REPORT

Fukuoka, Japan
8–12 July 2013

Technical Panel on Phytosanitary Treatments
July 2013

Food and Agriculture Organization of the United Nations

CONTENTS

APPENDIXES

1. Opening of the Meeting

1.1 Welcome remarks

[1] The Host, Mr Masato FUKUSHIMA, Director of the Plant Quarantine Office, Plant Protection Division, Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF), Government of Japan, welcomed the participants of the Technical Panel on Phytosanitary Treatments (TPPT) meeting to Fukuoka. He underlined the importance of the International Plant Protection Convention (IPPC) work programme, and wished the participants a good and productive meeting.

[2] The IPPC Secretariat (hereafter Secretariat) thanked Mr FUKUSHIMA for hosting the meeting and also welcomed the participants.

[3] The panel members and Secretariat staff introduced themselves and briefly described their positions and roles in their home organizations.

1.2 Selection of Chairperson and Rapporteur

[4] The panel elected Mr Patrick GOMES as Chair.

[5] The panel elected Mr Guy HALLMAN as Rapporteur.

1.3 Review and adoption of the agenda

[6] The panel reviewed and adopted the agenda (see Appendix 1).

2. Administrative Matters

2.1 Documents list

[7] The panel reviewed and updated the documents list (see Appendix 2).

2.2 Participants list

[8] Panel members reviewed their contact information (see Appendix 3) and agreed to update it on the International Phytosanitary Portal (IPP)[1]. The Secretariat noted that if necessary invited expert was not able to travel to the meeting would participate via the internet for the relevant agenda items.

2.3 Local information

[9] The meeting organizer provided further information and answered logistical questions regarding the meeting and its location.

3. Updates from Relevant Bodies

3.1 2013 May Standards Committee

[10] The following items arose from the 2013 May Standards Committee (SC) meeting[2] for the TPPT to consider.

Call for experts

[11] The SC decided that the TPPT proposed call for experts for new TPPT members will be held to increase the membership of the TPPT and to add expertise in several areas.

[1] IPP can be found at https://www.ippc.int

[2] The report of the 2013 May SC meeting can be found at https://ippc.int/publications/2013-05-report-standards-committee

Call for treatments

[12] The SC decided that the TPPT recommendation to hold a call for treatments under the topics irradiation (2006-014), soil and growing media (2009-006), and fruit flies (2006-024) will be postponed.

3.2 Other technical panels

Technical Panel on Forest Quarantine

[13] The Technical Panel on Forest Quarantine (TPFQ) met in June 2013 in Brazil and drafted an annex to ISPM 15:2009 (*Regulation of wood packaging material in international trade*). This annex, *Process for testing new treatments for ISPM 15 (2006-010),* describes new treatments for inclusion in ISPM 15:2009; these need to be evaluated in accordance with procedures outlined in ISPM 28:2007 (*Phytosanitary treatments for regulated pests*).

[14] The TPFQ considered and agreed that better defined requirements are needed for ISPM 15:2009 treatments. Treatment submitters should ensure that a range of factors has been tested in the development of a phytosanitary treatment proposed for ISPM 15:2009. Such factors include the treatment's effect on quarantine pests and pest life stages likely to be associated with wood packaging material; the effect on treatment efficacy of wood types (e.g. hardwood vs. softwood, timber vs. logs); and environmental conditions (e.g. temperature, moisture content).

[15] One member asked how many individuals need to be tested for each target pest (test size). It was noted that the number of replicates required for testing that would be used to extrapolate the results will depend on the fit of the actual response data to the theoretical dose-response curve (and required sensitivity of the outcome at the 95% level of confidence). It is recommended that at least ten replicates are initially included, although the greater the number of replicates, the higher the confidence of the conclusions drawn. The level of efficacy initially required for treatment success is 99.99683% at the 95% level of confidence for all organisms selected for testing. However, for many species (e.g. *Anoplophora glabripennis*) it is difficult to obtain sufficient number on individual to allow for this level of testing, test sizes need to (1) better reflect the actual risk presented by the pest in international trade and (2) be based on statistically valid extrapolations or the use of substitute species.

[16] The draft annex is being finalized by the TPFQ and will be sent to the TPPT for review and comment. It will then be recommended to the SC for member consultation.

