetheart cherries at 6.0 ± 0.5 °C (Replicate 3). 200g fruit / test. Date of experimental series: 04-12-2006 - 31-1-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			314	298	320	326				
20	2	40	286	255	273	285	9.1	14.5	14.6	12.5
24	2	48	249	206	215	243	20.6	30.7	32.8	25.5
28	2	56	209	149	134	165	33.4	50.0	58.1	49.2
36	2	72	175	104	97	125	44.2	65.2	69.7	61.7
44	2	88	76	63	54	50	75.8	78.8	83.1	84.7
52	2	104	35	5	4	6	88.9	98.2	98.6	98.2
40	3	120	4	0	0	0	98.7	100.0	100.0	100.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.2 Cherries - Lapin

Data in tables 5.3.4 – 5.3.6 show that complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.4: Mortality Tests of the Most Tolerant Stage of Medfly in infested Lapin cherries at 6.0 ± 0.5 °C (Replicate 1). 200g fruit / test.
Date of experimental series: 04-02-2008 - 04-04-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			397	402	385	392				
20	2	40	357	322	298	336	10.1	19.9	22.6	14.4
24	2	48	304	252	263	274	23.4	37.3	31.7	30.2
28	2	56	256	222	207	228	35.4	44.7	46.2	41.8
36	2	72	220	144	132	184	44.5	64.1	65.7	53.2
44	2	88	142	90	89	125	64.2	77.6	76.9	68.1
52	2	104	99	32	27	59	75.1	92.1	93.0	85.0
40	3	120	25	1	3	5	93.7	99.7	99.2	98.7
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.5: Mortality Tests of the Most Tolerant Stage of Medfly in infested Lapin cherries at 6.0 ± 0.5 °C (Replicate 2). 200g fruit / test..
Date of experimental series: 04-02-2008 - 04-04-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			425	408	429	411				
20	2	40	397	370	383	371	6.5	9.4	10.7	9.7
24	2	48	370	304	325	332	12.9	25.5	24.3	19.2
28	2	56	344	240	256	267	19.1	41.3	40.3	34.9
36	2	72	300	145	164	221	29.4	64.6	61.8	46.2
44	2	88	241	99	105	165	43.2	75.7	75.4	59.8
52	2	104	160	39	57	81	62.2	90.5	86.8	80.4
40	3	120	41	0	0	1	90.4	100.0	100.0	99.7
32	4	128	1	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.6: Mortality Tests of the Most Tolerant Stage of Medfly in infested Lapin cherries at 6.0 ± 0.5 °C (Replicate 3). 200g fruit / test...
Date of experimental series: 04-02-2008 - 04-04-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			364	388	352	370				
20	2	40	332	337	310	328	8.9	13.1	11.8	11.5
24	2	48	315	268	247	287	13.6	30.9	29.9	22.5
28	2	56	264	199	180	208	27.6	48.7	48.9	43.7
36	2	72	225	135	111	156	38.2	65.3	68.4	57.8
44	2	88	162	87	73	113	55.6	77.7	79.4	69.5
52	2	104	112	20	17	59	69.3	94.9	95.1	83.9
40	3	120	39	0	0	1	89.3	100.0	100.0	99.9
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.3 Peaches – Snow King

Data in tables 5.3.7 – 5.3.9 show that complete mortality was achieved in 1st, 2nd and 3rd instars at 104 g.h.m⁻³ while eggs required 128 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.7: Mortality Tests of the Most Tolerant Stage of Medfly in infested Snow King Peaches at 6.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 06-02—2007 - 04-04-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			432	440	435	429				
20	2	40	399	348	343	365	7.7	20.9	21.2	15.0
24	2	48	357	259	261	330	17.4	41.2	40.1	23.0
28	2	56	310	208	209	278	28.2	52.8	52.0	35.2
36	2	72	251	156	166	205	41.8	64.5	61.8	52.2
44	2	88	201	84	75	138	53.4	81.0	82.8	67.9
52	2	104	138	14	10	62	68.1	96.9	97.6	85.6
40	3	120	44	0	0	1	89.8	100.0	100.0	99.9
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.8: Mortality Tests of the Most Tolerant Stage of Medfly in infested Snow King Peaches at 6.0 ± 0.5 °C (Replicate 2). 600g fruit / test..
Date of experimental series: 06-02—2007 - 04-04-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			511	502	502	506				
20	2	40	466	418	421	430	8.8	16.7	16.1	14.9
24	2	48	423	295	314	364	17.1	41.3	37.5	28.0
28	2	56	342	215	223	283	33.1	57.2	55.5	44.2
36	2	72	259	135	106	201	49.4	73.2	78.8	60.3
44	2	88	193	61	39	108	62.3	87.9	92.1	78.8
52	2	104	111	2	3	20	78.2	99.6	99.5	96.0
40	3	120	41	0	0	1	92.1	100.0	100.0	99.9
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.9: Mortality Tests of the Most Tolerant Stage of Medfly in infested Snow King Peaches at 6.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 06-02—2007 - 04-04-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			517	510	521	528				
20	2	40	491	431	433	454	5.1	15.4	16.8	14.1
24	2	48	454	320	330	366	12.3	37.3	36.7	30.6
28	2	56	398	226	230	262	23.0	55.7	55.9	50.4
36	2	72	300	168	169	200	42.0	67.0	67.5	62.1
44	2	88	220	62	74	127	57.4	87.8	85.8	75.9
52	2	104	148	5	4	67	71.3	99.0	99.2	87.3
40	3	120	47	0	0	1	90.9	100.0	100.0	99.9
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.4 Peaches – Zee Lady

Data in tables 5.3.10 – 5.3.12 show complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.10: Mortality Tests of the Most Tolerant Stage of Medfly in infested Zee Lady Peaches at 6.0 ± 0.5 °C (Replicate 1).). 600g fruit / test..
Date of experimental series: 03-12—2007 - 31-01-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			416	422	425	407				
20	2	40	386	352	350	362	7.2	16.7	17.6	11.1
24	2	48	347	287	274	310	16.6	32.0	35.6	23.9
28	2	56	303	228	225	245	27.1	46.0	47.1	39.7
36	2	72	255	174	179	202	38.8	58.8	57.8	50.3
44	2	88	208	114	126	149	49.9	73.0	70.4	63.3
52	2	104	136	2	3	68	67.2	99.5	99.3	83.4
40	3	120	46	0	0	8	89.0	100.0	100.0	98.1
32	4	128	1	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.11: Mortality Tests of the Most Tolerant Stage of Medfly in infested Zee Lady Peaches at 6.0 ± 0.5 °C (Replicate 2).). 600g fruit / test..
Date of experimental series: 03-12—2007 - 31-01-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			375	352	378	392				
20	2	40	343	294	318	343	8.5	16.4	15.9	12.5
24	2	48	313	236	264	296	16.5	32.9	30.2	24.4
28	2	56	254	182	211	240	32.2	48.2	44.1	38.8
36	2	72	208	146	164	199	44.6	58.6	56.7	49.4
44	2	88	161	97	112	135	57.1	72.4	70.5	65.6
52	2	104	90	33	31	60	76.0	90.7	91.7	84.8
40	3	120	32	3	1	4	91.5	99.0	99.8	99.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.12: Mortality Tests of the Most Tolerant Stage of Medfly in infested Zee Lady Peaches at 6.0 ± 0.5 °C (Replicate 3).). 600g fruit / test..
Date of experimental series: 03-12—2007 - 31-01-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			477	468	450	462				
20	2	40	439	398	387	401	8.0	15.0	14.0	13.2
24	2	48	390	319	312	344	18.3	31.9	30.7	25.4
28	2	56	330	250	249	280	30.8	46.6	44.6	39.4
36	2	72	263	195	189	224	44.8	58.3	57.9	51.5
44	2	88	202	129	123	157	57.6	72.5	72.6	65.9
52	2	104	139	41	34	54	70.9	91.2	92.3	88.4
40	3	120	45	3	5	10	90.6	99.4	99.0	97.8
32	4	128	1	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.5 Nectarines – Arctic Snow

Data in tables 5.3.13 – 5.3.15 show complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.13: Mortality Tests of the Most Tolerant Stage of Medfly in infested Arctic Snow Nectarines at 6.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 30-03-2007 - 30-05-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			540	551	553	582				
20	2	40	493	415	435	510	8.6	24.7	21.4	12.4
24	2	48	455	296	290	404	15.7	46.3	47.5	30.6
28	2	56	344	198	222	298	36.4	64.1	59.8	48.8
36	2	72	230	119	143	191	57.3	78.4	74.1	67.2
44	2	88	179	23	15	51	66.9	95.7	97.3	91.3
52	2	104	113	0	0	1	79.1	100.0	100.0	99.8
40	3	120	28	0	0	0	94.9	100.0	100.0	100.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.14: Mortality Tests of the Most Tolerant Stage of Medfly in infested Arctic Snow Nectarines at 6.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 30-03-2007 - 30-05-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			624	603	614	630				
20	2	40	545	474	488	516	12.7	21.4	20.5	18.1
24	2	48	467	345	345	406	25.2	42.8	43.8	35.5
28	2	56	365	263	285	337	41.4	56.3	53.6	46.6
36	2	72	267	133	130	201	57.2	77.9	78.8	68.1
44	2	88	198	68	86	157	68.2	88.7	86.0	75.0
52	2	104	124	7	27	64	80.1	98.8	95.6	89.8
40	3	120	39	0	0	1	93.8	100.0	100.0	99.8
32	4	128	1	0	0	0	99.8	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.15: Mortality Tests of the Most Tolerant Stage of Medfly in infested Arctic Snow Nectarines at 6.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 30-03-2007 - 30-05-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			578	612	595	622				
20	2	40	517	459	448	476	10.6	25.1	24.7	23.5
24	2	48	446	343	321	372	22.8	43.9	46.1	40.1
28	2	56	351	263	272	328	39.3	57.0	54.2	47.3
36	2	72	276	176	162	224	52.3	71.3	72.8	63.9
44	2	88	179	103	101	161	69.1	83.2	83.0	74.2
52	2	104	108	5	6	11	81.3	99.2	99.0	98.2
40	3	120	32	0	0	0	94.4	100.0	100.0	100.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.6 Nectarines – August Red

Data in tables 5.3.16 – 5.3.18 show complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.16: Mortality Tests of the Most Tolerant Stage of Medfly in infested August Red Nectarines at 6.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 27-05-2008 - 08-08-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			560	569	554	548				
20	2	40	521	486	453	491	7.0	14.5	18.3	10.3
24	2	48	476	419	395	439	15.0	26.4	28.6	20.0
28	2	56	404	285	276	325	27.8	49.9	50.1	40.7
36	2	72	329	203	222	259	41.2	64.3	60.0	52.7
44	2	88	263	113	89	142	53.0	80.2	83.9	74.2
52	2	104	189	1	2	57	66.2	99.9	99.7	89.6
40	3	120	54	0	0	1	90.4	100.0	100.0	99.8
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.17: Mortality Tests of the Most Tolerant Stage of Medfly in infested August Red Nectarines at 6.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 27-05-2008 - 08-08-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			575	568	590	602				
20	2	40	551	488	507	535	4.2	14.1	14.1	11.1
24	2	48	481	407	443	459	16.3	28.3	24.9	23.7
28	2	56	386	301	329	336	32.8	47.1	44.2	44.3
36	2	72	291	169	193	209	49.3	70.2	67.3	65.3
44	2	88	219	34	42	66	62.0	94.0	93.0	89.1
52	2	104	129	0	0	6	77.6	100.0	100.0	99.1
40	3	120	45	0	0	0	92.1	100.0	100.0	100.0
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.18: Mortality Tests of the Most Tolerant Stage of Medfly in infested August Red Nectarines at 6.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 27-05-2008 - 08-08-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			597	582	538	546				
20	2	40	540	439	410	480	9.6	24.6	23.9	12.1
24	2	48	490	374	335	404	17.9	35.8	37.7	26.0
28	2	56	398	261	247	312	33.4	55.2	54.1	42.9
36	2	72	320	144	140	245	46.3	75.2	73.9	55.1
44	2	88	255	65	73	136	57.3	88.9	86.5	75.0
52	2	104	144	7	1	47	75.8	98.7	99.8	91.4
40	3	120	73	0	0	0	87.8	100.0	100.0	99.9
32	4	128	2	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.7 Plums – Angelino

The data in tables 5.3.19 – 5.3.21 show that complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.19: Mortality Tests of the Most Tolerant Stage of Medfly in infested Angelino Plums at 6.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 22-05-2007 - 29-07-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			436	429	415	398				
20	2	40	388	347	329	340	11.1	19.2	20.7	14.5
24	2	48	332	268	272	280	23.8	37.5	34.5	29.6
28	2	56	280	214	219	228	35.7	50.2	47.3	42.7
36	2	72	232	119	111	164	46.9	72.3	73.3	58.9
44	2	88	135	56	41	98	69.0	86.9	90.1	75.5
52	2	104	89	5	1	25	79.7	98.8	99.7	93.7
40	3	120	48	0	0	2	89.1	100.0	100.0	99.4
32	4	128	2	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.20: Mortality Tests of the Most Tolerant Stage of Medfly in infested Angelino Plums at 6.0 ± 0.5 °C (Replicate 2) 600g fruit / test.
Date of experimental series: 22-05-2007 - 29-07-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			471	492	503	448				
20	2	40	412	386	407	373	12.6	21.5	19.1	16.8
24	2	48	337	289	305	292	28.5	41.2	39.3	34.9
28	2	56	278	203	226	220	40.9	58.8	55.1	50.9
36	2	72	209	121	131	152	55.7	75.4	73.9	66.0
44	2	88	137	60	54	101	70.8	87.9	89.3	77.5
52	2	104	76	10	4	33	83.9	98.0	99.3	92.7
40	3	120	24	0	0	0	94.8	100.0	100.0	99.9
32	4	128	0	0	0	0	100.0	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.21: Mortality Tests of the Most Tolerant Stage of Medfly in infested Angelino Plums at 6.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 22-05-2007 - 29-07-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			539	518	524	520				
20	2	40	483	425	447	450	10.3	17.9	14.6	13.5
24	2	48	436	326	345	368	19.1	37.2	34.2	29.3
28	2	56	389	252	269	307	27.7	51.3	48.7	40.9
36	2	72	308	173	190	220	42.9	66.6	63.8	57.7
44	2	88	225	98	91	123	58.2	81.1	82.6	76.3
52	2	104	144	4	5	53	73.4	99.2	99.1	89.9
40	3	120	44	0	0	0	91.8	100.0	100.0	99.9
32	4	128	2	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

5.3.8 Plums – Tegan Blue

The data in tables 5.3.22 – 5.3.24 show that complete mortality was achieved in 1st, 2nd and 3rd instars at 120 g.h.m⁻³ while eggs required 144 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.22: Mortality Tests of the Most Tolerant Stage of Medfly in infested Tegan Blue Plums at 6.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 28-03-2008 - 25-05-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			312	300	286	297				
20	2	40	291	253	229	268	6.8	15.6	19.9	9.7
24	2	48	264	204	202	232	15.3	32.1	29.2	21.8
28	2	56	230	172	149	193	26.4	42.7	47.8	35.1
36	2	72	194	137	124	172	38.0	54.2	56.8	42.0
44	2	88	155	99	90	125	50.2	67.1	68.5	57.9
52	2	104	116	66	59	83	62.8	77.9	79.5	72.2
40	3	120	51	2	0	1	83.6	99.4	99.9	99.6
32	4	128	3	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.23: Mortality Tests of the Most Tolerant Stage of Medfly in infested Tegan Blue Plums at 6.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 28-03-2008 - 25-05-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			445	462	489	418				
20	2	40	408	402	417	369	8.4	13.0	14.6	11.7
24	2	48	369	290	308	308	17.0	37.3	37.1	26.4
28	2	56	302	235	253	242	32.2	49.0	48.3	42.1
36	2	72	230	143	164	187	48.4	69.1	66.5	55.3
44	2	88	170	52	46	90	61.7	88.6	90.5	78.5
52	2	104	54	1	5	23	87.9	99.8	99.0	94.4
40	3	120	34	0	0	1	92.4	100.0	100.0	99.8
32	4	128	1	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.24: Mortality Tests of the Most Tolerant Stage of Medfly in infested Tegan Blue Plums at 6.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 28-03-2008 - 25-05-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			338	395	404	422				
20	2	40	302	359	347	353	10.6	9.1	14.0	16.4
24	2	48	261	314	281	268	22.9	20.4	30.5	36.5
28	2	56	219	270	205	189	35.3	31.5	49.4	55.2
36	2	72	189	208	144	104	44.0	47.4	64.3	75.3
44	2	88	135	155	83	67	60.0	60.7	79.4	84.1
52	2	104	98	75	3	5	70.9	81.0	99.3	98.8
40	3	120	43	4	0	0	87.3	99.0	100.0	100.0
32	4	128	2	0	0	0	99.9	100.0	100.0	100.0
48	3	144	0	0	0	0	100.0	100.0	100.0	100.0
52	3	156	0	0	0	0	100.0	100.0	100.0	100.0
48	4	192	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.25: Comparison of the concentration x time product (g.h.m^{-3}) of methyl bromide at 6°C required to kill 50% (LD_{50}) and 99% (LD_{99}) of the four immature life stages of Mediterranean fruit fly (Medfly), *Ceratitis capitata* Wiedemann, in 8 stone fruit cultivars. The analysis is based on three replicate trials for each life stage.

Stone fruit Cultivar and Life stage treated	g.h.m ⁻³	95% Fiducial Limits		g.h.m ⁻³	95% Fiducial Limits	
	LD_{50}	<u>Lower</u>	<u>Upper</u>	LD_{99}	<u>Lower</u>	<u>Upper</u>
<i>Cherries - Sweetheart</i>						
<i>Eggs</i>	73.0	71.4	74.5	151.4	148.1	155.0
<i>1st instar larvae</i>	61.8	60.5	63.1	128.3	125.4	131.4
<i>2nd instar larvae</i>	61.4	60.1	62.6	127.3	124.5	130.3
<i>3rd instar larvae</i>	66.7	65.3	68.1	138.5	135.5	141.8
<i>Cherries- Lapin</i>						
<i>Eggs</i>	85.0	83.7	86.3	169.2	166.1	172.5
<i>1st instar larvae</i>	66.6	65.6	67.6	132.5	130.1	135.1
<i>2nd instar larvae</i>	67.0	65.9	68.0	133.3	130.9	135.9
<i>3rd instar larvae</i>	74.0	72.9	75.2	147.3	144.7	150.2
<i>Peaches - Snow King</i>						
<i>Eggs</i>	80.7	79.5	81.9	166.5	163.8	169.4
<i>1st instar larvae</i>	59.3	58.4	60.2	122.3	120.3	124.5
<i>2nd instar larvae</i>	59.1	58.2	59.9	121.9	119.8	124.1
<i>3rd instar larvae</i>	67.4	66.4	68.4	139.0	136.7	141.5
<i>Peaches - Zee Lady</i>						
<i>Eggs</i>	84.9	83.7	86.2	165.8	162.9	169.0
<i>1st instar larvae</i>	69.0	68.0	70.0	134.7	132.3	137.3
<i>2nd instar larvae</i>	69.5	68.5	70.5	135.7	133.3	138.3
<i>3rd instar larvae</i>	75.6	74.5	76.7	147.6	145.0	150.4
<i>Nectarines - Arctic Snow</i>						
<i>Eggs</i>	73.7	72.5	74.9	156.4	154.0	158.9
<i>1st instar larvae</i>	56.2	55.4	57.1	119.3	117.4	121.3
<i>2nd instar larvae</i>	57.0	56.1	57.9	120.9	119.0	123.0
<i>3rd instar larvae</i>	62.8	61.9	63.8	133.3	131.2	135.5
<i>Nectarines - August Red</i>						
<i>Eggs</i>	82.2	81.2	83.2	158.3	156.0	160.6
<i>1st instar larvae</i>	61.3	60.6	62.1	118.1	116.3	119.9
<i>2nd instar larvae</i>	61.8	61.0	62.6	119.0	117.2	120.9
<i>3rd instar larvae</i>	68.1	67.2	68.9	131.1	129.1	133.1
<i>Plums - Angelino</i>						
<i>Eggs</i>	78.9	77.7	80.1	156.8	154.2	159.5
<i>1st instar larvae</i>	61.1	60.2	62.0	121.4	119.3	123.6
<i>2nd instar larvae</i>	61.6	60.6	62.5	122.3	120.1	124.5
<i>3rd instar larvae</i>	68.2	67.2	69.3	135.5	133.2	137.9
<i>Plums – Tegan Blue</i>						
<i>Eggs</i>	81.1	79.7	82.4	167.2	164.1	170.6
<i>1st instar larvae</i>	69.1	67.9	70.2	142.5	139.8	145.4
<i>2nd instar larvae</i>	64.0	63.0	65.1	132.1	129.6	134.8
<i>3rd instar larvae</i>	67.6	66.5	68.7	139.5	136.8	142.3

5.3.9 ANALYSIS OF THE DATA FOR METHYL BROMIDE FUMIGATION AT 6°C.

The results of exposure to a graded series of doses from 20 – 52 g/m³ for exposure periods ranging from 2-4 hours giving concentration x time product of 40 – 192 g.h.m⁻³ and insect mortality of the four life stages of Medfly replicated 3 times is given under the respective fruit varieties treated. Data for 8 cultivars treated at 6°C show that complete mortality was achieved at 156 g.h.m⁻³ in all stages.

The above bio-assay data were subjected to probit regression analysis (Finney, 1972) and analysed using the Genstat Program (Anon 2008) to obtain the LD₅₀ and LD₉₉ values together with their 95% Fiducial Limits. These are given in **Table 5.25**.

The results show that the egg stage is the most tolerant life stage at the LD₅₀ and at the LD₉₉ estimates for all varieties. The highest upper fiducial limit is 172.5 g.h.m⁻³ in Lapin cherries. It was decided that the large-scale trials should be done on the egg stage at ≥ 180 g.h.m⁻³. Therefore trials were conducted by exposing >10,000 individuals to methyl bromide dose x time periods in three replicates (>30,000) in all 8 summer fruit cultivars (2 varieties each of cherries, peaches, nectarines and plums). The results of these large-scale trials are given in **Section 6**.

5.4 RESULTS OF MOST TOLERANT LIFE STAGE METHYL BROMIDE TREATMENT TRIALS OF MEDFLY AT 11°C.

The fumigation trials at were conducted from November 2006 to July 2008 over the same period of the cold treatment trials reported in **Section 3**.

Life history data: The data used for test fruits is the same as for the 1°C trials since the same batch of harvested fruit was used for fumigation trials which were run in parallel.

Data for each cultivar: cold treatment temperatures and insect mortality of the four life stages of Medfly replicated 3 times are given under the respective fruit varieties treated.

5.4.1 Cherries - Sweetheart

Data in tables 5.26 – 5.28 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.26: Mortality Tests of the Most Tolerant Stage of Medfly in infested Sweetheart cherries at 11.0 ± 0.5 °C (Replicate 1). 200g fruit / test.
Date of experimental series: 04-12-2006 - 31-01-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			342	335	381	342				
12	2	24	269	180	198	201	21.3	46.3	48.0	41.2
16	2	32	229	175	184	200	33.0	47.8	51.7	41.5
20	2	40	165	112	125	132	51.8	66.6	67.2	61.4
24	2	48	112	45	45	77	67.3	86.7	88.2	77.5
28	2	56	52	15	16	27	84.8	95.4	95.9	92.2
32	2	64	14	3	2	9	96.0	99.0	99.4	97.4
40	2	80	5	0	0	0	98.7	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.27: Mortality Tests of the Most Tolerant Stage of Medfly in infested Sweetheart cherries at 11.0 ± 0.5 °C (Replicate 2). 200g fruit / test.
Date of experimental series: 04-12-2006 - 31-01-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			354	334	345	347				
12	2	24	288	193	209	229	18.6	42.1	39.5	34.0
16	2	32	243	175	198	212	31.4	47.6	42.6	38.9
20	2	40	187	113	127	154	47.2	66.2	63.2	55.6
24	2	48	131	63	84	120	63.0	81.1	75.6	65.3
28	2	56	68	35	44	56	80.8	89.6	87.1	83.9
32	2	64	20	2	3	8	94.4	99.4	99.1	97.7
40	2	80	0	0	0	0	100.0	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.28: Mortality Tests of the Most Tolerant Stage of Medfly in infested Sweetheart cherries at 11.0 ± 0.5 °C (Replicate 3). 200g fruit / test.
Date of experimental series: 04-12-2006 - 31-01-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			321	342	347	348				
12	2	24	287	235	253	266	10.6	31.4	27.0	23.6
16	2	32	229	186	195	223	28.5	45.5	43.8	36.0
20	2	40	189	129	114	145	41.1	62.3	67.2	58.2
24	2	48	155	84	77	105	51.7	75.5	77.9	69.9
28	2	56	73	38	24	31	77.3	88.9	93.1	91.1
32	2	64	23	5	4	9	92.8	98.4	98.7	97.4
40	2	80	0	0	0	0	100.0	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.2 Cherries - Lapin

Data in tables 5.29 – 5.31 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.29: Mortality Tests of the Most Tolerant Stage of Medfly in infested Lapin cherries at 11.0 ± 0.5 °C (Replicate 1). 200g fruit / test.
Date of experimental series: 04-02-2008 - 04-04-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			431	412	429	436				
12	2	24	337	202	178	280	21.8	51.0	58.5	35.8
16	2	32	284	132	143	224	34.1	68.0	66.7	48.6
20	2	40	186	102	87	208	56.8	75.2	79.7	52.3
24	2	48	120	43	12	64	72.2	89.6	97.2	85.3
28	2	56	93	20	4	45	78.4	95.1	99.1	89.7
32	2	64	99	9	0	20	77.1	97.8	100.0	95.4
40	2	80	4	0	0	0	99.1	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.30: Mortality Tests of the Most Tolerant Stage of Medfly in infested Lapin cherries at 11.0 ± 0.5 °C (Replicate 2). 200g fruit / test.
Date of experimental series: 04-02-2008 - 04-04-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			431	424	432	425				
12	2	24	377	250	363	321	12.5	41.0	16.0	24.5
16	2	32	250	184	205	227	42.0	56.6	52.5	46.6
20	2	40	200	110	96	180	53.6	74.1	77.8	57.6
24	2	48	140	55	42	109	67.5	87.0	90.3	74.4
28	2	56	110	36	30	87	74.5	91.5	93.1	79.5
32	2	64	44	4	5	11	89.8	99.1	98.8	97.4
40	2	80	9	0	0	0	97.9	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.31: Mortality Tests of the Most Tolerant Stage of Medfly in infested Lapin cherries at 11.0 ± 0.5 °C (Replicate 3). 200g fruit / test.
Date of experimental series: 04-02-2008 - 04-04-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			418	422	410	426				
12	2	24	300	217	190	288	28.2	48.6	53.7	32.4
16	2	32	245	188	170	203	41.4	55.5	58.5	52.3
20	2	40	199	107	105	144	52.4	74.6	74.4	66.2
24	2	48	157	55	41	98	62.4	87.0	90.0	77.0
28	2	56	82	24	23	33	80.4	94.3	94.4	92.3
32	2	64	39	5	6	12	90.7	98.8	98.5	97.2
40	2	80	8	0	0	0	98.1	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.3 Peaches – Snow King

Data in tables 5.32 – 5.34 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.32: Mortality Tests of the Most Tolerant Stage of Medfly in infested Snow King Peaches at 11.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 06-02-2007 - 04-04-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			432	428	442	431				
12	2	24	351	228	232	335	18.8	46.7	47.5	22.3
16	2	32	298	139	141	271	31.0	67.5	68.1	37.1
20	2	40	230	99	89	210	46.8	76.9	79.9	51.3
24	2	48	189	47	46	124	56.3	89.0	89.6	71.2
28	2	56	142	34	35	98	67.1	92.1	92.1	77.3
32	2	64	63	8	10	24	85.4	98.1	97.6	94.4
40	2	80	11	0	0	0	97.5	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.33: Mortality Tests of the Most Tolerant Stage of Medfly in infested Snow King Peaches at 11.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 06-02-2007 - 04-04-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			465	472	481	496				
12	2	24	403	249	204	399	13.3	47.2	57.6	19.6
16	2	32	348	175	149	235	25.2	62.9	69.0	52.6
20	2	40	245	96	103	187	47.3	79.7	78.6	62.3
24	2	48	136	36	34	96	70.8	92.4	92.9	80.6
28	2	56	99	12	9	44	78.7	97.5	98.1	91.1
32	2	64	24	0	0	8	94.8	100.0	100.0	98.4
40	2	80	2	0	0	0	99.6	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.34: Mortality Tests of the Most Tolerant Stage of Medfly in infested Snow King Peaches at 11.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 06-02-2007 - 04-04-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			523	514	537	532				
12	2	24	471	332	332	392	10.0	35.4	38.2	26.3
16	2	32	400	200	210	286	23.5	61.1	60.9	46.2
20	2	40	320	106	110	200	38.8	79.4	79.5	62.4
24	2	48	217	48	49	120	58.5	90.7	90.9	77.4
28	2	56	100	4	5	17	80.9	99.2	99.1	96.8
32	2	64	24	0	0	7	95.4	100.0	100.0	98.7
40	2	80	4	0	0	0	99.2	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.4 Peaches – Zee Lady

Data in tables 5.35 – 5.37 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.35: Mortality Tests of the Most Tolerant Stage of Medfly in infested Zee Lady Peaches at 11.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 03-12-2007 - 31-01-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			435	448	452	454				
12	2	24	366	293	285	300	15.9	34.6	36.9	33.9
16	2	32	298	217	209	265	31.5	51.6	53.8	41.6
20	2	40	201	128	132	185	53.8	71.4	70.8	59.3
24	2	48	130	45	49	99	70.1	90.0	89.2	78.2
28	2	56	98	11	6	56	77.5	97.5	98.7	87.7
32	2	64	46	2	0	12	89.4	99.6	100.0	97.4
40	2	80	9	0	0	0	97.9	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.36: Mortality Tests of the Most Tolerant Stage of Medfly in infested Zee Lady Peaches at 11.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 03-12-2007 - 31-01-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			455	462	459	473				
12	2	24	323	265	249	290	29.0	42.6	45.8	38.7
16	2	32	270	196	187	224	40.7	57.6	59.3	52.6
20	2	40	201	113	118	140	55.8	75.5	74.3	70.4
24	2	48	150	40	44	73	67.0	91.3	90.4	84.6
32	2	64	72	17	22	31	84.2	96.3	95.2	93.4
40	2	80	31	2	1	13	93.2	99.6	99.8	97.3
48	2	96	4	0	0	0	99.1	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.37: Mortality Tests of the Most Tolerant Stage of Medfly in infested Zee Lady Peaches at 11.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 03-12-2007 - 31-01-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			513	498	500	512				
12	2	24	423	277	267	360	17.5	44.4	46.6	29.7
16	2	32	320	219	224	247	37.6	56.0	55.2	51.8
20	2	40	245	136	140	185	52.2	72.7	72.0	63.9
24	2	48	160	35	35	106	68.8	93.0	93.0	79.3
28	2	56	81	11	13	37	84.2	97.8	97.4	92.8
32	2	64	31	0	2	14	94.0	100.0	99.6	97.3
40	2	80	6	0	0	1	98.8	100.0	100.0	99.8
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.5 Nectarines – Arctic Snow

Data in tables 5.38 – 5.40 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.38: Mortality Tests of the Most Tolerant Stage of Medfly in infested Arctic Snow Nectarines at 11.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 30-03-2007 - 30-05-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			538	534	549	543				
12	2	24	473	295	315	390	12.0	44.8	42.6	28.2
16	2	32	235	176	170	184	56.3	67.0	69.0	66.1
20	2	40	224	109	103	128	58.4	79.6	81.2	76.4
24	2	48	110	45	23	62	79.6	91.6	95.8	88.6
28	2	56	59	3	2	22	89.0	99.4	99.6	95.9
32	2	64	13	0	0	1	97.6	100.0	100.0	99.8
40	2	80	4	0	0	0	99.3	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.39: Mortality Tests of the Most Tolerant Stage of Medfly in infested Arctic Snow Nectarines at 11.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 30-03-2007 - 30-05-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			634	623	624	628				
12	2	24	525	454	468	496	17.3	27.2	25.0	21.0
16	2	32	347	225	225	286	45.3	63.9	63.9	54.5
20	2	40	245	143	145	217	61.4	77.0	76.8	65.4
24	2	48	147	20	21	81	76.8	96.8	96.6	87.1
28	2	56	78	8	6	37	87.7	98.7	99.0	94.1
32	2	64	24	2	3	6	96.2	99.7	99.5	99.0
40	2	80	5	0	0	0	99.2	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.40: Mortality Tests of the Most Tolerant Stage of Medfly in infested Arctic Snow Nectarines at 11.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 30-03-2007 - 30-05-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			598	600	603	587				
12	2	24	497	439	428	356	16.9	26.9	29.0	39.4
16	2	32	326	223	229	252	45.5	62.8	62.0	57.1
20	2	40	231	143	145	156	61.4	76.2	76.0	73.4
24	2	48	156	56	42	104	73.9	90.7	93.0	82.3
28	2	56	59	22	20	21	90.1	96.3	96.7	96.4
32	2	64	11	5	6	8	98.2	99.2	99.0	98.6
40	2	80	2	0	0	0	99.7	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.6 Nectarines – August Red

The data in tables 5.41 – 5.43 show that complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.41: Mortality Tests of the Most Tolerant Stage of Medfly in infested August Red Nectarines at 11.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 27-05-2008 - 08-08-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			559	658	562	556				
12	2	24	501	366	333	421	10.4	44.4	40.7	24.3
16	2	32	476	229	245	319	14.8	65.2	56.4	42.6
20	2	40	324	165	156	205	42.0	74.9	72.2	63.1
24	2	48	209	83	72	139	62.6	87.4	87.2	75.0
28	2	56	143	13	14	67	74.4	98.0	97.5	87.9
32	2	64	89	1	2	27	84.1	99.9	99.7	95.1
40	2	80	14	0	0	2	97.5	100.0	100.0	99.6
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.42: Mortality Tests of the Most Tolerant Stage of Medfly in infested August Red Nectarines at 11.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 27-05-2008 - 08-08-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			576	578	602	588				
12	2	24	531	368	387	415	7.6	36.3	35.7	29.4
16	2	32	420	200	221	339	27.0	65.4	63.3	42.3
20	2	40	266	97	99	216	53.7	83.2	83.6	63.3
24	2	48	172	49	53	100	70.1	91.5	91.2	83.0
28	2	56	99	14	22	46	82.8	97.5	96.4	92.3
32	2	64	29	1	2	6	95.0	99.8	99.7	99.0
40	2	80	4	0	0	0	99.3	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.43: Mortality Tests of the Most Tolerant Stage of Medfly in infested August Red Nectarines at 11.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 27-05-2008 - 08-08-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			609	598	547	553				
12	2	24	520	419	390	402	14.6	30.0	28.8	27.3
16	2	32	430	254	375	184	29.4	57.5	31.4	66.7
20	2	40	300	141	127	92	50.7	76.4	76.8	83.4
24	2	48	210	45	35	25	65.5	92.5	93.6	95.5
28	2	56	134	19	13	16	78.0	96.8	97.6	97.1
32	2	64	44	7	1	7	92.8	98.8	99.8	98.7
40	2	80	12	0	0	0	98.0	100.0	100.0	99.9
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.7 Plums – Angelino

Data in tables 5.44 – 5.46 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.44: Mortality Tests of the Most Tolerant Stage of Medfly in infested Angelino Plums at 11.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 22-05-2007 - 29-07-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			443	440	425	407				
12	2	24	368	327	309	302	17.0	25.8	27.2	25.8
16	2	32	243	148	152	190	45.1	66.4	64.2	53.3
20	2	40	160	94	99	97	63.9	78.6	76.7	76.2
24	2	48	112	26	30	44	74.7	94.1	92.9	89.2
28	2	56	45	6	11	22	89.8	98.6	97.4	94.6
32	2	64	21	1	1	3	95.3	99.8	99.7	99.3
40	2	80	8	0	0	0	98.2	100.0	100.0	100.0
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.45: Mortality Tests of the Most Tolerant Stage of Medfly in infested Angelino Plums at 11.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 22-05-2007 - 29-07-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			469	488	499	452				
12	2	24	392	302	287	303	16.5	38.1	42.5	33.0
16	2	32	317	169	185	122	32.5	65.4	62.9	73.0
20	2	40	205	83	86	88	56.3	83.0	82.8	80.5
24	2	48	108	42	51	32	77.0	91.4	89.8	92.9
28	2	56	37	11	14	20	92.1	97.7	97.2	95.6
32	2	64	15	2	4	5	96.8	99.6	99.3	98.9
40	2	80	3	0	0	0	99.4	100.0	100.0	99.9
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.46: Mortality Tests of the Most Tolerant Stage of Medfly in infested Angelino Plums at 11.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 22-05-2007 - 29-07-2007

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			532	511	530	543				
12	2	24	424	305	347	338	20.3	40.3	34.5	37.8
16	2	32	316	206	225	200	40.6	59.7	57.5	63.2
20	2	40	245	132	140	187	53.9	74.2	73.6	65.6
24	2	48	188	53	40	110	64.7	89.6	92.5	79.7
28	2	56	105	18	12	54	80.3	96.5	97.7	90.1
32	2	64	34	4	5	13	93.6	99.1	99.1	97.6
40	2	80	9	0	0	0	98.3	100.0	100.0	99.9
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

5.4.8 Plums – Tegan Blue

Data in tables 5.47 – 5.49 show complete mortality was achieved in 1st, 2nd and 3rd instars at 80 g.h.m⁻³ while eggs required 96 g.h.m⁻³. This data was used in the Probit analysis of LD₅₀ and LD₉₉ to provide an estimate of the most tolerant stage and the treatment required for successful disinfestation in large scale trials of >30,000 insects.

Table 5.47: Mortality Tests of the Most Tolerant Stage of Medfly in infested Tegan Blue Plums at 11.0 ± 0.5 °C (Replicate 1). 600g fruit / test.
Date of experimental series: 28-03-2008 - 25-05-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			311	308	291	300				
12	2	24	271	136	109	230	12.9	55.8	62.5	23.3
16	2	32	214	84	82	165	31.2	72.7	71.8	45.0
20	2	40	160	42	39	117	48.6	86.4	86.6	61.0
24	2	48	110	17	13	53	64.6	94.5	95.5	82.3
28	2	56	65	5	7	22	79.1	98.4	97.6	92.7
32	2	64	32	0	1	12	89.7	100.0	99.7	96.0
40	2	80	4	0	0	1	98.7	100.0	99.9	99.6
48	2	96	0	0	0	0	99.9	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.48: Mortality Tests of the Most Tolerant Stage of Medfly in infested Tegan Blue Plums at 11.0 ± 0.5 °C (Replicate 2). 600g fruit / test.
Date of experimental series: 28-03-2008 - 25-05-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			449	460	491	420				
12	2	24	328	282	290	312	26.9	38.7	40.9	25.7
16	2	32	249	170	188	206	44.5	63.0	61.7	51.0
20	2	40	142	94	97	134	68.4	79.6	80.2	68.1
24	2	48	87	33	34	67	80.6	92.8	93.1	84.0
28	2	56	50	12	12	3	88.9	97.4	97.6	99.3
32	2	64	21	0	2	11	95.3	100.0	99.6	97.4
40	2	80	5	0	0	1	98.9	100.0	100.0	99.8
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.47: Mortality Tests of the Most Tolerant Stage of Medfly in infested Tegan Blue Plums at 11.0 ± 0.5 °C (Replicate 3). 600g fruit / test.
Date of experimental series: 28-03-2008 - 25-05-2008

Dose	Exposure period (hours)	Conc. x time product g.h.m ⁻³	Number of survivors (pupae) from infested fruit following treatment as :				Percentage mortality (criteria : pupation) following treatment as :			
			Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae	Eggs	1st instar larvae	2nd instar larvae	3rd instar larvae
(control)			347	390	404	420				
12	2	24	242	200	211	220	30.3	48.7	47.8	47.6
16	2	32	165	94	98	148	52.4	75.9	75.7	64.8
20	2	40	99	50	45	92	71.5	87.2	88.9	78.1
24	2	48	47	28	34	34	86.5	92.8	91.6	91.9
28	2	56	20	5	6	17	94.2	98.7	98.5	96.0
32	2	64	9	1	3	5	97.4	99.7	99.3	98.8
40	2	80	1	0	0	1	99.7	100.0	100.0	99.8
48	2	96	0	0	0	0	100.0	100.0	100.0	100.0
56	2	112	0	0	0	0	100.0	100.0	100.0	100.0
40	3	120	0	0	0	0	100.0	100.0	100.0	100.0
64	2	128	0	0	0	0	100.0	100.0	100.0	100.0

Table 5.50: Comparison of the concentration x time product (g.h.m⁻³) of methyl bromide at 11°C required to kill 50% (LD₅₀) and 99% (LD₉₉) of the four immature life stages of Mediterranean fruit fly (Medfly), *Ceratitis capitata* Wiedemann, in 8 stone fruit cultivars. The analysis is based on three replicate trials for each life stage.

Stone fruit Cultivar and Life stage treated	g.h.m ⁻³ 95% confidence intervals			g.h.m ⁻³ 95% confidence intervals		
	LD ₅₀	<u>Lower</u>	<u>Upper</u>	LD ₉₉	<u>Lower</u>	<u>Upper</u>
<i>Cherries - Sweetheart</i>						
<i>Eggs</i>	48.4	47.6	49.2	83.7	82.0	85.6
<i>1st instar larvae</i>	40.9	40.2	41.6	70.7	69.3	72.3
<i>2nd instar larvae</i>	40.7	40.0	41.4	70.4	69.0	71.9
<i>3rd instar larvae</i>	44.1	43.3	44.8	76.2	74.6	77.8
<i>Cherries- Lapin</i>						
<i>Eggs</i>	46.6	45.6	47.6	96.6	94.5	98.8
<i>1st instar larvae</i>	34.7	33.9	35.4	71.8	70.3	73.4
<i>2nd instar larvae</i>	33.5	32.8	34.2	69.4	68.0	71.0
<i>3rd instar larvae</i>	40.5	39.6	41.3	83.9	82.1	85.8
<i>Peaches - Snow King</i>						
<i>Eggs</i>	44.7	43.9	45.6	97.3	95.4	99.3
<i>1st instar larvae</i>	30.4	29.8	31.0	66.2	65.0	67.5
<i>2nd instar larvae</i>	29.8	29.2	30.4	64.9	63.7	66.2
<i>3rd instar larvae</i>	37.8	37.0	38.5	82.1	80.6	83.8
<i>Peaches - Zee Lady</i>						
<i>Eggs</i>	46.4	45.6	47.2	86.4	84.8	88.2
<i>1st instar larvae</i>	35.6	35.0	36.3	66.4	65.1	67.7
<i>2nd instar larvae</i>	35.7	35.0	36.3	66.4	65.2	67.8
<i>3rd instar larvae</i>	40.4	39.7	41.1	75.2	73.8	76.7
<i>Nectarines - Arctic Snow</i>						
<i>Eggs</i>	37.8	37.0	38.6	79.5	78.2	80.9
<i>1st instar larvae</i>	30.7	30.0	31.3	64.6	63.5	65.7
<i>2nd instar larvae</i>	30.4	29.8	31.0	64.0	62.9	65.1
<i>3rd instar larvae</i>	33.1	32.4	33.8	69.7	68.6	70.9
<i>Nectarines - August Red</i>						
<i>Eggs</i>	43.6	42.9	44.3	92.8	91.3	94.4
<i>1st instar larvae</i>	30.6	30.1	31.1	65.2	64.2	66.3
<i>2nd instar larvae</i>	31.8	31.2	32.3	67.6	66.5	68.8
<i>3rd instar larvae</i>	34.6	34.0	35.2	73.7	72.5	74.9
<i>Plums - Angelino</i>						
<i>Eggs</i>	40.2	39.2	41.1	86.6	85.0	88.3
<i>1st instar larvae</i>	31.0	30.3	31.7	66.8	65.5	68.1
<i>2nd instar larvae</i>	31.3	30.6	32.0	67.4	66.2	68.8
<i>3rd instar larvae</i>	33.0	32.2	33.8	71.1	69.8	72.5
<i>Plums – Tegan Blue</i>						
<i>Eggs</i>	39.6	38.4	40.7	85.7	83.8	87.7
<i>1st instar larvae</i>	29.4	28.5	30.2	63.6	62.2	65.1
<i>2nd instar larvae</i>	29.4	28.5	30.2	63.6	62.3	65.1
<i>3rd instar larvae</i>	34.8	33.8	35.7	75.3	73.6	77.1

5.4.9 ANALYSIS OF THE DATA FOR METHYL BROMIDE FUMIGATION AT 11°C.

The results of exposure to a graded series of doses from 12 – 64 g/m³ for exposure periods ranging from 2-3 hours giving concentration x time product of 24 – 128 g.h.m⁻³ and insect mortality of the four life stages of Medfly replicated 3 times is given under the respective fruit varieties treated. Data for 8 cultivars treated at 11°C show that complete mortality was achieved at 112 g.h.m⁻³ in all stages.

The above bio-assay data were subjected to probit regression analysis (Finney, 1972) and analysed using the Genstat Program (Anon 2008) to obtain the LD₅₀ and LD₉₉ values together with their 95% Fiducial Limits. These are given in **Table 5.50**.

The results show that the egg stage is the most tolerant life stage at the LD₅₀ and at the LD₉₉ estimates for all varieties. The highest upper fiducial limit is 99.3 g.h.m⁻³ in Snow King peaches. It was decided that the large-scale trials should be done on the egg stage at ≥ 120 g.h.m⁻³. Therefore trials were conducted by exposing >10,000 individuals to methyl bromide dose x time periods in three replicates (>30,000) in all 8 summer fruit cultivars (2 varieties each of cherries, peaches, nectarines and plums). The results of these large-scale trials are given in **Section 6**.

6. FUMIGATION TREATMENTS – LARGE SCALE TRIALS.

6.1 PLAN OF THE LARGE SCALE TRIALS AT 6°C and 11°C

The large-scale trials were conducted in the following manner:

1. All fruits were supplied directly from the farms in export cartons and were held in cold rooms #1 and #2 and in a refrigerated container as described in **Section 2** until required for the trials.
2. A life history study of Medfly was conducted out at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh in each cultivar before each series of trials to determine the course of development of immature stages and the date when egg stage was most prevalent ($\geq 50\%$) as the stage to be tested.
3. The large-scale trials were conducted by infesting (**Section 2**) sufficient fruit of each cultivar to obtain more than 10,000 viable pupae in each replicate to be treated.
4. In each replicate, sufficient fruits were also infested for untreated controls and for dissection on day of treatment to verify numbers of eggs present at the time of the trial.
5. Each replicate of infested fruits was exposed to methyl bromide fumigation treatment for the specified doses and treatment times at $6^\circ\text{C} \geq 180 \text{ g.h.m}^{-3}$ and at $11^\circ\text{C} \geq 120 \text{ g.h.m}^{-3}$ and then incubated at $26 \pm 1^\circ\text{C}$ and 60 - 65% rh for 3 weeks for emergence of any survivors.
6. Untreated controls for each replicate treatment were incubated at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh for a further 3 weeks to obtain pupae. The number of pupae obtained from each untreated control was used to confirm the estimate of the number of live eggs exposed to the treatment.
7. The methyl bromide fumigation treatment was considered successful if no survivors were obtained after the incubation period of the treated fruit.

6.2 METHODS FOR LARGE SCALE TRIALS AT 6°C and 11°C

Preparation of test fruits

Fruit were infested as described in **Section 2**. The infested fruits were incubated in a controlled environment room at $26 \pm 1.0^\circ\text{C}$; 60 - 65% rh. Because eggs were shown to be more tolerant to methyl bromide fumigation treatment, the required quantity of fruit were infested for this stage (days 1 & 2) as shown below. Extra fruit were infested for dissection to determine the numbers of viable eggs present on the day of treatment. The infested fruits in each treatment replicate were incubated for $>50\%$ development of egg stage for testing. Selection of fruits for treatment and control was done at random. On the day of treatment the specified weight of fruit for each stage for treatment and control were separated. The control fruits were returned to the controlled environment room for development to pupation.

The specified weight of infested fruits for treatment (see below) were taken and placed on trays in the centre of ventilated export cartons (25 litre, 10kg) containing uninfested filler fruits and packed following standard export practice. The cartons were then stacked in the fumigation facility in the standard arrangement for good circulation of fumigant gas for the disinfestation trial (**Appendix 5**). Cartons were labelled to assist recovery of infested fruits after treatment.