3.3 IPPC Secretariat

Standard setting process

[17] The Secretariat gave a presentation on the current standard setting process. The Secretariat suggested adding the *Working TPPT criteria for treatment evaluation* document to the Procedure Manual for Standard Setting, which is to be used by national plant protection organizations (NPPOs) and regional plant protection organizations (RPPOs) as a reference when submitting treatment data in response to a call for treatments. The panel agreed to this.

Expert Consultation on Cold Treatments

[18] The Secretariat gave a presentation that had been given at CPM-8 (2013) on the Expert Consultation on Cold Treatments (ECCT). The presentation highlighted the lack of harmonization in the use of cold treatments in international trade. The ECCT meeting is scheduled for 2–6 December 2013 in Buenos Aires, Argentina and concept note for the ECCT is posted on the IPP.

[19] The Secretariat noted that it had issued a call for experts and scientists to participate in the ECCT. The closing date for the call is 30 August 2013.

Phytosanitary treatment portfolios

[20] During the 2013 June TPPT virtual meeting, the Secretariat proposed a new type of document – the "treatment portfolio" – to track the history, main stages of development and decisions taken in regards to the development of a treatment. These documents will be updated before and after a treatment is discussed during a TPPT meeting (virtual or face-to-face) and will be used as a working paper for future meetings. The panel welcomed the concept, noting that it would facilitate discussions and aid new members.

Status chart of phytosanitary treatments under the TPPT work programme

[21] The Secretariat had developed a status chart to visually track the progress of each treatment submission under the TPPT work programme. The panel suggested a few changes to the format for clarity.

[22] The TPPT welcomed the concept, noting that it would facilitate discussion and suggested to have it as a working paper for next face-to-face meeting.

Phytosanitary treatment numbering and naming conventions

[23] In past years the SC had expressed concerns regarding treatment titles and had requested they be more specific (e.g. by including the treatment schedule in the official title). The SC considered the lack of specificity a disadvantage when similar treatments are being discussed and reviewed. Currently, the official treatment title does not contain specific information regarding the treatment schedule, but a unique identifier called the topic number is used until the treatment is adopted.

[24] The Secretariat requested the TPPT to consider whether it is necessary to include the treatment schedule information in treatment titles, in particular for treatments that have the same active ingredient, pest and host.

[25] The panel suggested placing the topic number at the beginning of the file, using shorthand (international codes) for treatment type and pest names, and/or providing the schedule in parentheses (e.g. (2C/16D)). It was noted that the concern regarding treatment title may be a one-time issue and may not arise again. The TPPT recommended that the Secretariat considers continuing to name treatments in the current way, explaining the current naming convention to SC and IPPC members, and moving the topic number to the front of the treatment title.

TPPT Lead and Support

[26] The Secretariat reminded the panel that, after this meeting, Ms Stephanie DUBON will no longer be the Secretariat support for the TPPT and Mr Artur SHAMILOV will remain the TPPT Secretariat lead for the panel. The panel thanked Ms DUBON for her hard work over the past three years.

4. Review of Wood packaging material treatments (2006-015)

[27] During member consultation for the draft *Heat treatment of wood packaging material using dielectric heating* (2007-114), some countries raised concerns about the lack of implementation information on the dielectric heat treatment. In response, the Italian company Emitech, developed a brochure to demonstrate the technology used to apply dielectric heating. The Secretariat provided the TPPT with this document, titled *Wood pallets and packaging from the birth of ISPM 15 to the present: History, national and international legislation, practical and operational aspects of the standards for packaging companies and users, managing treatments, traceability, managing new and used packaging, Fitok System*. The document covers the application of microwave treatments for wood packaging material and its potential use under ISPM 15:2009.

[28] The Secretariat reminded the panel that the SC, on request from the submitting NPPO, had removed the treatment *Methyl isothiocyanate and sulfuryl fluoride (Ecotwin mixture) fumigation for* Bursaphelenchus xylophilus, *Coleoptera: Cerambycidae, and Coleoptera: Scolytinae of wood packaging material* (2007-102) from the *List of topics for IPPC standards*.