Data for large scale fumigation treatments:

(1) Number of treatments:

Four treatments were selected as follows

6°C:

$$\begin{aligned} 48\text{g/m}^3 \times 4 \text{ h} &= 192 \text{ g.h.m}^3 \\ 60\text{g/m}^3 \times 3 \text{ h} &= 180 \text{ g.h.m}^3 \end{aligned}$$

11°C:

$$\begin{aligned} 40\text{g/m}^3 \times 4 \text{ h} &= 120 \text{ g.h.m}^3 \\ 48\text{g/m}^3 \times 2.5 \text{ h} &= 120 \text{ g.h.m}^3 \end{aligned}$$

(2) Quantity of infested fruits used for each cultivar:

Test Fruit & Cultivar	Test stage	Wt. / Rep Treated (kg)	Wt. / Rep Control (kg)	Total Wt. 3 Reps Treated (kg)	Total Wt. 3 Reps Control (kg)	Total Wt. Infested / dose (kg)	Total Wt. / fruit cultivar x 4 doses (kg)
Cherry Sweetheart	Eggs	20	10	60	30	90	360
Cherry Lapin	Eggs	20	10	60	30	90	360
Peach Snow King	Eggs	30	10	90	30	120	480
Peach Zee Lady	Eggs	30	10	90	30	120	480
Nectarine Arctic Snow	Eggs	30	10	90	30	120	480
Nectarine August Red	Eggs	30	10	90	30	120	480
Plum Angelino	Eggs	30	10	90	30	120	480
Plum Tegan Blue	Eggs	30	10	90	30	120	480

(3) Loading of export cartons in 44.14 m³ fumigation room for each trial:

Number of cartons / layer = 8
Number of layers / pallet = 7
Numbers of pallets / fumigation room = 8
8 cartons / layer x 7 layers / pallet = 56 cartons / pallet
8 pallets / treatment = 8 x 56 = 448 cartons / fumigation room

(4) Data on load factors in 44.14 m³ fumigation room for each trial:

No. of export cartons / replicate = 448 cartons
10 kg / carton x 448 cartons = 4,480 kg
Size of carton: 210mm (h) x 285mm (w) 430mm (l)
Volume of carton = 25.7 litres
Total volume of 448 cartons = $448 \times 25.7 / 1000 = 11.5 \text{ m}^3$
Volume of fumigation room = 44.14 m³
Load factor (weight) = $4,480 / 44.14 = 101.49 \text{ kg / m}^3$
Load factor % (volume) = $(11.5 \text{ m}^3 / 44.14) \times 100 = 26.05 \%$

(5) Data on load factors in 1.067 m³ fumigation chamber for each trial:

No. of export cartons / replicate = 18 cartons
10 kg / carton x 18 cartons = 180 kg
Size of carton: 210mm (h) x 285mm (w) 430mm (l)
Volume of carton = 25.7 litres
Total volume of 18 cartons = $18 \times 25.7 / 1000 = 0.4626 \text{ m}^3$
Volume of fumigation chamber = 1.067 m³
Load factor (weight) = $180 / 1.067 = 168.7 \text{ kg / m}^3$
Load factor % (volume) = $(0.4626 \text{ m}^3 / 1.067) \times 100 = 43.36 \%$

(6) Trial arrangement

Two of the 3 replicated trials was set-up the fumigation chamber (5) above with a load volume factor of 43.36 % while the third replicate was set up in the 44.14 m³ fumigation room (4) above load volume factor of 26.05%. The required weight of infested fruits 20 or 30 kg / replicate are shown in (2) above and these fruits were placed in selected cartons so as to give representative dispersion of fumigant treatment throughout the fruit in cartons. Test fruit were exposed to fumigant dosage as shown in (1) above.

After exposure to the fumigation treatment, the infested fruits were removed from the cartons and taken to the controlled environment room and placed in containers over sand to collect pupae.

Record of temperatures during the trials

Temperatures were recorded on a “Squirrel” (Grant Instruments, Cambridge, England) data logger with an accuracy of $\pm 0.01^{\circ}\text{C}$. A total of 6 thermistor probes were used, 3 to record air temperatures at various positions. Fruit pulp temperatures were recorded by placing the probes in the core of uninfested fruit in 3 locations throughout the stack so as to give representative data for the whole trial. Temperature recordings were automatically logged at 10-minute intervals throughout the trial.

6.3 RESULTS OF LARGE SCALE METHYL BROMIDE FUMIGATION TRIALS OF MEDFLY AT 6°C: 48g/m³ for 4 hour exposure

The trials at were conducted from November 2008 to July 2010.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations during the treatment period and mortality of eggs of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits are the same as for the large scale 1°C trials since fruit from the same harvested batch of was used for large scale fumigation trials.

6.3.1 Cherries - Sweetheart

Fumigation treatment records are given in tables 6.1 – 6.3. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.4.

Table 6.1: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 08-12-2008. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.4	54.8	55.9	55.4	6.2	6.3		
10	54.4	52.6	53.3	53.4	6.1	6.3	3.5	6.9
30	51.8	52.2	53.3	52.4	6.1	6.3	5.3	17.8
60	49.2	50.1	53.7	51.0	6.1	6.3	7.9	39.3
90	47.9	49.8	52.9	50.2	6.1	6.3	9.3	63.8
120	47.5	49.0	52.6	49.7	6.1	6.3	10.3	87.9
150	46.5	49.0	52.3	49.3	6.1	6.3	11.0	111.8
180	44.6	49.0	51.9	48.5	6.1	6.3	12.4	135.5
210	45.2	48.1	50.4	47.9	6.1	6.3	13.5	157.6
240	45.0	48.0	50.3	47.8	6.1	6.3	13.7	179.6
Average	48.0	49.8	52.3	50.0	6.1	6.3	9.7	
±s.d.	3.3	1.6	1.2	2.0			3.6	
Average dose range = 192.0 – 208.0 g.h.m ⁻³								

Table 6.2: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 11-12-2008. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.9	54.8	55.8	55.5	6.1	6.3		
10	53.2	51.7	49.8	51.6	6.1	6.3	7.1	6.9
30	52.9	50.9	49.8	51.2	6.1	6.3	7.7	17.2
60	52.9	49.8	50.2	51.0	6.1	6.3	8.2	38.4
90	51.6	48.7	49.4	49.9	6.1	6.3	10.1	63.7
120	51.4	48.6	49.1	49.7	6.1	6.3	10.5	87.3
150	51.6	48.3	49.3	49.7	6.1	6.3	10.4	111.8
180	50.8	47.0	48.9	48.9	6.1	6.3	11.9	136.8
210	50.2	47.1	48.8	48.7	6.1	6.3	12.3	158.9
240	48.8	47.0	49.2	48.3	6.1	6.3	12.9	182.6
Average	51.5	48.8	49.4	49.9	6.1	6.3	10.1	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 195.2 – 208.0 g.h.m ⁻³								

Table 6.3: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 15-12-2008. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.7	54.1	53.4	54.1	6.1	6.2		
10	51.2	50.3	49.6	50.4	6.1	6.2	6.8	6.8
30	51.2	50.2	49.6	50.3	6.1	6.2	6.9	16.8
60	50.3	49.5	49.5	49.8	6.1	6.2	8.0	37.8
90	50.5	49.5	49.3	49.8	6.0	6.2	8.0	62.2
120	50.0	49.6	49.4	49.7	6.0	6.2	8.1	87.1
150	50.1	49.3	48.7	49.4	6.0	6.2	8.7	111.8
180	49.8	49.0	48.6	49.1	6.0	6.2	9.1	135.8
210	49.9	48.8	48.4	49.0	6.0	6.2	9.3	159.7
240	49.5	48.8	48.3	48.9	6.0	6.2	9.6	183.9
Average	50.3	49.4	49.0	49.6	6.0	6.2	8.3	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 196.4 – 200.4 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.4) show that from the dissection data an estimated 1,101,832 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 155,422 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 179.6 – 183.9 g.h.m⁻³) or as a final dose (range 192.0 – 208.0 g.h.m⁻³) at 6°C in Sweetheart cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.4: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20 kg/rep fruit before fumigation (20kg / rep)	No. eggs surviving fumigation	Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30 kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60 kg	Number of surviving pupae after fumigation treatment
08-12-2008	1	335,086	0	28,174	56,348	0
11-12-2008	2	369,196	0	25,684	51,368	0
15-12-2008	3	397,550	0	23,853	47,706	0
	Total	1,101,832	0	77,711	155,422	0

6.3.2 Cherries - Lapin

Fumigation treatment records are given in tables 6.5 – 6.7. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.8.

Table 6.5: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 18-01-2010 Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.0	53.4	55.5	54.6	6.1	6.2		
10	54.7	52.9	54.0	53.9	6.1	6.2	1.4	6.8
30	52.1	52.5	54.0	52.9	6.1	6.2	3.2	18.0
60	49.5	50.4	54.4	51.4	6.1	6.2	5.8	39.7
90	48.2	50.1	53.6	50.6	6.1	6.2	7.3	64.3
120	47.8	49.3	53.3	50.1	6.1	6.2	8.3	88.6
150	46.8	49.3	53.0	49.7	6.1	6.2	9.0	112.8
180	44.9	49.3	52.6	48.9	6.1	6.2	10.5	136.7
210	45.5	48.4	51.1	48.3	6.1	6.2	11.5	159.0
240	45.3	48.3	51.0	48.2	6.1	6.2	11.8	181.3
Average	48.3	50.1	53.0	50.5	6.1	6.2	7.6	
±s.d.	3.3	1.6	1.2	2.0			3.6	
Average dose range = 194.0 – 210.0 g.h.m ⁻³								

Table 6.6: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 20-01-2010 Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.7	54.2	55.2	55.4	6.0	6.1		
10	53.4	51.9	50.0	51.8	6.0	6.1	6.5	6.9
30	53.1	51.1	50.0	51.4	6.0	6.1	7.2	17.3
60	53.1	50.0	50.4	51.2	6.0	6.1	7.6	38.6
90	51.8	48.9	49.6	50.1	6.0	6.1	9.5	64.0
120	51.6	48.8	49.3	49.9	6.0	6.1	9.9	87.7
150	51.8	48.5	49.5	49.9	6.0	6.1	9.8	112.3
180	51.0	47.2	49.1	49.1	6.0	6.1	11.3	137.3
210	50.4	47.3	49.0	48.9	6.0	6.1	11.7	159.6
240	49.0	47.2	49.4	48.5	6.0	6.1	12.3	183.4
Average	51.7	49.0	49.6	50.1	6.0	6.1	9.5	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 196.0 – 208.8 g.h.m ⁻³								

Table 6.7: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 22-01-2010 . Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.5	54.8	53.9	54.4	6.1	6.2		
10	50.6	49.7	49.0	49.8	6.1	6.2	8.5	6.8
30	50.6	49.6	49.0	49.7	6.1	6.2	8.6	16.6
60	49.7	48.9	48.9	49.2	6.1	6.2	9.6	37.3
90	49.9	48.9	48.7	49.2	6.1	6.2	9.6	61.5
120	49.4	49.0	48.8	49.1	6.1	6.2	9.8	86.0
150	49.5	48.7	48.1	48.8	6.1	6.2	10.4	110.4
180	49.2	48.4	48.0	48.5	6.1	6.2	10.8	134.1
210	49.3	48.2	47.8	48.4	6.1	6.2	11.0	157.7
240	48.9	48.2	47.7	48.3	6.1	6.2	11.3	181.6
Average	49.7	48.8	48.4	49.0	6.1	6.2	9.9	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 194.0 – 198.0 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.8) show that from the dissection data an estimated 1,172,314 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 164,812 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 181.3 – 183.4 g.h.m⁻³) or as a final dose (range 194.0 – 210.0 g.h.m⁻³) at 6°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.8: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20 kg/rep fruit before fumigation (20kg/rep)	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30 kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
18-01-2010	1	374,904	0		30,215	60,430	0
20-01-2010	2	375,300	0		24,094	48,188	0
22-01-2010	3	422,110	0		28,097	56,194	0
	Total	1,172,314	0		82,406	164,812	0

6.3.3 Peaches – Snow King

Fumigation treatment records are given in tables 6.9 – 6.11. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.12.

Table 6.9: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 04-02-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.0	54.4	56.5	55.6	6.1	6.2		
10	54.3	52.5	53.6	53.5	6.1	6.2	3.9	7.0
30	51.7	52.1	53.6	52.5	6.2	6.2	5.7	17.8
60	49.1	50.0	54.0	51.0	6.2	6.2	8.3	39.4
90	47.8	49.7	53.2	50.2	6.2	6.2	9.7	63.8
120	47.4	48.9	52.9	49.7	6.2	6.2	10.6	87.9
150	46.4	48.9	52.6	49.3	6.2	6.2	11.4	111.9
180	44.5	48.9	52.2	48.5	6.2	6.2	12.8	135.6
210	45.1	48.0	50.7	47.9	6.1	6.2	13.8	157.7
240	44.9	47.9	50.6	47.8	6.1	6.2	14.1	179.8
Average	47.9	49.7	52.6	50.1	6.1	6.2	10.0	
±s.d.	3.3	1.6	1.2	2.0			3.5	
Average dose range = 192.4 – 208.4 g.h.m ⁻³								

Table 6.10: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 06-02-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.1	54.6	54.6	55.1	6.1	6.2		
10	53.3	51.8	49.9	51.7	6.1	6.2	6.2	6.9
30	53.0	51.0	49.9	51.3	6.1	6.2	6.9	17.2
60	53.0	49.9	50.3	51.1	6.1	6.2	7.3	38.5
90	51.7	48.8	49.5	50.0	6.1	6.2	9.3	63.8
120	51.5	48.7	49.2	49.8	6.1	6.2	9.6	87.5
150	51.7	48.4	49.4	49.8	6.1	6.2	9.6	112.1
180	50.9	47.1	49.0	49.0	6.1	6.2	11.1	137.0
210	50.3	47.2	48.9	48.8	6.1	6.2	11.4	159.3
240	48.9	47.1	49.3	48.4	6.1	6.2	12.1	183.0
Average	51.6	48.9	49.5	50.0	6.1	6.2	9.3	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 195.6 – 204.4 g.h.m ⁻³								

Table 6.11: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 09-02-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.3	54.6	55.9	54.9	6.2	6.3		
10	50.5	49.6	48.9	49.7	6.2	6.3	9.6	6.9
30	50.5	49.5	48.9	49.6	6.2	6.3	9.6	16.6
60	49.6	48.8	48.8	49.1	6.2	6.3	10.7	37.2
90	49.8	48.8	48.6	49.1	6.2	6.3	10.7	61.3
120	49.3	48.9	48.7	49.0	6.2	6.3	10.9	85.9
150	49.4	48.6	48.0	48.7	6.2	6.3	11.4	110.2
180	49.1	48.3	47.9	48.4	6.2	6.3	11.8	133.8
210	49.2	48.1	47.7	48.3	6.2	6.3	12.0	157.4
240	48.8	48.1	47.6	48.2	6.2	6.3	12.3	181.3
Average	49.6	48.7	48.3	48.9	6.2	6.3	11.0	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 193.6 – 197.6 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.12) show that from the dissection data an estimated 703,944 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 131,184 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 189.8 – 183.0 g.h.m⁻³) or as a final dose (range 192.4 – 208.4 g.h.m⁻³) at 6°C in Snow King Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.12: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30 kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate: Total 30kg)	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate: Total 90 kg)	Number of surviving pupae after fumigation treatment
04-02-2009.	1	244,874	0		14,500	43,500	0
06-02-2009.	2	237,952	0		14,772	44,316	0
09-02-2009.	3	221,118	0		14,456	43,367	0
	Total	703,944	0		43,728	131,184	0

6.3.4 Peaches – Zee Lady

Fumigation treatment records are given in tables 6.13 – 6.15. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.16.

Table 6.13: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 26-11-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.5	54.9	57.0	56.1	6.1	6.3		
10	53.9	52.1	53.2	53.1	6.1	6.3	5.5	7.0
30	51.3	51.7	53.2	52.1	6.1	6.2	7.2	17.7
60	48.7	49.6	53.6	50.6	6.1	6.2	9.8	39.1
90	47.4	49.3	52.8	49.8	6.1	6.2	11.2	63.3
120	47.0	48.5	52.5	49.3	6.1	6.2	12.1	87.2
150	46.0	48.5	52.2	48.9	6.1	6.2	12.9	111.0
180	44.1	48.5	51.8	48.1	6.1	6.2	14.3	134.5
210	44.7	47.6	50.3	47.5	6.1	6.2	15.3	156.4
240	44.5	47.5	50.2	47.4	6.1	6.2	15.6	178.3
Average	47.5	49.3	52.2	49.7	6.1	6.2	11.5	
±s.d.	3.3	1.6	1.2	2.0			3.5	
Average dose range = 190.8 – 206.8 g.h.m ⁻³								

Table 6.14: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 30-11-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.5	54.8	53.5	54.6	6.0	6.2		
10	53.7	52.2	51.1	52.3	6.0	6.2	4.2	6.8
30	53.4	51.4	51.1	52.0	6.0	6.2	4.8	17.4
60	53.4	50.3	51.5	51.7	6.0	6.2	5.3	39.0
90	52.1	49.2	50.7	50.7	6.0	6.2	7.2	64.7
120	51.9	49.1	50.4	50.5	6.0	6.2	7.6	88.7
150	52.1	48.8	50.6	50.5	6.0	6.2	7.5	113.6
180	51.3	47.5	50.2	49.7	6.0	6.2	9.0	138.9
210	50.7	47.6	50.1	49.5	6.0	6.2	9.4	161.4
240	49.3	47.5	50.5	49.1	6.0	6.2	10.1	185.5
Average	52.0	49.3	50.7	50.7	6.0	6.2	7.2	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 198.4 – 207.2 g.h.m ⁻³								

Table 6.15: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 2-12-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.1	51.4	51.8	52.4	6.0	6.1		
10	49.7	48.8	48.1	48.9	6.0	6.1	6.8	6.6
30	49.7	48.7	48.1	48.8	6.0	6.1	6.9	16.3
60	48.8	48.0	48.0	48.3	6.0	6.1	7.9	36.6
90	49.0	48.0	47.8	48.3	6.0	6.1	7.9	60.3
120	48.5	48.1	47.9	48.2	6.0	6.1	8.1	84.5
150	48.6	47.8	47.2	47.9	6.0	6.1	8.7	108.4
180	48.3	47.5	47.1	47.6	6.0	6.1	9.2	131.6
210	48.4	47.3	46.9	47.5	6.0	6.1	9.3	154.8
240	48.0	47.3	46.8	47.4	6.0	6.1	9.7	178.3
Average	48.8	47.9	47.5	48.1	6.0	6.1	8.3	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 190.4 – 194.4 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.16) show that from the dissection data an estimated 765,006 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 129,846 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 178.3 – 185.5 g.h.m⁻³) or as a final dose (range 190.4 – 207.2 g.h.m⁻³) at 6°C in Zee Lady Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.16: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
26-11-2009	1	244,912	0		14,377	43,131	0
30-11-2009	2	268,736	0		14,526	43,578	0
02-12-2009	3	251,358	0		14,379	43,137	0
	Total	765,006	0		43,282	129,846	0

6.3.5 Nectarines – Arctic Snow

Fumigation treatment records are given in tables 6.17 – 6.19. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.20.

Table 6.17: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 27-03-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.6	55.0	57.6	56.4	6.1	6.3		
10	53.9	52.1	52.0	52.7	6.1	6.3	6.6	7.1
30	51.3	51.7	52.0	51.7	6.1	6.3	8.4	17.6
60	48.7	49.6	52.4	50.2	6.1	6.3	10.9	38.8
90	47.4	49.3	51.6	49.4	6.1	6.3	12.3	62.8
120	47.0	48.5	51.3	48.9	6.1	6.3	13.3	86.5
150	46.0	48.5	51.0	48.5	6.1	6.3	14.0	110.1
180	44.1	48.5	50.6	47.7	6.1	6.3	15.4	133.4
210	44.7	47.6	49.1	47.1	6.1	6.3	16.4	155.1
240	44.5	47.5	49.0	47.0	6.1	6.3	16.7	176.8
Average	47.5	49.3	51.0	49.3	6.1	6.3	12.7	
±s.d.	3.3	1.6	1.2	2.0			3.5	
Average dose range = 189.2 – 205.2 g.h.m ⁻³								

Table 6.18: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 30-03-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.7	55.8	53.8	54.8	6.0	6.2		
10	53.4	51.9	48.4	51.2	6.0	6.2	6.5	6.8
30	53.1	51.1	48.4	50.9	6.0	6.2	7.1	17.1
60	53.1	50.0	48.8	50.6	6.1	6.2	7.5	38.2
90	51.8	48.9	48.0	49.6	6.1	6.2	9.5	63.3
120	51.6	48.8	47.7	49.4	6.1	6.2	9.9	86.7
150	51.8	48.5	47.9	49.4	6.1	6.2	9.8	111.1
180	51.0	47.2	47.5	48.6	6.1	6.2	11.3	135.9
210	50.4	47.3	47.4	48.4	6.1	6.2	11.7	157.8
240	49.0	47.2	47.8	48.0	6.1	6.2	12.4	181.4
Average	51.7	49.0	48.0	49.6	6.1	6.2	9.5	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 194.0 – 202.8 g.h.m ⁻³								

Table 6.19: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 02-04-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.9	51.2	51.7	52.3	6.1	6.2		
10	48.7	47.8	47.1	47.9	6.1	6.2	8.4	6.5
30	48.7	47.7	47.1	47.8	6.1	6.2	8.5	16.0
60	47.8	47.0	47.0	47.3	6.1	6.2	9.6	35.9
90	48.0	47.0	46.8	47.3	6.1	6.2	9.6	59.1
120	47.5	47.1	46.9	47.2	6.1	6.2	9.8	82.7
150	47.6	46.8	46.2	46.9	6.1	6.2	10.3	106.1
180	47.3	46.5	46.1	46.6	6.1	6.2	10.8	128.9
210	47.4	46.3	45.9	46.5	6.1	6.2	11.0	151.6
240	47.0	46.3	45.8	46.4	6.1	6.2	11.3	174.5
Average	47.8	46.9	46.5	47.1	6.1	6.2	9.9	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 186.4 – 190.4 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.20) show that from the dissection data an estimated 938,720 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 137,037 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 174.5 – 181.5 g.h.m⁻³) or as a final dose (range 186.4 – 205.2 g.h.m⁻³) at 6°C in Arctic Snow Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.20: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
27-03-2009	1	316,498	0		15,577	46,731	0
30-03-2009	2	291,538	0		15,161	45,483	0
02-04-2009	3	330,684	0		14,941	44,823	0
	Total	938,720	0		45,679	137,037	0

6.3.6 Nectarines – August Red

Fumigation treatment records are given in tables 6.21 – 6.23. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.24.

Table 6.21: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 26-04-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.4	54.8	57.4	56.2	6.1	6.2		
10	54.5	53.5	52.0	53.3	6.1	6.2	5.1	7.0
30	51.9	53.1	52.0	52.3	6.1	6.2	6.9	17.8
60	49.3	51.0	52.4	50.9	6.1	6.2	9.4	39.3
90	48.0	50.7	51.6	50.1	6.1	6.2	10.8	63.6
120	47.6	49.9	51.3	49.6	6.1	6.2	11.8	87.7
150	46.6	49.9	51.0	49.2	6.1	6.2	12.5	111.6
180	44.7	49.9	50.6	48.4	6.1	6.2	13.9	135.2
210	45.3	49.0	49.1	47.8	6.1	6.2	14.9	157.3
240	45.1	48.9	49.0	47.7	6.1	6.2	15.2	179.3
Average	48.1	50.7	51.0	49.9	6.1	6.2	11.2	
±s.d.	3.3	1.6	1.2	2.0			3.5	
Average dose range = 191.2 – 207.6 g.h.m ⁻³								

Table 6.22: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 28-04-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.8	54.9	55.7	55.1	6.1	6.3		
10	53.0	51.5	48.6	51.0	6.1	6.3	7.4	6.9
30	52.7	50.7	48.6	50.7	6.1	6.3	8.1	17.0
60	52.7	49.6	49.0	50.4	6.1	6.3	8.5	38.0
90	51.4	48.5	48.2	49.4	6.1	6.3	10.5	63.0
120	51.2	48.4	47.9	49.2	6.1	6.3	10.8	86.4
150	51.4	48.1	48.1	49.2	6.1	6.3	10.8	110.6
180	50.6	46.8	47.7	48.4	6.1	6.3	12.3	135.3
210	50.0	46.9	47.6	48.2	6.1	6.3	12.6	157.2
240	48.6	46.8	48.0	47.8	6.1	6.3	13.3	180.6
Average	51.3	48.6	48.2	49.4	6.1	6.3	10.5	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 193.2 – 202.0 g.h.m ⁻³								

Table 6.23: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 30-04-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.4	50.7	51.2	51.8	6.1	6.2		
10	48.9	48.0	47.3	48.1	6.1	6.2	7.1	6.5
30	48.9	47.9	47.3	48.0	6.1	6.2	7.2	16.0
60	48.0	47.2	47.2	47.5	6.1	6.2	8.3	36.0
90	48.2	47.2	47.0	47.5	6.1	6.2	8.3	59.3
120	47.7	47.3	47.1	47.4	6.1	6.2	8.5	83.1
150	47.8	47.0	46.4	47.1	6.1	6.2	9.1	106.6
180	47.5	46.7	46.3	46.8	6.1	6.2	9.5	129.4
210	47.6	46.5	46.1	46.7	6.1	6.2	9.7	152.2
240	47.2	46.5	46.0	46.6	6.1	6.2	10.0	175.3
Average	48.0	47.1	46.7	47.3	6.1	6.2	8.6	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 187.2 – 193.2 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.24) show that from the dissection data an estimated 1,027,258 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 142,620 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 175.3 – 180.6 g.h.m⁻³) or as a final dose (range 187.2 – 207.6 g.h.m⁻³) at 6°C in August Red Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.24: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 30kg)	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
26-04-2010	1	370,986	0		16,175	48,525	0
28-04-2010	2	344,692	0		15,803	47,409	0
30-04-2010	3	311,580	0		15,562	46,686	0
	Total	1,027,258	0		47,540	142,620	0

6.3.7 Plums – Angelino

Fumigation treatment records are given in tables 6.25 – 6.27. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.28.

Table 6.25: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 18-05-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.8	55.5	58.0	56.8	6.0	6.2		
10	54.4	53.2	54.0	53.9	6.0	6.2	5.1	7.1
30	51.8	52.8	54.0	52.9	6.0	6.2	6.9	18.0
60	49.2	50.7	54.4	51.4	6.0	6.2	9.4	39.7
90	47.9	50.4	53.6	50.6	6.0	6.2	10.8	64.3
120	47.5	49.6	53.3	50.1	6.0	6.2	11.7	88.6
150	46.5	49.6	53.0	49.7	6.0	6.2	12.4	112.8
180	44.6	49.6	52.6	48.9	6.0	6.2	13.8	136.7
210	45.2	48.7	51.1	48.3	6.0	6.2	14.8	159.0
240	45.0	48.6	51.0	48.2	6.0	6.2	15.1	181.3
Average	48.0	50.4	53.0	50.5	6.0	6.2	11.1	
±s.d.	3.3	1.6	1.2	2.0			3.5	
Average dose range = 194.0 – 210.0 g.h.m ⁻³								

Table 6.26: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 20-05-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.1	54.4	56.1	55.2	6.1	6.3		
10	53.7	52.2	48.7	51.5	6.0	6.3	6.6	6.9
30	53.4	51.4	48.7	51.2	6.0	6.3	7.3	17.2
60	53.4	50.3	49.1	50.9	6.0	6.3	7.7	38.4
90	52.1	49.2	48.3	49.9	6.1	6.3	9.7	63.7
120	51.9	49.1	48.0	49.7	6.1	6.3	10.0	87.3
150	52.1	48.8	48.2	49.7	6.0	6.3	10.0	111.8
180	51.3	47.5	47.8	48.9	6.1	6.3	11.5	136.7
210	50.7	47.6	47.7	48.7	6.1	6.3	11.8	158.8
240	49.3	47.5	48.1	48.3	6.1	6.3	12.5	182.5
Average	52.0	49.3	48.3	49.9	6.0	6.3	9.7	
±s.d.	1.4	1.7	0.5	1.1			2.1	
Average dose range = 195.2 – 204.0 g.h.m ⁻³								

Table 6.27: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 22-05-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.7	53.2	53.5	53.8	6.0	6.1		
10	49.0	48.2	47.4	48.2	6.0	6.1	10.4	6.7
30	49.0	48.1	47.4	48.2	6.0	6.1	10.5	16.1
60	48.1	47.4	47.3	47.6	6.0	6.1	11.5	36.1
90	48.3	47.4	47.1	47.6	6.0	6.1	11.5	59.5
120	47.8	47.5	47.2	47.5	6.0	6.1	11.7	83.3
150	47.9	47.2	46.5	47.2	6.1	6.1	12.3	106.9
180	47.6	46.9	46.4	47.0	6.1	6.1	12.7	129.8
210	47.7	46.7	46.2	46.9	6.1	6.1	12.9	152.6
240	47.3	46.7	46.1	46.7	6.1	6.1	13.2	175.8
Average	48.1	47.3	46.8	47.4	6.0	6.1	11.9	
±s.d.	0.6	0.5	0.5	0.5			1.0	
Average dose range = 187.6 – 191.6 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.28) show that from the dissection data an estimated 1,138,376 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 177,270 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 175.8 – 182.5 g.h.m⁻³) or as a final dose (range 187.6 – 210.0 g.h.m⁻³) at 6°C in Angelino Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.28: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
18-05-2009	1	377,068	0		20,525	61,575	0
20-05-2009	2	386,438	0		19,530	58,590	0
22-05-2009	3	374,870	0		19,035	57,105	0
	Total	1,138,376	0		59,090	177,270	0

6.3.8 Plums – Tegan Blue

Fumigation treatment records are given in tables 6.29 – 6.31. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.32.

Table 6.29: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 08-03-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	56.8	55.5	58.0	56.8	6.1	6.3		
10	53.5	51.6	49.2	51.4	6.1	6.3	9.4	7.1
30	52.8	48.9	48.9	50.2	6.1	6.3	11.6	17.1
60	52.5	48.8	49.2	50.2	6.1	6.3	11.6	37.7
90	51.9	48.2	49.0	49.7	6.1	6.3	12.4	62.7
120	51.2	48.3	49.0	49.5	6.1	6.3	12.8	87.0
150	51.0	48.7	49.1	49.6	6.1	6.3	12.6	111.4
180	51.1	49.1	48.8	49.7	6.1	6.3	12.5	136.4
210	51.0	47.7	49.1	49.3	6.1	6.3	13.2	161.4
240	50.8	48.1	48.7	49.2	6.1	6.3	13.3	184.8
Average	51.8	48.8	49.0	49.9	6.1	6.3	12.2	
±s.d.	1.0	1.1	0.2	0.7			1.2	
Average dose range = 196.8 – 202.4 g.h.m ⁻³								

Table 6.30: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 10-03-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.1	54.4	56.1	55.2	6.2	6.3		
10	49.4	47.9	43.6	47.0	6.2	6.3	14.9	6.9
30	49.1	48.1	43.8	47.0	6.2	6.3	14.9	15.7
60	49.1	47.0	43.4	46.5	6.2	6.3	15.8	35.3
90	48.8	45.9	44.1	46.3	6.2	6.3	16.2	58.1
120	48.6	45.8	43.6	46.0	6.2	6.3	16.7	81.0
150	48.8	46.1	43.9	46.3	6.2	6.3	16.2	103.5
180	49.0	45.6	43.4	46.0	6.2	6.3	16.7	127.2
210	48.4	45.3	43.4	45.7	6.2	6.3	17.2	149.5
240	49.0	45.5	43.4	46.0	6.2	6.3	16.7	171.4
Average	48.9	46.4	43.6	46.3	6.2	6.3	16.1	
±s.d.	0.3	1.1	0.3	0.5			0.8	
Average dose range = 183.2 – 187.2 g.h.m ⁻³								

Table 6.31: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 12-03-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	57.7	57.2	58.5	57.8	6.2	6.3		
10	52.4	50.7	49.5	50.9	6.2	6.3	12.0	7.2
30	52.8	50.5	49.1	50.8	6.2	6.3	12.1	17.0
60	52.6	50.5	49.2	50.8	6.2	6.3	12.2	38.1
90	52.5	50.4	48.8	50.6	6.2	6.3	12.5	63.5
120	49.2	49.3	48.9	49.1	6.2	6.3	15.0	88.5
150	49.2	49.2	48.7	49.0	6.2	6.3	15.2	110.6
180	49.0	49.0	49.1	49.0	6.2	6.3	15.2	134.8
210	48.9	48.9	48.6	48.8	6.2	6.3	15.6	159.4
240	49.1	48.7	48.4	48.7	6.2	6.3	15.7	183.0
Average	50.6	49.7	48.9	49.7	6.2	6.3	13.9	
±S.d.	1.8	0.8	0.3	1.0			1.7	
Average dose range = 194.8 – 202.8 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.32) show that from the dissection data an estimated 1,100,814 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 172,892 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 171.4 – 184.8 g.h.m⁻³) or as a final dose (range 183.2 – 202.8 g.h.m⁻³) at 6°C in Tegan Blue Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.32: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³. Expected dose 48g/m³ for 4 hour exposure = 192 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20 kg fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate)	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
08-03-2010	1	330,856	0		27,817	55,634	0
10-03-2010	2	378,630	0		29,595	59,190	0
12-03-2010	3	391,328	0		29,034	58,068	0
	Total	1,100,814	0		86,446	172,892	0

CONCLUSIONS

Data for 8 cultivars treated at 6°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 56g/m³. Approximately 10% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 4h was approximately 182 g.h.m⁻³ on average and about 200 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 48g/m³ for 4 h treatment giving cumulative gas concentration of 192 g.h.m⁻³. The results of the dose-mortality trials showed that eggs were the most tolerant stage and required 172 g.h.m⁻³. However Probit 9 estimates showed that exposure of Medfly eggs to 180 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

6.4 RESULTS OF LARGE SCALE METHYL BROMIDE FUMIGATION TRIALS OF MEDFLY AT 6°C: 60g/m³ for 3 hour exposure

The trials at were conducted from November 2008 to July 2010.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations during the treatment period and mortality of eggs of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits is the same as for the large scale 1°C trials since fruit from the same harvested batch of was used for large scale fumigation trials.

6.4.1 Cherries - Sweetheart

Fumigation treatment records are given in tables 6.33 – 6.35. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.36.

Table 6.33: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 1). Applied dose 72g/m³
Trial date: 18-12-2008. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	75.4	72.4	73.9	73.9	6.0	6.2		
10	65.5	61.7	62.8	63.3	6.0	6.2	14.3	9.2
30	63.9	61.3	62.8	62.7	6.0	6.2	15.2	21.1
60	61.3	59.2	63.2	61.2	6.0	6.2	17.1	47.0
90	60.1	58.9	62.4	60.5	6.0	6.2	18.2	76.5
120	59.6	58.1	62.1	59.9	6.0	6.2	18.9	105.8
150	58.6	58.1	61.8	59.5	6.0	6.2	19.5	134.9
180	56.7	58.1	61.4	58.7	6.0	6.2	20.5	163.6
Average	60.8	59.3	62.4	60.8	6.0	6.2	17.7	
±s.d.	3.0	1.5	0.6	1.7			2.3	
Average dose range = 177.3 – 187.5 g.h.m ⁻³								

Table 6.34: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 22-12-2008. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.2	73.1	76.1	73.8	6.0	6.2		
10	64.1	60.6	58.7	61.1	6.0	6.2	17.2	9.2
30	64.8	59.8	58.7	61.1	6.0	6.2	17.2	20.4
60	64.8	58.7	59.1	60.9	6.0	6.2	17.5	45.8
90	63.5	57.6	58.3	59.8	6.0	6.2	19.0	76.1
120	63.3	57.5	58.0	59.6	6.0	6.2	19.2	104.7
150	63.5	57.2	58.2	59.6	6.1	6.2	19.2	134.1
180	62.7	55.9	57.8	58.8	6.1	6.2	20.3	164.0
Average	63.8	58.2	58.4	60.1	6.0	6.2	18.5	
±s.d.	0.8	1.6	0.5	0.9			1.2	
Average dose range = 177.6 – 183.0 g.h.m ⁻³								

Table 6.35: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 24-12-2008. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	75.7	73.1	71.4	73.4	6.1	6.2		
10	62.1	59.2	58.5	59.9	6.1	6.2	18.3	9.2
30	63.1	59.1	58.5	60.2	6.1	6.2	17.9	20.0
60	62.2	58.4	58.4	59.7	6.1	6.2	18.7	45.2
90	62.4	58.4	58.2	59.7	6.1	6.2	18.7	74.6
120	61.9	58.5	58.3	59.6	6.1	6.2	18.8	104.4
150	62.0	58.2	57.6	59.3	6.1	6.2	19.3	134.0
180	61.7	57.9	57.5	59.0	6.1	6.2	19.6	163.0
Average	62.2	58.5	58.1	59.6	6.1	6.2	18.8	
±s.d.	0.5	0.5	0.4	0.4			0.5	
Average dose range = 177.6 – 180.0 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.36) show that from the dissection data an estimated 1,019,702 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 153,868 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 163.0 – 164.0 g.h.m⁻³) or as a final dose (range 177.3 – 187.5 g.h.m⁻³) at 6°C in Sweetheart Cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.36: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Starting. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
18-12-2008	1	371,286	0		27,892	55,784	0
22-12-2008	2	293,974	0		25,427	50,854	0
24-12-2008	3	354,442	0		23,615	47,229	0
	Total	1,019,702	0		76,934	153,868	0

6.4.2 Cherries - Lapin

Fumigation treatment records are given in tables 6.37 – 6.39. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.40.

Table 6.37: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 25-01-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	73.0	71.4	72.5	72.3	6.0	6.2		
10	65.6	61.8	62.9	63.4	6.0	6.2	12.3	9.0
30	64.0	61.4	62.9	62.8	6.0	6.2	13.2	21.1
60	61.4	59.3	63.3	61.3	6.0	6.2	15.2	47.1
90	60.1	59.0	62.5	60.5	6.0	6.2	16.3	76.7
120	59.7	58.2	62.2	60.0	6.0	6.2	17.0	105.9
150	58.7	58.2	61.9	59.6	6.0	6.2	17.6	135.1
180	57.8	58.2	61.5	59.2	6.0	6.2	18.2	163.9
Average	61.0	59.4	62.5	61.0	6.0	6.2	15.7	
±s.d.	2.8	1.5	0.6	1.6			2.2	
Average dose range = 178.2 – 187.8 g.h.m ⁻³								

Table 6.38: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 27-01-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.7	71.2	70.2	71.4	6.0	6.2		
10	62.3	60.8	58.9	60.7	6.0	6.2	15.0	8.9
30	63.0	60.0	58.9	60.6	6.0	6.2	15.0	20.2
60	63.0	58.9	59.3	60.4	6.0	6.2	15.4	45.5
90	61.7	57.8	58.5	59.3	6.0	6.2	16.9	75.5
120	61.5	57.7	58.2	59.1	6.0	6.2	17.1	103.8
150	61.7	57.4	58.4	59.2	6.0	6.2	17.1	133.1
180	60.9	56.1	58.0	58.3	6.0	6.2	18.3	162.7
Average	62.0	58.4	58.6	59.7	6.0	6.2	16.4	
±s.d.	0.8	1.6	0.5	0.9			1.3	
Average dose range = 175.8 – 181.8 g.h.m ⁻³								

Table 6.39: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 29-01-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.5	72.0	74.0	72.8	6.1	6.3		
10	61.8	58.9	58.2	59.6	6.1	6.3	18.1	9.1
30	62.8	58.8	58.2	59.9	6.1	6.3	17.7	19.9
60	61.9	58.1	58.1	59.4	6.1	6.3	18.5	45.0
90	62.1	58.1	57.9	59.4	6.1	6.3	18.5	74.2
120	61.6	58.2	58.0	59.3	6.1	6.3	18.6	103.9
150	61.7	57.9	57.3	59.0	6.1	6.3	19.0	133.4
180	61.4	57.6	57.2	58.7	6.1	6.3	19.4	162.2
Average	61.9	58.2	57.8	59.3	6.1	6.3	18.5	
±s.d.	0.5	0.5	0.4	0.4			0.5	
Average dose range = 176.7 – 179.1 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.40) show that from the dissection data an estimated 1,185,098 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 138,844 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 162.2 – 163.9 g.h.m⁻³) or as a final dose (range 175.8 – 187.8 g.h.m⁻³) at 6°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.40: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
25-01-2010	1	421,096	0		25,454	50,908	0
27-01-2010	2	377,510	0		23,670	47,340	0
29-01-2010	3	386,492	0		20,298	40,596	0
	Total	1,185,098	0		69,422	138,844	0

6.4.3 Peaches – Snow King

Fumigation treatment records are given in tables 6.41 – 6.43. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.44.

Table 6.41: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 12-02-2010 Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	74.0	72.4	74.5	73.6	6.0	6.2		
10	63.2	61.4	62.5	62.4	6.0	6.1	15.3	9.2
30	61.6	61.0	62.5	61.7	6.0	6.1	16.2	20.8
60	59.0	58.9	62.9	60.3	6.0	6.1	18.2	46.3
90	57.7	58.6	62.1	59.5	6.0	6.1	19.2	75.3
120	57.6	57.8	61.8	59.1	6.0	6.1	19.8	104.1
150	56.7	57.8	61.5	58.7	5.9	6.1	20.3	132.9
180	54.5	57.8	61.1	57.8	5.9	6.1	21.5	161.3
Average	58.6	59.0	62.1	59.9	6.0	6.1	18.6	
±s.d.	3.0	1.5	0.6	1.6			2.2	
Average dose range = 174.9 – 187.5 g.h.m ⁻³								

Table 6.42: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 16-02-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	74.1	70.6	69.6	71.4	6.1	6.3		
10	62.5	61.0	59.1	60.9	6.1	6.2	14.8	8.9
30	63.2	60.2	59.1	60.8	6.1	6.2	14.8	20.3
60	63.2	59.1	59.5	60.6	6.1	6.2	15.2	45.6
90	61.9	58.0	58.7	59.5	6.1	6.2	16.7	75.8
120	61.7	57.9	58.4	59.3	6.1	6.2	16.9	104.2
150	61.9	57.6	58.6	59.4	6.1	6.2	16.9	133.5
180	61.1	56.3	58.2	58.5	6.1	6.2	18.1	163.3
Average	62.2	58.6	58.8	59.9	6.1	6.2	16.2	
±s.d.	0.8	1.6	0.5	0.9			1.3	
Average dose range = 177.0 – 182.4 g.h.m ⁻³								

Table 6.43: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 18-02-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.3	69.6	69.9	70.6	5.9	6.1		
10	61.4	60.5	59.8	60.6	5.9	6.1	14.2	8.8
30	62.4	60.4	59.8	60.9	5.9	6.1	13.8	20.2
60	61.5	59.7	59.7	60.3	5.9	6.1	14.6	45.7
90	61.7	59.7	59.5	60.3	5.9	6.1	14.6	75.4
120	61.2	59.8	59.6	60.2	5.9	6.1	14.7	105.5
150	61.3	59.5	58.9	59.9	5.9	6.1	15.2	135.5
180	61.0	59.2	58.8	59.7	5.9	6.1	15.5	164.7
Average	61.5	59.8	59.4	60.3	5.9	6.1	14.6	
±S.d.	0.5	0.5	0.4	0.4			0.6	
Average dose range = 179.7 – 182.1 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.44) show that from the dissection data an estimated 790,752 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 129,870 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 161.3 – 164.7 g.h.m⁻³) or as a final dose (range 177.0 – 187.5 g.h.m⁻³) at 6°C in Snow King Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.44: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
12-02-2009	1	269,316	0		14,355	43,065	0
16-02-2009	2	258,906	0		14,624	43,872	0
18-02-2009	3	262,530	0		14,311	42,933	0
	Total	790,752	0		43,290	129,870	0

6.4.4 Peaches – Zee Lady

Fumigation treatment records are given in tables 6.45 – 6.47. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.48.

Table 6.45: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 04-12-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	74.5	72.9	75.0	74.1	6.0	6.2		
10	64.8	61.0	62.1	62.6	6.0	6.2	15.5	9.3
30	63.2	60.6	62.1	62.0	6.0	6.2	16.4	20.9
60	60.6	58.5	62.5	60.5	6.0	6.2	18.3	46.5
90	59.3	58.2	61.7	59.7	6.0	6.2	19.4	75.7
120	58.8	57.4	61.4	59.2	6.0	6.2	20.1	104.5
150	58.0	57.4	61.1	58.8	6.0	6.2	20.6	133.2
180	57.8	57.4	60.7	58.6	6.0	6.2	20.9	161.8
Average	60.4	58.6	61.7	60.2	6.0	6.2	18.8	
±s.d.	2.7	1.5	0.6	1.6			2.1	
Average dose range = 175.8 – 185.4 g.h.m ⁻³								

Table 6.46: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 07-12-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	73.5	70.0	74.0	72.5	5.9	6.1		
10	62.4	62.9	60.2	61.8	5.9	6.1	14.7	9.1
30	63.1	62.1	60.2	61.8	5.9	6.1	14.8	20.6
60	63.1	61.0	60.6	61.6	5.9	6.1	15.1	46.4
90	61.8	59.9	59.8	60.5	5.9	6.1	16.6	77.0
120	61.6	59.8	59.5	60.3	6.0	6.1	16.8	105.9
150	61.8	59.5	59.7	60.3	6.0	6.1	16.8	135.7
180	61.0	58.2	59.3	59.5	6.0	6.1	17.9	165.9
Average	62.1	60.5	59.9	60.8	6.0	6.1	16.1	
±s.d.	0.8	1.6	0.5	0.9			1.2	
Average dose range = 179.7 – 185.1 g.h.m ⁻³								

Table 6.47: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 09-12-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.1	69.4	69.8	70.4	6.0	6.1		
10	62.6	59.7	59.0	60.4	6.0	6.1	14.2	8.8
30	63.6	59.6	59.0	60.7	6.0	6.1	13.8	20.1
60	62.7	58.9	58.9	60.2	6.0	6.1	14.6	45.6
90	62.9	58.9	58.7	60.2	6.0	6.1	14.6	75.2
120	62.4	59.0	58.8	60.1	6.0	6.1	14.7	105.3
150	62.5	58.7	58.1	59.8	6.0	6.1	15.1	135.2
180	62.2	58.4	58.0	59.5	6.0	6.1	15.5	164.4
Average	62.7	59.0	58.6	60.1	6.0	6.1	14.6	
±s.d.	0.5	0.5	0.4	0.4			0.6	
Average dose range = 178.2 – 181.5 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.48) show that from the dissection data an estimated 888,162 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 128,547 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 161.8 – 165.9 g.h.m⁻³) or as a final dose (range 175.8 – 185.4 g.h.m⁻³) at 6°C in Zee Lady Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.48: Large scale trials of Medfly in infested **Zee Lady Peaches** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
04-12-2009	1	269,750	0		14,233	42,699	0
07-12-2009	2	299,764	0		14,380	43,140	0
09-12-2009	3	318,648	0		14,236	42,708	0
	Total	888,162	0		42,849	128,547	0

6.4.5 Nectarines – Arctic Snow

Fumigation treatment records are given in tables 6.49 – 6.51. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.52.

Table 6.49: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 06-04-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	74.6	73.0	75.6	74.4	6.0	6.1		
10	65.1	61.7	62.7	63.2	6.0	6.1	15.1	9.3
30	63.5	61.3	62.7	62.5	6.0	6.1	16.0	21.1
60	61.8	59.2	63.1	61.4	6.0	6.1	17.5	46.9
90	59.6	58.9	62.3	60.3	6.0	6.1	19.0	76.7
120	59.7	58.1	62.0	59.9	6.0	6.1	19.4	105.5
150	58.4	58.1	61.7	59.4	6.0	6.1	20.2	134.9
180	57.5	58.1	61.3	59.0	6.0	6.1	20.7	163.4
Average	60.8	59.3	62.3	60.8	6.0	6.1	18.3	
±s.d.	2.8	1.5	0.6	1.6			2.1	
Average dose range = 177.6 – 187.2 g.h.m ⁻³								

Table 6.50: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 09-04-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.7	72.2	74.0	73.0	6.0	6.1		
10	62.3	60.8	57.3	60.1	6.0	6.1	17.6	9.1
30	63.0	60.0	57.3	60.1	6.0	6.1	17.6	20.0
60	63.0	58.9	57.7	59.9	6.0	6.1	18.0	45.1
90	61.7	57.8	56.9	58.8	6.0	6.1	19.4	74.8
120	61.5	57.7	56.6	58.6	6.0	6.1	19.7	102.9
150	61.7	57.4	56.8	58.6	6.0	6.1	19.6	131.9
180	60.9	56.1	56.4	57.8	6.0	6.1	20.8	161.2
Average	62.0	58.4	57.0	59.1	6.0	6.1	19.0	
±s.d.	0.8	1.6	0.5	0.9			1.2	
Average dose range = 174.6 – 180.0 g.h.m ⁻³								

Table 6.51: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 14-04-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	71.9	69.2	69.7	70.3	6.0	6.1		
10	61.6	58.7	58.0	59.4	6.0	6.1	15.4	8.8
30	62.6	58.6	58.0	59.7	6.0	6.1	15.0	19.8
60	61.7	57.9	57.9	59.2	6.0	6.1	15.8	44.8
90	61.9	57.9	57.7	59.2	6.0	6.1	15.8	74.0
120	61.4	58.0	57.8	59.1	6.0	6.1	15.9	103.5
150	61.5	57.7	57.1	58.8	6.0	6.1	16.4	132.9
180	61.2	57.4	57.0	58.5	6.0	6.1	16.7	161.6
Average	61.7	58.0	57.6	59.1	6.0	6.1	15.9	
±S.d.	0.5	0.5	0.4	0.4			0.6	
Average dose range = 176.1 – 178.5 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.52) show that from the dissection data an estimated 1,147,296 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 135,669 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 161.2 – 163.4 g.h.m⁻³) or as a final dose (range 174.6 – 187.2 g.h.m⁻³) at 6°C in Zee Lady Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.52: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
06-04-2009	1	377,308	0		15,422	46,266	0
09-04-2009	2	394,884	0		15,009	45,027	0
14-04-2009	3	375,104	0		14,792	44,376	0
	Total	1,147,296	0		45,223	135,669	0

6.4.6 Nectarines – August Red

Fumigation treatment records are given in tables 6.53 – 6.55. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.56.

Table 6.53: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 03-05-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	74.4	75.1	75.4	75.0	6.0	6.1		
10	63.4	60.4	61.3	61.7	6.0	6.1	17.7	9.4
30	62.8	60.0	61.3	61.4	6.0	6.1	18.1	20.6
60	59.2	57.9	61.7	59.6	6.0	6.1	20.5	46.0
90	58.8	57.6	60.9	59.1	6.0	6.1	21.2	74.5
120	57.6	56.8	60.6	58.3	6.0	6.1	22.2	103.4
150	56.5	56.8	60.3	57.9	6.0	6.1	22.8	131.3
180	56.1	56.8	59.9	57.6	6.0	6.1	23.2	159.1
Average	59.2	58.0	60.9	59.4	6.0	6.1	20.8	
±s.d.	2.9	1.5	0.6	1.6			2.2	
Average dose range = 172.5 – 183.0 g.h.m ⁻³								

Table 6.54: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 05-05-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.8	69.9	77.7	73.5	6.0	6.1		
10	62.5	61.0	57.5	60.3	6.0	6.1	17.9	9.2
30	63.2	60.2	57.5	60.3	6.0	6.1	17.9	20.1
60	63.2	59.1	57.9	60.1	6.0	6.1	18.2	45.2
90	61.9	58.0	57.1	59.0	6.0	6.1	19.7	75.1
120	61.7	57.9	56.8	58.8	6.0	6.1	20.0	103.3
150	61.9	57.6	57.0	58.8	6.0	6.1	19.9	132.3
180	61.1	56.3	56.6	58.0	6.0	6.1	21.1	161.8
Average	62.2	58.6	57.2	59.3	6.0	6.1	19.2	
±s.d.	0.8	1.6	0.5	0.9			1.2	
Average dose range = 175.2 – 180.6 g.h.m ⁻³								

Table 6.55: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 07-05-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	71.4	68.7	69.2	69.8	5.9	6.1		
10	61.8	58.9	58.2	59.6	5.9	6.1	14.5	8.7
30	62.8	58.8	58.2	59.9	5.9	6.1	14.1	19.9
60	61.9	58.1	58.1	59.4	5.9	6.1	14.9	45.0
90	62.1	58.1	57.9	59.4	5.9	6.1	14.9	74.2
120	61.6	58.2	58.0	59.3	5.9	6.1	15.1	103.9
150	61.7	57.9	57.3	59.0	5.9	6.1	15.5	133.4
180	61.4	57.6	57.2	58.7	5.9	6.1	15.8	162.2
Average	61.9	58.2	57.8	59.3	5.9	6.1	15.0	
±s.d.	0.5	0.5	0.4	0.4			0.6	
Average dose range = 176.7 – 179.1 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.56) show that from the dissection data an estimated 1,153,872 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 141,195 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 159.1 – 162.2 g.h.m⁻³) or as a final dose (range 175.2 – 183.0 g.h.m⁻³) at 6°C in August Red Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.56: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
03-05-2010	1	388,750	0		16,014	48,042	0
05-05-2010	2	371,368	0		15,645	46,935	0
07-05-2010	3	393,754	0		15,406	46,218	0
	Total	1,153,872	0		47,065	141,195	0

6.4.7 Plums – Angelino

Fumigation treatment records are given in tables 6.57 – 6.59. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.60.

Table 6.57: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 25-05-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	75.1	74.5	76.0	75.2	5.9	6.1		
10	64.1	61.4	62.2	62.6	5.9	6.1	16.8	9.4
30	62.5	61.0	62.2	61.9	5.9	6.1	17.7	20.9
60	59.9	58.9	62.6	60.5	5.9	6.1	19.6	46.4
90	58.6	58.6	61.8	59.7	5.9	6.1	20.7	75.6
120	58.1	57.8	61.5	59.1	5.9	6.1	21.4	104.4
150	57.2	57.8	61.2	58.7	5.9	6.1	21.9	133.1
180	55.4	57.8	60.8	58.0	5.9	6.1	22.9	161.5
Average	59.4	59.0	61.8	60.1	5.9	6.1	20.1	
±s.d.	3.0	1.5	0.6	1.7			2.2	
Average dose range = 175.2 – 185.4 g.h.m ⁻³								

Table 6.58: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 27-05-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	71.1	70.4	70.0	70.5	6.0	6.2		
10	62.9	59.4	55.9	59.4	6.0	6.2	15.7	8.8
30	63.6	58.6	55.9	59.4	6.0	6.2	15.8	19.8
60	63.6	57.5	56.3	59.1	6.0	6.2	16.1	44.5
90	62.3	56.4	55.5	58.1	6.0	6.2	17.6	73.9
120	62.1	56.3	55.2	57.9	6.0	6.2	17.9	101.6
150	62.3	56.0	55.4	57.9	6.0	6.2	17.9	130.2
180	61.5	54.7	55.0	57.1	6.0	6.2	19.1	159.2
Average	62.6	57.0	55.6	58.4	6.0	6.2	17.2	
±s.d.	0.8	1.6	0.5	0.9			1.3	
Average dose range = 171.9 – 177.9 g.h.m ⁻³								

Table 6.59: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 29-05-2009. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.7	72.2	70.5	71.8	6.1	6.2		
10	61.9	59.1	58.3	59.8	6.1	6.2	16.8	9.0
30	62.9	59.0	58.3	60.1	6.1	6.2	16.3	19.9
60	62.0	58.3	58.2	59.5	6.1	6.2	17.1	45.1
90	62.2	58.3	58.0	59.5	6.1	6.2	17.1	74.4
120	61.7	58.4	58.1	59.4	6.1	6.2	17.3	104.1
150	61.8	58.1	57.4	59.1	6.2	6.2	17.7	133.7
180	61.5	57.8	57.3	58.9	6.2	6.2	18.0	162.5
Average	62.0	58.4	57.9	59.5	6.1	6.2	17.2	
±S.d.	0.5	0.5	0.4	0.4			0.6	
Average dose range = 177.3 – 179.7 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.60) show that from the dissection data an estimated 1,082,896 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 193,230 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 159.2 – 162.5 g.h.m⁻³) or as a final dose (range 171.9 – 185.4 g.h.m⁻³) at 6°C in Angelino Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.60: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
25-05-2009	1	358,486	0		22,373	67,119	0
27-05-2009	2	363,100	0		21,288	63,864	0
29-05-2009	3	361,310	0		20,749	62,247	0
	Total	1,082,896	0		64,410	193,230	0

6.4.8 Plums – Tegan Blue

Fumigation treatment records are given in tables 6.61 – 6.63. Temperatures were maintained evenly: ranging from 6.0 – 6.3°C air; fruit 6.2°C. The mortality data are given in table 6.64.

Table 6.61: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 15-03-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	72.1	74.6	74.4	73.7	6.0	6.1		
10	61.4	58.4	59.3	59.7	6.0	6.1	19.0	9.2
30	60.8	58.0	59.3	59.4	6.0	6.1	19.4	19.9
60	57.2	55.9	59.7	57.6	6.0	6.1	21.8	44.5
90	56.8	55.6	58.9	57.1	6.0	6.1	22.5	72.0
120	55.6	54.8	58.6	56.3	6.0	6.1	23.6	99.9
150	54.5	54.8	58.3	55.9	6.0	6.1	24.2	126.8
180	54.1	54.8	57.9	55.6	6.0	6.1	24.6	153.6
Average	57.2	56.0	58.9	57.4	6.0	6.1	22.2	
±s.d.	2.9	1.5	0.6	1.6			2.2	
Average dose range = 167.4 – 177.0 g.h.m ⁻³								

Table 6.62: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 17-03-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	73.5	72.9	72.3	72.9	6.0	6.1		
10	61.5	60.0	56.5	59.3	6.0	6.1	18.6	9.1
30	62.2	59.2	56.5	59.3	6.0	6.1	18.7	19.8
60	62.2	58.1	56.9	59.1	6.0	6.1	19.0	44.5
90	60.9	57.0	56.1	58.0	6.0	6.1	20.4	73.8
120	60.7	56.9	55.8	57.8	6.0	6.1	20.7	101.5
150	60.9	56.6	56.0	57.8	6.0	6.1	20.7	130.1
180	60.1	55.3	55.6	57.0	6.0	6.1	21.8	159.0
Average	61.2	57.6	56.2	58.3	6.0	6.1	20.0	
±s.d.	0.8	1.6	0.5	0.9			1.2	
Average dose range = 171.3 – 177.6 g.h.m ⁻³								

Table 6.63: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 19-03-2010. Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³.

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	73.6	71.5	70.8	72.0	5.9	6.1		
10	60.8	57.9	57.2	58.6	5.9	6.1	18.5	9.0
30	61.8	57.8	57.2	58.9	5.9	6.1	18.1	19.5
60	60.9	57.1	57.1	58.4	5.9	6.1	18.9	44.2
90	61.1	57.1	56.9	58.4	5.9	6.1	18.9	73.0
120	60.6	57.2	57.0	58.3	5.9	6.1	19.0	102.1
150	60.7	56.9	56.3	58.0	5.9	6.1	19.5	131.1
180	60.4	56.6	56.2	57.7	5.9	6.1	19.8	159.4
Average	60.9	57.2	56.8	58.3	5.9	6.1	19.0	
±s.d.	0.5	0.5	0.4	0.4			0.6	
Average dose range = 173.7 – 176.1 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.64) show that from the dissection data an estimated 1,269,094 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 188,454 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 153.6 – 159.4 g.h.m⁻³) or as a final dose (range 167.4 – 177.6 g.h.m⁻³) at 6°C in Tegan Blue Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.64: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (3 Replicates).
Applied dose 72g/m³. Expected dose 60g/m³ for 3 hour exposure = 180 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate 30kg)	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
15-03-2010	1	422,852	0		20,214	60,642	0
17-03-2010	2	426,552	0		21,506	64,518	0
19-03-2010	3	419,690	0		21,098	63,294	0
	Total	1,269,094	0		62,818	188,454	0

CONCLUSIONS

Data for 8 cultivars treated at 6°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 72g/m³. Approximately 16% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 160 g.h.m⁻³ on average and about 180 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 60g/m³ for 3 h treatment giving cumulative gas concentration of 180 g.h.m⁻³. The results of the dose-mortality trials showed that eggs were the most tolerant stage and required 172 g.h.m⁻³. However Probit 9 estimates showed that exposure of Medfly eggs to 180 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

6.5 RESULTS OF LARGE SCALE METHYL BROMIDE FUMIGATION TRIALS OF MEDFLY AT 11°C: 40g/m³ for 3 hour exposure

The trials at were conducted from November 2008 to July 2010.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations during the treatment period and mortality of eggs of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits are the same as for the large scale 1°C trials since fruit from the same harvested batch of was used for large scale fumigation trials.

6.5.1 Cherries - Sweetheart

Fumigation treatment records are given in tables 6.65 – 6.67. Temperatures were maintained evenly: ranging from 11.0 – 11.2°C air; fruit 11.2°C. The mortality data are given in table 6.68.

Table 6.65: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 05-01-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	49.6	48.0	50.1	49.2	11.1	11.2		
10	45.6	45.8	46.9	46.1	11.1	11.2	6.4	6.2
30	44.0	45.4	46.9	45.4	11.1	11.2	7.7	15.4
60	41.4	43.3	47.3	44.0	11.1	11.2	10.6	34.1
90	40.2	43.0	46.5	43.2	11.1	11.2	12.2	55.0
120	39.7	42.2	46.2	42.7	11.1	11.2	13.3	75.7
150	38.7	42.2	45.9	42.3	11.1	11.2	14.2	96.1
180	36.8	42.2	45.5	41.5	11.1	11.2	15.7	116.2
Average	40.9	43.4	46.5	43.6	11.1	11.2	11.4	
±s.d.	3.0	1.5	0.6	1.7			3.4	
Average dose range = 125.7 – 135.9 g.h.m ⁻³								

Table 6.66: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 09-01-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.1	48.0	47.0	48.4	11.1	11.2		
10	44.2	44.7	43.8	44.2	11.1	11.2	8.5	6.0
30	44.9	43.9	43.8	44.2	11.1	11.2	8.6	14.7
60	44.9	42.8	44.2	44.0	11.1	11.2	9.1	33.2
90	43.6	41.7	43.4	42.9	11.1	11.2	11.3	55.0
120	43.4	41.6	43.1	42.7	11.1	11.2	11.7	75.1
150	43.6	41.3	43.3	42.7	11.1	11.2	11.6	96.1
180	42.8	40.0	42.9	41.9	11.1	11.2	13.4	117.5
Average	43.9	42.3	43.5	43.2	11.1	11.2	10.6	
±s.d.	0.8	1.6	0.5	0.9			1.9	
Average dose range = 128.1 – 132.3 g.h.m ⁻³								

Table 6.67: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 12-01-2009. Applied dose 48g/m^3 . Expected dose 40g/m^3 for 3 hour exposure = 120 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	48.9	46.3	47.6	47.6	11.1	11.2		
10	42.2	43.3	43.6	43.0	11.1	11.2	9.6	6.0
30	43.2	43.2	43.6	43.3	11.2	11.2	9.0	14.3
60	42.3	42.5	43.5	42.8	11.2	11.2	10.2	32.5
90	42.5	42.5	43.3	42.8	11.2	11.2	10.2	53.5
120	42.0	42.6	43.4	42.7	11.2	11.2	10.4	74.8
150	42.1	42.3	42.7	42.4	11.2	11.2	11.0	96.0
180	41.8	42.0	42.6	42.1	11.2	11.2	11.5	116.5
Average	42.3	42.6	43.2	42.7	11.1	11.2	10.2	
±s.d.	0.5	0.5	0.4	0.4			0.8	
Average dose range = $126.9 - 129.3\text{ g.h.m}^{-3}$								

Insect mortality from methyl bromide treatment

The results (table 6.68) show that from the dissection data an estimated 1,081,017 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 145,498 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range $116.2 - 117.5\text{ g.h.m}^{-3}$) or as a final dose (range $125.7 - 135.9\text{ g.h.m}^{-3}$) at 11°C in Sweetheart Cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.68: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m^3 - Expected dose 40g/m^3 for 3 hour exposure = 120 g.h.m^{-3} . Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
05-01-2009	1	331,548	0		26,375	52,750	0
09-01-2009	2	344,268	0		24,044	48,088	0
12-01-2009	3	308,862	0		22,330	44,660	0
	Total	1,081,017	0		72,749	145,498	0

6.5.2 Cherries - Lapin

Fumigation treatment records are given in tables 6.69 – 6.71. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C. The mortality data are given in table 6.72.

Table 6.69: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 01-02-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	49.2	47.6	49.7	48.8	11.1	11.2		
10	44.7	44.9	46.0	45.2	11.1	11.2	7.4	6.1
30	43.1	44.5	46.0	44.5	11.1	11.2	8.8	15.1
60	40.5	42.4	46.4	43.1	11.1	11.2	11.7	33.4
90	39.2	42.1	45.6	42.3	11.1	11.2	13.4	53.9
120	38.8	41.3	45.3	41.8	11.1	11.2	14.4	74.0
150	37.8	41.3	45.0	41.4	11.1	11.2	15.3	94.1
180	36.9	41.3	44.6	40.9	11.1	11.2	16.2	113.8
Average	40.1	42.5	45.6	42.7	11.1	11.2	12.5	
±s.d.	2.8	1.5	0.6	1.6			3.3	
Average dose range = 123.3 – 132.9 g.h.m ⁻³								

Table 6.70: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 03-02-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.9	47.4	46.4	48.2	11.1	11.2		
10	43.4	43.9	43.0	43.4	11.1	11.2	10.0	6.0
30	44.1	43.1	43.0	43.4	11.1	11.2	10.0	14.5
60	44.1	42.0	43.4	43.2	11.1	11.2	10.5	32.6
90	42.8	40.9	42.6	42.1	11.1	11.2	12.7	54.0
120	42.6	40.8	42.3	41.9	11.1	11.2	13.1	73.7
150	42.8	40.5	42.5	41.9	11.1	11.2	13.1	94.3
180	42.0	39.2	42.1	41.1	11.1	11.2	14.8	115.3
Average	43.1	41.5	42.7	42.4	11.1	11.2	12.0	
±s.d.	0.8	1.6	0.5	0.9			1.9	
Average dose range = 124.5 – 129.9 g.h.m ⁻³								

Table 6.71: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 05-02-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	48.7	46.0	46.2	47.0	11.1	11.2		
10	41.9	43.0	43.3	42.7	11.1	11.2	9.0	5.9
30	42.9	42.9	43.3	43.0	11.1	11.2	8.4	14.2
60	42.0	42.2	43.2	42.5	11.1	11.2	9.6	32.3
90	42.2	42.2	43.0	42.5	11.1	11.2	9.6	53.1
120	41.7	42.3	43.1	42.4	11.1	11.2	9.8	74.3
150	41.8	42.0	42.4	42.1	11.1	11.2	10.4	95.3
180	41.5	41.7	42.3	41.8	11.1	11.2	10.9	115.7
Average	42.0	42.3	42.9	42.4	11.1	11.2	9.7	
±s.d.	0.5	0.5	0.4	0.4			0.8	
Average dose range = 126.0 – 128.4 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.72) show that from the dissection data an estimated 1,219,022 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 151,430 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 113.8 – 115.7 g.h.m⁻³) or as a final dose (range 123.3 – 132.9 g.h.m⁻³) at 11°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.72: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m³ - Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m³.. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
01-02-2010	1	398,508	0		27,745	55,490	0
03-02-2010	2	400,264	0		25,800	51,600	0
05-02-2010	3	420,250	0		22,125	44,250	0
	Total	1,219,022	0		75,670	151,340	0

6.5.3 Peaches – Snow King

Fumigation treatment records are given in tables 6.73 – 6.75. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.2°C. The mortality data are given in table 6.76.

Table 6.73: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 20-02-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.2	48.6	50.7	49.8	11.1	11.2		
10	44.3	44.5	46.6	45.1	11.1	11.2	9.4	6.2
30	42.7	44.1	46.6	44.5	11.1	11.2	10.8	15.0
60	40.1	42.0	47.0	43.0	11.1	11.2	13.6	33.4
90	38.8	41.7	46.2	42.2	11.1	11.2	15.3	53.8
120	38.7	40.9	45.9	41.8	11.0	11.2	16.1	73.9
150	37.8	40.9	45.6	41.4	11.0	11.2	16.9	94.1
180	35.6	40.9	45.2	40.6	11.0	11.2	18.6	113.9
Average	39.7	42.1	46.2	42.7	11.0	11.2	14.4	
±s.d.	3.0	1.5	0.6	1.6			3.3	
Average dose range = 123.3 – 132.9 g.h.m ⁻³								

Table 6.74: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 23-02-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.3	46.8	45.8	47.6	11.0	11.2		
10	42.6	43.1	42.2	42.6	11.0	11.2	10.5	6.0
30	43.3	42.3	42.2	42.6	11.0	11.2	10.6	14.2
60	43.3	41.2	42.6	42.4	11.0	11.2	11.1	32.0
90	42.0	40.1	41.8	41.3	11.0	11.2	13.3	53.0
120	41.8	40.0	41.5	41.1	11.0	11.2	13.7	72.3
150	42.0	39.7	41.7	41.1	11.0	11.2	13.6	92.5
180	41.2	38.4	41.3	40.3	11.0	11.2	15.4	113.1
Average	42.3	40.7	41.9	41.6	11.0	11.2	12.6	
±s.d.	0.8	1.6	0.5	0.9			1.9	
Average dose range = 122.1 – 127.5 g.h.m ⁻³								

Table 6.75: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 25-02-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	48.5	45.8	46.1	46.8	11.0	11.2		
10	40.5	41.6	41.9	41.3	11.0	11.2	11.7	5.9
30	41.5	41.5	41.9	41.6	11.0	11.2	11.0	13.8
60	40.6	40.8	41.8	41.1	11.0	11.2	12.3	31.2
90	40.8	40.8	41.6	41.1	11.0	11.2	12.3	51.3
120	40.3	40.9	41.7	41.0	11.0	11.2	12.5	71.9
150	40.4	40.6	41.0	40.7	11.0	11.2	13.1	92.2
180	40.1	40.3	40.9	40.4	11.0	11.2	13.6	111.8
Average	40.6	40.9	41.5	41.0	11.0	11.2	12.3	
±s.d.	0.5	0.5	0.4	0.4			0.9	
Average dose range = 121.8 – 124.2 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.76) show that from the dissection data an estimated 793,142 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 122,808 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 111.8 – 113.9 g.h.m⁻³) or as a final dose (range 121.8 – 132.9 g.h.m⁻³) at 11°C in Snow King Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.76: Large scale trials of Medfly in infested Snow King Peaches at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m³ - Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m³.. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate 30kg)	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
20-02-2009	1	250,878	0		13,574	40,722	0
23-02-2009	2	255,752	0		13,829	41,487	0
25-02-2009	3	286,512	0		13,533	40,599	0
	Total	793,142	0		40,936	122,808	0

6.5.4 Peaches – Zee Lady

Fumigation treatment records are given in tables 6.77 – 6.79. Temperatures were maintained evenly: ranging from 11.0 – 11.2°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.80.

Table 6.77: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 11-12-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.7	49.1	51.2	50.3	11.0	11.2		
10	43.9	44.1	45.2	44.4	11.0	11.2	11.8	6.3
30	42.3	43.7	45.2	43.7	11.0	11.2	13.1	14.8
60	39.7	41.6	45.6	42.3	11.0	11.2	16.0	32.8
90	38.4	41.3	44.8	41.5	11.0	11.2	17.5	52.9
120	37.9	40.5	44.5	41.0	11.0	11.2	18.6	72.6
150	37.1	40.5	44.2	40.6	11.0	11.2	19.3	92.2
180	36.9	40.5	43.8	40.4	11.0	11.2	19.7	111.7
Average	39.5	41.7	44.8	42.0	11.0	11.2	16.6	
±s.d.	2.7	1.5	0.6	1.6			3.1	
Average dose range = 121.2 – 130.8 g.h.m ⁻³								

Table 6.78: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 14-12-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	49.7	46.2	45.2	47.0	11.0	11.2		
10	43.5	44.0	42.3	43.3	11.0	11.1	8.0	5.9
30	44.2	43.2	42.3	43.2	11.0	11.1	8.1	14.4
60	44.2	42.1	42.7	43.0	11.0	11.1	8.6	32.4
90	42.9	41.0	41.9	41.9	11.0	11.1	10.8	53.8
120	42.7	40.9	41.6	41.7	11.0	11.1	11.3	73.4
150	42.9	40.6	41.8	41.8	11.0	11.1	11.2	93.9
180	42.1	39.3	41.4	40.9	11.0	11.1	13.0	114.9
Average	43.2	41.6	42.0	42.3	11.0	11.1	10.1	
±s.d.	0.8	1.6	0.5	0.9			1.9	
Average dose range = 124.8 – 129.6 g.h.m ⁻³								

Table 6.79: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 16-12-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	48.3	45.6	46.0	46.6	11.0	11.2		
10	40.7	41.8	42.1	41.5	11.1	11.2	10.9	5.8
30	41.7	41.7	42.1	41.8	11.1	11.2	10.3	13.8
60	40.8	41.0	42.0	41.3	11.1	11.2	11.5	31.4
90	41.0	41.0	41.8	41.3	11.1	11.2	11.5	51.6
120	40.5	41.1	41.9	41.2	11.1	11.2	11.7	72.2
150	40.6	40.8	41.2	40.9	11.1	11.2	12.4	92.6
180	40.3	40.5	41.1	40.6	11.1	11.2	12.9	112.4
Average	40.8	41.1	41.7	41.2	11.1	11.2	11.6	
±s.d.	0.5	0.5	0.4	0.4			0.9	
Average dose range = 122.4 – 124.8 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.80) show that from the dissection data an estimated 815,320 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 121,554 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 111.7 – 114.9 g.h.m⁻³) or as a final dose (range 121.2 – 130.8 g.h.m⁻³) at 11°C in Zee Lady Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.80: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m³ - Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
11-12-2009	1	255,378	0		13,459	40,377	0
14-12-2009	2	290,592	0		13,598	40,794	0
16-12-2009	3	269,350	0		13,461	40,383	0
	Total	815,320	0		40,518	121,554	0

6.5.5 Nectarines – Arctic Snow

Fumigation treatment records are given in tables 6.81 – 6.83. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.2°C. The mortality data are given in table 6.84.

Table 6.81: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 20-04-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.8	49.2	51.8	50.6	11.1	11.2		
10	44.2	44.8	46.8	45.3	11.1	11.2	10.5	6.3
30	42.6	44.4	46.8	44.6	11.1	11.2	11.9	15.1
60	40.9	42.3	47.2	43.5	11.1	11.2	14.1	33.5
90	38.7	42.0	46.4	42.4	11.1	11.2	16.3	54.3
120	38.8	41.2	46.1	42.0	11.1	11.2	16.9	74.1
150	37.5	41.2	45.8	41.5	11.1	11.2	18.0	94.6
180	36.6	41.2	45.4	41.1	11.1	11.2	18.8	114.1
Average	39.9	42.4	46.4	42.9	11.1	11.2	15.2	
±s.d.	2.8	1.5	0.6	1.6			3.1	
Average dose range = 123.9 – 133.5 g.h.m ⁻³								

Table 6.82: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 23-04-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	48.9	46.0	44.0	46.3	11.1	11.2		
10	43.4	43.9	41.4	42.9	11.1	11.2	7.3	5.8
30	44.1	43.1	41.4	42.9	11.1	11.2	7.4	14.3
60	44.1	42.0	41.8	42.6	11.1	11.2	7.9	32.2
90	42.8	40.9	41.0	41.6	11.1	11.2	10.2	53.3
120	42.6	40.8	40.7	41.4	11.1	11.2	10.7	72.7
150	42.8	40.5	40.9	41.4	11.1	11.2	10.6	93.1
180	42.0	39.2	40.5	40.6	11.1	11.2	12.4	113.9
Average	43.1	41.5	41.1	41.9	11.1	11.2	9.5	
±s.d.	0.8	1.6	0.5	0.9			2.0	
Average dose range = 123.0 – 128.4 g.h.m ⁻³								

Table 6.83: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 27-04-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	48.1	45.4	45.9	46.5	11.1	11.2		
10	40.7	41.8	42.1	41.5	11.1	11.2	10.6	5.8
30	41.7	41.7	42.1	41.8	11.0	11.2	10.0	13.8
60	40.8	41.0	42.0	41.3	11.0	11.2	11.2	31.4
90	41.0	41.0	41.8	41.3	11.0	11.2	11.2	51.6
120	40.5	41.1	41.9	41.2	11.0	11.2	11.4	72.2
150	40.6	40.8	41.2	40.9	11.0	11.2	12.1	92.6
180	40.3	40.5	41.1	40.6	11.0	11.2	12.6	112.4
Average	40.8	41.1	41.7	41.2	11.0	11.2	11.3	
±s.d.	0.5	0.5	0.4	0.4			0.9	
Average dose range = 122.4 – 124.8 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.84) show that from the dissection data an estimated 896,260 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 128,286 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 112.4 – 114.1 g.h.m⁻³) or as a final dose (range 123.9 – 133.5 g.h.m⁻³) at 11°C in Arctic Snow Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.84: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m³ - Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m³.. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
20-04-2009	1	311,756	0		14,582	43,746	0
23-04-2009	2	299,370	0		14,193	42,579	0
27-04-2009	3	285,134	0		13,987	41,961	0
	Total	896,260	0		42,762	128,286	0

6.5.6 Nectarines – August Red

Fumigation treatment records are given in tables 6.85 – 6.87. Temperatures were maintained evenly: ranging from 11.0°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.88.

Table 6.85: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 1)
Trial date: 10-05-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.6	49.0	51.6	50.4	11.0	11.2		
10	45.5	45.5	47.4	46.1	11.0	11.2	8.5	6.3
30	44.9	45.1	47.4	45.8	11.0	11.2	9.1	15.4
60	41.3	43.0	47.8	44.0	11.0	11.2	12.6	34.4
90	40.9	42.7	47.0	43.5	11.0	11.2	13.6	55.0
120	39.7	41.9	46.7	42.8	11.0	11.2	15.1	76.2
150	38.6	41.9	46.4	42.3	11.0	11.2	16.1	96.2
180	38.2	41.9	46.0	42.0	11.0	11.2	16.6	116.3
Average	41.3	43.1	47.0	43.8	11.0	11.2	13.1	
±s.d.	2.9	1.5	0.6	1.6			3.2	
Average dose range = 126.6 – 135.6 g.h.m ⁻³								

Table 6.86: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 2)
Trial date: 12-05-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	49.0	46.1	43.9	46.3	11.0	11.2		
10	44.6	45.1	42.6	44.1	11.0	11.2	4.8	5.8
30	45.3	44.3	42.6	44.1	11.0	11.2	4.9	14.7
60	45.3	43.2	43.0	43.8	11.0	11.2	5.4	33.1
90	44.0	42.1	42.2	42.8	11.0	11.2	7.7	54.8
120	43.8	42.0	41.9	42.6	11.0	11.2	8.1	74.8
150	44.0	41.7	42.1	42.6	11.0	11.2	8.1	95.8
180	43.2	40.4	41.7	41.8	11.0	11.2	9.9	117.2
Average	44.3	42.7	42.3	43.1	11.0	11.2	7.0	
±s.d.	0.8	1.6	0.5	0.9			1.9	
Average dose range = 126.6 – 132.0 g.h.m ⁻³								

Table 6.87: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 3)
Trial date: 14-05-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	47.6	44.9	45.4	46.0	11.0	11.2		
10	41.9	43.0	43.3	42.7	11.0	11.2	7.0	5.7
30	42.9	42.9	43.3	43.0	11.0	11.2	6.4	14.2
60	42.0	42.2	43.2	42.5	11.0	11.1	7.6	32.3
90	42.2	42.2	43.0	42.5	11.0	11.1	7.6	53.1
120	41.7	42.3	43.1	42.4	11.0	11.1	7.8	74.3
150	41.8	42.0	42.4	42.1	11.0	11.1	8.5	95.3
180	41.5	41.7	42.3	41.8	11.0	11.1	9.0	115.7
Average	42.0	42.3	42.9	42.4	11.0	11.1	7.7	
±s.d.	0.5	0.5	0.4	0.4			0.9	
Average dose range = 126.0 – 128.4 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.88) show that from the dissection data an estimated 827,904 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 133,515 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 115.7 – 117.2 g.h.m⁻³) or as a final dose (range 126.6 – 135.6 g.h.m⁻³) at 11°C in August Red Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.88: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (3 Replicates).

Applied dose 48g/m³ - Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m³.. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
10-05-2010	1	298,432	0		15,143	45,429	0
12-05-2010	2	271,564	0		14,794	44,382	0
14-05-2010	3	257,908	0		14,568	43,704	0
	Total	827,904	0		44,505	133,515	0

6.5.7 Plums – Angelino

Fumigation treatment records are given in tables 6.89 – 6.91. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.92.

Table 6.89: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 01-06-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.0	49.7	52.2	51.0	11.0	11.1		
10	45.9	45.2	45.0	45.4	11.0	11.1	11.0	6.4
30	44.3	44.8	45.0	44.7	11.0	11.1	12.3	15.1
60	41.7	42.7	45.4	43.3	11.0	11.1	15.1	33.5
90	40.4	42.4	44.6	42.5	11.0	11.1	16.7	54.1
120	39.9	41.6	44.3	41.9	11.0	11.1	17.7	74.3
150	39.0	41.6	44.0	41.5	11.0	11.1	18.5	94.4
180	37.2	41.6	43.6	40.8	11.0	11.1	19.9	114.2
Average	41.2	42.8	44.6	42.9	11.0	11.1	15.9	
± s.d.	3.0	1.5	0.6	1.7			3.3	
Average dose range = 123.6 – 133.8 g.h.m ⁻³								

Table 6.90: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 03-06-2009. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	49.3	46.6	44.2	46.7	11.0	11.1		
10	44.2	44.7	42.2	43.7	11.0	11.1	6.4	5.8
30	44.9	43.9	42.2	43.7	11.0	11.1	6.5	14.6
60	44.9	42.8	42.6	43.4	11.0	11.1	7.0	32.8
90	43.6	41.7	41.8	42.4	11.0	11.1	9.3	54.3
120	43.4	41.6	41.5	42.2	11.0	11.1	9.7	74.1
150	43.6	41.3	41.7	42.2	11.0	11.1	9.6	94.9
180	42.8	40.0	41.3	41.4	11.0	11.1	11.4	116.1
Average	43.9	42.3	41.9	42.7	11.0	11.1	8.6	
±s.d.	0.8	1.6	0.5	0.9			1.9	
Average dose range = 127.7 – 130.8 g.h.m ⁻³								

Table 6.91: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 05-06-2009. Applied dose 48g/m^3 . Expected dose 40g/m^3 for 3 hour exposure = 120 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	47.9	45.4	45.7	46.3	11.0	11.1		
10	42.0	43.2	43.4	42.9	11.0	11.1	7.5	5.8
30	43.0	43.1	43.4	43.2	11.1	11.2	6.8	14.3
60	42.1	42.4	43.3	42.6	11.1	11.2	8.1	32.4
90	42.3	42.4	43.1	42.6	11.1	11.2	8.1	53.3
120	41.8	42.5	43.2	42.5	11.1	11.2	8.3	74.6
150	41.9	42.2	42.5	42.2	11.1	11.2	8.9	95.6
180	41.6	41.9	42.4	42.0	11.1	11.2	9.4	116.1
Average	42.1	42.5	43.0	42.6	11.1	11.2	8.2	
±s.d.	0.5	0.5	0.4	0.4			0.9	
Average dose range = $126.6 - 129.0\text{ g.h.m}^{-3}$								

Insect mortality from methyl bromide treatment

The results (table 6.92) show that from the dissection data an estimated 826,980 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 182,895 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range $114.2 - 116.1\text{ g.h.m}^{-3}$) or as a final dose (range $123.6 - 133.8\text{ g.h.m}^{-3}$) at 11°C in Angelino Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.92: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m^3 - Expected dose 40g/m^3 for 3 hour exposure = 120 g.h.m^{-3} . Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
01-06-2009	1	289,564	0		20,924	62,772	0
03-06-2009	2	270,992	0		19,862	59,586	0
05-06-2009	3	266,424	0		20,179	60,537	0
	Total	826,980	0		60,965	182,895	0

6.5.8 Plums – Tegan Blue

Fumigation treatment records are given in tables 6.93 – 6.95. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.96.

Table 6.93: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 22-03-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	45.8	45.2	46.9	46.0	11.0	11.2		
10	42.9	43.1	44.2	43.4	11.0	11.2	5.6	5.7
30	41.3	42.7	44.2	42.7	11.0	11.2	7.0	14.5
60	38.7	40.6	44.6	41.3	11.0	11.2	10.2	32.1
90	37.4	40.3	43.8	40.5	11.0	11.2	11.9	51.6
120	36.9	39.5	43.5	40.0	11.0	11.2	13.1	70.9
150	36.1	39.5	43.2	39.6	11.0	11.2	13.9	89.9
180	35.9	39.5	42.8	39.4	11.0	11.2	14.3	108.9
Average	38.5	40.7	43.8	41.0	11.0	11.2	10.8	
±s.d.	2.7	1.5	0.6	1.6			3.4	
Average dose range = 118.2 – 127.8 g.h.m ⁻³								

Table 6.94: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 24-03-2010. Applied dose 48g/m³. Expected dose 40g/m³ for 3 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	45.1	44.7	48.3	46.0	11.0	11.2		
10	42.5	43.0	41.3	42.3	11.0	11.1	8.2	5.8
30	43.2	42.2	41.3	42.2	11.0	11.1	8.3	14.1
60	43.2	41.1	41.7	42.0	11.0	11.1	8.8	31.7
90	41.9	40.0	40.9	40.9	11.0	11.1	11.1	52.5
120	41.7	39.9	40.6	40.7	11.0	11.1	11.5	71.6
150	41.9	39.6	40.8	40.8	11.0	11.1	11.4	91.7
180	41.1	38.3	40.4	39.9	11.0	11.1	13.3	112.1
Average	42.2	40.6	41.0	41.3	11.0	11.1	10.4	
±s.d.	0.8	1.6	0.5	0.9			2.0	
Average dose range = 120.6 – 126.6 g.h.m ⁻³								

Table 6.95: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 26-03-2010. Applied dose 48g/m^3 . Expected dose 40g/m^3 for 3 hour exposure = 120 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	46.2	45.3	46.8	46.1	11.0	11.2		
10	39.7	40.8	41.1	40.5	11.1	11.2	12.1	5.8
30	40.7	40.7	41.1	40.8	11.1	11.2	11.4	13.5
60	39.8	40.0	41.0	40.3	11.1	11.2	12.7	30.6
90	40.0	40.0	40.8	40.3	11.1	11.2	12.7	50.3
120	39.5	40.1	40.9	40.2	11.1	11.2	12.9	70.5
150	39.6	39.8	40.2	39.9	11.1	11.2	13.5	90.4
180	39.3	39.5	40.1	39.6	11.1	11.2	14.0	109.6
Average	39.8	40.1	40.7	40.2	11.1	11.2	12.7	
±s.d.	0.5	0.5	0.4	0.4			0.9	
Average dose range = $116.4 - 121.8\text{ g.h.m}^{-3}$								

Insect mortality from methyl bromide treatment

The results (table 6.96) show that from the dissection data an estimated 1,138,610 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 176,607 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range $108.9 - 112.1\text{ g.h.m}^{-3}$) or as a final dose (range $116.4 - 127.8\text{ g.h.m}^{-3}$) at 11°C in Tegan Blue Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.96: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 48g/m^3 - Expected dose 40g/m^3 for 3 hour exposure = 120 g.h.m^{-3} . Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
22-03-2010	1	365,312	0		19,810	59,430	0
24-03-2010	2	396,868	0		20,076	60,228	0
26-03-2010	3	376,430	0		18,983	56,949	0
	Total	1,138,610	0		58,869	176,607	0

CONCLUSIONS

Data for 8 cultivars treated at 11°C show that complete mortality was achieved in $>30,000$ insects. The applied methyl bromide (MeBr) dose was 48g/m^3 . Approximately 12% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 110 g.h.m^{-3} on average and about 126 g.h.m^{-3} when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 40g/m^3 for 3 h treatment giving cumulative gas concentration of 120 g.h.m^{-3} . The results of the dose-mortality trials showed that eggs were the most tolerant stage and required 100 g.h.m^{-3} . However Probit 9 estimates showed that exposure of Medfly eggs to 110 g.h.m^{-3} methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

6.6 RESULTS OF LARGE SCALE METHYL BROMIDE FUMIGATION TRIALS OF MEDFLY AT 11°C: 48g/m³ for 2.5 hour exposure

The trials at were conducted from November 2008 to July 2010.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations during the treatment period and mortality of eggs of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits are the same as for the large scale 1°C trials since fruit from the same harvested batch of was used for large scale fumigation trials.

6.6.1 Cherries - Sweetheart

Fumigation treatment records are given in tables 6.97 – 6.99. Temperatures were maintained evenly: ranging from 11.0 – 11.2°C air; fruit 11.2°C. The mortality data are given in table 6.100.

Table 6.97: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 15-01-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.6	52.9	54.1	53.9	11.1	11.2		
10	51.6	50.8	49.9	50.8	11.1	11.2	5.8	6.7
30	50.0	50.4	49.9	50.1	11.1	11.2	7.0	16.9
60	49.4	49.3	50.3	49.7	11.1	11.2	7.8	37.6
90	48.2	49.0	49.5	48.9	11.1	11.2	9.2	62.1
120	47.7	48.2	49.2	48.4	11.1	11.2	10.2	85.6
150	46.7	48.2	48.9	47.9	11.1	11.2	11.0	108.8
Average	48.9	49.3	49.6	49.3	11.1	11.2	8.5	
±s.d.	1.8	1.1	0.5	1.1			2.0	
Average dose range = 120.5 – 126.0 g.h.m ⁻³								

Table 6.98: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 19-01-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.5	54.1	53.7	54.1	11.0	11.1		
10	48.2	48.7	50.8	49.2	11.0	11.1	9.0	6.8
30	48.9	47.9	50.8	49.2	11.0	11.1	9.1	16.4
60	48.9	46.8	51.2	49.0	11.0	11.1	9.5	36.9
90	47.6	45.7	50.4	47.9	11.0	11.1	11.5	61.2
120	47.4	45.6	50.1	47.7	11.0	11.1	11.8	83.8
150	47.6	45.3	50.3	47.7	11.0	11.1	11.8	107.3
Average	48.1	46.7	50.6	48.5	11.0	11.1	10.4	
±s.d.	0.7	1.4	0.4	0.8			1.4	
Average dose range = 119.5 – 123.3 g.h.m ⁻³								

Table 6.99: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 22-01-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.9	53.3	54.6	53.9	11.0	11.1		
10	48.2	49.3	50.6	49.4	11.0	11.1	8.5	6.7
30	49.2	49.2	50.6	49.7	11.0	11.1	7.9	16.5
60	48.3	48.5	50.5	49.1	11.0	11.1	9.0	37.3
90	48.5	48.5	50.3	49.1	11.0	11.1	9.0	61.4
120	48.0	48.6	50.4	49.0	11.0	11.1	9.1	85.9
150	48.1	48.3	49.7	48.7	11.0	11.1	9.7	110.3
Average	48.4	48.7	50.4	49.2	11.0	11.1	8.9	
± s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 122.3 – 123.8 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.100) show that from the dissection data an estimated 1,117,588 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 158,594 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 107.3 – 110.3 g.h.m⁻³) or as a final dose (range 119.5 – 126.0 g.h.m⁻³) at 11°C in Sweetheart Cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.100: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
15-01-2009	1	364,832	0		28,749	57,498	0
19-01-2009	2	380,764	0		26,208	52,416	0
22-01-2009	3	371,992	0		24,340	48,680	0
	Total	1,117,588	0		79,297	158,594	0

6.6.2 Cherries - Lapin

Fumigation treatment records are given in tables 6.101 – 6.103. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C. The mortality data are given in table 6.104.

Table 6.101: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 08-02-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.2	54.6	56.7	55.2	11.2	11.3		
10	51.7	51.9	51.0	51.5	11.2	11.3	6.6	6.9
30	50.1	51.5	51.0	50.9	11.2	11.3	7.8	17.2
60	49.5	51.4	51.4	50.8	11.2	11.3	8.0	38.2
90	48.2	51.1	50.6	50.0	11.2	11.3	9.4	63.5
120	47.8	50.3	50.3	49.5	11.2	11.3	10.3	87.4
150	46.8	50.3	50.0	49.0	11.2	11.3	11.1	111.3
Average	49.0	51.1	50.7	50.3	11.2	11.3	8.9	
±s.d.	1.8	0.7	0.5	0.9			1.7	
Average dose range = 123.0 – 128.0 g.h.m ⁻³								

Table 6.102: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 10-02-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.9	52.4	53.4	53.2	11.2	11.3		
10	48.4	48.9	51.0	49.4	11.2	11.3	7.1	6.7
30	49.1	48.1	51.0	49.4	11.2	11.3	7.2	16.5
60	49.1	47.0	51.4	49.2	11.2	11.3	7.6	37.1
90	47.8	45.9	50.6	48.1	11.2	11.3	9.6	61.5
120	47.6	45.8	50.3	47.9	11.2	11.3	10.0	84.2
150	47.8	45.5	50.5	47.9	11.2	11.3	10.0	107.8
Average	48.3	46.9	50.8	48.7	11.2	11.3	8.6	
±s.d.	0.7	1.4	0.4	0.8			1.4	
Average dose range = 119.8 – 123.8 g.h.m ⁻³								

Table 6.103: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 12-02-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.7	53.0	53.2	53.6	11.2	11.3		
10	47.9	49.0	50.3	49.1	11.2	11.3	8.5	6.7
30	48.9	48.9	50.3	49.4	11.2	11.3	8.0	16.4
60	48.0	48.2	50.2	48.8	11.2	11.3	9.0	37.0
90	48.2	48.2	50.0	48.8	11.2	11.3	9.0	61.0
120	47.7	48.3	50.1	48.7	11.2	11.3	9.2	85.4
150	47.8	48.0	49.4	48.4	11.2	11.3	9.8	109.6
Average	48.1	48.4	50.1	48.9	11.2	11.3	8.9	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 121.5 – 125.5 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.104) show that from the dissection data an estimated 1,037,754 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 166,474 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 107.8 – 111.3 g.h.m⁻³) or as a final dose (range 119.8 – 128.0 g.h.m⁻³) at 11°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.104: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³.. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (20 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 20kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 20 kg/ replicate) 60kg	Number of surviving pupae after fumigation treatment
08-02-2010	1	373,180	0		30,520	61,040	0
10-02-2010	2	353,196	0		28,380	56,760	0
12-02-2010	3	311,378	0		24,337	48,674	0
	Total	1,037,754	0		83,237	166,474	0

6.6.3 Peaches – Snow King

Fumigation treatment records are given in tables 6.105 – 6.107. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.2°C. The mortality data are given in table 6.108.

Table 6.105: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 02-03-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.2	52.6	54.7	53.8	11.0	11.2		
10	51.3	51.5	49.6	50.8	11.0	11.2	5.6	6.7
30	49.7	51.1	49.6	50.1	11.0	11.2	6.9	16.9
60	49.1	51.0	50.0	50.0	11.0	11.2	7.1	37.6
90	47.8	50.7	49.2	49.2	11.0	11.2	8.5	62.5
120	47.7	49.9	48.9	48.8	11.0	11.2	9.3	86.2
150	46.8	49.9	48.6	48.4	11.0	11.2	10.0	109.9
Average	48.7	50.7	49.3	49.6	11.0	11.2	7.9	
±s.d.	1.6	0.7	0.5	0.9			1.7	
Average dose range = 121.3 – 125.8 g.h.m ⁻³								

Table 6.106: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 05-03-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.3	50.8	52.8	52.0	11.0	11.2		
10	48.6	49.1	51.2	49.6	11.0	11.2	4.5	6.5
30	49.3	48.3	51.2	49.6	11.0	11.2	4.6	16.5
60	49.3	47.2	51.6	49.4	11.0	11.2	5.0	37.2
90	48.0	46.1	50.8	48.3	11.0	11.2	7.1	61.7
120	47.8	46.0	50.5	48.1	11.0	11.2	7.4	84.5
150	48.0	45.7	50.7	48.1	11.0	11.2	7.4	108.2
Average	48.5	47.1	51.0	48.9	11.0	11.2	6.0	
±s.d.	0.7	1.4	0.4	0.8			1.4	
Average dose range = 120.3 – 124.3 g.h.m ⁻³								

Table 6.107: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 09-03-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.5	53.8	54.1	53.8	11.0	11.2		
10	47.5	48.6	51.9	49.3	11.0	11.2	8.3	6.7
30	48.5	48.5	51.9	49.6	11.0	11.2	7.7	16.4
60	47.6	47.8	51.8	49.1	11.0	11.2	8.8	37.2
90	47.8	47.8	51.6	49.1	11.0	11.2	8.8	61.3
120	47.3	47.9	51.7	49.0	11.0	11.2	9.0	85.9
150	47.4	47.6	51.0	48.7	11.0	11.2	9.5	110.2
Average	47.7	48.0	51.7	49.1	11.0	11.2	8.7	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 122.0 – 123.5 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.108) show that from the dissection data an estimated 987,206 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 133,863 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 108.2 – 110.2 g.h.m⁻³) or as a final dose (range 120.3 – 125.8 g.h.m⁻³) at 11°C in Snow King Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.108: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
02-03-2009	1	308,654	0		14,796	44,388	0
05-03-2009	2	331,564	0		15,074	45,222	0
09-03-2009	3	346,988	0		14,751	44,253	0
	Total	987,206	0		44,621	133,863	0

6.6.4 Peaches – Zee Lady

Fumigation treatment records are given in tables 6.109 – 6.111. Temperatures were maintained evenly: ranging from 11.0 – 11.2°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.112.