4.1 Sulfuryl fluoride fumigation of wood packaging material (2007-101)

[29] The treatment lead provided an update on this treatment based on information received from the submitter immediately before the meeting. In response to the 2010 TPPT request and 2010 TPPT meeting report, the submitter provided the results of research completed in 2011 and 2012 (Bonifacio L. Inácio M. L., Sousa, E. Buckley S. & Thoms E. M**.** 2013) *Complementary studies to validate the proposed fumigation schedules of sulfuryl fluoride for inclusion in ISPM No. 15 for the eradication of pine wood nematode (Bursaphelenchus xylophilus) from wood packaging material*. Because the additional information was submitted late, the panel was able to only briefly analyse these results and made the following observations:

- The panel agrees it is plausible that the eggs stage of pinewood nematode, *Bursaphelenchus xylophilus* (PWN), is the most resistant life stage to sulfuryl fluoride fumigation, and would be controlled by extending the fumigation period to 48 hours as proposed. However, the panel would need to confirm this by discussion with PWN experts on life-cycle response to temperature.

[30] The panel expressed concerns that lower temperature treatment (from 15 ºC to 20 ºC) is not consistent with the life-stage tolerance concept applied to the 20 ºC treatment.

[31] It was agreed to consider this treatment at the next TPPT meeting, after consultation with PWN specialists, to complete the evaluation.

4.2 Heat treatment of wood packaging material using dielectric heating (2007-114)

[32] The CPM-8 (2013) adopted the newly revised ISPM 15:2009 Annex 1 *Approved treatments associated with wood packaging material*, which includes guidance on treating wood packaging material using dielectric heating. Because of this adoption, the panel could again work on *Heat treatment of wood packaging material using dielectric heating* (2007-114). This draft annex to ISPM 28:2007 was put on hold by the SC after member consultation in 2010 until member countries had gained some experience with the use of dielectric heating. The panel reconsidered the title of the annex as the scope of the treatment is wood, not only wood packaging material. The TPPT agreed to change the title to *Heat treatment of wood using dielectric heating* (2007-114).

[33] Because the ISPM 28:2007 dielectric heating treatment schedule is for wood (not just wood packaging material), it is independent of ISPM 15:2009 and, therefore, the evaluation and approval process should proceed independently of the TPFQ, under the work plan of the TPPT.

[34] Since Annex 1 to ISPM 15:2009 and the draft treatment schedule were developed, new research has indicated that some of the limitations of the treatment stated in Annex 1 to ISPM 15:2009 (e.g. limit the wood dimensions to 20 cm) may not be necessary or appropriate for a treatment schedule developed for ISPM 28:2007. A number of trials are under way on radio frequency and the results will be available soon. Dielectric heating incorporates both microwaves and radio frequency and, as discussed during the June 2013 TPFQ meeting, compared to microwaves, radio frequency has greater penetration and need not be limited to 20 cm dimensions. Therefore, it was recommended that the panel hold off evaluating the treatment pending publication of the research. One member asked if the new research was carried out to determine the penetration level or the efficacy for the different type of pests. The treatment lead explained that research on temperature effectiveness targeted all aspects of the treatment, such as type of wood, penetration, and affected insects, nematodes and fungi (one species).

[35] The TPFQ, at its meeting in June 2013, suggested that the TPPT consider any discrepancy that might exist between the proposed Heat treatment of wood packaging material using dielectric heating (2007-114) and adopted ISPM 15:2009 Annex 1. The TPPT agreed to consider this and other possible discrepancies while drafting the treatment schedule. The panel agreed to evaluate the dielectric heating treatment at a future TPPT meeting

[36] A concern was raised by the TPPT that, while additional research regarding radio waves would greatly broaden the application technology, the existing guidelines lack such useful information. The Secretariat informed the panel that at its 2013 May meeting the SC considered the TPPT concern that the TPPT should be given the opportunity to review treatment guidelines and other material related to guidance on phytosanitary treatments before final approval by the Capacity Development Committee (CDC). The SC requested that the Secretariat provide an opportunity for the TPPT to review this material before final approval by the CDC, and agreed that guidelines and training material for all treatment standards should not be released before formal approval of the standards.

[37] The TPPT highlighted that the Secretariat had not yet provided an opportunity for the TPPT to submit comments on treatment guidelines. The panel therefore again requested the opportunity to review such guidelines before final approval. Particular note was made of the dielectric heating guidelines and the new data, which could be available for radio waves and considered for implementation of ISPM 15:2009. The panel considered that this information should be incorporated into the guidelines.