Table 6.109: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 18-12-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.7	53.1	53.2	53.7	11.1	11.2		
10	50.9	51.1	49.2	50.4	11.1	11.2	6.1	6.7
30	49.3	50.7	49.2	49.7	11.1	11.2	7.3	16.8
60	48.7	49.6	49.6	49.3	11.1	11.2	8.1	37.3
90	47.4	49.3	48.8	48.5	11.2	11.2	9.6	61.6
120	46.9	48.5	48.5	48.0	11.2	11.2	10.6	84.9
150	46.1	48.5	48.2	47.6	11.1	11.2	11.3	107.9
Average	48.2	49.6	48.9	48.9	11.1	11.2	8.9	
±s.d.	1.8	1.1	0.5	1.1			2.0	
Average dose range = 119.5 – 125.0 g.h.m ⁻³								

Table 6.110: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 21-12-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.7	52.2	55.2	53.7	11.1	11.2		
10	48.5	49.0	50.3	49.3	11.1	11.2	8.3	6.7
30	49.2	48.2	50.3	49.2	11.1	11.2	8.3	16.4
60	49.2	47.1	50.7	49.0	11.1	11.2	8.8	36.9
90	47.9	46.0	49.9	47.9	11.1	11.2	10.7	61.3
120	47.7	45.9	49.6	47.7	11.1	11.2	11.1	83.9
150	47.9	45.6	49.8	47.8	11.1	11.2	11.0	107.4
Average	48.4	47.0	50.1	48.5	11.1	11.2	9.7	
±s.d.	0.7	1.4	0.4	0.8			1.4	
Average dose range = 118.3 – 123.3 g.h.m ⁻³								

Table 6.111: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 23-12-2009. Applied dose 56g/m^3 . Expected dose 48g/m^3 for 2.5 hour exposure = 120 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	54.3	51.6	53.0	53.0	11.1	11.2		
10	46.7	49.8	51.1	49.2	11.1	11.2	7.1	6.6
30	47.7	49.7	51.1	49.5	11.1	11.2	6.5	16.4
60	46.8	49.0	51.0	48.9	11.1	11.2	7.6	37.1
90	47.0	49.0	50.8	48.9	11.1	11.2	7.6	61.2
120	46.5	49.1	50.9	48.8	11.1	11.2	7.8	85.6
150	46.6	48.8	50.2	48.5	11.1	11.2	8.4	109.9
Average	46.9	49.2	50.9	49.0	11.1	11.2	7.5	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = $121.8 - 123.3\text{ g.h.m}^{-3}$								

Insect mortality from methyl bromide treatment

The results (table 6.112) show that from the dissection data an estimated 741,696 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 132,495 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range $107.4 - 109.9\text{ g.h.m}^{-3}$) or as a final dose (range $118.3 - 125.0\text{ g.h.m}^{-3}$) at 11°C in Zee Lady Peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.112: Large scale trials of Medfly in infested **Zee Lady Peaches** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m^3 - Expected dose 48g/m^3 for 2.5 hour exposure = 120 g.h.m^{-3} . Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
18-12-2009	1	232,858	0		14,670	44,011	0
21-12-2009	2	237,912	0		14,822	44,466	0
23-12-2009	3	270,926	0		14,673	44,019	0
	Total	741,696	0		44,165	132,495	0

6.6.5 Nectarines – Arctic Snow

Fumigation treatment records are given in tables 6.113 – 6.115. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C. The mortality data are given in table 6.116.

Table 6.113: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 29-04-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.8	53.2	53.8	53.9	11.1	11.2		
10	51.2	51.8	51.8	51.6	11.1	11.2	4.3	6.7
30	49.6	51.4	51.8	50.9	11.1	11.2	5.6	17.2
60	50.9	51.3	52.2	51.5	11.1	11.2	4.6	38.2
90	48.7	51.0	51.4	50.4	11.1	11.2	6.6	64.3
120	48.8	50.2	51.1	50.0	11.1	11.2	7.2	88.1
150	47.5	50.2	50.8	49.5	11.1	11.2	8.2	112.6
Average	49.5	51.0	51.5	50.7	11.1	11.2	6.1	
±s.d.	1.4	0.7	0.5	0.8			1.5	
Average dose range = 124.8 – 129.5 g.h.m ⁻³								

Table 6.114: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 01-05-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.9	52.0	53.0	53.3	11.1	11.2		
10	50.4	50.9	51.4	50.9	11.1	11.2	4.5	6.7
30	51.1	50.1	51.4	50.9	11.1	11.2	4.6	17.0
60	51.1	49.0	51.8	50.6	11.1	11.2	5.0	38.2
90	49.8	47.9	51.0	49.6	11.1	11.2	7.0	63.3
120	49.6	47.8	50.7	49.4	11.1	11.2	7.4	86.7
150	49.8	47.5	50.9	49.4	11.1	11.2	7.3	111.1
Average	50.3	48.9	51.2	50.1	11.1	11.2	6.0	
±s.d.	0.7	1.4	0.4	0.8			1.4	
Average dose range = 124.3 – 127.3 g.h.m ⁻³								

Table 6.115: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 04-05-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.1	53.4	55.9	54.1	11.1	11.2		
10	46.7	47.8	50.1	48.2	11.1	11.2	11.0	6.8
30	47.7	47.7	50.1	48.5	11.1	11.2	10.4	16.1
60	46.8	47.0	50.0	47.9	11.1	11.2	11.5	36.4
90	47.0	47.0	49.8	47.9	11.1	11.2	11.5	59.9
120	46.5	47.1	49.9	47.8	11.1	11.2	11.6	83.9
150	46.6	46.8	49.2	47.5	11.1	11.2	12.2	107.6
Average	46.9	47.2	49.9	48.0	11.1	11.2	11.4	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 119.3 – 120.8 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.116) show that from the dissection data an estimated 1,059,214 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 139,836 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 107.6 – 112.6 g.h.m⁻³) or as a final dose (range 119.3 – 129.5 g.h.m⁻³) at 11°C in Arctic Snow Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.116: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
29-04-2009	1	339,608	0		15,895	47,685	0
01-05-2009	2	350,964	0		15,471	46,413	0
04-05-2009	3	368,642	0		15,246	45,738	0
	Total	1,059,214	0		46,612	139,836	0

6.6.6 Nectarines – August Red

Fumigation treatment records are given in tables 6.117 – 6.119. Temperatures were maintained evenly: ranging from 11.0°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.120.

Table 6.117: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 17-05-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.6	52.0	53.6	53.4	11.1	11.2		
10	51.5	52.5	46.4	50.1	11.1	11.2	6.1	6.7
30	50.9	52.1	46.4	49.8	11.1	11.2	6.7	16.7
60	49.3	52.0	46.8	49.4	11.1	11.2	7.6	37.4
90	48.9	51.7	46.0	48.9	11.1	11.2	8.5	61.7
120	47.7	50.9	45.7	48.1	11.1	11.2	9.9	85.5
150	46.6	50.9	45.4	47.6	11.1	11.2	10.8	108.2
Average	49.2	51.7	46.1	49.0	11.1	11.2	8.3	
±s.d.	1.9	0.7	0.5	1.0			1.8	
Average dose range = 120.0 – 125.0 g.h.m ⁻³								

Table 6.118: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 19-05-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.0	53.1	53.9	54.0	11.1	11.2		
10	48.6	49.1	49.6	49.1	11.1	11.2	9.1	6.8
30	49.3	48.3	49.6	49.1	11.1	11.2	9.1	16.4
60	49.3	47.2	50.0	48.8	11.1	11.2	9.6	36.8
90	48.0	46.1	49.2	47.8	11.1	11.2	11.5	61.0
120	47.8	46.0	48.9	47.6	11.1	11.2	11.9	83.6
150	48.0	46.7	49.1	47.9	11.1	11.2	11.2	107.0
Average	48.5	47.2	49.4	48.4	11.1	11.2	10.4	
±s.d.	0.7	1.2	0.4	0.7			1.3	
Average dose range = 119.3 – 122.8 g.h.m ⁻³								

Table 6.119: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 21-05-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.6	53.9	55.4	54.6	11.1	11.2		
10	47.9	49.0	50.3	49.1	11.1	11.2	10.2	6.8
30	48.9	48.9	50.3	49.4	11.1	11.2	9.6	16.4
60	48.0	48.2	50.2	48.8	11.1	11.2	10.7	37.0
90	48.2	48.2	50.0	48.8	11.1	11.2	10.7	61.0
120	47.7	48.3	50.1	48.7	11.1	11.2	10.9	85.4
150	47.8	48.0	49.4	48.4	11.1	11.2	11.4	109.6
Average	48.1	48.4	50.1	48.9	11.1	11.2	10.6	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 121.5 – 123.0 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.120) show that from the dissection data an estimated 1,107,432 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 145,533 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 107.0 – 109.6 g.h.m⁻³) or as a final dose (range 119.3 – 125.0 g.h.m⁻³) at 11°C in August Red Nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.120: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³. Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
17-05-2010	1	355,708	0		16,506	49,518	0
19-05-2010	2	367,092	0		16,126	48,378	0
21-05-2010	3	384,632	0		15,879	47,637	0
	Total	1,107,432	0		48,511	145,533	0

6.6.7 Plums – Angelino

Fumigation treatment records are given in tables 6.121 – 6.123. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.124.

Table 6.121: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 12-06-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.0	53.7	52.2	53.6	11.1	11.2		
10	51.9	53.2	51.0	52.0	11.1	11.2	3.0	6.7
30	50.3	52.8	51.0	51.4	11.1	11.2	4.2	17.3
60	48.7	51.7	51.4	50.6	11.1	11.2	5.7	38.5
90	47.4	51.4	50.6	49.8	11.1	11.2	7.1	63.3
120	46.9	50.6	50.3	49.3	11.1	11.2	8.1	87.2
150	46.0	50.6	50.0	48.9	11.1	11.2	8.9	110.9
Average	48.5	51.7	50.7	50.3	11.1	11.2	6.2	
±s.d.	2.2	1.1	0.5	1.2			2.3	
Average dose range = 122.8 – 128.8 g.h.m ⁻³								

Table 6.122: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 15-06-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.6	53.9	54.5	54.3	11.0	11.1		
10	51.2	51.7	50.2	51.0	11.0	11.1	6.1	6.8
30	51.9	50.9	50.2	51.0	11.0	11.1	6.1	17.0
60	50.9	49.8	50.6	50.4	11.0	11.1	7.2	38.3
90	49.6	48.7	49.8	49.4	11.0	11.1	9.1	63.0
120	50.0	48.6	49.5	49.4	11.1	11.1	9.1	86.4
150	50.1	48.3	49.7	49.4	11.1	11.1	9.1	111.1
Average	50.6	49.7	50.0	50.1	11.0	11.1	7.8	
±s.d.	0.9	1.4	0.4	0.8			1.5	
Average dose range = 123.3 – 127.3 g.h.m ⁻³								

Table 6.123: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 17-06-2009. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.4	51.4	54.7	53.2	10.9	11.1		
10	48.0	49.2	50.4	49.2	10.9	11.1	7.5	6.6
30	49.0	49.1	50.4	49.5	10.9	11.1	6.9	16.4
60	48.1	48.4	50.3	48.9	10.9	11.1	8.0	37.1
90	48.3	48.4	50.1	48.9	11.0	11.1	8.0	61.2
120	47.8	48.5	50.2	48.8	11.0	11.1	8.2	85.6
150	47.9	48.2	49.5	48.5	11.0	11.1	8.7	109.9
Average	48.2	48.6	50.2	49.0	11.0	11.1	7.9	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 121.8 – 123.5 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.124) show that from the dissection data an estimated 1,079,240 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 187,467 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 109.9 – 111.1 g.h.m⁻³) or as a final dose (range 121.8 – 128.8 g.h.m⁻³) at 11°C in Angelino Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.124: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (3 Replicates).
Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³. . Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
12-06-2009	1	355,136	0		20,653	61,959	0
15-06-2009	2	370,924	0		21,706	65,118	0
17-06-2009	3	353,180	0		20,130	60,390	0
	Total	1,079,240	0		62,489	187,467	0

6.6.8 Plums – Tegan Blue

Fumigation treatment records are given in tables 6.125 – 6.127. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 - 11.2°C. The mortality data are given in table 6.128.

Table 6.125: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 29-03-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.8	55.6	57.7	56.4	11.2	11.3		
10	52.7	52.9	52.0	52.5	11.2	11.3	6.8	7.0
30	51.1	52.5	52.0	51.9	11.2	11.3	8.0	17.5
60	50.5	52.4	52.4	51.8	11.2	11.3	8.2	38.9
90	49.2	52.1	51.6	51.0	11.2	11.3	9.6	64.7
120	48.8	51.3	51.3	50.5	11.2	11.3	10.5	89.2
150	47.8	51.3	51.0	50.0	11.2	11.3	11.2	113.6
Average	50.0	52.1	51.7	51.3	11.2	11.3	9.0	
±s.d.	1.8	0.7	0.5	0.9			1.7	
Average dose range = 125.5 – 130.5 g.h.m ⁻³								

Table 6.126: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 31-03-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.0	54.2	55.2	54.8	11.2	11.3		
10	49.4	49.9	52.0	50.4	11.2	11.3	8.0	6.9
30	50.1	49.1	52.0	50.4	11.2	11.3	8.0	16.8
60	50.1	48.0	52.4	50.2	11.2	11.3	8.5	37.8
90	48.8	46.9	51.6	49.1	11.2	11.3	10.4	62.7
120	48.6	46.8	51.3	48.9	11.2	11.3	10.8	85.9
150	48.8	46.5	51.5	48.9	11.2	11.3	10.7	110.0
Average	49.3	47.9	51.8	49.7	11.2	11.3	9.4	
±s.d.	0.7	1.4	0.4	0.8			1.4	
Average dose range = 122.3 – 126.3 g.h.m ⁻³								

Table 6.127: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 02-04-2010. Applied dose 56g/m³. Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	55.1	52.8	54.3	54.1	11.2	11.3		
10	48.9	50.0	51.3	50.1	11.2	11.3	7.4	6.8
30	49.9	49.9	51.3	50.4	11.2	11.3	6.8	16.7
60	49.0	49.2	51.2	49.8	11.2	11.3	7.9	37.8
90	49.2	49.2	51.0	49.8	11.2	11.3	7.9	62.3
120	48.7	49.3	51.1	49.7	11.2	11.3	8.1	87.2
150	48.8	49.0	50.4	49.4	11.2	11.3	8.6	111.8
Average	49.1	49.4	51.1	49.9	11.2	11.3	7.8	
±s.d.	0.4	0.4	0.3	0.3			0.6	
Average dose range = 124.0 – 125.5 g.h.m ⁻³								

Insect mortality from methyl bromide treatment

The results (table 6.128) show that from the dissection data an estimated 1,254,080 viable Medfly eggs were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 174,915 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 110.0 – 113.6 g.h.m⁻³) or as a final dose (range 122.3 – 130.5 g.h.m⁻³) at 11°C in Tegan Blue Plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 6.128: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (3 Replicates).

Applied dose 56g/m³ - Expected dose 48g/m³ for 2.5 hour exposure = 120 g.h.m³. Starting Estimated number of viable Medfly eggs in infested fruits on the day of fumigation and pupae recovered from control fruits (10 kg/rep) and treated fruit (30 kg / replicate).

Date of fumigation	Rep	Estimated No viable eggs treated in 30kg/rep fruit before fumigation	No. eggs surviving fumigation		Number of pupae obtained in (untreated) control fruit (3 x 10 kg/ replicate) 30kg	Estimated number of pupae in treated fruit (3 x 30 kg/ replicate) 90kg	Number of surviving pupae after fumigation treatment
29-03-2010	1	395,308	0		18,611	55,833	0
31-03-2010	2	437,864	0		19,225	57,675	0
02-04-2010	3	420,908	0		20,469	61,407	0
	Total	1,254,080	0		58,305	174,915	0

CONCLUSIONS

Data for 8 cultivars treated at 11°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 56g/m³. Approximately 12% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 2.5 h was approximately 110 g.h.m⁻³ on average and about 122 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 48g/m³ for 2.5 h treatment giving cumulative gas concentration of 120 g.h.m⁻³. The results of the dose-mortality trials showed that eggs were the most tolerant stage and required 100 g.h.m⁻³. However Probit 9 estimates showed that exposure of Medfly eggs to 110 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

6.7 SUMMARY AND CONCLUSIONS

This work provides the scientific basis for methyl bromide fumigation of 180 g.h.m⁻³ at 6°C and 120 g.h.m⁻³ 11°C cold disinfestation of Mediterranean fruit fly for the export of Australian cherries, peaches, nectarines and plums to Korea, Japan, USA, NZ and other countries. All 4 combinations of methyl bromide dose were equally effective. The choice of preferred dose which bests achieves fruit quality is left to the exporter. However, none of the treatment combinations tested affected fruit quality.

The data shows that the required dosage and temperature of 6°C and 11°C was maintained throughout the trials. In every replicate more than 10,000 pupae were treated in every fruit variety tested. The records of mortality show that more than 100,000 insects were successfully disinfested by the 4 fumigation treatments:

48g/m³-x 4 hours at 6°C

Data for 8 cultivars treated at 6°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 56g/m³. Approximately 10% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 4h was approximately 182 g.h.m⁻³ on average and about 200 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. Probit 9 estimates showed that exposure of Medfly eggs to 180 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

60g/m³-x 3 hours at 6°C

Data for 8 cultivars treated at 6°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 72g/m³. Approximately 16% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 160 g.h.m⁻³ on average and about 180 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. Probit 9 estimates showed that exposure of Medfly eggs to 180 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

40g/m³-x 3 hours at 11°C

Data for 8 cultivars treated at 11°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 48g/m³. Approximately 12% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 110 g.h.m⁻³ on average and about 126 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. Probit 9 estimates showed that exposure of Medfly eggs to 110 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

48g/m³-x 2.5 hours at 11°C

Data for 8 cultivars treated at 11°C show that complete mortality was achieved in >30,000 insects. The applied methyl bromide (MeBr) dose was 56g/m³. Approximately 12% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 2.5 h was approximately 110 g.h.m⁻³ on average and about 122 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. Probit 9 estimates showed that exposure of Medfly eggs to 110 g.h.m⁻³ methyl bromide would be sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

The requirements of the international protocols of China, Korea, Japan, USA, NZ and other countries have been satisfied for the conduct of the large scale trials for the methyl bromide disinfestation of 2 varieties each of cherries, peaches, nectarines and plums against eggs of Mediterranean fruit fly at 6°C and 11°C.

7. FUMIGATION + COLD TREATMENTS – LARGE SCALE TRIALS.

7.1 PLAN OF THE TRIALS

The large-scale trials were conducted in the following manner:

1. All fruits were supplied directly from the farms in export cartons and were held in cold rooms #1 and #2 and in a refrigerated container as described in **Section 2** until required for the trials.
2. A life history study of Medfly (**Section 2**) was conducted at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh in each cultivar before each series of trials to determine the date when eggs, 1st and 2nd instar was most prevalent ($\geq 50\%$) as the stages to be tested.
3. The large-scale trials were conducted by infesting **Section 2** sufficient fruit of each cultivar to obtain more than 10,000 insects in egg, 1st and 2nd instar stages in each replicate to be treated.
4. In each replicate, sufficient fruits were also infested for untreated controls and for dissection on day of treatment to verify numbers of viable eggs, live 1st and 2nd instars present at the time of the trial.
5. Each replicate of infested fruits was fumigated at 6°C (either 32g x 3h or 48g x 2h giving 96 g.h.m⁻³) or 11°C (either 21g x 3h or 32g x 2h giving 63 - 64 g.h.m⁻³) following which the fruits were exposed to cold treatment for 4 days at $1.0 \pm 0.5^\circ\text{C}$ and then incubated at $26 \pm 1^\circ\text{C}$ and 60 - 65% rh for 3 weeks for emergence of any survivors.
6. Untreated controls for each replicate treatment were incubated at $26 \pm 1^\circ\text{C}$ and 60 - 65 % rh for a further 3 weeks to obtain pupae. The number of pupae obtained from each untreated control was used to confirm the estimate of the number of viable eggs and live 1st and 2nd instar exposed to each combined treatment.
7. Each combined fumigation + cold treatment was considered successful if no survivors were obtained after the incubation period of the treated fruit.

7.2 METHODS FOR LARGE SCALE TRIALS FUMIGATION AT 6°C and 11°C + COLD TREATMENT FOR 4 DAYS

The basis for fumigation + cold treatment doses

The doses listed in point 5 above were obtained by combining the highest upper Fiducial Limit LD₅₀ dose at each fumigation temperature 6°C (86.3 g.h.m⁻³ in table 5.25) or 11°C (49.2 g.h.m⁻³ in table 5.50) with the highest upper Fiducial Limit LD₅₀ dose obtained for the most tolerant stage in 1°C cold treatment (3.88 days in table 3.65).

Infestation of fruit for the trials

Fruit were infested as described in **Section 2** to obtain life history data. The infested fruits were incubated in a controlled environment room at $26 \pm 1.0^\circ\text{C}$; 60 - 65% rh. The fruits contained eggs (days 1 & 2 >50% development of egg stage) which were the most tolerant stage to methyl bromide fumigation and 1st instar (days 3&4) and 2nd instar (days 5&6) which were shown to be most tolerant to cold treatment. Selection of fruits for treatment and control was done at random. On the day of treatment the specified weight of fruit for each stage for treatment and control were separated. The control fruits were returned to the controlled environment room for development to pupation. Extra fruit were infested for dissection to determine the numbers present in each life stage on the day of treatment. The specified weight of infested fruits treatment (see below) were taken and placed on trays in the centre of ventilated export cartons (25 litre, 10kg) containing uninfested filler fruits and packed following standard export practice. The cartons were then stacked in the fumigation facility in the standard arrangement for good circulation of fumigant gas for the disinfestation trial (**Appendix 5**). Cartons were labelled to assist recovery of infested fruits after treatment.

Data for large scale fumigation treatments:

(1) Number of treatments:

Four treatments were selected as follows

Methyl bromide + Cold 1°C for 4 days (96 h)

6°C:

32g/m³ x 3 h = 96 g.h.m³+ 96 h 1°C cold treatment

48g/m³ x 2 h = 96 g.h.m³+ 96 h 1°C cold treatment

11°C:

21g/m³ x 3 h = 63 g.h. m³+ 96 h 1°C cold treatment

32g/m³ x 2 h = 64 g.h. m³+ 96 h 1°C cold treatment

(2) Quantity of infested fruits used for each cultivar:

Test Fruit & Cultivar	Test stage	Wt. / Rep Treated (kg)	Wt. / Rep Control (kg)	Total Wt. 3 Reps Treated (kg)	Total Wt. 3 Reps Control (kg)	Total Wt. Infested / dose (kg)	Total Wt. Infested / fruit cultivar (kg)	Total Wt. / fruit cultivar x 4 doses (kg)
Cherry Sweetheart	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Cherry Lapin	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Peach Snow King	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Peach Zee Lady	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Nectarine Arctic Snow	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Nectarine August Red	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Plum Angelino	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540
Plum Tegan Blue	Eggs	10	5	30	15	45		
	1 st	10	5	30	15	45		
	2 nd	10	5	30	15	45	135	540

(3) Loading of export cartons in 44.14 m³ fumigation room for each trial:

Number of cartons / layer =	8
Number of layers / pallet =	7
Numbers of pallets / fumigation room	8
8 cartons / layer x 7 layers / pallet =	56 cartons / pallet
8 pallets / treatment =	8 x 56 = 448 cartons / fumigation room

(4) Data on load factors in 44.14 m³ fumigation room for each trial:

No. of export cartons / replicate =	448 cartons
10 kg / carton x 448 cartons =	4,480 kg
Size of carton =	210mm (h) x 285mm (w) 430mm (l)
Volume of carton =	25.7 litres
Total volume of 448 cartons =	$448 \times 25.7 / 1000 = 11.5 \text{ m}^3$
Volume of fumigation room =	44.14 m ³
Load factor (weight) =	$4,480 / 44.14 = 101.49 \text{ kg / m}^3$
Load factor % (volume) =	$(11.5 \text{ m}^3 / 44.14) \times 100 = 26.05 \%$

(5) Data on load factors in 1.067 m³ fumigation chamber for each trial:

No. of export cartons / replicate =	18 cartons
10 kg / carton x 18 cartons =	180 kg
Size of carton:	210mm (h) x 285mm (w) 430mm (l)
Volume of carton =	25.7 litres
Total volume of 18 cartons =	$18 \times 25.7 / 1000 = 0.4626 \text{ m}^3$
Volume of fumigation chamber =	1.067 m ³
Load factor (weight) =	$180 / 1.067 = 168.7 \text{ kg / m}^3$
Load factor % (volume) =	$(0.4626 \text{ m}^3 / 1.067) \times 100 = 43.36 \%$

(6) Trial arrangement

Two of the 3 replicated trials was set-up the fumigation chamber (5) above with a load volume factor of 43.36 %. while the third replicate was set up in the 44.14 m³ fumigation room (4) above with a load volume factor of 26.05%. The required weight of infested fruits 10 kg / replicate are shown in (2) above and these fruits were placed in selected cartons so as to give representative dispersion of fumigant treatment throughout the fruit in cartons. Test fruit were exposed to fumigant dosage as shown in (1) above.

After exposure to the fumigation treatment, the infested fruits were removed from the cartons and taken to the controlled environment room and placed in containers over sand to collect pupae.

Record of temperatures during the trials

Temperatures were recorded on a “Squirrel” (Grant Instruments, Cambridge, England) data logger with an accuracy of $\pm 0.01^\circ\text{C}$. A total of 6 thermistor probes were used, 3 to record air temperatures at various positions. Fruit pulp temperatures were recorded by placing the probes in the core of uninfested fruit in 3 locations throughout the stack so as to give representative data for the whole trial. Temperature recordings were automatically logged at 10-minute intervals throughout the trial.

7.3 RESULTS OF LARGE SCALE TRIALS OF MEDFLY USING: METHYL BROMIDE FUMIGATION AT 6°C: 32g/m³ for 3 hour exposure followed by COLD TREATMENT at 1.5°C for 96 hours

The combined fumigation + cold treatment trials were conducted from November 2010 to May 2011.

Data for each cultivar: life history of all stages in test fruits, air and fruit temperatures during fumigation, methyl bromide concentrations, 1°C cold treatment temperatures and Medfly mortality data replicated 3 times are given under the respective fruit varieties treated.

7.3.1 Cherries - Sweetheart

Life history data

The life history data (table 7.1) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.1: **Sweetheart Cherries** : Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	3/11/2010	100	0	0	0	100	eggs
1	4/11/2010	100	0	0	0	100	eggs
2	5/11/2010	100	0	0	0	100	eggs
3	6/11/2010	17	83	0	0	100	1st
4	7/11/2010	14	82	4	0	100	1st
5	8/11/2010	0	33	67	0	100	2nd
6	9/11/2010	0	22	69	9	100	2nd
7	10/11/2010	0	6	20	74	100	3rd
8	11/11/2010	0	4	9	87	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.2 – 7.4. Temperatures were maintained evenly: ranging from 6.1 – 6.3°C air; fruit 6.0 - 6.1°C.

Table 7.2: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 15/11/10. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.2	34.2	33.7	34.0	6.1	6.2		
10	34.3	33.5	33.6	33.8	6.1	6.2	0.7	4.3
30	33.7	33.1	32.6	33.1	6.1	6.2	2.6	11.3
60	33.1	32.0	31.0	32.0	6.1	6.2	5.9	24.9
90	32.9	31.7	30.2	31.6	6.1	6.2	7.1	40.0
120	31.4	30.9	29.9	30.7	6.1	6.2	9.7	55.3
150	31.4	30.4	29.6	30.5	6.1	6.3	10.5	69.2
180	30.5	29.9	29.2	29.9	6.1	6.3	12.2	83.8
Average	32.5	31.6	30.9	31.7	6.1	6.2	7.0	
±s.d.	1.4	1.3	1.6	1.4			4.2	
Average dose range = 90.7 – 99.3 g.h.m ⁻³								

Table 7.3: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 16/11/10. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	36.0	34.9	33.9	34.9	6.0	6.1		
10	35.9	33.4	32.5	33.9	6.0	6.1	2.9	4.4
30	34.6	32.6	32.5	33.2	6.0	6.1	4.9	11.3
60	33.6	32.5	31.9	32.7	6.0	6.1	6.5	24.9
90	32.3	31.4	30.1	31.3	6.0	6.1	10.5	40.8
120	31.1	30.3	30.0	30.5	6.0	6.1	12.8	54.7
150	30.3	30.0	29.2	29.8	6.0	6.1	14.6	68.6
180	29.5	29.7	29.1	29.4	6.0	6.1	15.7	82.0
Average	32.5	31.4	30.8	31.5	6.0	6.1	9.7	
±s.d.	2.3	1.5	1.5	1.8			5.0	
Average dose range = 89.4 – 99.9 g.h.m ⁻³								

Table 7.4: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 17/11/10. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	34.5	33.9	34.2	34.2	6.1	6.1		
10	33.9	33.0	33.3	33.4	6.0	6.1	2.3	4.3
30	32.9	32.9	32.3	32.7	6.0	6.1	4.4	11.1
60	32.0	31.2	32.2	31.8	6.0	6.1	7.0	24.5
90	31.2	30.2	32.0	31.1	6.0	6.1	9.0	39.8
120	30.7	30.0	31.1	30.6	6.0	6.2	10.5	54.5
150	30.2	29.7	30.4	30.1	6.1	6.2	12.0	68.9
180	29.5	29.5	30.3	29.8	6.1	6.2	13.0	82.8
Average	31.5	30.9	31.7	31.4	6.0	6.2	8.3	
±s.d.	1.5	1.5	1.1	1.3			3.9	
Average dose range = $90.0 - 98.1\text{g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.5

Table 7.5: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $32\text{g/m}^3 \times 3\text{h}$ at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C . (Data corrected using calibration records before trial). Test Fruit: **Sweetheart cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 15 – 22/11/2010																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.8	0.3	1.1	1.1	1.3	1.2	0.9	0.7	0.8	1.3	1.2	1.0	0.6	0.2	0.7	1.0	1.4	1.1
24	1	0.8	0.2	1.2	1.1	1.1	1.1	1.1	0.7	0.8	1.0	1.1	1.1	1.1	0.0	0.9	1.0	1.2	1.2
36		0.8	0.2	1.1	1.1	1.2	1.2	1.1	0.7	0.8	1.0	1.1	1.1	0.9	0.2	0.8	1.0	1.2	1.1
48	2	0.9	0.2	1.2	1.1	1.1	1.2	1.3	0.7	0.8	1.0	1.1	1.0	1.6	0.2	1.0	1.0	1.2	1.1
60		0.9	0.2	1.2	1.1	1.2	1.2	1.1	0.6	0.6	1.0	1.1	1.0	1.2	0.1	0.9	1.0	1.2	1.0
72	3	0.9	0.2	1.3	1.1	1.2	1.2	1.4	0.7	0.8	1.0	1.2	1.0	1.7	0.0	1.0	1.0	1.3	1.1
84		0.9	0.2	1.2	1.2	1.2	1.2	1.2	0.7	0.8	1.0	1.1	1.0	1.5	0.2	1.0	1.0	1.2	1.0
96	4	0.9	0.1	1.3	1.1	1.1	1.2	1.5	0.7	0.8	1.1	1.2	1.0	1.9	0.2	1.1	1.0	1.3	1.1
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.7 ±0.3						Av. air ± s. d. = 0.9 ±0.4						Av. air ± s. d. = 0.8 ±0.5					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.6) show that from the dissection data an estimated 1,029,706 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 218,108 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.0 – 83.8 g.h.m⁻³) or as a final dose (range 89.4 – 99.9 g.h.m⁻³) at 6°C in Sweetheart cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.6: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Sweetheart Cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	153,277	0		11,107	22,214	0
	1 st Instar	105,088	0		12,958	25,916	0
	2 nd instar	79,332	0		12,684	25,368	0
	Total	337,697	0		36,749	73,498	0
2	eggs	149,341	0		12,508	25,016	0
	1 st Instar	106,741	0		13,685	27,370	0
	2 nd instar	74,125	0		11,482	22,964	0
	Total	330,207	0		37,675	75,350	0
3	eggs	160,889	0		11,322	22,644	0
	1 st Instar	107,350	0		11,182	22,364	0
	2 nd instar	93,563	0		12,126	24,252	0
	Total	361,802	0		34,631	69,260	0
Total of all replicates		1,029,706	0		109,054	218,108	0

7.3.2 Cherries - Lapin

Life history data

The life history data (table 7.7) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.7: **Lapin Cherries** - : Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	20/11/2008	100	0	0	0	100	eggs
1	21/11/2008	100	0	0	0	100	eggs
2	22/11/2008	100	0	0	0	100	eggs
3	23/11/2008	5	95	0	0	100	1st
4	24/11/2008	4	94	2	0	100	1st
5	25/11/2008	0	27	73	0	100	2nd
6	26/11/2008	0	9	91	0	100	2nd
7	27/11/2008	0	8	30	62	100	3rd
8	28/11/2008	0	0	22	78	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.8 – 7.10. Temperatures were maintained evenly: ranging from 6.0°C air; fruit 6.2°C.

Table 7.8: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 1). Trial date: 4/12/10. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	36.8	36.2	36.3	36.4	6.0	6.2		
10	35.4	35.6	35.7	35.6	6.0	6.2	2.4	4.6
30	34.8	35.2	35.7	35.2	6.0	6.2	3.3	11.9
60	33.2	33.1	34.1	33.5	6.0	6.2	8.1	26.4
90	32.9	32.8	33.3	33.0	6.0	6.2	9.4	41.8
120	32.5	32.0	33.0	32.5	6.0	6.2	10.8	57.8
150	31.5	31.0	32.7	31.7	6.0	6.2	12.9	73.1
180	30.6	31.0	31.3	31.0	6.0	6.2	15.0	87.3
Average	33.0	33.0	33.7	33.2	6.0	6.2	8.8	
±s.d.	1.7	1.9	1.6	1.7			4.7	
Average dose range = 94.5 – 104.7 g.h.m ⁻³								

Table 7.9: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 5/12/10. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	36.5	35.1	34.0	35.2	6.0	6.2		
10	35.1	34.6	32.7	34.1	6.0	6.2	3.0	4.4
30	34.8	33.8	32.7	33.8	6.0	6.2	4.1	11.4
60	33.8	32.7	32.1	32.9	6.0	6.2	6.6	25.3
90	32.5	31.6	32.0	32.0	6.0	6.2	9.0	41.1
120	31.3	31.5	31.0	31.3	6.0	6.2	11.2	56.1
150	30.5	31.2	30.6	30.8	6.0	6.2	12.6	70.4
180	29.7	29.9	30.4	30.0	6.0	6.2	14.8	84.6
Average	32.5	32.2	31.6	32.1	6.0	6.2	8.8	
±s.d.	2.1	1.6	1.0	1.5			4.4	
Average dose range = 91.7 – 101.0 g.h.m ⁻³								

Table 7.10: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 6/12/10. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	36.3	32.8	33.8	34.3	6.0	6.2		
10	35.6	31.7	32.0	33.1	6.0	6.2	3.5	4.3
30	36.6	30.6	32.0	33.1	6.0	6.2	3.6	11.0
60	35.7	29.9	31.9	32.5	6.0	6.2	5.2	24.8
90	35.9	29.5	31.7	32.4	6.0	6.2	5.6	40.6
120	35.4	29.0	31.8	32.1	6.0	6.2	6.5	56.6
150	35.5	28.7	31.1	31.8	6.1	6.3	7.4	72.2
180	35.2	28.4	31.0	31.5	6.1	6.3	8.1	87.4
Average	35.7	29.7	31.6	32.3	6.1	6.2	5.7	
±s.d.	0.5	1.2	0.4	0.6			1.8	
Average dose range = 95.2 – 98.8 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.11

Table 7.11: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Lapin cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 4 to 11 December 2010																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.1	0.3	1.0	1.1	1.3	1.1	2.4	0.8	1.1	1.1	1.4	1.4	2.0	0.2	1.0	1.2	1.0	1.1
24	1	1.3	0.2	1.3	1.1	1.1	1.0	2.5	0.8	1.0	1.0	1.4	1.2	3.4	0.0	1.2	1.1	1.0	1.2
36		1.2	0.2	1.1	1.0	1.0	1.1	2.3	0.7	0.9	1.1	1.4	1.3	2.9	0.4	1.2	1.2	1.1	1.1
48	2	1.3	0.2	1.3	1.0	1.1	1.0	2.5	0.8	1.0	1.1	1.4	1.2	3.6	0.1	1.2	1.0	1.1	1.2
60		1.3	0.2	1.1	1.1	1.1	1.0	2.2	0.6	0.8	1.1	1.4	1.3	2.4	0.5	1.3	1.1	1.2	1.1
72	3	1.4	0.2	1.3	1.2	1.2	1.0	2.5	0.8	1.0	1.0	1.4	1.2	2.8	0.1	1.2	1.1	1.2	1.1
84		1.2	0.2	1.1	1.2	1.1	1.1	2.3	0.7	0.9	1.1	1.4	1.3	2.3	0.5	1.2	1.2	1.2	1.0
96	4	1.4	0.1	1.4	1.3	1.2	1.0	2.2	0.6	0.8	1.0	1.3	1.2	2.6	0.4	1.2	1.2	1.3	1.2
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.3						Av. air ± s. d. = 1.3 ±0.5						Av. air ± s. d. = 1.4 ±1.1					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.12) show that from the dissection data an estimated 1,009,210 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 240,342 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 84.6 – 87.4 g.h.m⁻³) or as a final dose (range 91.7 – 104.7 g.h.m⁻³) at 6°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.12: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep / stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Lapin cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	145,696	0	12,669	25,338	0
	1 st Instar	99,890	0	12,317	24,634	0
	2 nd instar	78,245	0	12,596	25,192	0
	Total	323,830	0	37,582	75,164	0
2	eggs	131,378	0	13,204	26,408	0
	1 st Instar	100,789	0	12,922	25,844	0
	2 nd instar	110,488	0	14,517	29,034	0
	Total	342,656	0	40,643	81,286	0
3	eggs	141,537	0	13,945	27,890	0
	1 st Instar	101,364	0	12,670	25,340	0
	2 nd instar	99,823	0	15,331	30,662	0
	Total	342,724	0	41,946	83,892	0
Total of all replicates		1,009,210	0	120,171	240,342	0

7.3.3 Peaches – Snow King

Life history data

The life history data (table 7.13) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.13: **Snow King Peaches** - Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	7/01/11	100	0	0	0	100	eggs
1	8/01/11	100	0	0	0	100	eggs
2	9/01/11	100	0	0	0	100	eggs
3	10/01/11	15	85	0	0	100	1st
4	11/01/11	7	93	0	0	100	1st
5	12/01/11	0	80	19	1	100	2nd
6	13/01/11	0	27	67	6	100	2nd
7	14/01/11	0	13	65	22	100	3rd
8	15/01/11	0	0	19	81	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.14 – 7.16. Temperatures were maintained evenly: ranging from 6.0 – 6.2°C air; fruit 6.1 - 6.2°C.

Table 7.14: Large scale trials of Medfly in infested **Snow King Peaches** at $6.0 \pm 0.5^\circ\text{C}$ (Replicate 1). Trial date: 18/1/11. Applied dose $36\text{g}/\text{m}^3$. Expected dose $32\text{g}/\text{m}^3$ for 3 hour exposure = $96\text{g.h}/\text{m}^3$

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air $^\circ\text{C}$	Fruit $^\circ\text{C}$	% loss of MeBr through sorption, leakage etc.	concentration x time sum $\text{g.h}/\text{m}^3$
5	37.8	36.2	34.3	36.1	6.1	6.2		
10	36.0	35.2	33.3	34.8	6.1	6.2	3.5	4.5
30	35.4	34.8	33.3	34.5	6.2	6.2	4.4	11.6
60	32.8	32.7	32.0	32.5	6.2	6.2	10.0	25.9
90	31.5	32.4	31.9	31.9	6.1	6.2	11.5	40.6
120	31.4	31.6	31.6	31.5	6.1	6.2	12.7	55.9
150	30.5	30.6	30.3	30.5	6.1	6.2	15.6	71.0
180	29.3	30.1	29.9	29.8	6.1	6.2	17.5	83.8
Average	32.4	32.5	31.8	32.2	6.1	6.2	10.8	
±s.d.	2.5	1.9	1.3	1.9			5.3	
Average dose range = $90.9 - 102.4\text{g.h}/\text{m}^3$								

Table 7.15: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 19/1/11. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	37.9	35.4	34.4	35.9	6.1	6.2		
10	36.3	34.8	33.9	35.0	6.1	6.2	2.5	4.5
30	34.0	34.0	32.9	33.6	6.1	6.2	6.3	11.7
60	33.1	32.9	32.3	32.8	6.1	6.2	8.7	25.2
90	32.5	31.8	31.5	31.9	6.1	6.2	11.0	41.0
120	31.3	31.7	31.2	31.4	6.1	6.2	12.5	55.9
150	30.2	31.4	30.4	30.7	6.1	6.2	14.6	70.7
180	29.6	30.1	29.5	29.7	6.1	6.2	17.2	84.3
Average	32.4	32.4	31.7	32.2	6.1	6.2	10.4	
±s.d.	2.3	1.6	1.5	1.8			5.0	
Average dose range = $91.1 - 101.9\text{ g.h.m}^{-3}$								

Table 7.16: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 20/1/11. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	36.1	35.4	34.7	35.4	6.1	6.2		
10	35.2	34.3	33.6	34.4	6.1	6.2	2.9	4.4
30	36.2	34.2	33.6	34.7	6.1	6.2	2.1	11.5
60	35.3	33.5	33.5	34.1	6.1	6.2	3.7	26.0
90	35.5	33.5	33.3	34.1	6.1	6.2	3.7	42.6
120	35.0	33.6	33.4	34.0	6.0	6.1	4.0	59.7
150	35.1	33.3	32.7	33.7	6.0	6.1	4.8	76.5
180	34.8	33.0	32.6	33.5	6.0	6.1	5.5	92.7
Average	35.3	33.6	33.2	34.1	6.1	6.2	3.8	
±s.d.	0.5	0.5	0.4	0.4			1.1	
Average dose range = $101.0 - 103.4\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.17

Table 7.17: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit:** Snow King Peaches

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 18 – 25 January 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.2	0.1	0.9	1.4	1.3	1.2	1.3	0.1	0.6	1.3	1.3	1.3	1.3	0.3	1.1	1.3	1.4	1.2
24	1	1.2	0.4	0.9	1.3	1.2	1.2	1.3	0.0	0.4	1.2	1.3	1.3	1.3	0.5	0.8	1.3	1.4	1.2
36		1.2	0.4	0.9	1.2	1.2	1.4	1.2	-0.3	0.3	1.2	1.3	1.4	1.2	0.4	0.7	1.2	1.3	1.2
48	2	1.2	0.3	0.9	1.2	1.2	1.4	1.2	-0.1	0.4	1.1	1.3	1.4	1.4	0.4	1.1	1.2	1.3	1.1
60		1.3	-0.1	0.7	1.3	1.2	1.3	1.3	-0.2	0.4	1.1	1.3	1.3	1.8	0.4	2.0	1.2	1.4	1.1
72	3	1.3	0.1	0.8	1.2	1.2	1.3	1.3	0.0	0.5	1.2	1.3	1.2	1.7	0.5	2.1	1.2	1.4	1.1
84		1.4	0.4	1.0	1.3	1.3	1.4	1.4	0.2	0.6	1.2	1.3	1.4	1.7	0.4	2.0	1.3	1.4	1.1
96	4	1.4	-0.1	0.7	1.3	1.3	1.3	1.4	0.0	0.6	1.3	1.3	1.2	1.5	0.5	1.8	1.3	1.5	1.0
		Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1					
		Av. air ± s. d. = 0.8 ±0.4						Av. air ± s. d. = 0.6 ±0.4						Av. air ± s. d. = 1.1 ±0.6					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.18) show that from the dissection data an estimated 1,298,138 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 154,530 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 83.8 – 92.7 g.h.m⁻³) or as a final dose (range 90.9 – 103.4 g.h.m⁻³) at 6°C in Snow King peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.18: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Snow King Peaches**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	202,768	0	7,909	15,818	0
	1 st Instar	110,091	0	7,574	15,148	0
	2 nd instar	79,080	0	7,891	15,782	0
	Total	391,940	0	23,374	46,748	0
2	eggs	211,325	0	8,127	16,254	0
	1 st Instar	115,496	0	7,953	15,906	0
	2 nd instar	119,489	0	9,118	18,236	0
	Total	446,311	0	25,198	50,396	0
3	eggs	223,180	0	9,988	19,976	0
	1 st Instar	113,251	0	9,076	18,152	0
	2 nd instar	123,456	0	9,629	19,258	0
	Total	459,888	0	28,693	57,386	0
Total of all replicates		1,298,138	0	77,265	154,530	0

7.3.4 Peaches – Zee Lady

Life history data

The life history data (table 7.19) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.19: **Zee Lady Peaches:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	16/12/2010	100	0	0	0	100	eggs
1	17/12/2010	100	0	0	0	100	eggs
2	18/12/2010	100	0	0	0	100	eggs
3	19/12/2010	7	93	0	0	100	1st
4	20/12/2010	5	95	0	0	100	1st
5	21/12/2010	0	29	71	0	100	2nd
6	22/12/2010	0	10	66	24	100	2nd
7	23/12/2010	0	18	28	54	100	3rd
8	24/12/2010	0	0	21	79	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.20 – 7.22. Temperatures were maintained evenly: ranging from $6.0 - 6.1^\circ\text{C}$ air; fruit $6.1 - 6.2^\circ\text{C}$.

Table 7.20: Large scale trials of Medfly in infested **Peaches Zee Lady** at $6.0 \pm 0.5^\circ\text{C}$ (Replicate 1).

Trial date: 28/12/1010. Applied dose $36\text{g}/\text{m}^3$. Expected dose $32\text{g}/\text{m}^3$ for 3 hour exposure = 96g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air $^\circ\text{C}$	Fruit $^\circ\text{C}$	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	38.3	35.7	36.8	36.9	6.1	6.2		
10	36.6	34.8	35.9	35.8	6.1	6.2	3.2	4.6
30	34.2	34.4	34.9	34.5	6.1	6.2	6.6	11.9
60	33.4	32.3	33.3	33.0	6.1	6.2	10.6	25.9
90	32.1	32.0	32.5	32.2	6.1	6.2	12.8	41.3
120	31.6	31.2	31.2	31.3	6.0	6.2	15.2	56.4
150	30.8	30.2	30.9	30.6	6.0	6.2	17.1	70.5
180	29.6	29.0	29.5	29.4	6.0	6.2	20.5	84.2
Average	32.6	32.0	32.6	32.4	6.1	6.2	12.3	
$\pm\text{s.d.}$	2.3	2.1	2.3	2.2			6.0	
Average dose range = $90.5 - 103.9\text{g.h.m}^{-3}$								

Table 7.21: Large scale trials of Medfly in infested **Peaches Zee Lady** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 29/12/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.3	33.8	32.8	33.6	6.1	6.2		
10	33.2	33.7	31.0	32.6	6.1	6.2	3.0	4.2
30	33.9	32.9	31.0	32.6	6.1	6.2	3.1	10.9
60	33.9	31.8	31.4	32.4	6.1	6.2	3.8	24.5
90	32.6	30.7	30.6	31.3	6.1	6.2	6.9	40.5
120	32.4	30.6	30.3	31.1	6.1	6.2	7.5	54.8
150	32.6	30.3	30.5	31.1	6.1	6.2	7.4	70.0
180	31.8	29.0	30.1	30.3	6.1	6.2	9.9	85.6
Average	32.9	31.3	30.7	31.6	6.1	6.2	5.9	
±s.d.	0.8	1.6	0.5	0.9			2.7	
Average dose range = 92.2 – 97.6 g.h.m ⁻³								

Table 7.22: Large scale trials of Medfly in infested **Peaches Zee Lady** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 30/12/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.9	33.2	33.6	34.2	6.1	6.2		
10	33.4	31.5	31.8	32.2	6.1	6.2	5.8	4.3
30	32.4	31.4	31.8	31.9	6.1	6.2	6.9	10.7
60	31.5	30.7	31.7	31.3	6.1	6.2	8.6	23.9
90	31.7	30.7	31.5	31.3	6.1	6.2	8.6	39.1
120	31.2	30.8	31.6	31.2	6.0	6.1	8.9	54.8
150	31.3	30.5	30.9	30.9	6.0	6.1	9.7	70.2
180	31.0	30.2	30.8	30.7	6.0	6.1	10.4	85.0
Average	31.8	30.8	31.4	31.4	6.0	6.2	8.4	
±s.d.	0.8	0.5	0.4	0.5			1.6	
Average dose range = 92.4 – 95.7 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.23

Table 7.23: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Zee Lady Peaches**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 28/12/2010 – 03/01/2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.6	0.6	0.9	1.3	1.2	1.1	1.0	0.7	1.2	1.4	1.4	1.0	1.2	0.8	1.1	1.4	1.4	1.3
24	1	1.6	0.5	1.0	1.2	1.1	1.1	1.3	0.7	1.0	1.3	1.3	1.0	1.3	0.4	0.9	1.2	1.3	1.3
36		1.8	0.7	1.1	1.2	1.1	1.1	1.3	0.8	1.1	1.2	1.2	1.0	1.3	0.7	1.1	1.2	1.2	1.3
48	2	1.8	0.6	1.2	1.1	1.1	1.0	1.2	0.7	1.0	1.2	1.2	1.0	1.3	0.7	1.1	1.2	1.2	1.3
60		1.8	0.7	1.1	1.1	1.1	1.0	1.0	0.6	1.1	1.1	1.1	1.0	1.2	0.9	1.2	1.2	1.2	1.3
72	3	1.9	0.5	1.2	1.1	1.1	1.0	1.2	0.6	0.9	1.1	1.1	1.0	1.3	0.7	1.1	1.2	1.3	1.3
84		1.9	0.7	1.1	1.1	1.1	1.0	1.0	0.7	1.1	1.1	1.0	1.0	1.2	1.0	1.2	1.2	1.3	1.3
96	4	2.0	0.5	1.1	1.1	1.1	1.0	1.3	0.6	1.0	1.1	1.0	1.0	1.3	0.7	1.0	1.2	1.3	1.3
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1					
		Av. air ± s. d. = 1.2 ±0.3						Av. air ± s. d. = 1.3 ±0.3						Av. air ± s. d. = 1.0 ±1.0					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.24) show that from the dissection data an estimated 957,087 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 80,608 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 84.2 – 85.0 g.h.m⁻³) or as a final dose (range 90.5 – 103.9 g.h.m⁻³) at 6°C in Zee Lady peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.24: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep / stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Peaches Zee Lady**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	138,010	0	8,415	16,830	0
	1 st Instar	88,741	0	8,618	17,236	0
	2 nd instar	79,080	0	9,119	18,238	0
	Total	305,831	0	26,152	52,304	0
2	eggs	143,834	0	9,533	19,066	0
	1 st Instar	93,098	0	8,371	16,742	0
	2 nd instar	83,232	0	9,597	19,194	0
	Total	320,164	0	27,501	55,002	0
3	eggs	151,903	0	9,262	18,524	0
	1 st Instar	91,288	0	8,865	17,730	0
	2 nd instar	87,901	0	8,828	17,656	0
	Total	331,092	0	26,955	53,910	0
Total of all replicates		957,087	0	80,608	161,216	0

7.3.5 Nectarines – Arctic Snow

Life history data

The life history data (table 7.25) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.25: **Arctic Snow Nectarines:** Incubation of immature stages of Medfly at $26 \pm 1^\circ\text{C}$; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	31/1/2011	100	0	0	0	100	eggs
1	1/2/2011	100	0	0	0	100	eggs
2	2/2/2011	100	0	0	0	100	eggs
3	3/2/2011	17	83	0	0	100	1st
4	4/2/2011	4	96	0	0	100	1st
5	5/2/2011	0	89	11	0	100	2nd
6	6/2/2011	0	20	80	0	100	2nd
7	7/2/2011	0	0	88	12	100	3rd
8	8/2/2011	0	0	26	74	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.26 – 7.28. Temperatures were maintained evenly: ranging from $6.0 - 6.1^\circ\text{C}$ air; fruit $6.1 - 6.2^\circ\text{C}$.

Table 7.26: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at $6.0 \pm 0.5^\circ\text{C}$ (Replicate 1). Trial date: 10/2/2011. Applied dose $36\text{g}/\text{m}^3$. Expected dose $32\text{g}/\text{m}^3$ for 3 hour exposure = $96\text{g.h.}/\text{m}^3$

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons $\text{MeBr g}/\text{m}^3$	Air $^\circ\text{C}$	Fruit $^\circ\text{C}$	% loss of MeBr through sorption, leakage etc.	concentration x time sum $\text{g.h.}/\text{m}^3$
5	36.4	34.8	34.4	35.2	6.1	6.2		
10	34.0	33.5	32.5	33.3	6.1	6.2	5.3	4.4
30	33.3	33.1	32.0	32.8	6.1	6.2	6.8	11.1
60	31.6	31.0	31.5	31.4	6.1	6.2	10.9	24.6
90	29.4	30.7	31.5	30.5	6.1	6.2	13.3	39.2
120	29.5	29.9	31.1	30.2	6.0	6.1	14.3	53.4
150	29.2	29.9	30.5	29.9	6.0	6.1	15.2	67.9
180	28.3	28.9	30.5	29.2	6.0	6.1	17.0	82.1
Average	30.8	31.0	31.4	31.0	6.0	6.2	11.8	
$\pm\text{s.d.}$	2.2	1.7	0.7	1.5			4.4	
Average dose range = $88.5 - 97.7\text{g.h.}/\text{m}^3$								

Table 7.27: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 11/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.5	33.0	33.8	34.1	6.1	6.2		
10	34.1	32.6	31.1	32.6	6.1	6.2	4.4	4.3
30	33.8	31.8	31.1	32.2	6.1	6.2	5.5	10.9
60	33.1	30.7	31.5	31.8	6.1	6.2	6.8	24.2
90	32.5	29.6	30.7	30.9	6.1	6.2	9.3	39.7
120	32.3	29.5	30.4	30.7	6.0	6.2	9.9	54.1
150	31.5	29.2	30.6	30.4	6.0	6.2	10.8	69.2
180	30.7	28.9	30.2	29.9	6.0	6.2	12.2	83.7
Average	32.6	30.3	30.8	31.2	6.0	6.2	8.4	
±s.d.	1.2	1.4	0.5	1.0			2.9	
Average dose range = 90.7 – 96.7 g.h.m ⁻³								

Table 7.28: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 12/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.7	33.0	33.5	33.7	6.0	6.1		
10	33.4	32.5	32.8	32.9	6.1	6.2	2.5	4.2
30	32.4	31.4	31.8	31.9	6.1	6.2	5.5	11.0
60	31.5	30.7	31.7	31.3	6.1	6.2	7.2	23.9
90	30.7	29.7	30.5	30.3	6.1	6.2	10.2	39.1
120	30.2	29.1	30.2	29.8	6.1	6.2	11.6	53.0
150	29.3	28.5	29.9	29.2	6.0	6.1	13.3	67.1
180	29.0	28.2	28.8	28.7	6.0	6.1	15.0	80.4
Average	30.9	30.0	30.8	30.6	6.0	6.2	9.3	
±s.d.	1.6	1.6	1.4	1.5			4.5	
Average dose range = 87.2 – 96.3 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.29

Table 7.29: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Arctic Snow Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 10 - 17 February 2010																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.5	1.1	0.6	1.1	1.1	1.4	0.9	-0.2	0.3	1.3	1.3	1.2	1.7	0.6	1.2	1.2	1.2	1.0
24	1	1.0	0.9	1.1	1.1	1.0	1.4	1.2	-0.3	0.3	1.3	1.2	1.2	1.6	0.7	1.0	1.1	1.2	1.1
36		0.7	1.0	0.8	1.0	1.1	1.4	0.9	0.0	0.3	1.1	1.1	1.2	1.9	0.6	1.2	1.1	1.2	1.0
48	2	1.0	0.6	1.1	1.0	1.1	1.2	1.3	-0.2	0.4	1.1	1.2	1.2	1.8	0.6	1.1	1.1	1.2	1.0
60		0.7	1.1	0.8	1.1	1.1	1.3	1.0	-0.2	0.3	1.2	1.2	1.2	2.0	0.6	1.4	1.1	1.2	1.0
72	3	1.3	0.4	1.3	1.2	1.2	1.1	1.5	-0.2	0.5	1.3	1.3	1.2	1.8	0.6	1.1	1.1	1.2	1.0
84		0.9	0.8	1.0	1.2	1.2	1.2	1.2	-0.2	0.4	1.3	1.2	1.1	2.2	0.7	1.6	1.1	1.2	1.0
96	4	1.3	0.2	1.3	1.3	1.2	1.1	1.7	-0.2	0.5	1.4	1.3	1.2	1.9	0.7	1.2	1.2	1.3	1.0
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.0						Av. air ± s. d. = 0.5 ±0.3						Av. air ± s. d. = 1.2 ±1.1					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.30) show that from the dissection data an estimated 1,016,513 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 141,247 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.4 – 83.7 g.h.m⁻³) or as a final dose (range 87.2 – 97.7 g.h.m⁻³) at 6°C in Arctic Snow nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.30 : Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep / stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Arctic Snow Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	173,974	0	7,522	15,044	0
	1 st Instar	103,649	0	7,181	14,362	0
	2 nd instar	79,080	0	8,207	16,414	0
	Total	356,704	0	22,910	45,820	0
2	eggs	143,453	0	7,839	15,678	0
	1 st Instar	108,738	0	7,534	15,068	0
	2 nd instar	83,232	0	8,638	17,276	0
	Total	335,424	0	24,011	48,022	0
3	eggs	151,501	0	8,279	16,558	0
	1 st Instar	106,625	0	7,388	14,776	0
	2 nd instar	66,260	0	8,049	16,098	0
	Total	324,386	0	23,716	47,432	0
Total of all replicates		1,016,513	0	70,637	141,274	0

7.3.6 Nectarines – August Red

Life history data

The life history data (table 7.31) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.31: **August Red Nectarines:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	9/4/2011	100	0	0	0	100	eggs
1	10/4/2011	100	0	0	0	100	eggs
2	11/4/2011	100	0	0	0	100	eggs
3	12/4/2011	17	83	0	0	100	1st
4	13/4/2011	9	91	0	0	100	1st
5	14/4/2011	0	96	4	0	100	2nd
6	15/4/2011	0	17	83	0	100	2nd
7	16/4/2011	0	16	66	18	100	3rd
8	17/4/2011	0	0	26	74	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.32 – 7.34. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.1 - 6.2°C.

Table 7.32: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 1). Trial date: 20/4/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	37.2	33.9	35.2	35.4	6.0	6.2		
10	35.2	32.2	34.1	33.8	6.1	6.2	4.5	4.4
30	34.6	31.8	33.1	33.2	6.1	6.2	6.4	11.3
60	33.0	29.7	32.5	31.7	6.1	6.2	10.4	24.9
90	32.6	29.4	32.2	31.4	6.1	6.2	11.4	39.7
120	31.4	28.6	31.4	30.5	6.1	6.2	14.0	55.0
150	30.3	28.6	30.1	29.7	6.1	6.2	16.3	68.6
180	29.9	28.6	29.7	29.4	6.1	6.2	17.0	81.6
Average	32.4	29.8	31.9	31.4	6.1	6.2	11.4	
±s.d.	2.0	1.5	1.6	1.7			4.8	
Average dose range = 89.1 – 99.2 g.h.m ⁻³								

Table 7.33: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 21/4/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	36.6	35.7	32.5	34.9	6.0	6.1		
10	36.3	34.8	31.3	34.1	6.0	6.1	2.3	4.4
30	35.0	34.0	31.3	33.4	6.0	6.2	4.3	11.4
60	34.2	33.9	31.7	33.3	6.0	6.2	4.8	25.1
90	33.7	32.8	30.9	32.5	6.0	6.2	7.1	41.6
120	32.5	31.7	30.6	31.6	6.0	6.2	9.5	56.8
150	31.7	30.4	30.8	31.0	6.0	6.1	11.4	71.1
180	30.9	30.1	30.4	30.5	6.0	6.1	12.8	85.2
Average	33.5	32.5	31.0	32.3	6.0	6.1	7.4	
±s.d.	1.9	1.8	0.5	1.4			3.9	
Average dose range = 92.9 – 101.1 g.h.m ⁻³								

Table 7.34: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 22/4/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.2	34.5	33.1	34.3	6.0	6.2		
10	34.6	32.7	32.0	33.1	6.0	6.2	3.4	4.3
30	33.6	32.6	32.0	32.7	6.0	6.2	4.5	11.0
60	32.7	31.9	31.9	32.2	6.0	6.2	6.1	24.6
90	31.9	31.9	30.7	31.5	6.0	6.2	8.1	40.2
120	31.4	30.0	29.8	30.4	6.0	6.2	11.3	55.1
150	30.5	29.7	29.1	29.8	6.0	6.2	13.1	68.4
180	29.2	29.4	29.0	29.2	6.0	6.2	14.8	81.9
Average	32.0	31.2	30.6	31.3	6.0	6.2	8.8	
±s.d.	1.8	1.4	1.4	1.5			4.4	
Average dose range = 89.3 – 98.3 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.35

Table 7.35: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: August Red Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 20 - 27 April 2011																			
		Replicate 1: Cold Room #3							Replicate 2: Cold Room #4							Replicate 3: Cold Room #5					
		Air °C			Fruit °C				Air °C			Fruit °C				Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B		In	Ex	M	T	M	B		In	Ex	M	T	M	B
12		0.8	-0.2	0.2	1.4	1.4	1.1		1.8	0.6	0.6	1.3	1.4	1.1		1.1	1.1	2.1	1.5	1.4	1.3
24	1	1.4	0.0	0.7	1.2	1.2	1.1		2.2	0.7	0.6	1.1	1.4	1.3		0.9	0.8	2.3	1.1	1.3	1.2
36		1.0	0.0	0.4	1.0	1.1	1.1		1.8	0.6	0.5	1.0	1.3	1.3		1.2	1.2	2.2	1.0	1.4	1.1
48	2	1.6	0.0	0.9	1.0	1.1	1.1		2.2	0.6	0.4	1.0	1.2	1.3		1.1	0.9	2.4	1.0	1.3	1.2
60		1.0	0.1	0.5	1.0	1.1	1.1		1.9	0.6	0.6	1.1	1.2	1.2		1.3	1.3	2.2	1.1	1.3	1.2
72	3	1.6	0.0	0.9	1.1	1.1	0.9		2.3	0.7	0.5	1.1	1.2	1.2		0.9	0.8	2.3	1.2	1.3	1.1
84		1.1	0.0	0.4	1.1	1.1	1.0		1.9	0.6	0.6	1.1	1.2	1.2		1.2	1.1	2.3	1.1	1.3	1.0
96	4	1.8	0.0	0.8	1.1	1.1	1.0		2.4	0.7	0.6	1.2	1.2	1.3		0.6	0.4	2.4	1.2	1.2	1.0
		Av. fruit ± s. d. = 1.1 ±0.1							Av. fruit ± s. d. = 1.2 ±0.1							Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.6 ±0.3							Av. air ± s. d. = 1.1 ±0.3							Av. air ± s. d. = 1.4 ±1.7					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																					

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.36) show that from the dissection data an estimated 822,904 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 136,836 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 81.6 – 85.2 g.h.m⁻³) or as a final dose (range 89.1 – 101.1 g.h.m⁻³) at 6°C in August Red nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.36: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: August Red Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	145,332	0	6,954	13,908	0
	1 st Instar	82,105	0	7,298	14,596	0
	2 nd instar	57,395	0	8,340	16,680	0
	Total	284,832	0	22,592	45,184	0
2	eggs	151,465	0	6,881	13,762	0
	1 st Instar	86,136	0	7,657	15,314	0
	2 nd instar	60,408	0	8,778	17,556	0
	Total	298,009	0	23,316	46,632	0
3	eggs	159,962	0	6,838	13,676	0
	1 st Instar	84,462	0	7,508	15,016	0
	2 nd instar	55,639	0	8,164	16,328	0
	Total	300,063	0	22,510	45,020	0
Total of all replicates		882,904	0	68,418	136,836	0

7.3.7 Plums – Angelino

Life history data

The life history data (table 7.37) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.37: **Angelino Plums**: Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	8/3/2011	100	0	0	0	100	eggs
1	9/3/2011	100	0	0	0	100	eggs
2	10/3/2011	100	0	0	0	100	eggs
3	11/3/2011	15	85	0	0	100	1st
4	12/3/2011	13	85	2	0	100	1st
5	13/3/2011	0	41	59	0	100	2nd
6	14/3/2011	0	22	73	5	100	2nd
7	15/3/2011	0	3	26	71	100	3rd
8	16/3/2011	0	0	16	84	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.38 – 7.40. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.1 - 6.2°C.

Table 7.38: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 1). Trial date: 23/3/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	36.9	34.3	35.8	35.7	6.0	6.2		
10	35.9	33.3	34.0	34.4	6.0	6.2	3.6	4.5
30	34.3	33.2	33.4	33.6	6.0	6.2	5.7	11.5
60	33.7	32.8	32.6	33.0	6.0	6.2	7.4	25.2
90	32.4	30.7	32.3	31.8	6.0	6.2	10.8	41.3
120	31.9	30.4	32.0	31.4	6.1	6.2	11.9	55.7
150	31.0	29.6	31.6	30.7	6.1	6.2	13.8	70.7
180	30.0	29.6	30.0	29.9	6.1	6.2	16.3	84.5
Average	32.7	31.4	32.3	32.1	6.1	6.2	9.9	
±s.d.	2.0	1.7	1.3	1.6			4.6	
Average dose range = 91.5 – 101.3 g.h.m ⁻³								

Table 7.39: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 24/3/2011. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	34.9	34.2	34.8	34.6	6.0	6.2		
10	33.7	33.2	33.7	33.5	6.0	6.2	3.2	4.3
30	32.4	32.4	32.7	32.5	6.0	6.2	6.2	11.2
60	31.4	31.3	31.1	31.3	6.0	6.2	9.7	24.4
90	31.1	30.2	30.3	30.5	6.0	6.2	11.8	39.1
120	30.9	29.0	30.0	30.0	6.0	6.2	13.5	53.4
150	30.1	28.8	29.8	29.6	6.0	6.2	14.6	67.4
180	29.3	28.5	29.2	29.0	6.0	6.2	16.3	81.3
Average	31.3	30.5	31.0	30.9	6.0	6.2	10.8	
±s.d.	1.4	1.9	1.7	1.6			4.7	
Average dose range = $87.8 - 97.6\text{ g.h.m}^{-3}$								

Table 7.40: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 25/3/2011. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96 g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	36.5	34.0	34.3	34.9	6.0	6.1		
10	35.7	33.9	33.1	34.2	6.0	6.1	2.0	4.4
30	34.7	32.8	32.1	33.2	6.0	6.1	5.0	11.4
60	33.8	32.1	32.0	32.6	6.0	6.1	6.6	24.9
90	32.0	31.1	31.8	31.6	6.0	6.1	9.4	40.8
120	31.5	30.5	30.9	31.0	6.0	6.1	11.4	55.4
150	30.6	29.9	30.2	30.2	6.0	6.1	13.5	69.7
180	29.3	29.6	29.1	29.3	6.0	6.1	16.0	83.1
Average	32.5	31.4	31.3	31.7	6.0	6.1	9.1	
±s.d.	2.3	1.6	1.3	1.7			4.9	
Average dose range = $90.1 - 100.4\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.41

Table 7.41: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Angelino Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 23 - 30 March 2011																			
		Replicate 1: Cold Room #3							Replicate 2: Cold Room #4							Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C				Air °C			Fruit °C				Air °C			Fruit °C		
		In	Ex	M	T	M	B		In	Ex	M	T	M	B		In	Ex	M	T	M	B
12		0.7	0.5	0.8	1.3	1.3	1.0		0.6	0.4	0.6	1.0	1.1	1.2		0.5	0.4	0.9	1.3	1.4	1.1
24	1	1.4	0.5	1.0	1.3	1.2	1.0		1.1	0.5	0.8	1.0	1.0	1.1		0.6	0.3	1.2	1.3	1.3	1.1
36		0.7	0.5	0.8	1.4	1.2	1.0		0.9	0.6	0.8	1.1	1.2	1.0		0.7	1.0	1.6	1.2	1.2	1.0
48	2	1.6	0.5	1.1	1.4	1.2	1.0		1.3	0.6	0.8	1.1	1.2	1.0		1.1	0.8	1.7	1.1	1.1	1.0
60		1.0	0.5	1.0	1.3	1.2	1.0		0.8	0.6	0.8	1.1	1.2	1.0		0.8	1.1	1.6	1.1	1.1	1.0
72	3	1.2	0.5	1.0	1.3	1.2	1.0		1.2	0.6	0.8	1.1	1.2	1.0		1.0	0.6	1.4	1.2	1.1	1.0
84		0.8	0.5	0.8	1.2	1.1	1.1		0.8	0.5	0.7	1.1	1.2	1.1		0.9	1.1	1.5	1.1	1.1	1.0
96	4	1.1	0.5	0.9	1.3	1.1	1.0		1.3	0.6	0.8	1.1	1.2	1.1		1.3	0.6	1.5	1.1	1.2	1.0
		Av. fruit ± s. d. = 1.2 ±0.1							Av. fruit ± s. d. = 1.1 ±0.1							Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.8 ±0.3							Av. air ± s. d. = 0.8 ±0.4							Av. air ± s. d. = 1.0 ±1.3					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																					

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.42) show that from the dissection data an estimated 665,882 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 147,964 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 81.3 – 84.5 g.h.m⁻³) or as a final dose (range 87.1 – 101.3 g.h.m⁻³) at 6°C in Angelino plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.42: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Angelino Plums**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	115,429	0	8,005	16,010	0
	1 st Instar	60,561	0	8,161	16,322	0
	2 nd instar	39,688	0	8,025	16,050	0
	Total	215,678	0	24,191	48,382	0
2	eggs	120,300	0	8,343	16,686	0
	1 st Instar	63,534	0	8,072	16,144	0
	2 nd instar	41,772	0	8,098	16,196	0
	Total	225,606	0	24,513	49,026	0
3	eggs	127,049	0	8,811	17,622	0
	1 st Instar	53,434	0	7,915	15,830	0
	2 nd instar	44,115	0	8,552	17,104	0
	Total	224,598	0	25,278	50,556	0
Total of all replicates		665,882	0	73,982	147,964	0

7.3.8 Plums – Tegan Blue

Life history data

The life history data (table 7.43) was used to plan the infestation schedule of the fruit for the trials to determine the stage of treatment as well as the date of treatment for each stage following infestation so as to obtain the required stages at the time of exposure to the treatments. Eggs were predominant from the day of infestation and for the next 2 days; 1st instar was > 50% on days 3 and 4; 2nd instar was > 50% on days 5 and 6; 3rd instar was > 50% on days 7 and 8. Eggs were treated when more than 50% development had occurred. 1st and 2nd instar larvae were treated when more than 50% of the population of each stage was present in the test fruit.

Table 7.43: **Tegan Blue Plums:** Incubation of immature stages of Medfly at 26 ± 1 °C ; 60 - 65% rh to determine dates when >50% are in the stage for combined Large Scale trials 1°C cold treatment + methyl bromide fumigation trials.

Incubation days after infestation	Date	Percentage of immature insects in stage					Stage and day >50%
		Eggs	1st instar	2nd instar	3rd instar	totals	
0	18/2/2011	100	0	0	0	100	eggs
1	19/2/2011	100	0	0	0	100	eggs
2	20/2/2011	100	0	0	0	100	eggs
3	21/2/2011	8	92	0	0	100	1st
4	22/2/2011	5	83	12	0	100	1st
5	23/2/2011	0	49	51	0	100	2nd
6	24/2/2011	0	4	82	14	100	2nd
7	25/2/2011	0	2	34	64	100	3rd
8	26/2/2011	0	1	24	75	100	3rd

Fumigation treatments 32g x 3h at 6°C

Fumigation treatment records are given in tables 7.44 – 7.46. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.1 - 6.2°C.

Table 7.44: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 1). Trial date: 4/3/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 3 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.9	34.4	34.2	34.8	6.0	6.1		
10	34.2	33.2	33.1	33.5	6.0	6.1	3.8	4.4
30	33.6	32.8	33.1	33.2	6.0	6.1	4.8	11.2
60	32.2	31.7	33.0	32.3	6.0	6.1	7.3	24.9
90	31.6	30.9	32.7	31.7	6.0	6.1	8.9	40.4
120	31.1	30.6	31.4	31.0	6.0	6.1	10.9	55.5
150	30.5	29.8	30.1	30.1	6.0	6.1	13.5	69.8
180	29.9	29.6	29.7	29.7	6.0	6.1	14.6	82.9
Average	31.9	31.2	31.9	31.7	6.0	6.1	9.1	
±S.d.	1.6	1.4	1.5	1.4			4.1	
Average dose range = 90.6 – 99.3 g.h.m ⁻³								

Table 7.45: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 5/3/2011. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96 g.h.m^{-3}

Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	37.3	34.7	35.1	35.7	6.0	6.1		
10	35.3	33.8	33.3	34.1	6.0	6.1	4.4	4.5
30	35.0	33.0	32.3	33.4	6.0	6.1	6.3	11.4
60	34.3	32.9	31.7	33.0	6.0	6.1	7.7	25.1
90	34.0	31.8	30.9	32.2	6.0	6.1	9.7	41.2
120	33.5	30.7	30.6	31.6	6.0	6.1	11.5	56.4
150	32.5	29.4	29.8	30.6	6.0	6.1	14.4	71.1
180	31.2	28.1	29.4	29.6	6.0	6.1	17.2	84.1
Average	33.7	31.4	31.1	32.1	6.0	6.1	10.2	
±s.d.	1.4	2.1	1.4	1.6			4.5	
Average dose range = $91.4 - 101.1\text{ g.h.m}^{-3}$								

Table 7.46: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 6/3/2011. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 3 hour exposure = 96 g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	37.4	33.3	34.6	35.1	6.1	6.2		
10	36.6	32.7	33.0	34.1	6.1	6.2	2.8	4.4
30	35.6	31.6	32.0	33.1	6.1	6.2	5.8	11.4
60	34.7	30.9	31.9	32.5	6.1	6.2	7.4	24.8
90	33.9	29.9	30.7	31.5	6.1	6.2	10.3	40.6
120	32.4	29.0	30.0	30.5	6.1	6.2	13.2	55.1
150	31.5	28.7	29.1	29.8	6.1	6.2	15.2	68.6
180	30.2	28.4	28.7	29.1	6.1	6.2	17.1	81.9
Average	33.6	30.2	30.8	31.5	6.1	6.2	10.3	
±s.d.	2.3	1.6	1.6	1.8			5.2	
Average dose range = $89.0 - 100.0\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.47

Table 7.47: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 3h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Tegan Blue Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 4 - 11 March 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.0	0.4	1.0	1.5	1.6	1.3	1.1	0.4	0.8	1.2	1.2	1.4	1.1	0.8	1.1	1.2	1.4	1.2
24	1	0.8	0.6	1.0	1.5	1.5	1.4	1.6	0.5	0.9	1.3	1.4	1.3	1.2	0.4	0.9	1.3	1.4	1.2
36		1.2	0.5	1.1	1.5	1.4	1.5	1.4	0.6	0.9	1.4	1.4	1.3	1.2	0.7	1.0	1.2	1.2	1.2
48	2	0.7	0.5	1.0	1.5	1.4	1.6	1.8	0.6	1.0	1.4	1.4	1.2	1.2	0.7	1.0	1.1	1.1	1.2
60		1.1	0.5	1.1	1.4	1.3	1.4	1.3	0.6	1.0	1.4	1.4	1.3	1.1	0.9	1.1	1.1	1.1	1.2
72	3	1.2	0.5	1.0	1.4	1.3	1.5	1.7	0.6	0.9	1.4	1.5	1.2	1.2	0.7	1.1	1.2	1.2	1.2
84		0.8	0.5	1.0	1.4	1.2	1.3	1.3	0.5	0.9	1.4	1.4	1.3	1.1	1.0	1.2	1.1	1.1	1.2
96	4	1.3	0.5	1.1	1.4	1.2	1.4	1.8	0.6	1.0	1.4	1.5	1.3	1.2	0.7	1.0	1.1	1.1	1.2
		Av. fruit ± s. d. = 1.4 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.8 ±0.3						Av. air ± s. d. = 1.0 ±0.4						Av. air ± s. d. = 1.0 ±1.0					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.48) show that from the dissection data an estimated 657,192 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 141,184 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 81.9 – 84.1 g.h.m⁻³) or as a final dose (range 89.0 – 101.1 g.h.m⁻³) at 6°C in Tegan Blue plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.48: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 32g/m³ for 3 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Tegan Blue Plums**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	104,839	0	7,309	14,618	0
	1 st Instar	67,003	0	7,705	15,410	0
	2 nd instar	52,225	0	8,218	16,436	0
	Total	224,066	0	23,232	46,464	0
2	eggs	109,263	0	8,204	16,408	0
	1 st Instar	70,292	0	7,544	15,088	0
	2 nd instar	54,966	0	8,649	17,298	0
	Total	234,521	0	24,397	48,794	0
3	eggs	99,264	0	7,508	15,016	0
	1 st Instar	46,763	0	7,397	14,794	0
	2 nd instar	52,577	0	8,058	16,116	0
	Total	198,604	0	22,963	45,926	0
Total of all replicates		657,192	0	70,592	141,184	0

CONCLUSIONS

Data for 8 cultivars treated at 6°C with a methyl bromide fumigation dose of 96 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. Approximately 10% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 80 - 90 g.h.m⁻³ on average and about 90 - 110 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 32g/m³ for 3 h treatment giving cumulative gas concentration of 96 g.h.m⁻³. Cold treatment was maintained between 1.0 – 1.2°C over 96 hours. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times for both treatments if applied alone. The Probit 9 estimates show that this combined treatment of Medfly eggs, 1st and 2nd instar stages are sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

7.4 RESULTS OF LARGE SCALE TRIALS OF MEDFLY USING: METHYL BROMIDE FUMIGATION AT 6°C: 48g/m³ for 2 hour exposure followed by COLD TREATMENT at 1.5°C for 96 hours

The combined fumigation + cold treatment trials were conducted from November 2010 to May 2011.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations, cold treatment temperatures, and mortality of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits are the same as for that given in section 7.3 above since fruit from the same harvested batch of was used.

7.4.1 Cherries - Sweetheart

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.49 – 7.51. Temperatures were maintained evenly: ranging from 6.0 – 6.2°C air; fruit 6.2 - 6.3°C.

Table 7.49: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 18/11/2010. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.3	50.7	52.8	51.6	6.2	6.3		
10	50.3	48.5	50.6	49.8	6.2	6.3	3.5	6.5
30	49.3	47.1	49.6	48.7	6.2	6.3	5.7	16.6
60	48.1	46.5	48.6	47.7	6.2	6.3	7.5	36.5
90	47.9	45.7	47.2	46.9	6.2	6.3	9.0	59.7
120	47.0	44.9	46.9	46.3	6.2	6.3	10.3	82.1
Average	48.5	46.5	48.6	47.9	6.2	6.3	7.2	
±s.d.	1.3	1.4	1.6	1.4			2.7	
Average dose range = 93.0 – 98.6 g.h.m ⁻³								

Table 7.50: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 19/11/2010. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.8	50.7	50.7	51.1	6.1	6.2		
10	49.1	49.6	49.4	49.4	6.1	6.2	3.3	6.4
30	48.8	48.5	48.4	48.6	6.1	6.2	4.9	16.5
60	47.8	47.7	47.2	47.6	6.1	6.2	6.9	36.4
90	46.1	45.4	46.3	45.9	6.1	6.2	10.1	59.5
120	45.9	44.3	45.7	45.3	6.1	6.2	11.3	80.4
Average	47.5	47.1	47.4	47.3	6.1	6.2	7.3	
±s.d.	1.5	2.2	1.5	1.7			3.4	
Average dose range = 91.3 – 98.1 g.h.m ⁻³								

Table 7.51: Large scale trials of Medfly in infested **Sweetheart cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 20/11/2010. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.6	49.7	51.5	51.3	6.0	6.2		
10	50.1	48.9	49.7	49.6	6.0	6.2	3.3	6.4
30	49.9	47.8	48.7	48.8	6.0	6.2	4.8	16.5
60	48.8	46.1	47.6	47.5	6.0	6.2	7.3	36.6
90	47.6	45.1	46.4	46.4	6.0	6.2	9.6	59.4
120	46.1	44.2	45.5	45.3	6.0	6.2	11.7	81.1
Average	48.5	46.4	47.6	47.5	6.0	6.2	7.3	
±s.d.	1.7	1.9	1.7	1.7			3.4	
Average dose range = 91.5 – 98.5 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.52

Table 7.52: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2 h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Sweetheart cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 18 - 25 November 2010																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.9	0.2	1.1	1.0	1.2	1.2	1.1	0.7	0.7	1.5	1.1	1.2	1.4	0.2	0.9	1.2	1.1	1.2
24	1	1.3	0.1	1.5	1.0	1.1	1.1	1.9	0.9	1.0	1.1	1.3	1.3	3.0	-0.1	1.3	1.0	1.0	1.1
36		0.8	0.1	1.0	1.1	1.1	1.2	1.1	0.6	0.7	1.1	1.2	1.2	1.2	0.1	0.9	1.1	0.9	1.2
48	2	1.1	0.1	1.4	1.0	1.1	1.2	1.4	0.7	0.9	1.1	1.3	1.2	1.8	0.1	1.1	1.1	1.0	1.2
60		0.8	0.3	1.0	1.1	1.2	1.3	1.0	0.6	0.7	1.1	1.2	1.2	0.8	0.0	0.8	1.1	1.0	1.2
72	3	1.0	0.1	1.3	1.1	1.1	1.2	1.3	0.7	0.8	1.1	1.3	1.2	1.4	0.1	1.0	1.1	1.0	1.2
84		0.7	0.2	0.9	1.1	1.2	1.3	0.9	0.7	0.7	1.1	1.2	1.2	0.7	-0.1	0.7	1.1	1.0	1.2
96	4	1.0	0.2	1.4	1.0	1.1	1.2	1.3	0.7	0.8	1.1	1.3	1.2	1.6	-0.1	1.0	1.1	1.1	1.2
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.8 ±0.3						Av. air ± s. d. = 0.9 ±0.4						Av. air ± s. d. = 0.8 ±0.5					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.53) show that from the dissection data an estimated 1,070,184 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 226,044 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.4 – 82.1 g.h.m⁻³) or as a final dose (range 90.3 – 98.6 g.h.m⁻³) at 6°C in Sweetheart cherries plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.53 Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Sweetheart Cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	161,437	0		13,498	26,996	0
	1 st Instar	110,682	0		12,185	24,370	0
	2 nd instar	83,556	0		13,360	26,720	0
	Total	355,675	0		39,043	78,086	0
2	eggs	175,492	0		12,192	24,384	0
	1 st Instar	111,678	0		11,931	23,862	0
	2 nd instar	77,805	0		12,052	24,104	0
	Total	364,976	0		36,175	72,350	0
3	eggs	156,830	0		11,037	22,074	0
	1 st Instar	112,315	0		14,039	28,078	0
	2 nd instar	80,388	0		12,728	25,456	0
	Total	349,533	0		37,804	75,608	0
Total all reps		1,070,184	0		113,022	226,044	0

7.4.2 Cherries - Lapin

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.54 – 7.56. Temperatures were maintained evenly: ranging from 6.0 – 6.2°C air; fruit 6.2 – 6.3°C.

Table 7.54: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 8/12/2010. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.9	49.0	50.4	50.4	6.0	6.2		
10	50.6	48.8	49.9	49.8	6.0	6.2	1.3	6.3
30	49.2	47.4	48.9	48.5	6.0	6.2	3.8	16.6
60	48.1	46.3	47.9	47.4	6.0	6.2	5.9	36.4
90	47.6	45.0	46.1	46.2	6.0	6.1	8.3	59.3
120	46.2	44.2	45.8	45.4	6.0	6.1	10.0	80.9
Average	48.3	46.3	47.7	47.5	6.0	6.2	5.9	
±s.d.	1.7	1.8	1.8	1.7			3.5	
Average dose range = 91.5 – 98.4 g.h.m ⁻³								

Table 7.55: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 9/12/2010. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.6	49.1	51.1	50.6	6.0	6.1		
10	49.3	48.8	49.6	49.2	6.0	6.1	2.7	6.3
30	48.0	47.7	48.0	47.9	6.0	6.1	5.3	16.4
60	47.0	46.9	47.4	47.1	6.0	6.1	6.9	35.9
90	46.3	45.6	46.2	46.0	6.0	6.1	9.0	58.9
120	45.1	44.5	45.9	45.2	6.0	6.1	10.7	80.6
Average	47.1	46.7	47.4	47.1	6.0	6.1	6.9	
±s.d.	1.6	1.7	1.5	1.6			3.1	
Average dose range = 91.0 – 97.3 g.h.m ⁻³								

Table 7.56: Large scale trials of Medfly in infested **Lapin cherries** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 10/12/2010. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	54.4	50.4	52.5	52.4	6.0	6.1		
10	52.5	49.8	51.1	51.1	6.0	6.1	2.5	6.6
30	49.2	48.7	50.1	49.3	6.0	6.1	5.9	17.0
60	48.3	47.0	49.0	48.1	6.0	6.1	8.3	37.0
90	47.5	46.2	48.8	47.5	6.0	6.1	9.4	60.1
120	46.0	45.4	47.9	46.4	6.0	6.1	11.4	83.1
Average	48.7	47.4	49.4	48.5	6.0	6.1	7.5	
±s.d.	2.4	1.8	1.2	1.8			3.4	
Average dose range = 93.4 – 100.6 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.57

Table 7.57: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Lapin cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 8 - 15 December 2010																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.4	0.0	1.3	1.4	1.1	1.2	2.3	0.8	1.1	1.3	1.0	1.1	2.5	0.4	1.2	1.1	1.1	1.3
24	1	1.5	0.2	1.3	1.3	1.1	1.1	2.5	0.8	1.2	1.3	1.1	1.1	2.6	0.5	1.3	1.0	1.0	1.3
36		1.4	0.0	1.3	1.3	1.2	1.2	2.5	0.8	1.2	1.4	1.2	1.1	2.4	0.3	1.1	1.1	1.1	1.3
48	2	1.4	0.1	1.2	1.3	1.1	1.1	3.3	1.0	1.4	1.4	1.2	1.0	2.6	0.1	1.1	1.1	1.1	1.3
60		1.4	0.2	1.2	1.3	1.1	1.1	2.5	0.8	1.2	1.4	1.1	1.1	2.3	0.3	1.2	1.1	1.2	1.3
72	3	1.3	0.2	1.2	1.3	1.3	1.2	2.6	0.8	1.1	1.4	1.1	1.1	2.7	0.2	1.3	1.2	1.2	1.3
84		1.2	0.1	1.1	1.2	1.1	1.1	2.4	0.8	1.0	1.4	1.1	1.1	2.5	0.2	1.1	1.2	1.3	1.3
96	4	1.2	0.2	1.2	1.2	1.1	1.2	2.5	0.8	1.1	1.3	1.1	1.1	2.5	0.6	1.2	1.2	1.2	1.3
		Av. fruit ± s. d. = 1.2 ±0.1					Av. fruit ± s. d. = 1.2 ±0.1					Av. fruit ± s. d. = 1.2 ±0.1							
		Av. air ± s. d. = 0.9 ±0.3					Av. air ± s. d. = 1.5 ±0.6					Av. air ± s. d. = 1.3 ±0.8							
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.58) show that from the dissection data an estimated 1,070,184 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 226,044 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.6 – 83.1 g.h.m⁻³) or as a final dose (range 91.0 – 100.6 g.h.m⁻³) at 6°C in Lapin cherries plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.58: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³. + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Lapin cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	143,234	0	12,455	24,910	0
	1 st Instar	98,202	0	12,109	24,218	0
	2 nd instar	84,536	0	11,722	23,444	0
	Total	325,972	0	36,286	72,572	0
2	eggs	129,158	0	12,981	25,962	0
	1 st Instar	99,086	0	12,703	25,406	0
	2 nd instar	93,899	0	12,337	24,674	0
	Total	322,143	0	38,021	76,042	0
3	eggs	139,146	0	11,237	22,474	0
	1 st Instar	99,651	0	11,534	23,068	0
	2 nd instar	84,835	0	12,064	24,128	0
	Total	323,632	0	34,835	69,670	0
Total all reps		971,747	0	109,142	218,284	0

7.4.3 Peaches – Snow King

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.59 – 7.61. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.2°C.

7.59.1: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 23/1/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.8	48.2	50.3	50.1	6.0	6.2		
10	49.1	47.3	49.3	48.6	6.0	6.2	3.1	6.3
30	48.9	47.0	48.3	48.1	6.0	6.2	4.1	16.2
60	47.2	46.5	47.7	47.1	6.0	6.2	5.9	36.1
90	46.5	45.5	46.9	46.3	6.0	6.2	7.6	58.9
120	45.7	44.7	45.6	45.3	6.0	6.2	9.5	81.0
Average	47.5	46.2	47.6	47.1	6.0	6.2	6.0	
±s.d.	1.5	1.1	1.4	1.3			2.6	
Average dose range = 91.5 – 96.8 g.h.m ⁻³								

Table 7.60: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 24/1/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.9	49.4	50.4	50.6	6.1	6.2		
10	49.1	48.4	49.4	49.0	6.1	6.2	3.2	6.3
30	47.8	47.6	48.4	47.9	6.1	6.2	5.2	16.3
60	47.0	46.5	47.2	46.9	6.1	6.2	7.3	36.0
90	46.1	45.7	46.5	46.1	6.1	6.2	8.8	58.6
120	45.1	44.4	46.0	45.2	6.1	6.2	10.7	80.7
Average	47.0	46.5	47.5	47.0	6.1	6.2	7.0	
±s.d.	1.5	1.6	1.4	1.5			3.0	
Average dose range = 91.0 – 97.0 g.h.m ⁻³								

Table 7.61: Large scale trials of Medfly in infested **Snow King Peaches** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 25/1/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.2	52.2	54.8	53.4	6.1	6.2		
10	50.4	50.6	51.0	50.7	6.1	6.2	5.1	6.7
30	49.9	48.5	50.2	49.5	6.1	6.2	7.2	16.9
60	48.2	47.8	49.9	48.6	6.1	6.2	8.9	37.2
90	47.4	46.8	48.7	47.6	6.1	6.2	10.8	60.8
120	46.9	45.9	47.8	46.9	6.1	6.2	12.2	83.4
Average	48.6	47.9	49.5	48.7	6.1	6.2	8.9	
±s.d.	1.5	1.8	1.3	1.5			2.8	
Average dose range = 94.3 – 100.3 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.62

Table 7.62: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Snow King Peaches**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 23 - 30 January 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.4	0.1	0.8	1.4	1.3	1.3	1.4	0.2	0.6	1.4	1.2	1.3	1.7	0.3	1.9	1.1	1.4	1.3
24	1	1.3	0.2	1.0	1.3	1.3	1.4	1.4	0.2	0.7	1.3	1.3	1.3	1.6	0.4	1.6	1.1	1.3	1.3
36		1.3	0.3	1.0	1.3	1.2	1.5	1.4	0.1	0.7	1.2	1.2	1.4	1.4	0.4	1.1	1.0	1.3	1.3
48	2	1.1	0.0	0.9	1.2	1.1	1.5	1.4	0.0	0.6	1.2	1.2	1.3	1.5	0.3	1.0	1.0	1.2	1.2
60		1.0	0.2	0.8	1.3	1.2	1.4	1.2	0.1	0.5	1.2	1.2	1.2	1.5	0.2	1.1	1.1	1.2	1.2
72	3	1.1	0.3	1.0	1.3	1.2	1.4	1.1	-0.2	0.4	1.2	1.1	1.2	2.1	0.4	1.9	1.1	1.3	1.2
84		1.0	0.3	0.9	1.3	1.2	1.5	1.0	-0.1	0.4	1.3	1.2	1.3	2.1	0.3	1.9	1.1	1.3	1.2
96	4	1.0	-0.2	0.7	1.4	1.3	1.4	1.1	-0.1	0.5	1.3	1.2	1.2	1.7	0.4	1.4	1.1	1.3	1.2
		Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.7 ±0.4						Av. air ± s. d. = 0.6 ±0.5						Av. air ± s. d. = 1.2 ±0.6					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.63) show that from the dissection data an estimated 1,049,021 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 154,894 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.7 – 83.4 g.h.m⁻³) or as a final dose (range 90.1 – 100.3 g.h.m⁻³) at 6°C in Snow King peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.63 Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Snow King Peaches**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	164,944	0	8,433	16,866	0
	1 st Instar	100,543	0	8,198	16,396	0
	2 nd Instar	74,237	0	9,630	19,260	0
	Total	339,724	0	26,261	52,522	0
2	eggs	174,197	0	8,906	17,812	0
	1 st Instar	106,184	0	8,658	17,316	0
	2 nd Instar	78,402	0	8,718	17,436	0
	Total	358,783	0	26,282	52,564	0
3	eggs	183,970	0	7,865	15,730	0
	1 st Instar	83,744	0	8,150	16,300	0
	2 nd Instar	82,800	0	8,889	17,778	0
	Total	350,514	0	24,904	49,808	0
Total all reps		1,049,021	0	77,447	154,894	0

7.4.4 Peaches – Zee Lady

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.64 – 7.66. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.1 - 6.2°C.