[38] The TPPT changed the title of the topic 2007-114 from *Heat treatment of wood packaging material using dielectric* heating to *Heat treatment of wood using dielectric heating* (2007-114) and *asked* the Secretariat to reflect this change in the List of topics for IPPC standards.

[39] The TPPT:

(1) *recommended* that the SC consider whether the TPPT should be provided the opportunity to review all treatment guidelines before approval by the CDC to ensure the guidelines are of the highest standard. The TPPT review would take into account any new data that may have become available regarding the treatment guideline.

5. Review of Irradiation treatments (2006-014)

5.1 Irradiation for *Ostrinia nubilalis* (2012-009)

[40] The treatment lead provided an update on this treatment based on information received from the submitter, noting that all requirements had been met and recommending that this treatment should be progressed. This treatment prescribes irradiation at 289 Gy absorbed dose to prevent F_1 development from treated eggs through late pupae of *Ostrinia nubilalis.* One member raised a concern regarding the data provided by the submitter, showing that the research was done with a limited dose range and mentioning that if the researchers would carry out a trial with a wider range, then lower effective doses may be possible. The treatment lead noted that the data provided by the submitter could be used to support a decision and provided adequate evidence to support the treatment as scientifically based.

[41] There were concerns that older life stages such as late stage pupae of *Ostrinia nubilalis* require higher irradiation doses. One member noted that the presence of late stage pupae should be considered the main target (the most tolerant life stage) of this treatment. The treatment lead explained that the probability of late pupae stage being found inside regulated articles is low and that the probability of those insects surviving to adulthood and being trapped is very low.

[42] The panel was concerned that the end-point of treatment (adult or F_1 sterility) may result in detection of emergent adults in pheromone traps in the importing country and cause unwanted trade or control impacts. These unwanted impacts would make the treatment unsuitable for international trade. Data provided by the submitter show that the emergence of adults from previously sterilized pests is very low at this dose because only 0.011% of the eggs hatch. The treatment lead explained that after the treatment, any adults that survive will be sterile and will not establish in the new area. The Chair noted this issue can be addressed by the TPPT position paper on end-point of irradiation treatment, which is still under development and will be finalized at the next meeting.

[43] The panel agreed to send this treatment to the SC for member consultation.

[44] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[45] The TPPT:

(2) *recommended* Irradiation for *Ostrinia nubilalis* (2012-009) to the SC for member consultation.

5.2 Irradiation for *Dysmicoccus neobrevipes* Beardsley, *Planococcus lilacinus* (Cockerell) and *Planococcus minor* (Maskell) (Hemiptera: Pseudococcidae) (2012-011)

[46] In February 2013, the SC approved the treatment to be added to the *List of topics for IPPC standards* and approved it for member consultation. The draft was submitted to the 2013 member consultation, which ends on 1 December 2013.

6. Review of Fruit fly treatments (2006-024)

6.1 "Vapour heat treatment for *Bactrocera cucurbitae* on *Cucumis melo* var. *reticulatus*" (2006-110)

[47] The panel agreed that the submitter in their response provided all the additional information requested by the panel. It was noted that the heat tolerance discussion paper[3] supports this treatment. The treatment prescribes a pre-heating time between 3 and 5 hours using saturated water vapour (of greater than 90% relative humidity (RH)) at 46 °C to allow the core of the melons to reach the target temperature of 45 °C. Once the core temperature of the fruit reaches 45 °C, the fruit receives a further 30 minutes at 46 °C, also using saturated water vapour (of greater than 90% RH). The treatment should be followed by cooling at ambient air temperature, not by accelerated cooling.

[48] Regarding the type of artificial infestation, as long as the pest developmental stage tested has developed in the fruit (e.g. eggs placed and larvae tested, or eggs placed and tested), the panel considered this as satisfactory.

[49] It was noted that, for cold treatment testing, it may be necessary to confirm treatment efficacy against the target species on different cultivars. With heat treatment, however, the tolerance of the target pest has been shown to be related not to the host cultivar but rather to heating time (exposure). The panel agreed that, as long as the schedule specifies temperature and time (rather than time only), irrespective of the cultivar, it will be sufficient, because there is no evidence that the type of host will increase pest tolerance to the treatment. It was noted, however, that hosts (or host suitability to the pest) can reduce pest tolerance to a heat treatment, and stages exposed in artificial environments may also be more susceptible to heat. The panel considered that netted melons are a favoured host for melon flies and, as such, the host would not reduce pest tolerance in this case. Although the panel agreed that the treatment could be extended across other cultivars of the tested melon species (but not to other fruit species or genera) the panel noted that there is not a great body of research to support this conclusion, and, as the submitter had not requested this inclusion, the single cultivar would be put forward.