Table 7.64: Large scale trials of Medfly in infested **Peaches Zee Lady** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 02/01/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.4	49.8	52.9	51.4	6.0	6.2		
10	49.1	48.0	50.0	49.2	6.0	6.2	4.2	6.4
30	48.8	47.2	49.7	48.6	6.0	6.2	5.5	16.4
60	47.3	46.1	48.3	47.2	6.0	6.2	8.0	36.4
90	46.1	45.9	47.2	46.5	6.0	6.2	9.5	59.0
120	45.0	44.4	46.9	46.2	6.0	6.2	10.1	81.4
Average	47.3	46.3	48.4	47.5	6.0	6.2	7.4	
±s.d.	1.7	1.4	1.4	1.3			2.5	
Average dose range = 92.5 – 97.7 g.h.m ⁻³								

Table 7.65: Large scale trials of Medfly in infested **Peaches Zee Lady** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 03/01/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.4	50.7	52.4	51.5	6.0	6.2		
10	50.4	49.7	51.4	50.5	6.0	6.2	1.9	6.4
30	49.6	48.1	50.8	49.5	6.0	6.2	3.9	16.8
60	48.3	47.2	49.7	48.4	6.0	6.2	6.0	37.1
90	47.3	46.2	48.2	47.2	6.0	6.2	8.3	60.5
120	46.6	45.3	47.4	46.4	6.0	6.2	9.8	82.7
Average	48.4	47.3	49.5	48.4	6.0	6.2	6.0	
±s.d.	1.6	1.7	1.7	1.6			3.2	
Average dose range = 93.5 – 100.1 g.h.m ⁻³								

Table 7.66: Large scale trials of Medfly in infested **Peaches Zee Lady** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 04/01/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.0	49.0	51.7	50.6	6.1	6.1		
10	49.6	47.9	50.2	49.2	6.1	6.1	2.6	6.3
30	48.3	46.8	49.2	48.1	6.1	6.1	4.9	16.4
60	47.4	45.1	48.1	46.9	6.1	6.1	7.3	36.1
90	46.6	44.2	47.9	46.2	6.1	6.1	8.6	58.6
120	46.1	43.2	46.0	45.1	6.1	6.1	10.8	80.9
Average	47.6	45.4	48.3	47.1	6.1	6.1	6.8	
±s.d.	1.4	1.9	1.6	1.6			3.2	
Average dose range = 91.0 – 97.4 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.67

Table 7.67: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Zee Lady Peaches**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 2 - 9 January 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.8	0.7	1.0	1.2	1.0	1.0	1.2	0.6	1.0	1.2	1.3	1.2	1.4	0.7	1.1	1.3	1.3	1.1
24	1	2.6	0.7	1.6	1.2	1.0	1.0	1.3	0.7	1.0	1.2	1.2	1.2	1.4	0.5	1.0	1.1	1.2	1.1
36		1.9	0.6	1.2	1.2	1.0	1.0	1.2	0.7	1.1	1.2	1.1	1.2	1.3	0.5	1.0	1.2	1.3	1.0
48	2	2.0	0.6	1.2	1.2	1.0	1.0	1.3	0.7	1.2	1.1	1.0	1.2	1.3	0.7	1.1	1.3	1.3	1.1
60		1.8	0.7	1.1	1.2	1.0	1.1	1.2	0.7	1.1	1.0	1.0	1.2	1.3	0.8	1.2	1.3	1.3	1.1
72	3	2.4	0.7	1.6	1.2	1.0	1.1	1.3	0.7	1.0	1.0	0.9	1.2	1.4	1.0	1.3	1.3	1.4	1.2
84		1.7	0.6	1.0	1.2	1.0	1.0	1.0	0.6	1.1	1.0	0.9	1.2	1.2	0.8	1.1	1.2	1.3	1.1
96	4	1.9	0.6	1.1	1.1	1.0	1.1	1.3	0.6	1.0	1.0	0.9	1.2	1.4	0.6	1.0	1.2	1.3	1.2
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 1.3 ±0.3						Av. air ± s. d. = 1.0 ±1.2						Av. air ± s. d. = 1.0 ±1.0					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.68) show that from the dissection data an estimated 870,240 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 158,892 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.9 – 82.7 g.h.m⁻³) or as a final dose (range 91.0 – 100.1 g.h.m⁻³) at 6°C in Zee Lady peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.68: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Peaches Zee Lady**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	134,110	0	8,390	16,780	0
	1 st Instar	94,247	0	8,592	17,184	0
	2 nd instar	56,653	0	8,284	16,568	0
	Total	285,010	0	25,266	50,532	0
2	eggs	141,634	0	8,861	17,722	0
	1 st Instar	99,534	0	9,074	18,148	0
	2 nd instar	53,993	0	8,749	17,498	0
	Total	295,161	0	26,684	53,368	0
3	eggs	130,293	0	9,358	18,716	0
	1 st Instar	97,599	0	8,898	17,796	0
	2 nd instar	62,177	0	9,240	18,480	0
	Total	290,069	0	27,496	54,992	0
Total all reps		870,240	0	79,446	158,892	0

7.4.5 Nectarines – Arctic Snow

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.69 – 7.71. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.1 - 6.2°C.

Table 7.69: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 15/2/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.5	50.9	51.5	51.6	6.1	6.2		
10	50.3	48.0	50.8	49.7	6.1	6.2	3.7	6.5
30	49.9	47.6	49.8	49.1	6.1	6.2	4.9	16.6
60	48.2	46.3	48.2	47.6	6.1	6.2	7.9	36.8
90	47.5	45.5	47.4	46.8	6.1	6.2	9.4	59.5
120	46.6	44.2	46.1	45.6	6.1	6.2	11.6	81.9
Average	48.5	46.3	48.5	47.8	6.1	6.2	7.5	
±s.d.	1.6	1.6	1.9	1.7			3.2	
Average dose range = 92.2 – 98.8 g.h.m ⁻³								

Table 7.70: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 16/2/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.6	51.7	53.7	52.7	6.1	6.2		
10	50.3	49.8	51.9	50.7	6.1	6.2	3.8	6.6
30	49.0	48.7	50.9	49.5	6.1	6.2	5.9	16.9
60	48.4	47.2	49.9	48.5	6.1	6.2	7.9	37.2
90	47.3	46.9	48.5	47.6	6.1	6.2	9.7	60.6
120	46.1	46.5	47.2	46.6	6.1	6.2	11.5	83.2
Average	48.2	47.8	49.7	48.6	6.1	6.2	7.8	
±s.d.	1.6	1.4	1.9	1.6			3.0	
Average dose range = 94.0 – 100.3 g.h.m ⁻³								

Table 7.71: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 17/2/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.8	48.8	50.6	50.1	6.0	6.1		
10	49.5	47.9	48.2	48.5	6.0	6.1	3.1	6.3
30	48.5	47.0	47.2	47.6	6.0	6.1	5.0	16.2
60	47.6	46.1	46.1	46.6	6.0	6.1	6.9	35.7
90	46.8	45.5	45.7	46.0	6.0	6.1	8.1	58.3
120	46.3	44.1	45.0	45.1	6.0	6.1	9.9	80.5
Average	47.7	46.1	46.4	46.8	6.0	6.1	6.6	
±s.d.	1.3	1.4	1.3	1.3			2.7	
Average dose range = 90.9 – 96.2 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.72

Table 7.72: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Arctic Snow Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 15 -22 February 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room 74						Replicate 3: Cold Room #8					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.9	0.6	1.1	1.1	1.1	1.4	1.4	0.0	0.6	1.2	1.3	1.2	2.4	0.8	1.9	1.2	1.1	1.0
24	1	1.1	0.3	1.2	1.2	1.2	1.4	1.6	-0.2	0.5	1.1	1.1	1.2	2.1	0.6	1.5	1.1	1.1	1.1
36		0.9	1.0	1.0	1.1	1.2	1.5	1.2	-0.1	0.4	1.0	1.1	1.1	2.0	0.6	1.6	1.1	1.0	1.0
48	2	1.1	0.6	1.2	1.2	1.2	1.4	1.5	-0.1	0.5	1.1	1.1	1.2	1.8	0.7	1.3	1.1	1.1	1.0
60		0.8	0.6	0.9	1.1	1.1	1.4	1.1	-0.1	0.4	1.0	1.3	1.1	1.8	0.7	1.3	1.1	1.0	1.0
72	3	1.0	0.4	1.2	1.1	1.3	1.2	1.4	-0.1	0.5	1.1	1.3	1.1	1.7	0.6	1.1	1.1	1.1	1.0
84		0.8	0.8	1.0	1.0	1.1	1.2	1.1	0.0	0.4	0.9	1.3	1.1	1.9	0.7	1.3	1.1	1.1	1.0
96	4	1.1	0.8	1.2	1.0	1.2	1.1	1.3	-0.1	0.5	1.0	1.4	1.1	1.7	0.6	1.1	1.1	1.1	1.0
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.0					
		Av. air ± s. d. = 0.9 ±0.8						Av. air ± s. d. = 0.6 ±0.3						Av. air ± s. d. = 1.3 ±1.1					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.73) show that from the dissection data an estimated 862,758 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 140,190 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.5 – 83.2 g.h.m⁻³) or as a final dose (range 90.9 – 100.3 g.h.m⁻³) at 6°C in Arctic Snow nectarines and the treatment is suitable for probit 9 quarantine level of disinfection.

Table 7.73: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Arctic Snow Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	155,588	0	7,360	14,720	0
	1 st Instar	82,835	0	7,027	14,054	0
	2 nd Instar	51,125	0	8,254	16,508	0
	Total	289,548	0	22,641	45,282	0
2	eggs	164,317	0	7,773	15,546	0
	1 st Instar	66,702	0	7,421	14,842	0
	2 nd Instar	53,993	0	8,718	17,436	0
	Total	285,012	0	23,912	47,824	0
3	eggs	150,550	0	8,209	16,418	0
	1 st Instar	85,781	0	7,277	14,554	0
	2 nd Instar	51,866	0	8,056	16,112	0
	Total	288,198	0	23,542	47,084	0
Total all reps		862,758	0	70,095	140,190	0

7.4.6 Nectarines – August Red

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.74 – 7.76. Temperatures were maintained evenly: ranging from 6.0°C air; fruit 6.1°C.

Table 7.74: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 24/4/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.3	50.7	51.3	51.4	6.1	6.2		
10	51.4	49.4	50.8	50.5	6.1	6.2	1.7	6.4
30	50.5	49.0	49.8	49.8	6.1	6.2	3.2	16.8
60	49.4	48.4	48.2	48.7	6.1	6.2	5.4	37.3
90	48.6	47.6	47.4	47.9	6.1	6.2	6.9	60.8
120	47.7	46.8	46.1	46.9	6.1	6.2	8.9	83.8
Average	49.5	48.2	48.5	48.7	6.1	6.2	5.2	
±s.d.	1.5	1.1	1.9	1.5			2.8	
Average dose range = 94.6 – 100.4 g.h.m ⁻³								

Table 7.75: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 25/4/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.7	50.8	52.6	51.7	6.1	6.2		
10	49.9	49.4	49.2	49.5	6.1	6.2	4.3	6.5
30	48.6	48.3	48.2	48.4	6.1	6.2	6.4	16.5
60	47.6	47.5	48.0	47.7	6.1	6.2	7.7	36.3
90	46.9	46.2	47.8	47.0	6.1	6.2	9.2	59.6
120	46.2	45.1	46.5	45.9	6.1	6.2	11.2	82.2
Average	47.8	47.3	47.9	47.7	6.1	6.2	7.7	
±s.d.	1.5	1.7	1.0	1.4			2.6	
Average dose range = 92.7 – 98.1 g.h.m ⁻³								

Table 7.76: Large scale trials of Medfly in infested **August Red Nectarines** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 26/4/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.3	50.3	52.1	51.6	6.1	6.2		
10	50.8	49.1	49.4	49.8	6.1	6.2	3.5	6.4
30	49.5	48.2	48.4	48.7	6.1	6.2	5.6	16.6
60	48.6	47.3	47.3	47.7	6.1	6.2	7.4	36.5
90	47.8	46.3	46.1	46.7	6.1	6.2	9.4	59.7
120	46.3	45.4	45.2	45.6	6.1	6.2	11.5	81.8
Average	48.6	47.3	47.3	47.7	6.1	6.2	7.5	
±s.d.	1.7	1.5	1.7	1.6			3.1	
Average dose range = 92.2 – 98.7 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.77

Table 7.77: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: August Red Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 24April - 1 May 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.2	0.0	0.4	1.4	1.1	1.0	2.0	0.7	0.6	1.3	1.4	1.2	1.0	0.9	2.3	1.2	1.3	1.1
24	1	2.1	0.1	1.0	1.0	1.0	1.2	2.5	0.6	0.4	1.3	1.4	1.2	0.9	0.7	2.5	1.1	1.2	1.2
36		1.4	0.0	0.7	1.0	1.1	1.0	2.2	0.7	0.6	1.3	1.4	1.1	1.0	0.8	2.4	1.2	1.4	1.0
48	2	1.6	0.1	0.7	1.0	1.0	1.1	2.3	0.6	0.6	1.3	1.4	1.2	1.0	0.8	2.5	1.1	1.3	1.1
60		1.2	0.0	0.6	1.1	1.1	1.1	2.0	0.6	0.6	1.3	1.5	1.2	1.0	0.8	2.3	1.2	1.4	1.1
72	3	2.0	0.1	1.1	1.0	1.2	1.1	2.5	0.7	0.6	1.3	1.4	1.3	1.0	0.7	2.4	1.1	1.3	1.1
84		1.2	0.0	0.5	1.1	1.1	1.0	2.0	0.5	0.4	1.3	1.3	1.3	0.9	0.8	2.3	1.2	1.4	1.0
96	4	1.4	0.1	0.6	1.0	1.0	1.0	2.1	0.6	0.4	1.2	1.3	1.3	1.1	1.0	2.3	1.1	1.2	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.2 ±0.0					
		Av. air ± s. d. = 0.8 ±0.3						Av. air ± s. d. = 1.1 ±0.4						Av. air ± s. d. = 1.4 ±1.7					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.78) show that from the dissection data an estimated 673,377 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 136,496 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 81.8 – 83.8 g.h.m⁻³) or as a final dose (range 90.9 – 100.3 g.h.m⁻³) at 6°C in August Red nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.78: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: August Red Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	119,812	0	7,447	14,894	0
	1 st Instar	61,211	0	7,027	14,054	0
	2 nd instar	41,880	0	7,223	14,446	0
	Total	222,903	0	21,697	43,394	0
2	eggs	106,401	0	7,864	15,728	0
	1 st Instar	64,645	0	7,421	14,842	0
	2 nd instar	44,229	0	7,628	15,256	0
	Total	215,275	0	22,913	45,826	0
3	eggs	107,055	0	8,305	16,610	0
	1 st Instar	63,389	0	7,277	14,554	0
	2 nd instar	64,755	0	8,056	16,112	0
	Total	235,198	0	23,638	47,276	0
Total all reps		673,377	0	68,248	136,496	0

7.4.7 Plums – Angelino

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.79 – 7.81. Temperatures were maintained evenly: ranging from 6.0°C air; fruit 6.1 – 6.2°C.

Table 7.79: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 27/3/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.3	49.3	50.2	50.3	6.0	6.1		
10	49.8	48.0	49.2	49.0	6.0	6.1	2.5	6.3
30	48.2	47.6	48.2	48.0	6.0	6.1	4.5	16.3
60	47.4	46.4	47.6	47.1	6.0	6.1	6.2	36.0
90	46.4	45.1	47.1	46.2	6.0	6.1	8.1	58.9
120	45.2	44.3	46.5	45.3	6.0	6.1	9.8	80.9
Average	47.4	46.3	47.7	47.1	6.0	6.1	6.2	
±s.d.	1.7	1.6	1.0	1.4			2.9	
Average dose range = 91.4 – 97.2 g.h.m ⁻³								

Table 7.80: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 28/3/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.6	49.9	51.6	50.7	6.1	6.2		
10	49.2	48.5	49.2	49.0	6.0	6.2	3.4	6.3
30	48.9	47.7	48.2	48.3	6.0	6.2	4.8	16.3
60	47.9	47.2	47.6	47.6	6.0	6.2	6.2	36.2
90	46.6	46.5	46.8	46.6	6.0	6.2	8.0	59.5
120	45.4	45.1	45.5	45.3	6.0	6.2	10.6	81.6
Average	47.6	47.0	47.5	47.4	6.0	6.2	6.6	
±s.d.	1.6	1.3	1.4	1.4			2.8	
Average dose range = 91.9 – 97.5 g.h.m ⁻³								

Table 7.81: Large scale trials of Medfly in infested **Angelino Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 29/3/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	50.4	48.9	51.7	50.3	6.0	6.1		
10	49.7	47.4	50.5	49.2	6.0	6.1	2.3	6.3
30	48.7	46.3	49.5	48.2	6.0	6.1	4.3	16.4
60	47.8	45.6	48.4	47.3	6.0	6.1	6.1	36.1
90	47.0	44.6	47.2	46.3	6.0	6.1	8.1	59.1
120	46.5	43.7	46.3	45.5	6.0	6.1	9.6	81.0
Average	47.9	45.5	48.4	47.3	6.0	6.1	6.1	
±s.d.	1.3	1.4	1.7	1.5			2.9	
Average dose range = 91.6 – 97.5 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.82

Table 7.82: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Angelino Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 27 March - 3 April 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.8	0.5	0.9	1.3	1.1	1.2	1.0	0.6	0.8	1.1	1.0	1.2	0.7	0.9	1.5	1.5	1.3	1.2
24	1	1.2	0.6	1.0	1.3	1.0	1.3	1.1	0.5	0.6	1.1	1.0	1.0	1.0	0.9	1.5	1.3	1.2	1.2
36		0.8	0.5	0.9	1.1	1.0	1.4	1.0	0.5	0.7	1.2	1.1	1.0	0.7	1.0	1.6	1.2	1.0	1.2
48	2	1.3	0.6	1.1	1.1	1.0	1.5	1.1	0.6	0.8	1.2	1.1	1.0	0.9	0.9	1.5	1.1	1.0	1.2
60		1.1	0.5	1.0	1.2	0.9	1.3	0.9	0.6	0.8	1.2	1.1	1.0	0.6	0.8	1.5	1.0	1.0	1.2
72	3	1.3	0.5	1.1	1.2	1.1	1.4	1.0	0.5	0.7	1.2	1.1	1.0	0.9	1.0	1.6	1.0	1.1	1.2
84		0.8	0.4	0.9	1.1	1.0	1.2	0.9	0.6	0.8	1.2	1.1	1.1	0.7	1.0	1.6	1.0	1.0	1.2
96	4	1.3	0.6	1.1	1.2	1.1	1.3	1.1	0.4	0.6	1.2	1.2	1.1	0.9	0.8	1.5	1.0	1.0	1.2
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.0					
		Av. air ± s. d. = 0.9 ±0.3						Av. air ± s. d. = 0.8 ±0.4						Av. air ± s. d. = 1.1 ±1.2					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.83) show that from the dissection data an estimated 662,565 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 146,698 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 80.9 – 81.6 g.h.m⁻³) or as a final dose (range 91.4 – 97.5 g.h.m⁻³) at 6°C in Angelino plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.83 Large scale fumigation 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Angelino Plums**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	111,559	0	7,610	15,220	0
	1 st Instar	63,179	0	7,902	15,804	0
	2 nd instar	46,715	0	7,997	15,994	0
	Total	221,453	0	23,509	47,018	0
2	eggs	117,818	0	8,036	16,072	0
	1 st Instar	62,567	0	8,345	16,690	0
	2 nd instar	49,336	0	8,446	16,892	0
	Total	229,720	0	24,827	49,654	0
3	eggs	101,596	0	8,487	16,974	0
	1 st Instar	65,426	0	8,183	16,366	0
	2 nd instar	44,370	0	8,343	16,686	0
	Total	211,392	0	25,013	50,026	0
Total all reps		662,565	0	73,349	146,698	0

7.4.8 Plums – Tegan Blue

Fumigation treatments 48g x 2h at 6°C

Fumigation treatment records are given in tables 7.84 – 7.86. Temperatures were maintained evenly: ranging from 6.0 – 6.1°C air; fruit 6.2°C.

Table 7.84 Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 1).
Trial date: 8/3/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	52.4	51.4	51.8	51.9	6.1	6.2		
10	51.7	49.7	50.5	50.6	6.1	6.2	2.4	6.5
30	50.4	48.6	49.8	49.6	6.1	6.2	4.4	16.9
60	49.8	48.0	49.0	48.9	6.1	6.2	5.7	37.2
90	48.1	47.1	48.6	47.9	6.1	6.2	7.6	61.2
120	47.9	46.5	47.7	47.4	6.1	6.2	8.7	83.9
Average	49.6	48.0	49.1	48.9	6.1	6.2	5.7	
±s.d.	1.6	1.3	1.1	1.3			2.5	
Average dose range = 95.2 – 100.4 g.h.m ⁻³								

Table 7.85: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 2).
Trial date: 9/3/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2 hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	51.9	49.4	50.1	50.5	6.1	6.2		
10	49.6	48.6	49.3	49.2	6.1	6.2	2.6	6.3
30	48.6	47.5	48.9	48.3	6.1	6.2	4.2	16.4
60	48.0	46.4	48.6	47.7	6.1	6.2	5.5	36.3
90	47.1	45.3	47.1	46.5	6.1	6.2	7.9	59.6
120	46.3	44.6	46.0	45.6	6.1	6.2	9.6	81.4
Average	47.9	46.5	48.0	47.5	6.1	6.2	6.0	
±s.d.	1.3	1.6	1.4	1.4			2.8	
Average dose range = 92.1 – 97.7 g.h.m ⁻³								

Table 7.86: Large scale trials of Medfly in infested **Tegan Blue Plums** at 6.0 ± 0.5 °C (Replicate 3).
Trial date: 10/3/2011. Applied dose 52g/m³. Expected dose 48g/m³ for 2hour exposure = 96 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	53.6	53.5	54.8	54.0	6.0	6.2		
10	50.3	50.2	50.2	50.2	6.0	6.2	6.9	6.7
30	49.7	49.0	48.8	49.2	6.0	6.2	8.9	16.7
60	48.5	48.0	47.9	48.1	6.0	6.2	10.8	36.9
90	47.4	46.9	47.0	47.1	6.0	6.2	12.7	60.2
120	46.1	45.8	46.6	46.2	6.0	6.2	14.5	82.4
Average	48.4	48.0	48.1	48.2	6.0	6.2	10.8	
±s.d.	1.7	1.7	1.4	1.6			3.0	
Average dose range = 93.1 – 99.5 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.87

Table 7.87: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 48g/m³ x 2h at 6°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Tegan Blue Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 8 - 15 March 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.1	0.4	1.1	1.5	1.1	1.3	1.4	0.6	0.9	1.2	1.2	1.4	1.3	0.7	1.1	1.5	1.2	1.0
24	1	1.1	0.6	1.2	1.4	1.2	1.3	1.6	0.5	0.8	1.4	1.3	1.3	1.2	0.5	0.9	1.3	1.0	1.1
36		0.9	0.4	1.0	1.3	1.2	1.3	1.4	0.5	0.8	1.4	1.4	1.3	1.2	0.5	1.0	1.1	1.0	1.0
48	2	0.9	0.5	1.0	1.1	1.3	1.3	1.6	0.6	1.0	1.4	1.4	1.2	1.2	0.7	1.0	1.0	1.0	1.0
60		0.8	0.5	1.0	1.1	1.2	1.3	1.4	0.6	0.9	1.4	1.4	1.3	1.2	0.8	1.1	1.0	1.0	1.0
72	3	1.0	0.6	1.0	1.1	1.3	1.3	1.6	0.5	0.9	1.5	1.4	1.2	1.2	1.0	1.2	1.0	1.1	1.1
84		0.9	0.5	1.0	1.1	1.2	1.4	1.3	0.5	0.9	1.4	1.4	1.3	1.1	0.8	1.1	1.0	1.0	1.0
96	4	1.0	0.6	1.1	1.2	1.3	1.3	1.6	0.5	0.8	1.5	1.4	1.3	1.2	0.6	0.9	1.0	1.0	1.1
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.4 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.8 ±0.3						Av. air ± s. d. = 1.0 ±0.4						Av. air ± s. d. = 1.0 ±1.0					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.88) show that from the dissection data an estimated 650,658 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 143,326 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 81.4 – 83.9 g.h.m⁻³) or as a final dose (range 92.1 – 100.4 g.h.m⁻³) at 6°C in Tegan Blue plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.88: Large scale trials of Medfly. Fumigation at 6.0 ± 0.5 °C 48g/m³ for 2 hour exposure = 96 g.h.m⁻³. + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Tegan Blue Plums**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	111,797	0	7,406	14,812	0
	1 st Instar	63,159	0	7,808	15,616	0
	2 nd instar	51,125	0	7,915	15,830	0
	Total	226,081	0	23,129	46,258	0
2	eggs	98,358	0	7,822	15,644	0
	1 st Instar	45,923	0	8,246	16,492	0
	2 nd instar	53,993	0	8,359	16,718	0
	Total	198,274	0	24,427	48,854	0
3	eggs	103,876	0	8,261	16,522	0
	1 st Instar	65,406	0	8,086	16,172	0
	2 nd instar	57,022	0	7,760	15,520	0
	Total	226,303	0	24,107	48,214	0
Total all reps		650,658	0	71,663	143,326	0

CONCLUSIONS

Data for 8 cultivars treated at 6°C with a methyl bromide fumigation dose of 96 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. Approximately 10% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 2h was approximately 80 - 90 g.h.m⁻³ on average and about 90 - 100 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 48g/m³ for 2 h treatment giving cumulative gas concentration of 96 g.h.m⁻³. Cold treatment was maintained between 1.0 – 1.2°C over 96 hours. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times for both treatments if applied alone. The Probit 9 estimates show that this combined treatment of Medfly eggs, 1st and 2nd instar stages are sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

7.5 RESULTS OF LARGE SCALE TRIALS OF MEDFLY USING: METHYL BROMIDE FUMIGATION AT 11°C: 21g/m³ for 3 hour exposure followed by COLD TREATMENT at 1.5°C for 96 hours

The combined fumigation + cold treatment trials were conducted from November 2010 to May 2011.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations, cold treatment temperatures, and mortality of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits are the same as for that given in section 7.3 above since fruit from the same harvested batch of was used.

7.5.1 Cherries - Sweetheart

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.89 – 7.91. Temperatures were maintained evenly: ranging from 11.0°C air; fruit 11.1°C.

Table 7.89: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 24/11/2010. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.6	22.0	24.1	23.2	11.0	11.1		
10	22.6	22.8	23.9	23.1	11.0	11.1	0.6	2.9
30	21.0	22.4	23.9	22.4	11.0	11.1	3.4	7.7
60	20.4	21.0	23.5	21.6	11.0	11.1	6.9	16.8
90	20.2	20.0	23.5	21.2	11.0	11.1	8.6	27.0
120	20.2	19.2	23.2	20.9	11.0	11.1	10.2	37.2
150	19.9	19.2	22.9	20.7	11.0	11.1	11.0	47.0
180	19.8	19.2	22.5	20.5	11.0	11.1	11.8	56.8
Average	20.6	20.5	23.3	21.5	11.0	11.1	7.5	
±S.d.	1.0	1.6	0.5	1.0			4.2	
Average dose range = 61.6 – 67.4 g.h.m ⁻³								

Table 7.90: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 28/11/2010. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	24.1	23.2	21.9	23.1	11.0	11.1		
10	21.2	21.7	20.8	21.2	11.0	11.1	7.9	2.9
30	21.9	20.9	20.8	21.2	11.0	11.1	8.1	7.1
60	21.9	19.8	20.4	20.7	11.0	11.1	10.3	15.9
90	20.6	19.7	20.4	20.2	11.0	11.1	12.3	25.9
120	20.4	19.6	20.1	20.0	11.0	11.1	13.2	35.4
150	20.1	19.3	20.0	19.8	11.0	11.1	14.2	45.1
180	19.8	19.0	19.9	19.6	11.0	11.1	15.2	54.5
Average	20.8	20.0	20.3	20.4	11.0	11.1	11.6	
±s.d.	0.8	1.0	0.4	0.7			2.9	
Average dose range = 59.2 – 63.2 g.h.m ⁻³								

Table 7.91: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 26/11/2010. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.9	21.2	21.6	21.9	11.0	11.1		
10	20.2	20.3	20.6	20.4	11.0	11.1	7.0	2.7
30	20.2	20.2	20.6	20.3	11.0	11.1	7.2	6.8
60	19.3	19.5	20.5	19.8	11.0	11.1	9.7	15.3
90	19.5	19.5	20.1	19.7	11.0	11.1	10.0	24.7
120	19.0	19.6	20.2	19.6	11.0	11.1	10.5	34.5
150	19.1	19.3	19.5	19.3	11.0	11.1	11.9	44.1
180	18.8	19.0	19.4	19.1	11.0	11.1	12.9	53.1
Average	19.4	19.6	20.1	19.7	11.0	11.1	9.9	
±s.d.	0.6	0.5	0.5	0.5			2.2	
Average dose range = 57.7 – 60.7 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.92

Table 7.92: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 21g/m³ x 3h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Sweetheart cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 24 Nov - 1 Dec 2010																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.9	0.2	1.3	0.9	1.0	1.1	1.2	0.7	0.8	1.0	1.1	1.3	0.9	0.2	0.8	1.3	1.2	1.0
24	1	0.9	0.1	1.1	1.1	1.1	1.2	1.3	0.8	0.9	1.2	1.0	1.0	1.9	-0.1	1.1	1.2	1.1	1.0
36		1.1	0.1	1.3	1.2	1.2	1.2	1.3	0.7	0.8	1.2	1.0	1.0	1.5	0.1	1.0	1.1	1.2	1.0
48	2	1.0	0.1	1.2	1.1	1.1	1.1	1.3	0.7	0.8	1.3	1.0	1.0	1.9	0.2	1.1	1.2	1.1	1.0
60		1.0	0.1	1.3	1.2	1.2	1.2	1.3	0.7	0.9	1.2	1.0	1.0	1.6	0.1	0.9	1.1	1.2	1.0
72	3	1.0	0.2	1.2	1.1	1.1	1.1	1.2	0.7	0.9	1.3	1.0	1.0	1.4	0.1	0.9	1.2	1.1	1.1
84		0.9	0.2	1.1	1.2	1.2	1.2	1.0	0.7	0.8	1.2	1.0	1.0	0.8	0.0	0.7	1.2	1.2	1.0
96	4	0.9	0.2	1.1	1.1	1.1	1.1	1.1	0.7	0.8	1.3	1.1	1.0	1.0	0.1	0.9	1.2	1.1	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.8 ±0.2						Av. air ± s. d. = 0.9 ±0.4						Av. air ± s. d. = 0.8 ±0.4					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.93) show that from the dissection data an estimated 996,501 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 213,198 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 53.1 – 56.8 g.h.m⁻³) or as a final dose (range 57.7 – 67.4 g.h.m⁻³) at 11°C in Sweetheart cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.93: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Sweetheart Cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments	Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	153,358	0	12,348	24,696	0
	1 st Instar	105,143	0	12,466	24,932	0
	2 nd instar	77,219	0	12,346	24,692	0
	Total	335,721	0	37,160	74,320	0
2	eggs	138,287	0	11,208	22,416	0
	1 st Instar	106,089	0	11,334	22,668	0
	2 nd instar	91,396	0	11,138	22,276	0
	Total	335,772	0	33,680	67,360	0
3	eggs	148,981	0	11,837	23,674	0
	1 st Instar	106,694	0	11,114	22,228	0
	2 nd instar	69,333	0	12,808	25,616	0
	Total	325,009	0	35,759	71,518	0
Total all reps		996,501	0	106,599	213,198	0

7.5.2 Cherries - Lapin

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.94 – 7.96. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 – 11.2°C.

Table 7.94: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 12/12/2010. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.2	23.4	23.7	23.4	11.1	11.2		
10	21.7	22.9	23.0	22.5	11.1	11.2	3.8	2.9
30	20.1	22.5	23.0	21.9	11.1	11.2	6.7	7.5
60	19.5	20.4	22.4	20.8	11.1	11.2	11.4	16.4
90	19.2	20.1	22.6	20.6	11.1	11.2	11.9	26.0
120	19.1	19.1	22.3	20.2	11.1	11.2	13.9	36.1
150	19.0	19.0	22.0	20.0	11.1	11.2	14.7	45.4
180	19.0	19.0	21.6	19.9	11.1	11.2	15.2	55.0
Average	19.7	20.4	22.4	20.8	11.1	11.2	11.1	
±s.d.	1.0	1.7	0.5	1.0			4.3	
Average dose range = 59.5 – 65.5 g.h.m ⁻³								

Table 7.95: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 13/12/2010. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	24.9	22.6	21.3	22.9	11.0	11.1		
10	21.4	21.9	21.0	21.4	11.0	11.1	6.5	2.9
30	22.1	21.1	21.0	21.4	11.0	11.1	6.7	7.1
60	22.1	20.0	20.4	20.8	11.0	11.1	9.2	16.1
90	20.8	19.9	20.6	20.4	11.0	11.1	10.9	26.0
120	20.6	19.8	20.3	20.2	11.0	11.1	11.8	35.8
150	20.8	19.5	20.5	20.3	11.0	11.1	11.6	45.5
180	20.0	19.2	20.1	19.8	11.0	11.1	13.8	55.7
Average	21.1	20.2	20.6	20.6	11.0	11.1	10.1	
±s.d.	0.8	1.0	0.3	0.6			2.7	
Average dose range = 60.0 – 63.8 g.h.m ⁻³								

Table 7.96: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 14/12/2010. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.7	21.9	22.1	22.2	11.0	11.1		
10	19.9	20.0	20.3	20.1	11.0	11.1	9.7	2.8
30	19.9	19.9	20.3	20.0	11.0	11.1	9.9	6.7
60	19.0	19.2	20.2	19.5	11.0	11.1	12.4	15.0
90	19.2	19.2	19.8	19.4	11.0	11.1	12.7	24.3
120	18.7	19.3	19.7	19.2	11.0	11.1	13.5	34.0
150	18.8	19.0	19.2	19.0	11.0	11.1	14.5	43.3
180	18.5	18.7	19.1	18.8	11.0	11.1	15.6	52.3
Average	19.1	19.3	19.8	19.4	11.0	11.1	12.6	
±s.d.	0.6	0.5	0.5	0.5			2.2	
Average dose range = 56.8 – 59.7 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.97

Table 7.97: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 21g/m³ x 3h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Lapin cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 12 - 19 October 2010																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.2	0.2	1.2	1.2	1.1	1.3	2.2	0.6	0.8	1.2	1.1	1.3	2.5	0.0	1.1	0.9	1.2	1.0
24	1	1.4	0.1	1.2	1.2	1.1	1.1	2.0	0.6	0.8	1.2	1.0	1.2	2.3	0.6	1.2	1.0	1.1	1.0
36		1.2	0.2	1.2	1.1	1.1	1.3	2.2	0.6	0.8	1.3	1.0	1.2	2.6	0.4	1.2	1.1	1.2	1.0
48	2	1.5	0.0	1.2	1.2	1.1	1.2	1.8	0.4	0.6	1.2	1.0	1.2	2.1	0.4	1.1	1.1	1.2	1.1
60		1.4	0.2	1.1	1.3	1.1	1.3	2.2	0.5	0.7	1.2	1.0	1.2	2.7	0.1	1.1	1.1	1.3	1.1
72	3	1.5	0.1	1.2	1.2	1.1	1.2	2.0	0.5	0.6	1.2	1.1	1.1	2.3	0.3	1.0	1.1	1.3	1.2
84		1.3	0.0	1.2	1.2	1.3	1.4	2.3	0.5	0.7	1.2	1.0	0.9	2.8	0.2	1.2	1.1	1.3	1.2
96	4	1.5	0.2	1.2	1.3	1.2	1.3	2.2	0.5	0.7	1.2	1.1	0.9	2.8	0.3	1.2	1.1	1.3	1.2
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.2						Av. air ± s. d. = 1.1 ±0.5						Av. air ± s. d. = 1.3 ±0.8					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.98) show that from the dissection data an estimated 1,125,235 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 226,746 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 52.3 – 55.7 g.h.m⁻³) or as a final dose (range 56.8 – 65.5 g.h.m⁻³) at 11°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.98: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly **eggs**, **1st & 2nd instars** in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Lapin cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	161,883	0		11,731	23,462	0
	1 st Instar	107,311	0		12,578	25,156	0
	2 nd instar	99,635	0		11,513	23,026	0
	Total	368,830	0		35,822	71,644	0
2	eggs	147,922	0		12,389	24,778	0
	1 st Instar	124,330	0		13,283	26,566	0
	2 nd instar	95,728	0		12,159	24,318	0
	Total	367,980	0		37,831	75,662	0
3	eggs	159,360	0		13,084	26,168	0
	1 st Instar	125,039	0		15,630	31,260	0
	2 nd instar	104,027	0		11,006	22,012	0
	Total	388,426	0		39,720	79,440	0
Total all reps		1,125,235	0		113,373	226,746	0

7.5.3 Peaches – Snow King

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.99 – 7.101. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 – 11.2°C.

Table 7.99: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 29/1/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	24.2	24.5	24.2	24.3	11.0	11.1		
10	22.3	23.0	22.9	22.7	11.0	11.1	6.4	3.0
30	21.7	22.6	22.9	22.4	11.0	11.1	7.8	7.6
60	21.1	20.5	23.3	21.6	11.0	11.1	11.0	16.8
90	20.8	20.2	22.5	21.2	11.0	11.1	12.9	27.0
120	20.2	19.4	22.2	20.6	11.0	11.1	15.2	37.0
150	20.0	19.4	21.9	20.4	11.0	11.1	15.9	46.4
180	19.6	19.4	21.5	20.2	11.0	11.1	17.0	56.2
Average	20.8	20.6	22.5	21.3	11.0	11.1	12.3	
±s.d.	1.0	1.5	0.6	1.0			4.1	
Average dose range = 60.9 – 66.9 g.h.m ⁻³								

Table 7.100: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 30/1/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	24.3	24.0	22.7	23.7	11.1	11.2		
10	22.6	22.1	22.2	22.3	11.1	11.2	5.8	3.0
30	21.3	21.3	21.2	21.3	11.1	11.2	10.1	7.4
60	21.0	20.2	20.6	20.6	11.1	11.2	13.0	16.0
90	20.4	20.1	20.8	20.4	11.1	11.2	13.7	25.8
120	20.1	20.0	20.5	20.2	11.1	11.2	14.6	35.8
150	20.0	19.7	20.7	20.1	11.1	11.2	14.9	45.5
180	19.2	19.4	20.3	19.6	11.1	11.2	17.0	55.4
Average	20.7	20.4	20.9	20.7	11.1	11.2	12.7	
±s.d.	1.1	1.0	0.6	0.9			3.7	
Average dose range = 59.3 – 64.6 g.h.m ⁻³								

Table 7.101: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 31/1/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.5	20.6	21.1	21.4	11.1	11.2		
10	20.5	20.6	20.8	20.6	11.1	11.2	3.6	2.7
30	21.5	20.5	20.8	20.9	11.1	11.2	2.2	6.9
60	20.6	19.8	20.7	20.4	11.1	11.2	4.8	15.7
90	20.8	19.8	20.5	20.4	11.1	11.2	4.8	25.5
120	20.3	19.7	20.6	20.2	11.1	11.2	5.6	35.6
150	20.4	19.6	19.9	20.0	11.1	11.2	6.7	45.5
180	20.1	19.3	19.8	19.7	11.1	11.2	7.8	54.9
Average	20.6	19.9	20.4	20.3	11.1	11.2	5.1	
±s.d.	0.5	0.5	0.4	0.4			1.9	
Average dose range = 59.7 – 62.1 g.h.m ⁻³								

7.3.1 – 7.3.8 = Cold Treatment for 96 hours after fumigation

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.102

Table 7.102: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 21g/m³ x 3h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit:** Snow King Peaches

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 29 Jan - 5 Feb 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.4	0.2	0.9	1.4	1.2	1.5	1.5	0.3	0.8	1.4	1.4	1.3	1.6	0.4	2.0	1.4	1.2	1.4
24	1	1.4	0.0	0.8	1.3	1.2	1.3	1.4	0.0	0.6	1.3	1.3	1.2	1.7	0.4	2.1	1.3	1.1	1.3
36		1.4	0.2	0.9	1.3	1.1	1.3	1.3	0.1	0.5	1.2	1.2	1.2	1.6	0.4	1.7	1.3	1.1	1.2
48	2	1.4	0.3	0.8	1.2	1.1	1.2	1.1	-0.1	0.4	1.2	1.2	1.1	1.6	0.4	1.8	1.2	1.1	1.2
60		1.4	0.0	0.8	1.3	1.1	1.3	1.0	-0.2	0.4	1.2	1.2	1.2	1.7	0.4	2.0	1.2	1.1	1.2
72	3	1.3	0.2	1.0	1.3	1.1	1.3	0.9	-0.3	0.4	1.3	1.3	1.2	1.7	0.5	1.7	1.3	1.1	1.2
84		1.3	0.2	1.0	1.3	1.1	1.3	1.4	0.2	0.6	1.3	1.3	1.2	1.5	0.4	1.2	1.3	1.2	1.3
96	4	1.1	0.1	0.9	1.3	1.2	1.4	1.3	0.3	0.8	1.3	1.3	1.3	1.5	0.3	1.0	1.3	1.2	1.3
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.8 ±0.4						Av. air ± s. d. = 0.6 ±0.5						Av. air ± s. d. = 1.2 ±0.5					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.103) show that from the dissection data an estimated 917,122 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 166,242 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 54.9 – 56.2 g.h.m⁻³) or as a final dose (range 59.3 – 66.9 g.h.m⁻³) at 11°C in Snow King peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.103: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: Snow King Peaches

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	131,093	0		8,217	16,434	0
	1 st Instar	98,314	0		9,222	18,444	0
	2 nd instar	76,135	0		9,138	18,276	0
	Total	305,542	0		26,577	53,154	0
2	eggs	136,625	0		8,564	17,128	0
	1 st Instar	95,612	0		9,674	19,348	0
	2 nd instar	80,132	0		9,618	19,236	0
	Total	312,370	0		27,856	55,712	0
3	eggs	120,828	0		9,045	18,090	0
	1 st Instar	93,754	0		9,486	18,972	0
	2 nd instar	84,628	0		10,157	20,314	0
	Total	299,210	0		28,688	57,376	0
Total all reps		917,122	0		83,121	166,242	0

7.5.4 Peaches – Zee Lady

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.104 – 7.106. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C.

Table 7.104: Large scale trials of Medfly in infested **Peaches Zee Lady** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 7/1/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.7	23.1	22.6	22.8	11.1	11.2		
10	21.9	22.1	22.2	22.1	11.1	11.2	3.2	2.9
30	20.3	21.7	22.2	21.4	11.1	11.2	6.1	7.4
60	19.7	20.3	21.6	20.5	11.1	11.2	9.9	16.1
90	19.4	20.0	21.8	20.4	11.1	11.2	10.5	25.7
120	19.4	19.2	21.5	20.0	11.1	11.2	12.1	35.7
150	19.3	19.2	21.2	19.9	11.1	11.2	12.7	45.1
180	19.1	19.2	20.8	19.7	11.1	11.2	13.6	54.7
Average	19.9	20.2	21.6	20.6	11.1	11.2	9.8	
±s.d.	1.0	1.2	0.5	0.9			3.8	
Average dose range = 59.1 – 64.3 g.h.m ⁻³								

Table 7.105: Large scale trials of Medfly in infested **Peaches Zee Lady** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 8/1/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.7	21.4	21.1	22.1	11.1	11.2		
10	22.5	21.0	19.8	21.1	11.1	11.2	4.4	2.8
30	21.2	20.2	19.8	20.4	11.1	11.2	7.6	7.0
60	21.2	19.1	19.7	20.0	11.1	11.2	9.4	15.3
90	19.9	19.0	19.4	19.4	11.1	11.2	11.9	25.0
120	19.7	18.9	19.1	19.2	11.1	11.2	12.8	34.0
150	19.4	18.6	19.3	19.1	11.1	11.2	13.4	43.3
180	19.1	18.3	18.9	18.8	11.1	11.2	15.0	52.5
Average	20.4	19.3	19.4	19.7	11.1	11.2	10.6	
±s.d.	1.2	1.0	0.4	0.8			3.7	
Average dose range = 56.7 – 61.6 g.h.m ⁻³								

Table 7.106: Large scale trials of Medfly in infested **Peaches Zee Lady** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 9/1/2011. Applied dose 24g/m^3 . Expected dose 21g/m^3 for 3 hour exposure = 63 g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.3	23.6	23.9	23.3	11.1	11.2		
10	21.7	22.8	21.9	22.1	11.1	11.2	4.9	2.9
30	21.5	22.7	21.9	22.0	11.1	11.2	5.3	7.4
60	20.6	22.0	21.8	21.5	11.1	11.2	7.7	16.5
90	20.8	22.0	21.6	21.5	11.1	11.2	7.7	26.8
120	20.3	21.1	21.7	21.0	11.1	11.2	9.6	37.6
150	20.4	20.8	21.0	20.7	11.1	11.2	10.9	47.3
180	20.1	20.5	20.9	20.5	11.1	11.2	11.9	57.0
Average	20.8	21.7	21.5	21.3	11.1	11.2	8.3	
±s.d.	0.6	0.9	0.4	0.6			2.7	
Average dose range = $62.2 - 65.9\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.107

Table 7.107: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $21\text{g/m}^3 \times 3\text{h}$ at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C . (Data corrected using calibration records before trial). **Test Fruit: Zee Lady Peaches**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 7 - 14 January 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.4	0.6	0.9	1.2	1.2	1.4	1.2	0.8	1.2	1.4	1.5	1.2	1.3	0.6	1.0	1.4	1.3	1.6
24	1	2.2	0.7	1.5	1.0	1.1	1.2	1.2	0.7	1.1	1.4	1.3	1.1	1.3	0.7	1.1	1.2	1.3	1.4
36		1.6	0.6	1.0	1.0	1.1	1.2	1.2	0.6	1.0	1.3	1.1	1.1	1.4	0.3	0.8	1.2	1.2	1.3
48	2	2.0	0.7	1.3	1.0	1.1	1.2	1.2	0.6	1.0	1.2	1.0	1.0	1.4	0.8	1.2	1.2	1.2	1.2
60		1.5	0.6	0.9	1.0	1.1	1.2	1.3	0.7	1.1	1.2	1.1	1.0	1.4	0.5	1.0	1.2	1.2	1.2
72	3	2.0	0.7	0.9	1.0	1.1	1.2	1.1	0.6	1.1	1.2	1.0	1.0	1.2	0.8	1.1	1.3	1.2	1.2
84		1.6	0.6	0.9	1.0	1.1	1.2	1.3	0.6	1.0	1.2	1.0	1.0	1.4	0.5	0.9	1.2	1.2	1.2
96	4	2.2	0.7	1.1	1.0	1.1	1.2	1.3	0.7	1.2	1.2	1.0	1.0	1.4	0.8	1.2	1.2	1.2	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 1.2 ±0.3						Av. air ± s. d. = 1.0 ±1.1						Av. air ± s. d. = 1.0 ±1.0					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.108) show that from the dissection data an estimated 751,292 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 156,758 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 52.5 – 57.0 g.h.m⁻³) or as a final dose (range 56.7 – 64.3 g.h.m⁻³) at 11°C in Zee Lady peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.108: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Peaches Zee Lady**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	113,324	0		8,056	16,112	0
	1 st Instar	77,503	0		9,523	19,046	0
	2 nd instar	50,280	0		9,436	18,872	0
	Total	241,106	0		27,015	54,030	0
2	eggs	118,106	0		8,396	16,792	0
	1 st Instar	81,308	0		8,618	17,236	0
	2 nd instar	50,424	0		8,567	17,134	0
	Total	249,839	0		25,581	51,162	0
3	eggs	124,732	0		8,867	17,734	0
	1 st Instar	79,728	0		8,450	16,900	0
	2 nd instar	55,888	0		8,466	16,932	0
	Total	260,347	0		25,783	51,566	0
Total all reps		751,292	0		78,379	156,758	0

7.5.5 Nectarines – Arctic Snow

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.109 – 7.111. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C.

Table 7.109: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 20/2/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	24.8	23.2	23.8	23.9	11.1	11.2		
10	23.2	21.8	22.6	22.5	11.1	11.2	5.8	3.0
30	21.6	21.4	22.6	21.9	11.1	11.2	8.6	7.5
60	19.9	20.0	23.0	21.0	11.1	11.2	12.4	16.4
90	19.8	19.6	22.2	20.5	11.1	11.2	14.2	26.2
120	19.3	18.8	21.9	20.0	11.1	11.2	16.4	35.9
150	19.2	18.8	21.6	19.9	11.1	11.2	17.0	45.0
180	19.1	18.8	21.2	19.7	11.1	11.2	17.7	54.6
Average	20.3	19.9	22.2	20.8	11.1	11.2	13.2	
±s.d.	1.5	1.3	0.6	1.1			4.5	
Average dose range = 59.1 – 65.6 g.h.m ⁻³								

Table 7.110: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 21/2/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.9	22.2	22.5	22.5	11.1	11.2		
10	21.8	22.3	20.8	21.6	11.1	11.2	4.0	2.8
30	21.1	21.5	20.8	21.1	11.1	11.2	6.2	7.2
60	21.1	20.4	21.2	20.9	11.1	11.2	7.2	15.9
90	19.8	19.3	20.4	19.8	11.1	11.2	12.0	26.1
120	19.6	19.2	20.1	19.6	11.1	11.2	12.9	34.7
150	19.8	19.6	20.3	19.9	11.1	11.2	11.7	44.2
180	19.0	19.1	19.9	19.3	11.1	11.2	14.2	54.7
Average	20.3	20.2	20.5	20.3	11.1	11.2	9.7	
±s.d.	1.0	1.3	0.5	0.9			3.9	
Average dose range = 58.4 – 63.6 g.h.m ⁻³								

Table 7.111: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 22/2/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.1	24.3	24.3	23.9	11.1	11.2		
10	22.5	22.6	22.9	22.7	11.1	11.2	5.2	3.0
30	21.9	22.5	22.9	22.4	11.1	11.2	6.1	7.6
60	21.6	21.8	22.8	22.1	11.1	11.2	7.7	16.8
90	21.5	21.8	22.6	22.0	11.1	11.2	8.1	27.6
120	21.3	21.9	22.7	22.0	11.1	11.2	8.1	38.4
150	21.1	21.6	22.0	21.6	11.1	11.2	9.8	49.4
180	20.9	21.3	21.9	21.4	11.1	11.2	10.6	59.3
Average	21.5	21.9	22.5	22.0	11.1	11.2	7.9	
±s.d.	0.5	0.5	0.4	0.5			1.9	
Average dose range = 64.7 – 67.4 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.112

Table 7.112: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 21g/m³ x 3h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Arctic Snow Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 20 -27 February 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.9	0.8	1.1	1.2	1.1	1.0	1.2	0.0	0.4	1.4	1.4	1.2	1.9	0.7	1.4	1.0	1.0	1.0
24	1	0.9	1.1	0.9	1.2	1.1	1.2	1.1	0.0	0.4	1.3	1.3	1.3	2.0	0.6	1.7	1.0	1.0	1.0
36		0.7	0.5	1.0	1.1	1.1	1.3	1.5	-0.1	0.6	1.2	1.2	1.4	1.9	0.6	1.5	1.0	1.0	1.0
48	2	0.7	0.9	0.9	1.1	1.2	1.3	1.2	-0.2	0.4	1.2	1.3	1.3	2.1	0.7	1.7	1.0	1.0	1.0
60		0.8	0.7	1.1	1.2	1.1	1.3	1.6	-0.3	0.4	1.3	1.2	1.3	1.8	0.6	1.5	1.0	1.0	1.0
72	3	0.6	0.7	0.8	1.2	1.2	1.3	1.4	0.0	0.5	1.3	1.3	1.3	1.7	0.6	1.1	1.0	1.1	1.0
84		1.1	0.8	1.2	1.2	1.3	1.4	1.6	-0.2	0.6	1.2	1.4	1.3	1.7	0.6	1.1	1.1	1.0	1.0
96	4	0.8	1.1	0.9	1.3	1.3	1.4	1.4	-0.1	0.5	1.4	1.4	1.4	1.7	0.6	1.2	1.1	1.1	1.0
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.0 ±0.1					
		Av. air ± s. d. = 0.9 ±0.7						Av. air ± s. d. = 0.6 ±0.3						Av. air ± s. d. = 1.3 ±1.1					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.113) show that from the dissection data an estimated 898,178 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 154,640 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 54.6 – 59.3 g.h.m⁻³) or as a final dose (range 58.4 – 65.6 g.h.m⁻³) at 11°C in Arctic Snow nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.113: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Arctic Snow Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	160,833	0		8,378	16,756	0
	1 st Instar	93,554	0		9,233	18,466	0
	2 nd instar	47,810	0		7,925	15,850	0
	Total	302,196	0		25,536	51,072	0
2	eggs	144,999	0		8,731	17,462	0
	1 st Instar	98,147	0		9,686	19,372	0
	2 nd instar	50,320	0		8,342	16,684	0
	Total	293,466	0		26,759	53,518	0
3	eggs	153,134	0		7,988	15,976	0
	1 st Instar	96,239	0		8,228	16,456	0
	2 nd instar	53,143	0		8,809	17,618	0
	Total	302,515	0		25,025	50,050	0
Total all reps		898,178	0		77,320	154,640	0

7.5.6 Nectarines – August Red

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.114 – 7.116. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.2°C.

Table 7.114: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 3/5/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.6	22.0	24.6	23.4	11.1	11.2		
10	22.5	22.5	23.2	22.7	11.1	11.2	2.8	2.9
30	21.9	22.1	23.2	22.4	11.1	11.2	4.3	7.6
60	20.3	20.7	23.6	21.5	11.1	11.2	8.0	16.8
90	20.9	20.4	22.8	21.4	11.1	11.2	8.7	26.9
120	20.6	19.6	22.5	20.9	11.1	11.2	10.7	37.4
150	20.8	19.6	22.2	20.9	11.1	11.2	10.8	47.0
180	20.4	19.6	21.8	20.6	11.1	11.2	12.0	57.4
Average	21.1	20.6	22.8	21.5	11.1	11.2	8.2	
±s.d.	0.8	1.2	0.6	0.8			3.5	
Average dose range = 62.0 – 66.9 g.h.m ⁻³								

Table 7.115: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 4/5/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.0	21.3	22.8	22.4	11.0	11.2		
10	21.6	22.1	21.6	21.8	11.0	11.2	2.7	2.8
30	22.3	21.3	21.6	21.7	11.0	11.2	2.8	7.3
60	22.3	20.2	21.0	21.2	11.0	11.2	5.4	16.3
90	21.0	20.1	21.2	20.8	11.0	11.2	7.2	26.5
120	20.8	20.0	20.9	20.6	11.0	11.2	8.0	36.3
150	20.8	19.7	20.9	20.5	11.0	11.2	8.5	46.3
180	20.2	19.4	20.7	20.1	11.0	11.2	10.1	56.3
Average	21.3	20.4	21.1	20.9	11.0	11.2	6.4	
±s.d.	0.8	1.0	0.4	0.6			2.9	
Average dose range = 60.9 – 64.7 g.h.m ⁻³								

Table 7.116: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 5/5/2011. Applied dose 24g/m^3 . Expected dose 21g/m^3 for 3 hour exposure = 63g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.5	22.8	23.3	23.2	11.0	11.2		
10	22.3	21.8	22.1	22.1	11.0	11.2	4.9	2.9
30	23.3	21.7	22.1	22.4	11.0	11.2	3.6	7.4
60	22.4	21.0	22.0	21.8	11.0	11.2	6.0	16.8
90	22.6	21.0	21.8	21.8	11.0	11.2	6.0	27.3
120	22.1	21.1	21.9	21.7	11.0	11.2	6.5	38.2
150	22.2	20.8	21.2	21.4	11.0	11.2	7.8	48.8
180	21.9	20.5	21.1	21.2	11.0	11.2	8.8	58.9
Average	22.4	21.1	21.7	21.8	11.0	11.2	6.2	
±s.d.	0.5	0.5	0.4	0.4			1.7	
Average dose range = $64.1 - 66.5\text{g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.117

Table 7.117: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $21\text{g/m}^3 \times 3\text{h}$ at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C . (Data corrected using calibration records before trial). **Test Fruit: : August Red Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 3 - 10 May 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.9	0.0	0.4	1.5	1.4	1.2	1.9	0.6	0.6	1.2	1.2	1.1	0.9	0.7	2.2	1.4	1.2	1.3
24	1	1.7	0.1	1.0	1.3	1.3	1.1	2.2	0.7	0.7	1.0	1.3	1.2	1.3	1.3	2.2	1.1	1.1	1.2
36		1.1	0.0	0.5	1.3	1.2	1.1	2.0	0.6	0.5	0.9	1.3	1.3	1.0	0.9	2.3	1.1	1.3	1.4
48	2	1.5	0.1	0.8	1.3	1.2	1.1	2.1	0.8	0.7	1.0	1.2	1.3	1.2	1.0	2.2	1.0	1.1	1.3
60		1.0	0.0	0.4	1.3	1.2	1.1	1.9	0.7	0.6	1.1	1.2	1.3	1.1	1.0	2.3	1.3	1.2	1.2
72	3	1.5	0.1	0.4	1.4	1.3	1.1	2.0	0.6	0.5	1.0	1.3	1.3	1.4	1.5	2.3	1.2	1.1	1.3
84		1.1	0.0	0.4	1.3	1.2	1.1	2.0	0.5	0.4	1.0	1.3	1.3	0.9	0.7	2.4	1.1	1.3	1.4
96	4	1.7	0.1	0.6	1.4	1.1	1.1	2.1	0.6	0.6	1.1	1.3	1.3	1.4	1.3	2.4	1.1	1.2	1.4
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.6 ±0.3						Av. air ± s. d. = 1.1 ±0.4						Av. air ± s. d. = 1.5 ±1.7					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.118) show that from the dissection data an estimated 739,819 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 149,566 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 56.3 – 58.9 g.h.m⁻³) or as a final dose (range 60.9 – 66.9 g.h.m⁻³) at 11°C in August Red nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.118 Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **August Red Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	128,249	0		8,433	16,866	0
	1 st Instar	77,766	0		8,038	16,076	0
	2 nd instar	50,280	0		7,965	15,930	0
	Total	256,294	0		24,436	48,872	0
2	eggs	107,504	0		8,789	17,578	0
	1 st Instar	81,584	0		8,433	16,866	0
	2 nd instar	52,919	0		8,383	16,766	0
	Total	242,008	0		25,605	51,210	0
3	eggs	113,535	0		8,698	17,396	0
	1 st Instar	79,998	0		7,748	15,496	0
	2 nd instar	47,984	0		8,296	16,592	0
	Total	241,517	0		24,742	49,484	0
Total all reps		739,819	0		74,783	149,566	0

7.5.7 Plums – Angelino

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.119 – 7.121. Temperatures were maintained evenly: ranging from 11.0°C air; fruit 11.1°C.

Table 7.119: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 2/4/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.0	23.7	24.2	23.6	11.0	11.1		
10	22.9	22.2	22.0	22.4	11.0	11.1	5.4	3.0
30	21.3	21.8	22.0	21.7	11.0	11.1	8.2	7.5
60	20.7	20.4	21.4	20.8	11.0	11.1	11.8	16.3
90	20.4	20.1	21.6	20.7	11.0	11.1	12.4	26.0
120	20.4	19.3	21.3	20.3	11.0	11.1	14.0	36.2
150	20.2	19.3	21.0	20.2	11.0	11.1	14.7	45.8
180	20.2	19.3	20.6	20.0	11.0	11.1	15.2	55.5
Average	20.9	20.3	21.4	20.9	11.0	11.1	11.7	
±s.d.	1.0	1.2	0.5	0.9			3.6	
Average dose range = 60.0 – 65.2 g.h.m ⁻³								

Table 7.120: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 3/4/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	23.3	21.8	21.1	22.1	11.0	11.1		
10	21.2	21.7	20.2	21.0	11.0	11.1	4.7	2.8
30	21.9	20.9	20.2	21.0	11.0	11.1	4.8	7.0
60	21.9	19.8	19.6	20.4	11.0	11.1	7.4	15.8
90	20.6	19.7	19.8	20.0	11.0	11.1	9.2	25.5
120	20.4	19.6	19.5	19.8	11.0	11.1	10.1	35.1
150	20.6	19.3	19.7	19.9	11.0	11.1	10.0	44.6
180	19.8	19.0	19.3	19.4	11.0	11.1	12.2	54.6
Average	20.9	20.0	19.8	20.2	11.0	11.1	8.4	
±s.d.	0.8	1.0	0.3	0.6			2.8	
Average dose range = 58.8 – 62.6 g.h.m ⁻³								

Table 7/121: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 4/4/2011. Applied dose 24g/m^3 . Expected dose 21g/m^3 for 3 hour exposure = 63 g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	24.6	22.1	22.4	23.0	11.0	11.1		
10	22.0	22.2	22.4	22.2	11.0	11.1	3.6	2.9
30	20.0	20.1	20.4	20.2	11.0	11.1	12.4	7.4
60	19.1	19.4	20.3	19.6	11.0	11.1	14.9	15.1
90	19.3	19.4	19.9	19.5	11.0	11.1	15.2	24.5
120	18.8	19.5	19.6	19.3	11.0	11.1	16.2	34.2
150	18.9	19.2	19.3	19.1	11.0	11.1	16.9	43.4
180	18.6	18.9	19.2	18.9	11.0	11.1	17.9	52.6
Average	19.5	19.8	20.2	19.8	11.0	11.1	13.9	
±s.d.	1.2	1.1	1.1	1.1			4.9	
Average dose range = $56.1 - 62.9\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.122

Table 7.122: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $21\text{g/m}^3 \times 3\text{h}$ at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C . (Data corrected using calibration records before trial). **Test Fruit: Angelino Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 2 - 9 April 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.2	0.4	1.1	1.3	1.3	1.2	1.2	0.6	0.8	1.1	1.3	1.0	0.7	0.9	1.6	1.5	1.5	1.5
24	1	1.3	0.6	1.1	1.1	1.3	1.1	1.0	0.7	0.9	1.1	1.3	1.0	0.8	1.0	1.6	1.4	1.2	1.3
36		1.2	0.5	1.1	1.3	1.3	1.1	1.1	0.5	0.7	1.2	1.2	1.2	0.8	0.6	1.4	1.3	1.2	1.2
48	2	1.2	0.5	1.0	1.1	1.5	1.0	0.9	0.5	0.6	1.2	1.3	1.2	0.4	0.8	1.3	1.3	1.1	1.1
60		1.3	0.4	1.0	1.2	1.2	1.0	1.1	0.6	0.8	1.2	1.2	1.2	0.7	0.7	1.3	1.3	1.1	1.1
72	3	1.3	0.5	1.1	1.1	1.4	1.0	1.0	0.5	0.7	1.2	1.2	1.2	0.4	0.9	1.3	1.3	1.1	1.1
84		1.1	0.4	1.1	1.2	1.1	1.0	1.1	0.5	0.7	1.2	1.2	1.1	0.4	0.7	1.3	1.3	1.1	1.1
96	4	1.2	0.5	1.1	1.2	1.3	1.0	0.8	0.5	0.7	1.2	1.2	1.1	0.5	1.0	1.4	1.3	1.0	1.0
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.9 ±0.3						Av. air ± s. d. = 0.8 ±0.4						Av. air ± s. d. = 0.9 ±1.1					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.123) show that from the dissection data an estimated 757,252 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 149,824 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 52.6 – 55.5 g.h.m⁻³) or as a final dose (range 56.1 – 65.2 g.h.m⁻³) at 11°C in Angelino plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.123: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: Angelino Plums

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	126,338	0		8,166	16,332	0
	1 st Instar	78,220	0		7,869	15,738	0
	2 nd instar	54,802	0		8,979	17,958	0
	Total	259,360	0		25,014	50,028	0
2	eggs	131,669	0		7,887	15,774	0
	1 st Instar	56,966	0		8,231	16,462	0
	2 nd instar	55,185	0		8,182	16,364	0
	Total	243,819	0		24,300	48,600	0
3	eggs	115,326	0		8,326	16,652	0
	1 st Instar	80,466	0		8,634	17,268	0
	2 nd instar	58,280	0		8,638	17,276	0
	Total	254,072	0		25,598	51,196	0
Total all reps		757,252	0		74,912	149,824	0

7.5.8 Plums – Tegan Blue

Fumigation treatments 21g x 3h at 11°C

Fumigation treatment records are given in tables 7.124 – 7.126. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.1 – 11.2°C.

Table 7.124: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 13/3/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	21.8	21.2	22.9	22.0	11.0	11.1		
10	20.9	21.1	22.2	21.4	11.0	11.1	2.6	2.7
30	20.3	20.7	22.2	21.1	11.0	11.1	4.1	7.1
60	20.2	19.6	21.6	20.5	11.0	11.1	6.8	15.8
90	19.4	19.7	21.8	20.3	11.0	11.1	7.6	25.6
120	19.4	19.5	21.5	20.1	11.0	11.1	8.3	35.5
150	19.3	19.5	21.2	20.0	11.0	11.1	9.0	45.3
180	19.2	19.5	20.8	19.8	11.0	11.1	9.7	55.0
Average	19.8	19.9	21.6	20.5	11.0	11.1	6.9	
±s.d.	0.7	0.7	0.5	0.6			2.6	
Average dose range = 59.6 – 63.1 g.h.m ⁻³								

Table 7.125: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 14/3/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.0	21.6	23.2	22.3	11.0	11.1		
10	21.5	20.0	20.3	20.6	11.0	11.1	7.5	2.8
30	20.2	19.2	20.3	19.9	11.0	11.1	10.6	6.9
60	20.2	18.1	19.7	19.3	11.0	11.1	13.2	14.9
90	19.9	19.0	19.9	19.6	11.0	11.1	12.0	24.2
120	19.7	18.9	19.6	19.4	11.0	11.1	12.9	34.3
150	19.9	18.6	19.8	19.4	11.0	11.1	12.7	43.7
180	19.1	18.3	19.4	18.9	11.0	11.1	15.0	53.4
Average	20.1	18.9	19.9	19.6	11.0	11.1	12.0	
±s.d.	0.7	0.6	0.3	0.5			2.4	
Average dose range = 57.2 – 60.4 g.h.m ⁻³								

Table 7.126: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 15/3/2011. Applied dose 24g/m³. Expected dose 21g/m³ for 3 hour exposure = 63 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	22.2	23.3	24.8	23.4	11.0	11.2		
10	21.6	22.7	23.0	22.4	11.0	11.2	4.3	2.9
30	20.7	21.6	22.1	21.5	11.0	11.2	8.4	7.5
60	20.4	20.4	21.1	20.6	11.0	11.2	11.9	16.1
90	20.0	20.0	20.8	20.3	11.0	11.2	13.5	25.8
120	19.5	20.1	20.9	20.2	11.0	11.2	13.9	35.5
150	19.6	19.8	20.2	19.9	11.0	11.2	15.2	45.4
180	19.3	19.5	20.1	19.6	11.0	11.2	16.2	54.6
Average	20.2	20.6	21.2	20.6	11.0	11.2	11.9	
±s.d.	0.8	1.1	1.0	1.0			4.2	
Average dose range = 58.9 – 64.9 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.127

Table 7.127: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 21g/m³ x 3h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Tegan Blue Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 13 - 20 March 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.3	0.4	1.2	1.5	1.3	1.4	1.6	0.6	0.9	1.3	1.2	1.2	1.2	0.7	1.0	1.3	1.2	1.6
24	1	1.1	0.4	1.1	1.4	1.3	1.3	1.6	0.6	1.0	1.4	1.3	1.3	1.2	0.7	1.0	1.0	1.1	1.3
36		1.2	0.4	1.1	1.3	1.4	1.2	1.6	0.5	0.8	1.4	1.4	1.4	1.2	0.3	0.8	1.0	1.0	1.2
48	2	1.0	0.5	1.0	1.3	1.5	1.1	1.5	0.5	0.8	1.4	1.4	1.4	1.2	0.8	1.1	1.0	1.0	1.1
60		1.3	0.5	1.2	1.3	1.3	1.2	1.5	0.6	0.9	1.4	1.4	1.4	1.3	0.5	0.9	1.0	1.0	1.1
72	3	1.2	0.5	1.0	1.3	1.4	1.1	1.5	0.5	0.8	1.5	1.4	1.4	1.1	0.8	1.1	1.1	1.0	1.1
84		1.4	0.5	1.3	1.3	1.2	1.2	1.6	0.5	0.9	1.4	1.3	1.4	1.3	0.5	0.9	1.0	1.0	1.2
96	4	1.1	0.5	1.1	1.3	1.4	1.2	1.4	0.5	0.9	1.5	1.4	1.4	1.3	0.8	1.1	1.0	1.0	1.1
		Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.4 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.3						Av. air ± s. d. = 1.0 ±0.4						Av. air ± s. d. = 1.0 ±1.0					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.128) show that from the dissection data an estimated 680,443 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 144,594 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 53.4 – 55.0 g.h.m⁻³) or as a final dose (range 57.2 – 64.9 g.h.m⁻³) at 11°C in Tegan Blue plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.128: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 21g/m³ for 3 hour exposure = 63 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly **eggs, 1st & 2nd instars** in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Tegan Blue Plums**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	114,014	0		7,959	15,918	0
	1 st Instar	67,241	0		7,315	14,630	0
	2 nd instar	52,432	0		8,259	16,518	0
	Total	233,687	0		23,533	47,066	0
2	eggs	102,026	0		8,294	16,588	0
	1 st Instar	70,542	0		8,174	16,348	0
	2 nd instar	55,185	0		8,126	16,252	0
	Total	227,753	0		24,594	49,188	0
3	eggs	103,855	0		7,539	15,078	0
	1 st Instar	56,867	0		8,574	17,148	0
	2 nd instar	58,280	0		8,057	16,114	0
	Total	219,003	0		24,170	48,340	0
Total all reps		680,443	0		72,297	144,594	0

CONCLUSIONS

Data for 8 cultivars treated at 11°C with a methyl bromide fumigation dose of 63 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. Approximately 10% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 52 - 57 g.h.m⁻³ on average and about 57 - 65 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 21g/m³ for 3 h treatment giving cumulative gas concentration of 63 g.h.m⁻³. Cold treatment was maintained between 1.0 – 1.2°C over 96 hours. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times for both treatments if applied alone. The Probit 9 estimates show that this combined treatment of Medfly eggs, 1st and 2nd instar stages are sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

7.6 RESULTS OF LARGE SCALE TRIALS OF MEDFLY USING: METHYL BROMIDE FUMIGATION AT 11°C: 32g/m³ for 2 hour exposure followed by COLD TREATMENT at 1.5°C for 96 hours

The combined fumigation + cold treatment trials were conducted from November 2010 to May 2011.

Data for each cultivar: air and fruit temperatures during fumigation, methyl bromide concentrations, cold treatment temperatures, and mortality of Medfly replicated 3 times are given under the respective fruit varieties treated.

Life history data: The data used for test fruits are the same as for that given in section 7.3 above since fruit from the same harvested batch of was used.

7.6.1 Cherries - Sweetheart

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.129 – 7.131. Temperatures were maintained evenly: ranging from 11.0 – 11.1°C air; fruit 11.2°C.

Table 7.129: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 29/11/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.8	32.2	34.3	33.4	11.0	11.2		
10	32.5	32.7	33.8	33.0	11.0	11.2	1.3	4.2
30	31.9	32.3	33.8	32.7	11.0	11.2	2.3	11.0
60	30.3	31.1	33.2	31.5	11.0	11.2	5.7	24.5
90	29.9	30.8	32.4	31.0	11.0	11.2	7.2	39.4
120	29.4	30.0	32.1	30.5	11.0	11.2	8.8	54.3
Average	30.8	31.4	33.1	31.7	11.0	11.2	5.0	
±s.d.	1.3	1.1	0.8	1.1			3.2	
Average dose range = 61.4 – 65.6 g.h.m ⁻³								

Table 7.130: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 30/11/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.9	34.8	33.8	34.5	11.1	11.2		
10	33.9	32.4	31.5	32.6	11.1	11.2	5.5	4.3
30	32.6	31.6	31.5	31.9	11.1	11.2	7.5	10.9
60	32.6	30.5	31.3	31.5	11.1	11.2	8.8	23.9
90	31.3	29.4	31.1	30.6	11.1	11.2	11.3	39.3
120	31.1	29.3	30.8	30.4	11.1	11.2	11.9	53.6
Average	32.3	30.6	31.2	31.4	11.1	11.2	9.0	
±s.d.	1.1	1.4	0.3	0.9			2.6	
Average dose range = 61.0 – 64.6 g.h.m ⁻³								

Table 7.131: Large scale trials of Medfly in infested **Sweetheart cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 1/12/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.7	33.8	34.4	34.6	11.1	11.2		
10	32.2	33.3	33.6	33.0	11.1	11.2	4.6	4.3
30	33.2	33.2	33.6	33.3	11.1	11.2	3.8	11.0
60	32.3	32.5	33.5	32.8	11.1	11.2	5.4	25.0
90	32.5	32.5	33.3	32.8	11.1	11.2	5.4	41.0
120	32.0	32.3	33.1	32.5	11.1	11.2	6.3	57.3
Average	32.4	32.8	33.4	32.9	11.1	11.2	5.1	
±s.d.	0.5	0.5	0.2	0.3			0.9	
Average dose range = 65.1 – 66.4 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.132

Table 7.132: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 2h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Sweetheart cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 29 Nov - 6 December 2010																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.0	0.2	1.4	0.9	1.0	1.1	1.3	0.7	0.8	0.9	1.1	1.0	0.9	0.2	0.8	1.3	1.2	1.0
24	1	0.8	0.2	1.0	1.1	1.2	1.2	0.9	0.7	0.7	1.0	1.1	1.1	1.9	-0.1	1.1	1.2	1.1	1.0
36		1.1	0.2	1.4	1.1	1.3	1.2	1.4	0.7	0.8	1.0	1.1	1.1	1.5	0.1	1.0	1.1	1.2	1.0
48	2	0.8	0.2	1.0	1.0	1.2	1.1	1.0	0.7	0.8	1.0	1.2	1.1	1.9	0.2	1.1	1.2	1.1	1.0
60		0.9	0.1	1.1	1.1	1.3	1.2	1.2	0.9	0.8	1.0	1.1	1.1	1.6	0.1	0.9	1.1	1.2	1.0
72	3	0.7	0.2	1.0	1.0	1.2	1.1	1.0	0.6	0.7	1.1	1.2	1.1	1.4	0.1	0.9	1.2	1.1	1.1
84		0.9	0.2	1.2	1.1	1.3	1.2	1.2	0.7	0.8	1.0	1.1	1.1	0.8	0.0	0.7	1.2	1.2	1.0
96	4	0.8	0.3	1.2	1.0	1.2	1.1	1.1	0.7	0.8	1.1	1.2	1.1	1.0	0.1	0.9	1.2	1.1	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.7 ±0.3						Av. air ± s. d. = 0.9 ±0.5						Av. air ± s. d. = 0.8 ±0.4					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.133) show that from the dissection data an estimated 965,737 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 215,752 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 53.6 – 57.3 g.h.m⁻³) or as a final dose (range 61.0 – 66.4 g.h.m⁻³) at 11°C in Sweetheart cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.133: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Sweetheart Cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	140,057	0		12,179	24,358	0
	1 st Instar	96,024	0		11,840	23,680	0
	2 nd instar	86,398	0		11,590	23,180	0
	Total	322,480	0		35,609	71,218	0
2	eggs	127,978	0		12,862	25,724	0
	1 st Instar	97,535	0		12,504	25,008	0
	2 nd instar	111,798	0		12,240	24,480	0
	Total	337,311	0		37,606	75,212	0
3	eggs	137,875	0		11,320	22,640	0
	1 st Instar	98,091	0		12,261	24,522	0
	2 nd instar	69,980	0		11,080	22,160	0
	Total	305,946	0		34,661	69,322	0
Total all reps		965,737	0		107,876	215,752	0

7.6.2 Cherries - Lapin

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.134 – 7.136. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C.

Table 7.134: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 17/12/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.4	34.4	36.5	34.8	11.1	11.2		
10	32.4	33.6	34.4	33.5	11.1	11.2	3.7	4.3
30	31.9	32.2	33.7	32.6	11.1	11.2	6.2	11.2
60	30.3	30.1	33.6	31.3	11.1	11.2	9.9	24.5
90	29.2	29.8	33.3	30.8	11.1	11.2	11.5	39.2
120	28.8	29.0	33.0	30.3	11.1	11.2	12.9	53.8
Average	30.5	30.9	33.6	31.7	11.1	11.2	8.9	
±s.d.	1.6	1.9	0.5	1.3			3.8	
Average dose range = 60.7 – 66.0 g.h.m ⁻³								

Table 7.135: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 18/12/2010. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.0	32.2	33.2	33.1	11.1	11.2		
10	33.1	31.6	30.7	31.8	11.1	11.2	4.0	4.1
30	32.8	31.4	30.7	31.6	11.1	11.2	4.5	10.6
60	32.2	30.3	30.6	31.0	11.1	11.2	6.3	23.7
90	31.5	29.2	30.3	30.3	11.1	11.2	8.5	38.8
120	31.3	29.1	30.0	30.1	11.1	11.2	9.1	53.1
Average	32.2	30.3	30.5	31.0	11.1	11.2	6.5	
±s.d.	0.8	1.2	0.3	0.7			2.3	
Average dose range = 60.5 – 63.5 g.h.m ⁻³								

Table 7.136: Large scale trials of Medfly in infested **Lapin cherries** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 19/12/2010. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 2 hour exposure = 64g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m^3 measured in Top carton of fruit stack	MeBr g/m^3 measured in Mid-point carton of fruit stack	MeBr g/m^3 measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m^3	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m^{-3}
5	33.9	32.8	33.0	33.2	11.1	11.2		
10	32.8	31.7	31.0	31.8	11.1	11.2	4.2	4.2
30	32.3	30.6	31.0	31.3	11.1	11.2	5.8	10.6
60	32.0	29.9	30.9	30.9	11.1	11.2	6.9	23.5
90	31.8	29.9	30.7	30.8	11.1	11.2	7.3	38.7
120	31.7	29.4	30.1	30.4	11.1	11.2	8.5	53.9
Average	32.1	30.3	30.7	31.1	11.1	11.2	6.6	
±s.d.	0.4	0.9	0.4	0.5			1.6	
Average dose range = $61.0 - 63.2\text{g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.137

Table 7.137: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $32\text{g/m}^3 \times 2\text{h}$ at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C . (Data corrected using calibration records before trial). **Test Fruit: Lapin cherries**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 17 - 24 December 2010																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.2	0.2	1.0	1.2	1.2	1.2	2.1	0.6	0.7	1.2	1.3	1.5	3.1	0.3	1.3	1.1	1.0	1.0
24	1	1.4	0.2	1.3	1.0	1.2	1.2	2.5	0.7	0.8	1.1	1.3	1.4	2.3	0.3	1.1	1.1	1.0	0.9
36		1.2	0.3	1.0	1.1	1.2	1.2	2.3	1.1	1.3	1.1	1.3	1.5	2.9	0.1	1.2	1.1	1.1	1.0
48	2	1.4	0.1	1.3	1.0	1.1	1.1	2.3	0.7	0.9	1.2	1.3	1.5	2.4	0.6	1.2	1.1	1.1	1.0
60		1.3	0.3	1.0	1.1	1.2	1.1	1.9	0.4	0.6	1.1	1.3	1.5	2.5	0.2	1.1	1.1	1.2	1.0
72	3	1.4	0.1	1.4	1.0	1.1	1.2	2.2	0.6	0.7	1.2	1.3	1.5	2.0	0.1	0.8	1.2	1.2	1.1
84		1.2	0.2	1.0	1.1	1.3	1.2	1.9	0.4	0.6	1.1	1.3	1.5	2.9	-0.2	1.0	1.1	1.2	1.1
96	4	1.1	0.1	2.0	1.0	1.2	1.2	2.0	0.5	0.7	1.2	1.3	1.4	2.3	0.3	1.1	1.2	1.2	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.4						Av. air ± s. d. = 1.2 ±0.8						Av. air ± s. d. = 1.3 ±0.7					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.138) show that from the dissection data an estimated 1,058,816 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 208,054 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 53.1 – 53.9 g.h.m⁻³) or as a final dose (range 61.0 – 66.0 g.h.m⁻³) at 11°C in Lapin cherries and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.138: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: **Lapin cherries**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	164,945	0		11,953	23,906	0
	1 st Instar	113,087	0		11,620	23,240	0
	2 nd instar	74,322	0		10,969	21,938	0
	Total	352,354	0		34,542	69,084	0
2	eggs	148,735	0		11,155	22,310	0
	1 st Instar	114,105	0		12,191	24,382	0
	2 nd instar	84,215	0		12,507	25,014	0
	Total	347,056	0		35,853	71,706	0
3	eggs	160,237	0		11,276	22,552	0
	1 st Instar	127,666	0		11,034	22,068	0
	2 nd instar	71,504	0		11,322	22,644	0
	Total	359,407	0		33,632	67,264	0
Total all reps		1,058,816	0		104,027	208,054	0

7.6.3 Peaches – Snow King

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.139 – 7.141. Temperatures were maintained evenly: ranging from 11.1°C air; fruit 11.2°C.

Table 7.139: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 3/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.5	35.4	33.9	34.3	11.1	11.2		
10	33.0	33.2	32.7	33.0	11.1	11.2	3.8	4.3
30	31.4	32.8	31.8	32.0	11.1	11.2	6.6	11.0
60	31.8	30.7	32.2	31.6	11.1	11.2	7.9	24.0
90	30.5	30.4	31.4	30.8	11.1	11.2	10.2	39.5
120	30.4	29.6	31.1	30.4	11.1	11.2	11.4	53.8
Average	31.4	31.3	31.8	31.5	11.1	11.2	8.0	
±s.d.	1.1	1.6	0.6	1.0			3.0	
Average dose range = 61.0 – 65.1 g.h.m ⁻³								

Table 7.140: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 4/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.4	33.6	32.6	33.5	11.1	11.2		
10	32.6	33.1	31.8	32.5	11.1	11.2	3.1	4.2
30	31.0	30.0	31.1	30.7	11.1	11.2	8.4	10.8
60	31.0	29.9	30.3	30.4	11.1	11.2	9.3	23.0
90	29.7	29.5	29.5	29.6	11.1	11.2	11.8	38.0
120	29.5	29.4	29.2	29.4	11.1	11.2	12.4	51.7
Average	30.8	30.4	30.4	30.5	11.1	11.2	9.0	
±s.d.	1.2	1.5	1.1	1.2			3.7	
Average dose range = 58.5 – 63.5 g.h.m ⁻³								

Table 7.141: Large scale trials of Medfly in infested **Snow King Peaches** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 5/2/2011. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 2 hour exposure = 64 g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	32.4	32.6	32.9	32.6	11.1	11.2		
10	31.5	31.2	31.7	31.5	11.1	11.2	3.6	4.1
30	31.5	31.1	31.7	31.4	11.1	11.2	3.7	10.5
60	30.6	30.4	31.3	30.8	11.1	11.2	5.7	23.6
90	30.5	30.4	31.0	30.6	11.1	11.2	6.1	38.5
120	30.3	30.3	30.9	30.5	11.1	11.2	6.5	53.6
Average	30.9	30.7	31.3	31.0	11.1	11.2	5.1	
±s.d.	0.6	0.4	0.4	0.5			1.4	
Average dose range = $61.0 - 62.8\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.142

Table 7.142: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $32\text{g/m}^3 \times 2\text{h}$ at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Snow King Peaches**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 3 - 10 February 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.1	0.2	0.9	1.3	1.3	1.4	1.3	0.0	0.5	1.3	1.2	1.0	2.1	0.4	1.8	1.5	1.4	1.3
24	1	1.0	0.1	0.7	1.3	1.3	1.3	1.1	0.0	0.5	1.3	1.2	1.1	1.9	0.3	1.8	1.4	1.3	1.2
36		1.3	-0.1	0.8	1.2	1.2	1.3	1.1	-0.2	0.4	1.2	1.1	1.1	1.4	0.5	0.9	1.3	1.2	1.2
48	2	1.4	0.3	0.9	1.2	1.2	1.3	0.9	-0.2	0.4	1.1	1.1	1.1	1.4	0.5	0.9	1.3	1.2	1.2
60		1.0	0.3	0.9	1.2	1.2	1.3	1.1	-0.2	0.3	1.2	1.1	1.0	1.2	0.4	0.7	1.3	1.2	1.2
72	3	1.1	0.2	0.8	1.2	1.2	1.2	1.2	-0.1	0.4	1.2	1.1	1.0	1.4	0.3	1.1	1.3	1.2	1.3
84		1.2	0.2	0.8	1.2	1.2	1.3	1.2	-0.1	0.4	1.2	1.2	1.1	1.6	0.4	2.0	1.4	1.3	1.3
96	4	1.3	0.0	0.8	1.3	1.3	1.4	1.2	-0.1	0.5	1.2	1.2	1.1	1.7	0.4	2.1	1.4	1.3	1.3
		Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1					
		Av. air ± s. d. = 0.7 ±0.4						Av. air ± s. d. = 0.5 ±0.5						Av. air ± s. d. = 1.1 ±0.7					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.143) show that from the dissection data an estimated 1,135,993 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 161,900 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 51.7 – 53.8 g.h.m⁻³) or as a final dose (range 58.5 – 65.1 g.h.m⁻³) at 11°C in Snow King peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.143: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: Snow King Peaches

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	167,680	0		8,743	17,486	0
	1 st Instar	118,134	0		9,016	18,032	0
	2 nd instar	77,560	0		9,713	19,426	0
	Total	363,374	0		27,472	54,944	0
2	eggs	174,756	0		8,433	16,866	0
	1 st Instar	123,935	0		8,846	17,692	0
	2 nd instar	81,631	0		9,462	18,924	0
	Total	380,322	0		26,741	53,482	0
3	eggs	184,560	0		8,289	16,578	0
	1 st Instar	121,525	0		9,275	18,550	0
	2 nd instar	86,211	0		9,173	18,346	0
	Total	392,296	0		26,737	53,474	0
Total all reps		1,135,993	0		80,950	161,900	0

7.6.4 Peaches – Zee Lady

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.144 – 7.146. Temperatures were maintained evenly: ranging from 11.0 - 11.1°C air; fruit 11.1 - 11.2°C.

Table 7.144: Large scale trials of Medfly in infested **Peaches Zee Lady** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 12/1/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.2	33.6	34.7	33.8	11.0	11.1		
10	32.6	32.8	33.9	33.1	11.0	11.1	2.2	4.2
30	31.0	32.4	33.5	32.3	11.0	11.1	4.5	11.0
60	30.7	31.6	33.2	31.8	11.0	11.1	5.9	24.2
90	30.4	31.3	32.4	31.4	11.0	11.1	7.3	39.8
120	29.9	30.5	31.1	30.5	11.0	11.1	9.9	54.9
Average	30.9	31.7	32.8	31.8	11.0	11.1	6.0	
±s.d.	1.0	0.9	1.1	1.0			2.9	
Average dose range = 61.7 – 65.6 g.h.m ⁻³								

Table 7.145: Large scale trials of Medfly in infested **Peaches Zee Lady** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 13/1/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.5	33.0	32.0	32.8	11.0	11.1		
10	32.2	32.7	31.0	32.0	11.0	11.1	2.6	4.1
30	31.9	30.9	30.0	30.9	11.0	11.1	5.8	10.7
60	31.9	29.8	30.4	30.7	11.0	11.1	6.5	23.2
90	30.6	28.7	29.6	29.6	11.0	11.1	9.7	38.4
120	30.4	28.6	29.3	29.4	11.0	11.1	10.4	51.9
Average	31.4	30.1	30.1	30.5	11.0	11.1	7.0	
±s.d.	0.8	1.7	0.7	1.0			3.1	
Average dose range = 59.0 – 63.1 g.h.m ⁻³								

Table 7.146: Large scale trials of Medfly in infested **Peaches Zee Lady** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 14/1/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.1	34.0	34.8	34.3	11.1	11.2		
10	32.6	33.7	34.1	33.5	11.1	11.2	2.4	4.3
30	32.5	32.5	32.9	32.6	11.1	11.2	4.9	11.2
60	31.3	31.5	32.5	31.8	11.1	11.2	7.4	24.5
90	31.5	31.5	32.3	31.8	11.1	11.2	7.4	39.7
120	31.0	31.6	32.4	31.7	11.1	11.2	7.7	55.6
Average	31.8	32.2	32.8	32.3	11.1	11.2	5.9	
±s.d.	0.7	1.0	0.7	0.8			2.3	
Average dose range = 63.0 – 66.1 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.147

Table 7.147: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 2h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Zee Lady Peaches**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 12 - 19 January 2011																	
		Replicate 1: Cold Room #3						Replicate 2: Cold Room #4						Replicate 3: Cold Room #5					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		2.3	0.6	1.2	1.1	1.1	1.2	1.3	0.7	1.0	1.4	1.5	1.4	1.4	0.5	1.0	1.5	1.3	1.2
24	1	2.3	0.8	1.2	1.0	0.9	1.0	1.3	0.7	1.1	1.2	1.4	1.3	1.2	0.4	0.8	1.3	1.3	1.2
36		2.2	0.6	1.2	1.0	0.9	1.0	1.4	0.7	1.1	1.2	1.3	1.2	1.5	0.7	1.2	1.2	1.4	1.1
48	2	1.7	0.6	0.9	1.1	0.9	1.0	0.7	0.4	0.7	1.1	1.3	1.1	1.0	0.6	0.9	1.2	1.4	1.2
60		1.9	0.7	1.2	1.1	0.9	1.0	0.6	0.4	0.8	1.1	1.2	1.1	0.5	0.3	0.6	1.2	1.4	1.2
72	3	1.6	0.6	1.1	1.1	0.9	1.0	0.6	0.3	0.6	1.0	1.2	1.1	0.7	0.4	0.8	1.2	1.4	1.3
84		2.1	0.6	1.2	1.1	0.9	1.0	0.2	0.2	0.5	1.0	1.2	1.0	0.4	0.7	0.9	1.2	1.4	1.2
96	4	1.6	0.6	1.2	1.0	0.9	1.0	0.6	0.3	0.7	1.0	1.2	1.1	0.6	0.1	0.6	1.2	1.4	1.2
		Av. fruit ± s. d. = 1.0 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1					
		Av. air ± s. d. = 1.2 ±0.4						Av. air ± s. d. = 0.7 ±0.8						Av. air ± s. d. = 0.7 ±0.7					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.148) show that from the dissection data an estimated 815,470 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 160,136 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 51.9 – 55.6 g.h.m⁻³) or as a final dose (range 59.0 – 65.6 g.h.m⁻³) at 11°C in Zee Lady peaches and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.148: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Peaches Zee Lady**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	129,453	0		7,914	15,828	0
	1 st Instar	80,924	0		8,957	17,914	0
	2 nd instar	60,879	0		9,639	19,278	0
	Total	271,256	0		26,510	53,020	0
2	eggs	114,255	0		8,248	16,496	0
	1 st Instar	84,898	0		9,397	18,794	0
	2 nd instar	64,075	0		8,749	17,498	0
	Total	263,228	0		26,394	52,788	0
3	eggs	138,121	0		8,711	17,422	0
	1 st Instar	83,248	0		9,214	18,428	0
	2 nd instar	59,618	0		9,239	18,478	0
	Total	280,986	0		27,164	54,328	0
Total all reps		815,470	0		80,068	160,136	0

7.6.5 Nectarines – Arctic Snow

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.149 – 7.151. Temperatures were maintained evenly: ranging from 11.0 - 11.1°C air; fruit 11.1 - 11.2°C.

Table 7.149: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 24/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.6	33.0	35.6	34.4	11.0	11.1		
10	33.0	32.5	34.5	33.3	11.0	11.1	3.1	4.3
30	32.4	32.1	34.5	33.0	11.0	11.1	4.1	11.1
60	31.7	30.0	33.9	31.9	11.0	11.1	7.4	24.8
90	30.5	29.7	32.1	30.8	11.0	11.1	10.6	39.8
120	30.5	29.6	31.8	30.6	11.0	11.1	10.9	53.8
Average	31.6	30.8	33.4	31.9	11.0	11.1	7.2	
±s.d.	1.1	1.4	1.3	1.2			3.6	
Average dose range = 61.4 – 66.3 g.h.m ⁻³								

Table 7.150: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 25/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	32.7	32.8	32.7	32.7	11.1	11.2		
10	32.1	32.7	31.9	32.2	11.1	11.2	1.5	4.1
30	31.8	31.9	31.2	31.6	11.1	11.2	3.4	10.7
60	31.1	30.8	30.3	30.7	11.1	11.2	6.1	23.7
90	30.5	29.7	30.1	30.1	11.1	11.2	8.0	38.4
120	30.3	29.6	29.2	29.7	11.1	11.2	9.3	52.7
Average	31.2	30.9	30.5	30.9	11.1	11.2	5.7	
±s.d.	0.8	1.4	1.0	1.1			3.2	
Average dose range = 59.7 – 63.9 g.h.m ⁻³								

Table 7.151: Large scale trials of Medfly in infested **Arctic Snow Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 26/2/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.9	32.2	32.7	33.3	11.0	11.1		
10	33.0	31.9	32.2	32.4	11.0	11.1	2.7	4.2
30	33.0	31.8	32.2	32.3	11.0	11.1	2.8	10.8
60	32.9	31.1	32.1	32.0	11.0	11.1	3.7	24.3
90	32.1	31.1	32.1	31.8	11.0	11.1	4.5	40.0
120	31.6	30.0	31.4	31.0	11.0	11.1	6.8	55.6
Average	32.5	31.2	32.0	31.9	11.0	11.1	4.1	
±s.d.	0.6	0.8	0.3	0.6			1.7	
Average dose range = 62.7 – 64.9 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.152

Table 7.152: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 2h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Arctic Snow Nectarines**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 24 Feb - 3 March 2011																	
		Replicate 1: Cold Room 6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		0.6	1.2	0.8	1.1	1.0	1.0	1.3	1.5	-0.1	0.5	1.3	1.4	1.8	0.7	1.1	1.0	1.0	1.0
24	1	0.7	0.5	1.0	1.2	1.0	0.9	1.3	1.1	-0.2	0.4	1.3	1.2	2.0	0.7	1.6	1.0	1.0	1.1
36		0.5	0.6	0.8	1.2	1.0	1.0	1.4	1.5	0.0	0.5	1.3	1.1	1.8	0.8	0.9	1.0	1.0	1.0
48	2	0.6	0.5	0.8	1.2	1.0	1.1	0.7	1.0	-0.1	0.4	1.3	1.2	1.9	0.7	1.5	1.1	1.0	1.1
60		0.6	0.5	0.9	1.1	1.0	1.1	0.6	1.4	-0.3	0.4	1.3	1.2	1.6	0.6	1.0	1.1	1.0	1.1
72	3	0.4	0.9	0.7	1.2	1.0	1.1	0.6	1.1	-0.2	0.4	1.3	1.2	2.0	0.8	1.6	1.2	1.1	1.1
84		0.6	0.4	0.9	1.2	1.0	1.2	0.2	1.4	0.0	0.5	1.3	1.2	1.7	0.6	1.1	1.1	1.0	1.1
96	4	0.5	1.0	0.7	1.2	1.0	1.2	0.6	1.1	0.0	0.4	1.4	1.2	2.2	0.7	1.8	1.2	1.1	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.7 ±0.3						Av. air ± s. d. = 0.5 ±0.4						Av. air ± s. d. = 1.3 ±1.1					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.153) show that from the dissection data an estimated 958,442 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 151,678 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 52.7 – 55.6 g.h.m⁻³) or as a final dose (range 59.7 – 66.3 g.h.m⁻³) at 11°C in Arctic Snow nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.153: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³. + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly **eggs, 1st & 2nd instars** in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Arctic Snow Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	145,013	0		7,221	14,442	0
	1 st Instar	103,380	0		8,837	17,674	0
	2 nd instar	65,708	0		8,200	16,400	0
	Total	314,102	0		24,258	48,516	0
2	eggs	151,133	0		7,526	15,052	0
	1 st Instar	108,456	0		9,271	18,542	0
	2 nd instar	69,158	0		8,631	17,262	0
	Total	328,747	0		25,428	50,856	0
3	eggs	136,208	0		7,948	15,896	0
	1 st Instar	106,348	0		9,090	18,180	0
	2 nd instar	73,038	0		9,115	18,230	0
	Total	315,594	0		26,153	52,306	0
Total all reps		958,442	0		75,839	151,678	0

7.6.6 Nectarines – August Red

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.154 – 7.156. Temperatures were maintained evenly: ranging from 11.0 - 11.1°C air; fruit 11.1 - 11.2°C.