[50] Concerns were raised about whether the third instar larvae or eggs are the most tolerant life stage of *Bactrocera cucurbitae*. The literature available to the panel indicates that eggs are more tolerant to heat. The panel noted that the studies that support this finding had exposed eggs and larvae in their natural positions in fruit. The studies found that third instar larvae, even though they are deep in the fruit, are less tolerant to heat than eggs, which are located close to the surface of the fruit.

[51] The panel decided that when calculating the effective dose (ED), the first replicate should be eliminated due to differences in loading factors.

[52] The panel agreed to recommend this treatment to the SC for CPM adoption.

[53] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[3] TPPT_2013_Jul_19

[54] The TPPT:

(3) *recommended Vapour heat treatment for* Bactrocera cucurbitae on Cucumis melo *var*. reticulatus (2006-110) to the SC for adoption by the CPM.

6.2 Vapour heat treatment for *Mangifera indica* var. Manila Super (2009-108)

[55] The treatment lead provided an update on this treatment based on information received from the submitter. It was noted that the submitter's calculated efficacy of the treatment at the 95% level of confidence, 99.9968%, was not consistent with the data provided by the submitter.

[56] The panel reviewed the research report provided by the submitter (Merino S.R. Eugenio M.M. Ramos A.U. & Hernandez S.T 1985 *Fruit Fly disinfestation of Mangoes Mafnifera indica Linn var manila super by vapour heat treatment*. In this report, hot water dip (HWD) experiments were used to determine that oriental fruit fly *Bactrocera dorsalis* is more tolerant than melon fly *Bactrocera cucurbitae*. The experiments were also used to show that first instar larvae of *B. dorsalis* are the most tolerant life stage when exposed to a temperature of 45 ºC. The panel questioned the relevance of a 45 ºC water bath test to support a 46 ºC treatment. The panel also considered that testing such parameters under conditions different from the vapour heat treatment (VHT) as it would be used in practice (e.g. in fruit) was unable to confirm the relative fruit fly or life-stage tolerance for confirmatory testing. The panel concluded that the tests using VHT in fruit did provide more appropriate results for life-stage tolerances.

[57] Of the life stages tested in the confirmatory trials, only the results from third instar larvae from egg-inoculated fruit were considered as reliable. In the high humidity environment of VHT, larvae (even young larvae) can emerge from the fruit during treatment. The mortality of these larvae supports treatment success. However, larvae should not be included in the mortality total for determining efficacy, because once they have emerged from the fruit, they receive a higher treatment dose than they otherwise would.

[58] One member noted that this treatment has problems such as operational cost and the cost of treatment equipment. It was explained that these costs are usually taken into account in bilateral agreements.

[59] The panel re-calculated the ED and found it was lower than what would be expected for an appropriate treatment in international trade. The panel also noted that the results on mortality rate and most tolerant life stage, as well as the number of pests tested during the experiments and examination methods, need to be clarified.

[60] The TPPT agreed that a request for information should be sent to the submitter of the treatment *Vapour heat treatment for* Mangifera indica *var*. *Manila Super* (2009-108).

[61] Refer to Appendix 9 of this report for the TPPT evaluation of the treatment.

6.3 Vapour heat treatment for *Bactrocera dorsalis* on *Carica papaya* var. Solo (2009-109)

[62] The treatment lead provided an update on this treatment based on information received from the submitter. This treatment prescribes using VHT at 46.0–47.6 °C and 100% RH for 70 consecutive minutes.

[63] Panel members expressed concerns over why the researchers concluded that eggs older than 24 hours comprised the most tolerant life stage. A wider discussion by the panel concluded that this finding was consistent with the panel position on the most thermotolerant stage of the fruit fly.

[64] The panel agreed that the calculated ED needs to take into account the error in the estimated treated population from the control fruit. Because the control fruit infestation data are known for each individual fruit, the standard error can be used. This calculation results in 18,857 exposed eggs or an ED of 99.9841% at the 95% level of confidence (one survivor in 6,286 exposed eggs) (see Table 1 in Appendix 4 of this report). It was noted that the number and different stage of pests treated during the experiments are not provided in the data submitted. In addition, it was noted that while there was

insufficient information provided on the equipment used in the treatment, this treatment is currently used in international trade.