Table 7.154: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 8/5/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.4	35.8	36.4	35.9	11.0	11.1		
10	34.4	33.2	35.1	34.2	11.0	11.1	4.6	4.5
30	33.8	32.8	34.1	33.6	11.0	11.1	6.4	11.4
60	32.9	30.7	33.5	32.4	11.0	11.1	9.8	25.2
90	31.8	29.4	32.7	31.3	11.0	11.1	12.7	40.5
120	30.6	29.0	31.4	30.3	11.0	11.1	15.4	54.8
Average	32.7	31.0	33.4	32.4	11.0	11.1	9.8	
±s.d.	1.5	1.9	1.4	1.6			4.5	
Average dose range = 61.5 – 67.9 g.h.m ⁻³								

Table 7.155: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 9/5/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	35.8	32.9	33.7	34.1	11.1	11.2		
10	34.3	32.8	33.3	33.5	11.1	11.2	2.0	4.3
30	33.0	32.0	33.3	32.8	11.1	11.2	4.0	11.2
60	32.0	30.9	32.7	31.9	11.1	11.2	6.6	24.6
90	31.7	29.8	31.9	31.1	11.1	11.2	8.8	39.8
120	30.9	29.7	30.6	30.4	11.1	11.2	10.9	54.5
Average	32.4	31.0	32.4	31.9	11.1	11.2	6.5	
±s.d.	1.3	1.4	1.1	1.2			3.6	
Average dose range = 61.4 – 66.3 g.h.m ⁻³								

Table 7.156: Large scale trials of Medfly in infested **August Red Nectarines** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 10/5/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.4	33.7	32.2	33.4	11.0	11.2		
10	32.6	31.7	31.0	31.8	11.0	11.2	5.0	4.2
30	31.6	30.6	31.0	31.1	11.0	11.2	7.1	10.6
60	30.7	29.9	30.9	30.5	11.0	11.2	8.8	23.3
90	29.9	29.9	30.7	30.2	11.0	11.2	9.8	38.1
120	29.4	29.0	30.8	29.7	11.0	11.2	11.1	52.8
Average	30.8	30.2	30.9	30.6	11.0	11.2	8.3	
±s.d.	1.3	1.0	0.1	0.8			2.4	
Average dose range = 59.7 – 62.9 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.157

Table 7.157: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 2h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit:** : August Red Nectarines

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 8 - 15 May 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.7	0.0	0.7	1.3	1.3	1.5	2.5	0.7	0.6	1.2	1.2	1.4	0.8	0.6	2.5	1.2	1.4	1.2
24	1	2.0	0.2	0.8	1.1	1.2	1.3	2.2	0.6	0.5	1.0	1.1	1.3	1.0	0.8	2.3	1.0	1.3	1.1
36		1.9	0.0	0.8	1.0	1.1	1.2	2.7	0.8	0.6	1.2	1.0	1.3	0.6	0.3	2.6	1.1	1.4	1.1
48	2	2.0	0.1	0.9	0.9	1.1	1.2	2.3	0.7	0.7	1.1	1.0	1.4	0.9	0.7	2.5	1.0	1.3	1.0
60		2.0	0.1	0.8	1.0	1.1	1.3	2.1	0.7	0.6	1.1	1.0	1.4	0.1	-0.2	1.5	1.0	1.3	1.1
72	3	1.6	0.0	0.6	1.0	1.1	1.2	1.7	0.6	0.6	1.1	1.0	1.4	0.7	0.4	1.3	1.0	1.2	1.0
84		1.7	0.0	0.7	1.0	1.1	1.3	2.1	0.6	0.5	1.1	1.0	1.4	0.2	-0.1	1.6	1.0	1.3	1.1
96	4	2.0	0.0	0.7	1.0	1.1	1.3	1.7	0.6	0.6	1.1	1.1	1.4	0.7	0.4	1.4	1.0	1.3	1.1
		Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.4						Av. air ± s. d. = 1.1 ±0.3						Av. air ± s. d. = 1.0 ±1.3					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.158) show that from the dissection data an estimated 850,188 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 151,164 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 52.8 – 54.8 g.h.m⁻³) or as a final dose (range 59.7 – 67.9 g.h.m⁻³) at 11°C in August Red nectarines and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.158: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly **eggs, 1st & 2nd instars** in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: August Red Nectarines**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	124,383	0		7,885	15,770	0
	1 st Instar	90,994	0		8,345	16,690	0
	2 nd instar	60,879	0		8,884	17,768	0
	Total	276,257	0		25,114	50,228	0
2	eggs	129,632	0		8,218	16,436	0
	1 st Instar	95,462	0		8,227	16,454	0
	2 nd instar	64,075	0		8,151	16,302	0
	Total	289,170	0		24,596	49,192	0
3	eggs	136,905	0		8,679	17,358	0
	1 st Instar	93,607	0		8,585	17,170	0
	2 nd instar	54,250	0		8,608	17,216	0
	Total	284,761	0		25,872	51,744	0
Total all reps		850,188	0		75,582	151,164	0

7.6.7 Plums – Angelino

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.159 – 7.161. Temperatures were maintained evenly: ranging from 11.0°C air; fruit 11.1°C.

Table 7.159: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 7/4/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.8	34.5	34.0	34.1	11.0	11.1		
10	33.6	32.9	33.7	33.4	11.0	11.1	2.1	4.3
30	32.0	32.5	32.7	32.4	11.0	11.1	5.0	11.1
60	29.4	30.4	31.1	30.3	11.0	11.1	11.1	24.3
90	28.1	30.1	31.3	29.8	11.0	11.1	12.5	37.9
120	27.6	29.3	30.0	29.0	11.0	11.1	15.1	52.2
Average	30.1	31.0	31.8	31.0	11.0	11.1	9.1	
±s.d.	2.6	1.6	1.4	1.9			5.4	
Average dose range = 58.3 – 65.7 g.h.m ⁻³								

Table 7.160: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 8/4/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.1	33.4	32.0	33.2	11.0	11.1		
10	33.9	32.4	31.9	32.7	11.0	11.1	1.3	4.1
30	32.6	31.6	30.9	31.7	11.0	11.1	4.4	10.9
60	32.2	30.5	30.3	31.0	11.0	11.1	6.5	23.8
90	31.3	29.4	29.5	30.1	11.0	11.1	9.3	38.8
120	29.1	29.3	29.2	29.2	11.0	11.1	12.0	52.6
Average	31.8	30.6	30.4	30.9	11.0	11.1	6.7	
±s.d.	1.8	1.4	1.1	1.4			4.2	
Average dose range = 59.1 – 64.6 g.h.m ⁻³								

Table 7.161: Large scale trials of Medfly in infested **Angelino Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 9/4/2011. Applied dose 36g/m^3 . Expected dose 32g/m^3 for 2 hour exposure = 64 g.h.m^{-3}

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	34.7	33.2	34.5	34.1	11.0	11.1		
10	33.7	31.9	32.1	32.6	11.0	11.1	4.6	4.3
30	32.7	30.8	31.4	31.6	11.0	11.1	7.3	10.9
60	31.8	30.5	31.0	31.1	11.0	11.1	8.9	23.7
90	30.0	30.1	30.8	30.3	11.0	11.1	11.2	38.9
120	29.5	29.2	29.9	29.5	11.0	11.1	13.5	53.0
Average	31.5	30.5	31.0	31.0	11.0	11.1	9.1	
±s.d.	1.8	1.0	0.8	1.2			3.4	
Average dose range = $59.7 - 64.4\text{ g.h.m}^{-3}$								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.162

Table 7.162: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation $32\text{g/m}^3 \times 2\text{h}$ at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Angelino Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 7 - 14 April 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
Hours	Days	Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
		In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.3	0.5	1.1	1.5	1.5	1.4	1.1	0.6	0.8	1.1	1.1	1.1	1.0	0.6	1.3	1.3	1.3	1.2
24	1	0.9	0.5	0.9	1.5	1.4	1.3	0.5	0.5	0.7	1.0	1.1	1.0	0.3	1.0	1.2	1.2	1.3	1.2
36		1.2	0.5	1.0	1.5	1.4	1.1	1.2	0.7	0.9	1.1	1.2	1.1	0.9	0.8	1.5	1.1	1.3	1.1
48	2	1.0	0.5	0.8	1.3	1.4	1.0	0.6	0.5	0.7	1.1	1.2	1.1	0.5	1.1	1.4	1.1	1.3	1.1
60		1.3	0.5	1.1	1.2	1.4	1.0	1.0	0.7	0.9	1.1	1.2	1.1	0.2	0.5	1.4	1.1	1.3	1.2
72	3	1.2	0.6	1.1	1.1	1.3	1.0	1.1	0.8	1.1	1.1	1.2	1.1	0.2	0.4	1.3	1.1	1.3	1.2
84		1.1	0.4	1.0	1.1	1.3	1.0	0.9	0.6	0.8	1.1	1.2	1.1	0.1	0.4	1.2	1.1	1.3	1.2
96	4	1.3	0.5	1.0	1.0	1.3	1.0	1.0	0.8	1.0	1.1	1.2	1.1	0.0	0.4	1.1	1.1	1.2	1.2
		Av. fruit ± s. d. = 1.2 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1						Av. fruit ± s. d. = 1.2 ±0.1					
		Av. air ± s. d. = 0.9 ±0.3						Av. air ± s. d. = 0.8 ±0.4						Av. air ± s. d. = 0.8 ±0.9					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.163) show that from the dissection data an estimated 755,857 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 147,186 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 52.6 – 53.0 g.h.m⁻³) or as a final dose (range 58.3 – 66.7 g.h.m⁻³) at 11°C in Angelino plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.163: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³.+ Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly **eggs, 1st & 2nd instars** in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. **Test Fruit: Angelino Plums**

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	109,192	0		7,782	15,564	0
	1 st Instar	73,144	0		8,356	16,712	0
	2 nd instar	63,294	0		7,754	15,508	0
	Total	245,630	0		23,892	47,784	0
2	eggs	113,800	0		8,110	16,220	0
	1 st Instar	76,736	0		8,237	16,474	0
	2 nd instar	53,909	0		8,161	16,322	0
	Total	244,445	0		24,508	49,016	0
3	eggs	120,184	0		7,978	15,956	0
	1 st Instar	75,244	0		8,596	17,192	0
	2 nd instar	70,354	0		8,619	17,238	0
	Total	265,782	0		25,193	50,386	0
Total all reps		755,857	0		73,593	147,186	0

7.6.8 Plums – Tegan Blue

Fumigation treatments 32g x 2h at 11°C

Fumigation treatment records are given in tables 7.164 – 7.166. Temperatures were maintained evenly: ranging from 11.0°C air; fruit 11.1 - 11.2°C.

Table 7.164: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 1).
Trial date: 17/3/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	32.6	33.0	33.7	33.1	11.0	11.1		
10	31.6	31.8	32.9	32.1	11.0	11.1	3.0	4.1
30	29.0	30.4	31.9	30.4	11.0	11.1	8.1	10.7
60	28.4	29.3	30.3	29.3	11.0	11.1	11.4	22.8
90	28.1	29.0	29.5	28.9	11.0	11.1	12.8	36.7
120	27.6	28.2	29.2	28.3	11.0	11.1	14.4	50.5
Average	28.9	29.7	30.8	29.8	11.0	11.1	9.9	
±s.d.	1.6	1.4	1.6	1.5			4.5	
Average dose range = 56.6 – 62.6 g.h.m ⁻³								

Table 7.165: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 2).
Trial date: 18/3/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	32.9	32.5	35.1	33.5	11.0	11.1		
10	32.2	31.7	33.0	32.3	11.0	11.1	3.6	4.2
30	31.9	29.9	32.2	31.3	11.0	11.1	6.5	10.8
60	30.2	28.8	31.8	30.3	11.0	11.1	9.7	23.5
90	29.6	28.7	30.9	29.7	11.0	11.1	11.2	37.8
120	29.4	27.6	29.8	28.9	11.0	11.1	13.6	52.0
Average	30.7	29.3	31.5	30.5	11.0	11.1	8.9	
±s.d.	1.3	1.6	1.2	1.3			4.0	
Average dose range = 58.4 – 63.7g.h.m ⁻³								

Table 7.166: Large scale trials of Medfly in infested **Tegan Blue Plums** at 11.0 ± 0.5 °C (Replicate 3).
Trial date: 19/3/2011. Applied dose 36g/m³. Expected dose 32g/m³ for 2 hour exposure = 64 g.h.m⁻³

.Fumigation period (minutes)	MeBr g/m ³ measured in Top carton of fruit stack	MeBr g/m ³ measured in Mid-point carton of fruit stack	MeBr g/m ³ measured in bottom carton of fruit stack	Average dose in all 3 fruit cartons MeBr g/m ³	Air °C	Fruit °C	% loss of MeBr through sorption, leakage etc.	concentration x time sum g.h.m ⁻³
5	33.0	32.1	33.6	32.9	11.0	11.2		
10	31.4	31.5	32.8	31.9	11.0	11.2	3.0	4.1
30	30.4	30.4	31.8	30.9	11.0	11.2	6.2	10.6
60	29.5	29.7	30.7	30.0	11.0	11.2	8.9	23.2
90	28.7	28.7	29.5	29.0	11.0	11.2	12.0	37.5
120	28.2	27.8	28.6	28.2	11.0	11.2	14.3	50.7
Average	29.6	29.6	30.7	30.0	11.0	11.2	8.9	
±s.d.	1.3	1.4	1.7	1.5			4.5	
Average dose range = 57.0 – 62.9 g.h.m ⁻³								

Cold Treatment for 96 hours after fumigation

Cold treatments were conducted on fumigated fruit immediately after aeration of methyl bromide was completed. The 12 hour summary records are given below of all 3 replicate tests in table 7.167

Table 7.167: Cold Treatment at 1.5°C for 96 hours after Methyl Bromide Fumigation 32g/m³ x 2h at 11°C

Data of 3 replicate cold rooms: 12 hour average temperatures over the treatment period when majority of fruit sensor probes achieved 1.5°C. (Data corrected using calibration records before trial). **Test Fruit: Tegan Blue Plums**

Treatment period		Cold Treatment Data from 3 Replicate Cold Rooms. Treatment Dates: 17 - 25 March 2011																	
		Replicate 1: Cold Room #6						Replicate 2: Cold Room #7						Replicate 3: Cold Room #8					
		Air °C			Fruit °C			Air °C			Fruit °C			Air °C			Fruit °C		
Hours	Days	In	Ex	M	T	M	B	In	Ex	M	T	M	B	In	Ex	M	T	M	B
12		1.5	0.4	1.2	1.5	1.5	1.5	1.5	0.6	0.9	1.1	1.3	1.2	1.2	0.5	0.9	1.1	1.5	1.1
24	1	0.9	0.4	1.0	1.4	1.4	1.3	1.0	0.5	0.9	1.3	1.2	1.3	1.1	0.4	0.8	1.1	1.4	1.1
36		1.5	0.5	1.4	1.3	1.4	1.1	1.6	0.6	1.0	1.3	1.3	1.3	1.3	0.8	1.1	1.0	1.3	1.0
48	2	0.9	0.4	1.0	1.4	1.4	1.1	1.1	0.5	0.9	1.3	1.3	1.4	1.1	0.7	1.0	1.0	1.3	1.1
60		1.5	0.4	1.3	1.3	1.4	1.1	1.3	0.7	1.1	1.2	1.3	1.4	0.8	0.5	0.8	1.0	1.3	1.1
72	3	1.1	0.4	1.1	1.3	1.4	1.2	1.7	0.8	1.1	1.2	1.3	1.4	1.2	0.8	1.1	1.1	1.3	1.2
84		1.2	0.7	1.2	1.2	1.3	1.1	1.3	0.7	1.1	1.2	1.3	1.3	1.2	0.9	1.1	1.0	1.3	1.1
96	4	0.9	0.4	1.0	1.2	1.3	1.1	1.6	0.7	1.1	1.2	1.3	1.4	1.2	0.9	1.2	1.0	1.3	1.1
		Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.3 ±0.1						Av. fruit ± s. d. = 1.1 ±0.1					
		Av. air ± s. d. = 0.9 ±0.3						Av. air ± s. d. = 1.0 ±0.4						Av. air ± s. d. = 0.9 ±0.9					
Air Temperatures: In = Inlet Air; Ex = Exit Air; M = Middle of stack air. Fruit Temperatures: T = Top carton; M = Middle carton; B = Bottom carton in treatment stacks																			

Insect mortality from combined methyl bromide + cold treatments

The results (table 7.168) show that from the dissection data an estimated 834,386 viable Medfly were exposed to methyl bromide treatment, with no survivors. Another estimate from the pupae obtained in the untreated control fruit show that 144,576 Medfly were exposed to fumigation treatment. There were no survivors in all 3 replicates measured as a cumulative dose (range 50.5 – 52.0 g.h.m⁻³) or as a final dose (range 56.6 – 63.7 g.h.m⁻³) at 11°C in Tegan Blue plums and the treatment is suitable for probit 9 quarantine level of disinfestation.

Table 7.168: Large scale trials of Medfly. Fumigation at 11.0 ± 0.5 °C 32g/m³ for 2 hour exposure = 64 g.h.m⁻³ + Cold Treatment 1.5°C for 96 hours. Estimated number of viable Medfly eggs, 1st & 2nd instars in infested fruits on the day of fumigation and pupae recovered from control fruits (5 kg / rep/ stage) and treated fruit (10 kg / rep / stage) after completion of fumigation and cold treatments. Test Fruit: Tegan Blue Plums

Replicate	Stage	Estimated No treated in 90 kg/rep fruit before fumigation + cold treatment (9x10kg / rep / stage)	No. surviving both treatments		Number of pupae obtained in (untreated) control fruit (9 x 5 kg / rep / stage) 45 kg	Estimated number of pupae in treated fruit (9x10kg / rep / stage) 90 kg	Number of surviving pupae after fumigation treatment
1	eggs	125,173	0		7,656	15,312	0
	1 st Instar	88,757	0		8,353	16,706	0
	2 nd instar	70,538	0		7,284	14,568	0
	Total	284,467	0		23,293	46,586	0
2	eggs	130,455	0		7,979	15,958	0
	1 st Instar	93,115	0		8,234	16,468	0
	2 nd instar	61,534	0		7,666	15,332	0
	Total	285,103	0		23,879	47,758	0
3	eggs	116,578	0		8,427	16,854	0
	1 st Instar	91,305	0		8,593	17,186	0
	2 nd instar	56,934	0		8,096	16,192	0
	Total	264,816	0		25,116	50,232	0
Total all reps		834,386	0		72,288	144,576	0

CONCLUSIONS

Data for 8 cultivars treated at 11°C with a methyl bromide fumigation dose of 64 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. Approximately 10% methyl bromide was lost due to sorption and leakage; cumulative gas concentration over 3h was approximately 50 - 56 g.h.m⁻³ on average and about 61 - 66 g.h.m⁻³ when calculated on final methyl bromide concentration for the 24 large scale trials. The planned dosage was 32g/m³ for 2 h treatment giving cumulative gas concentration of 64 g.h.m⁻³. Cold treatment was maintained between 1.0 – 1.2°C over 96 hours. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times for both treatments if applied alone. The Probit 9 estimates show that this combined treatment of Medfly eggs, 1st and 2nd instar stages are sufficient for disinfestation of Medfly eggs in cherries, peaches, nectarines and plums. The results show that Probit 9 level of disinfestation was successfully achieved.

6.7 SUMMARY AND CONCLUSIONS

This work provides the scientific basis for methyl bromide fumigation of 96 g.h.m⁻³ at 6°C and 63-64 g.h.m⁻³ 11°C cold disinfestation of Mediterranean fruit fly for the export of Australian cherries, peaches, nectarines and plums to Korea, Japan, USA, NZ and other countries. All 4 combinations of methyl bromide dose were equally effective. The choice of preferred dose which bests achieves fruit quality is left to the exporter. However, none of the treatment combinations tested affected fruit quality.

The data shows that the required dosage and temperature of 6°C and 11°C was maintained throughout the trials. The cold treatment temperature was well maintained at 1.0 – 1.2°C for 96 hours. In every replicate more than 10,000 pupae were treated in every fruit variety tested. The records of mortality show that more than 100,000 insects were successfully disinfested by the 4 fumigation treatments:

32g/m³-x 3 hours at 6°C

Data for 8 cultivars treated at 6°C with a methyl bromide fumigation dose of 96 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times than for both treatments if applied alone. The results show that Probit 9 level of disinfestation was successfully achieved in cherries, peaches, nectarines and plums.

48g/m³-x 2 hours at 6°C

Data for 8 cultivars treated at 6°C with a methyl bromide fumigation dose of 96 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times than for both treatments if applied alone. The results show that Probit 9 level of disinfestation was successfully achieved in cherries, peaches, nectarines and plums.

21g/m³-x 3 hours at 11°C

Data for 8 cultivars treated at 11°C with a methyl bromide fumigation dose of 63 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times for both treatments if applied alone. The results show that Probit 9 level of disinfestation was successfully achieved in cherries, peaches, nectarines and plums.

32g/m³-x 2 hours at 11°C

Data for 8 cultivars treated at 11°C with a methyl bromide fumigation dose of 64 g.h.m⁻³ followed by cold treatment of 1°C for 4 days shows that complete mortality was achieved in >30,000 insects. The results of the combined dose-mortality trials show that eggs, 1st and 2nd instar stages are effectively controlled by the treatments at lower doses and shorter times for both treatments if applied alone. The results show that Probit 9 level of disinfestation was successfully achieved in cherries, peaches, nectarines and plums.

The requirements of the international protocols of China, Korea, Japan, USA, NZ and other countries have been satisfied for the conduct of the large scale trials for the methyl bromide disinfestation of 2 varieties each of cherries, peaches, nectarines and plums against eggs of Mediterranean fruit fly at 6°C and 11°C.

8. RESIDUE ANALYSIS OF METHYL BROMIDE IN STONE FRUIT

METHYL BROMIDE RESIDUES IN STONE FRUIT

In 2008 and 2010 - 11 at the end of specific large scale fumigation trials stone fruit samples were frozen and submitted for residue analysis to the internationally accredited Government Chemistry Centre (<http://www.chemcentre.wa.gov.au>) Resources and Chemistry Precinct, Curtin University, Bentley WA 6102.

No methyl bromide residues could be detected therefore fruit were analysed for bromide residues by ion chromatography. The results are summarised in table 1 below.

Table 1: Residues of bromide after methyl bromide fumigation of stone fruit

Variety	Fumigation temperature	Applied Dose	Exposure period hours	Residue level bromide mg/kg	Difference from control mg/kg (ppm)
<i>Report of Examination Reference No. 09/714 08E0708; 3:1:1 of 11/12/2008</i>					
Cherries	6°C	Control	0	<5	0
		60 g.m ⁻³	4 h	16	11
Peaches	6°C	Control	0	<5	0
		60 g.m ⁻³	4 h	6	1
Nectarines	6°C	Control	0	<5	0
		60 g.m ⁻³	4 h	7	2
Plums	6°C	Control	0	<5	0
		60 g.m ⁻³	4 h	<5	0
Cherries	11°C	Control	0	<5	0
		62.5 g.m ⁻³	3 h	7	2
Peaches	11°C	Control	0	<5	0
		75 g.m ⁻³	3 h	7	2
Nectarines	11°C	Control	0	<5	0
		75 g.m ⁻³	3 h	6	1
Plums	11°C	Control	0	<5	0
		62.5 g.m ⁻³	3 h	<5	0
<i>Report of Examination Reference No. 11/3298 10E2083of 12/05/2011</i>					
Cherries	11°C	Control	0	<5	0
		21 g.m ⁻³	3 h	<5	0
Peaches	11°C	Control	0	<5	0
		21 g.m ⁻³	3 h	<5	0
Nectarines	11°C	Control	0	<5	0
		21 g.m ⁻³	3 h	<5	0
Plums	11°C	Control	0	<5	0
		21 g.m ⁻³	3 h	<5	0
Cherries	11°C	Control	0	<5	0
		32 g.m ⁻³	2 h	<5	0
Peaches	11°C	Control	0	<5	0
		32 g.m ⁻³	2 h	<5	0
Nectarines	11°C	Control	0	<5	0
		32 g.m ⁻³	2 h	<5	0

Plums	11°C	Control	0	<5	0
		32 g.m ⁻³	2 h	<5	0
Cherries	6°C	Control	0	<5	0
		32 g.m ⁻³	3 h	<5	0
Peaches	6°C	Control	0	<5	0
		32 g.m ⁻³	3 h	<5	0
Nectarines	6°C	Control	0	<5	0
		32 g.m ⁻³	3 h	<5	0
Plums	6°C	Control	0	<5	0
		32 g.m ⁻³	3 h	<5	0
Cherries	6°C	Control	0	<5	0
		48 g.m ⁻³	2.5 h	<5	0
Peaches	6°C	Control	0	<5	0
		48 g.m ⁻³	2.5 h	<5	0
Nectarines	6°C	Control	0	<5	0
		48 g.m ⁻³	2.5 h	<5	0
Plums	6°C	Control	0	<5	0
		48 g.m ⁻³	2.5 h	<5	0
Cherries	6°C	Control	0	<5	0
		48 g.m ⁻³	4 h	<5	0
Peaches	6°C	Control	0	<5	0
		48 g.m ⁻³	4 h	<5	0
Nectarines	6°C	Control	0	<5	0
		48 g.m ⁻³	4 h	<5	0
Plums	6°C	Control	0	<5	0
		48 g.m ⁻³	4 h	<5	0
Cherries	6°C	Control	0	<5	0
		48 g.m ⁻³	6 h	<5	0
Peaches	6°C	Control	0	<5	0
		48 g.m ⁻³	6 h	9	4
Nectarines	6°C	Control	0	<5	0
		48 g.m ⁻³	6 h	7	2
Plums	6°C	Control	0	<5	0
		48 g.m ⁻³	6 h	<5	0

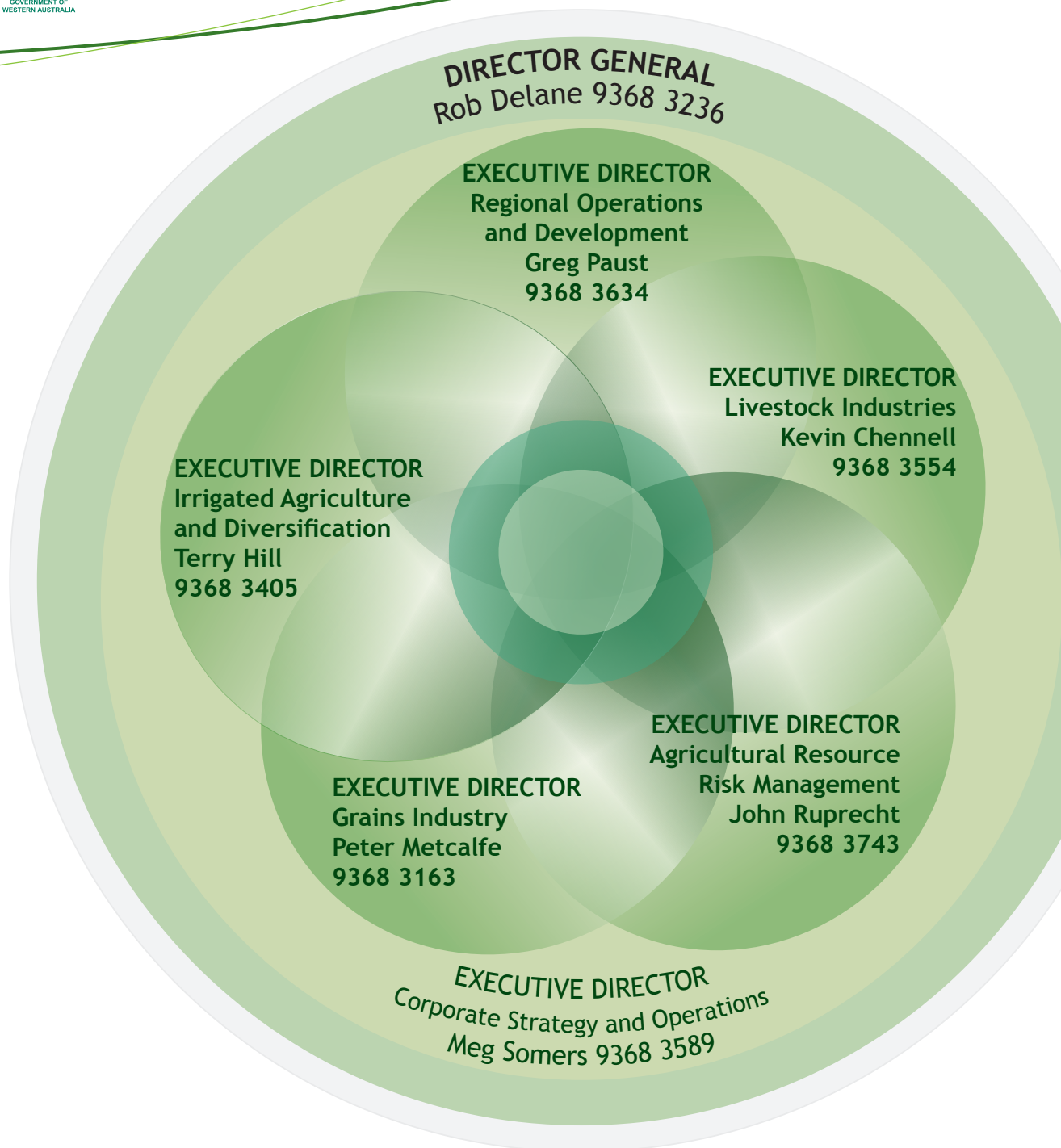
Some treatment doses higher than proposed in this report were tested and these show bromide residues higher than control. Some of the recommended fumigation treatments have residues greater than control but none of the residues exceed the legislated maximum residue limit of 20 mg/kg.

In the Australian Government Federal Register of Legislative Instruments F2011C00552 (Schedule 1) (www.comlaw.gov.au/.../f74586cf-c16c-4853-8f01-d071bb889312) the maximum residue limit for inorganic bromide (Bromide ion) in stone fruits is 20 mg/kg (20 ppm).

9. REFERENCES

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Genstat Release 8.1 2005. Lawes Agricultural Trust. Rothamsted, UK, Rothamsted Experimental Station.



IRRIGATED AGRICULTURE AND DIVERSIFICATION

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**Irrigated Agriculture Industries
Development**
David Windsor

Agri-business Development
Paul Frapple

Food Industry Development
Stuart Clarke

GRAINS INDUSTRY

Genetic and Product Innovation
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Practice and Systems Innovation
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APPENDIX 2

DISINFESTATION RESEARCH FACILITIES SCHEMATIC & MEDITERRANEAN FRUIT FLY COLONY.

DISINFESTATION RESEARCH FACILITIES, DEPARTMENT OF FOOD & AGRICULTURE WESTERN AUSTRALIA 2011

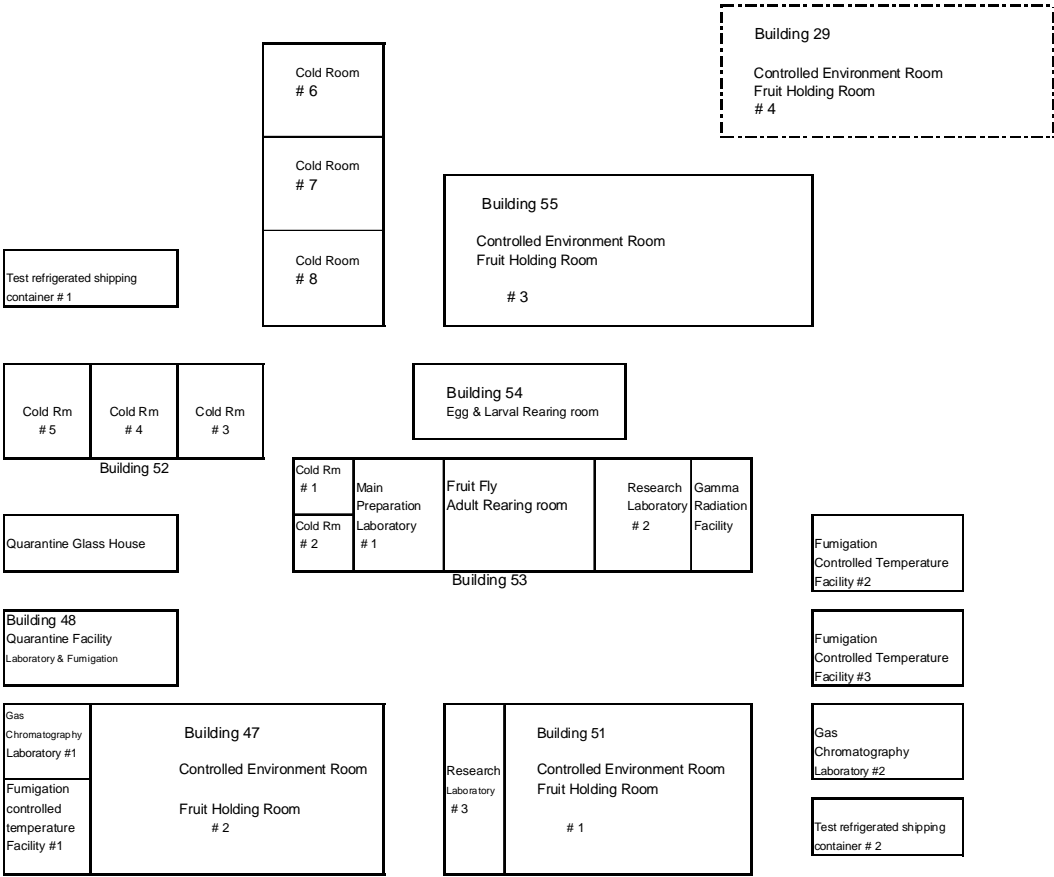




Figure 1 : Rearing cages for adult Mediterranean fruit fly. Four cages each containing 250,000 to 300,000 adult flies are maintained in the constant environment room. A fresh cage is prepared each week for continuous breeding of the insect population.



Figure 2 : Rearing cages for immature stages of the Mediterranean fruit fly. The cage to the right holds the trays for rearing of Mediterranean fruit fly larvae, while the cage to the left is the pupal maturation cage.

Appendix 3

Cold treatment rooms, Temperature Controls and Recording equipment

Figure 1 Building 52 houses three cold rooms #3, #4, #5, for 3 replicated cold disinfestation trials to be done simultaneously. View of refrigeration units - there is a separate compressor for each cold room. There is a separate thermostat controller and a separate alarm relay for each cold room. Temperatures are measured and logged using Grant Squirrel data loggers Model 1256 Series, one for each cold room. The loggers are connected to the computer via RS 232 C serial interface.

Figure 2 Building 52B houses three cold rooms #6, #7, #8, for 3 replicated cold disinfestation trials to be done simultaneously. View of refrigeration units - there is a separate compressor for each cold room. There is a separate thermostat controller and a separate alarm relay for each cold room. Temperatures are measured and logged using Grant Squirrel data loggers Model 2020 Series, one for each cold room. The loggers are connected to the computer via an Ethernet interface.

Figure 3 View of temperature probe sensors in cold room to record air and fruit temperatures during trials. Details of location of sensor probes for each trial are given in the main report. Temperature sensors (type U mini thermistors) are calibrated against a certified mercury glass thermometer immersed in melting ice before and after each trial.



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Figure 3 View of temperature probe sensors in cold room to record air and fruit temperatures during trials. Details of location of sensor probes for each trial are given in the main report. Temperature sensors (type U mini thermistors) are calibrated against a certified mercury glass thermometer immersed in melting ice before and after each trial.

Appendix 4

MOST TOLERANT STAGE TRIALS

COLD Treatment at 1 & 3°C

MEBR Fumigation at 6°C & 11°C

Figure 1 Natural infestation of cherries in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. After the required period of infestation the trays containing the fruits are removed and any flies remaining are cleared using a moist cotton swab (above bottom right). This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.

Figure 2 Natural infestation of nectarines in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.

Figure 3 Natural infestation of peaches in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.

Figure 4 Natural infestation of plums in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.

Figure 5 Infested cherries, plums, peaches and nectarines are placed in polystyrene trays over sand in ventilated plastic boxes and covered with terylene voile for incubation of eggs and larvae at $26\pm 1^\circ\text{C}$; 60-65% rh to determine the life history in each variety before each series of trials.

Figure 6 Most Tolerant Stage trials. Infested fruits are placed in ventilated plastic boxes for incubation of eggs and larvae at $26\pm 1^\circ\text{C}$; 60-65% rh before being placed in cold rooms for treatment. After the designated cold treatment period the fruits are incubated for emergence of pupae.

Figure 7 The plastic boxes (shown in Figure 6) containing immature stages in fruits are placed in 3 replicate cold rooms for exposure to 1°C or 3°C for conduct of the Most Tolerant Stage trials. Plastic boxes are removed from the cold room on designated dates after required period of cold exposure and returned to the incubation room to count survivors as pupae.

Figure 8 Methyl Bromide Most Tolerant Stage trials. Fruits containing infested immature stages of Medfly are exposed to a series of doses in glass desiccators at controlled temperatures 6 & 11°C in separate fumigation rooms (top). Methyl bromide concentrations are monitored at 30 minute intervals throughout the trial period using gas chromatography (centre). After aeration, treated fruits are placed in plastic boxes and incubated for emergence of pupae at $26\pm 1^\circ\text{C}$; 60-65% rh (bottom).



Figure 1 Natural infestation of cherries in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. After the required period of infestation the trays containing the fruits are removed and any flies remaining are cleared using a moist cotton swab (above bottom right). This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.

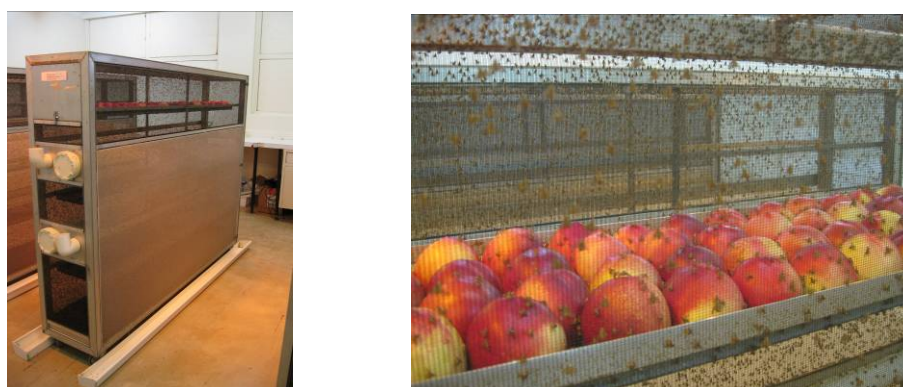


Figure 2 Natural infestation of nectarines in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.



Figure 3 Natural infestation of peaches in cages containing approximately 100,000 male and female adults of Mediterranean fruit fly. This natural infestation method is used for all trials: cold treatment, methyl bromide fumigation and combination of methyl bromide + cold treatment.



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Figure 5 Infested cherries, plums, peaches and nectarines are placed in polystyrene trays over sand in ventilated plastic boxes and covered with terylene voile for incubation of eggs and larvae at $26 \pm 1^\circ\text{C}$; 60-65% rh to determine the life history in each variety before each series of trials.



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Figure 7 The plastic boxes (shown in Figure 6) containing immature stages in fruits are placed in 3 replicate cold rooms for exposure to 1°C or 3°C for conduct of the Most Tolerant Stage trials. Plastic boxes are removed from the cold room on designated dates after required period of cold exposure and returned to the incubation room to count survivors as pupae.



Figure 8 Methyl Bromide Most Tolerant Stage trials. Fruits containing infested immature stages of Medfly are exposed to a series of doses in glass desiccators at controlled temperatures 6 & 11 °C in separate fumigation rooms (top). Methyl bromide concentrations are monitored at 30 minute intervals throughout the trial period using gas chromatography (centre). After aeration, treated fruits are placed in plastic boxes and incubated for emergence of pupae at $26 \pm 1^\circ\text{C}$; 60-65% rh (bottom).

APPENDIX 5

LARGE SCALE TRIALS : COLD & FUMIGATION TREATMENTS

Figure 1 Large Scale trials at 1°C or 3°C: Styrofoam trays containing fruits infested with 1st and 2nd instar Medfly for disinfestation at 1°C and 3°C are placed in cartons containing filler fruits during loading in the cold rooms. Trials in cold rooms are monitored with temperature sensor probes in fruit and in air. There are 8 pallet stacks each 7 layers high in each cold room. Each of the 3 replicate cold rooms #3, #4, #5 is filled in the same way.

A similar setup was done for the combined treatments of methyl bromide fumigation followed by cold treatment at 1°C in cold rooms #3, #4, #5 and #6, #7, #8.

After the designated period of cold treatment the fruits are incubated (with untreated control fruit) for emergence of pupae at 26±1°C; 60-65% rh.

Figure 2 Stacking arrangements for stone fruit pallets in each replicate cold room. A similar setup was followed for each variety tested in cold treatments and in combined treatments in cold rooms #3, #4, #5 and #6, #7, #8.

Figure 3 Large Scale methyl bromide fumigation trials: Ventilated cardboard cartons containing fruits infested with eggs, 1st and 2nd instar larvae Medfly for fumigation at 6°C and 11°C are placed with 18 cartons containing filler fruits during loading in the 1067 litre fumigation chamber. Trials are monitored with temperature sensor probes in fruit and in air. Methyl bromide concentrations are monitored at 30 minute intervals throughout the trial period using a Riken® Gas Interferometer and gas samples are collected in 100 ml gastight aluminum lined bags for confirmatory analysis using gas chromatography. Treatments are replicated 3 times at each dose. After fumigation the fruits are incubated (with untreated control fruit) for emergence of pupae at 26±1°C; 60-65% rh.

A similar procedure was done for the combined treatments of methyl bromide fumigation followed by cold treatment at 1°C in cold rooms #3, #4, #5 and #6, #7, #8.

Figure 4 Commercial Scale methyl bromide fumigation trials: Ventilated cardboard cartons containing fruits infested with eggs, 1st and 2nd instar Medfly for fumigation at 6°C and 11°C are placed with cartons containing uninfested filler fruits during loading in the 40 m³ fumigation chamber. Trials are monitored with temperature sensor probes in fruit and in air. Methyl bromide concentrations are monitored at 30 minute intervals throughout the trial period using a Riken® Meter and gas samples are collected in 100 ml gastight aluminum lined bags for confirmatory analysis using gas chromatography. Treatments are replicated 3 times at each dose. After fumigation the fruits are incubated (with untreated control fruit) for emergence of pupae at 26±1°C; 60-65% rh.

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After the designated period of cold treatment the fruits are incubated (with untreated control fruit) for emergence of pupae at 26±1°C; 60-65% rh.

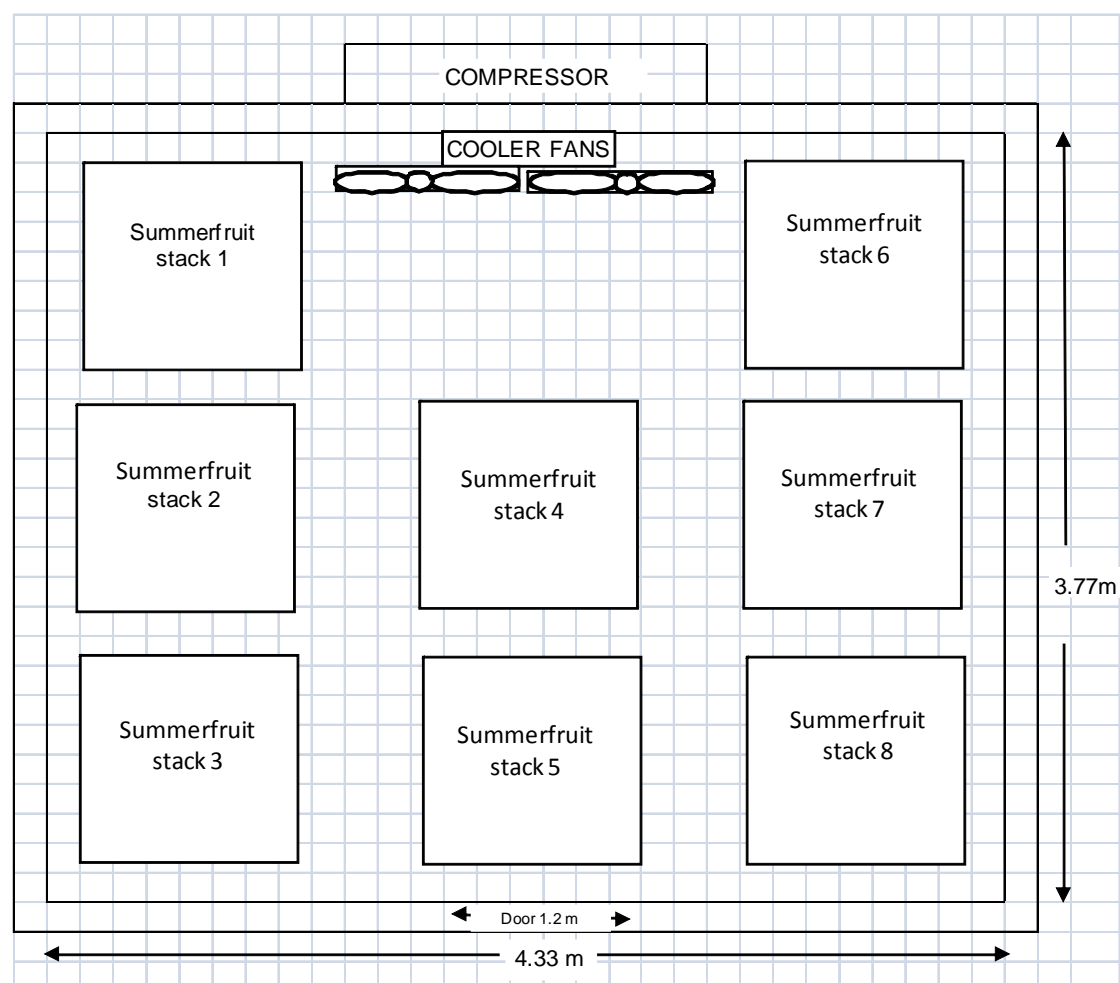


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A similar procedure was done for the combined treatments of methyl bromide fumigation followed by cold treatment at 1°C in cold rooms #3, #4, #5 and #6, #7, #8.

Appendix 6

FRUIT QUALITY AFTER FUMIGATION

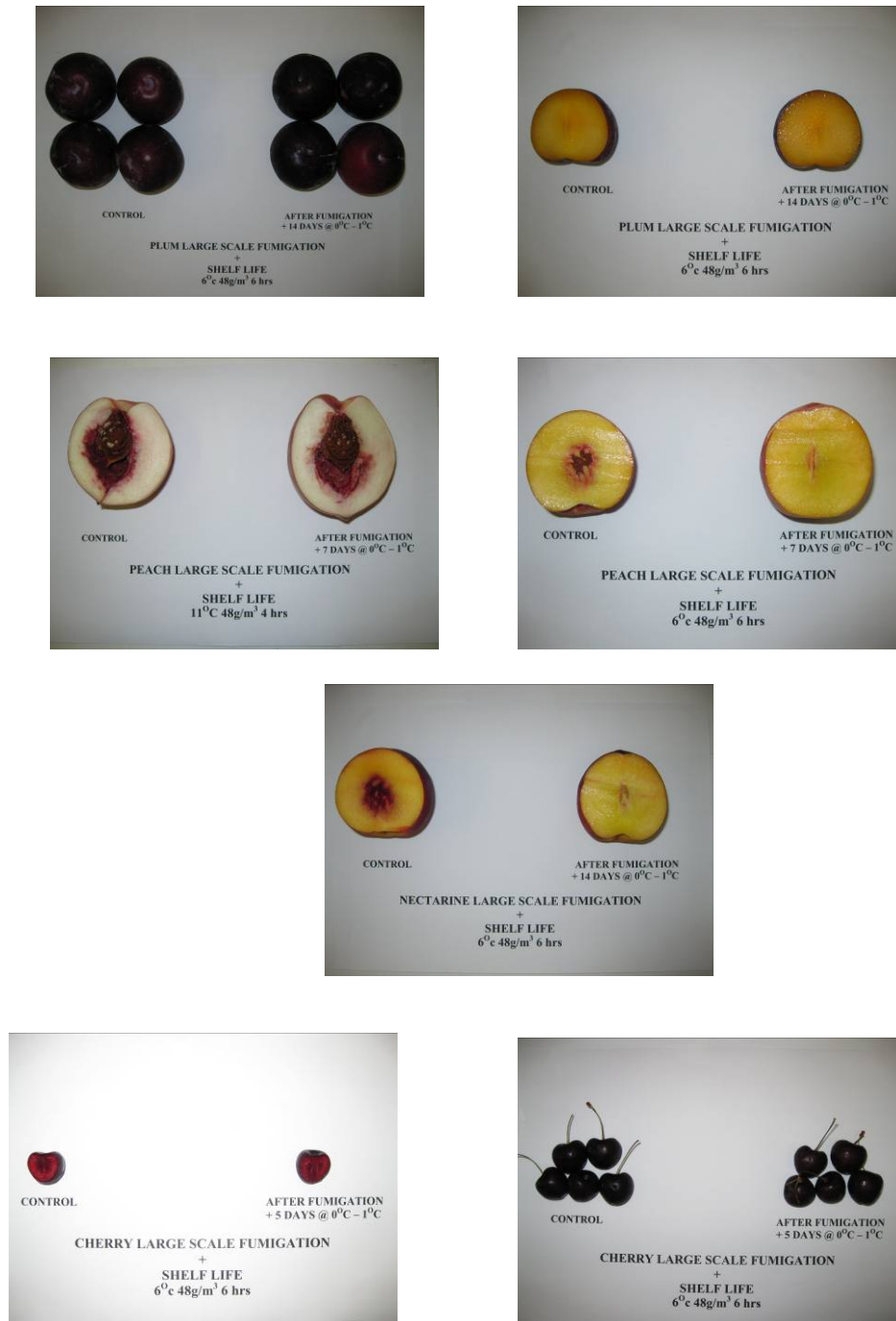


Figure 1 Quality of plums, peaches, nectarines and cherries 5 – 14 days after fumigation at 48 g/m³ for 6 hours. No damage from fumigation or cold storage is found.