[65] The panel agreed to recommend this treatment to SC for member consultation.

[66] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[67] The TPPT:

(4) *recommended* Vapour heat treatment for *Bactrocera dorsalis* on *Carica papaya* var. Solo (2009-109) to the SC for member consultation.

6.4 Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* (2010-106)

[68] In response to the TPPT request for additional information on this treatment, the submitter provided new information taken directly from the research report:

[69] Heather, N.W., Corcoran, R.J., Heard, T., Jacobi, K. & Coates, L. 1993. *Heat disinfestation of mangoes against fruit fly with "hot air" as vapour heat.*

[70] This treatment prescribes VHT at ≥ 46.5 ^{0}C and 95% RH for 10 consecutive minutes.

[71] The end-point for the treatment was recorded as the lack of puparial formation. Previously this end-point has been accepted in cold treatment research, with the fruit dissected and examined carefully for any live larvae as part of the evaluation.

[72] The panel noted that, in the information provided by the submitter, the load factors of the four replicates are different. In the data provided from laboratory records, it was found that the heat-up time for the second replicate was significantly less than for the other replicates. Therefore, when calculating the ED, the panel removed the second replicate.

[73] The panel discussed the age of the fruit fly colony used and whether that would have an impact on the efficacy of the treatment. The panel concluded that rejuvenation of colonies is important, but how significant rejuvenation is to treatment efficacy is unknown at this time. The panel agreed that while some flexibility should be allowed, 20 years without rejuvenation is not likely to be acceptable as the colony may no longer represent the wild population. In the data provided by the submitter, colony rejuvenation was stated to occur by the researchers. Until evidence is provided that a certain level of rejuvenation is required or a best practice is needed, this assurance should be considered sufficient. The panel concluded that the following factors should be taken into account when performing colony rejuvenation:

- introducing wild-type pupae into an existing colony is not successful because few wild-type individuals survive
- it is preferable to take wild-type flies and establish a new colony; once wild-type numbers have built up, the old colony should be destroyed.

[74] The panel agreed that the ED needs to take into account the error in the estimated treated population from the control fruit. Control fruit infestation data are not known for each individual fruit in each replicate control; therefore, standard error cannot be used for each replicate. The control replicate estimates for treated fruit were calculated using the combined control calculation. The control fruit were split between the locations of Brisbane (where the fruit were tested) and Perth (where the fruit were infested and in some cases tested). The panel agreed that these two groups of control data could be used to estimate the treated number. A *t*-test indicated that the control numbers in Brisbane and Perth were not significantly different and could be considered controls for the treated fruit. Using all of the control data for each replicate (Perth and Brisbane), the estimated number of treated pests is calculated to be 12,901 + 30,292 + 34,406 + 15,467 = 93,027 exposed eggs or an ED of 99.9968% at the 95% level of confidence (one survivor in 31,009 exposed eggs) (see Tables 2a–e in Appendix 4 of this report).

[75] The panel agreed to recommend this treatment to the SC for member consultation.

[76] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[77] The TPPT:

(5) *recommended* Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* (2010-106) to the SC for member consultation.

6.5 Vapour heat treatment for *Bactrocera tryoni* on *Mangifera indica* (2010-107)

[78] The submitter provided new information taken directly from the research report:

[79] Heather, N.W., Corcoran, R.J., Heard, T., Jacobi, K. & Coates, L. 1993. *Heat disinfestation of mangoes against fruit fly with "hot air" as vapour heat.*

[80] The panel noted that the experimental results show no significant difference in the heat response of treated eggs of the *Kensington, R2E2, Kent* and *Keitt* mango varieties, and that eggs of the variety *Palmer* were significantly less tolerant than these.

[81] The end-point for the treatment is lack of pupal formation (emergence), and this has been accepted in cold treatment research, with the fruit dissected and examined carefully for any live larvae as part of the evaluation.

[82] The panel noted that the load factors of the seven replicates for egg exposure and the six replicates for larval exposure are not the same. From the data provided, heat-up time for replicates varied. The panel did not include any of these replicates when calculating the ED.

[83] The panel again discussed the age of the fruit fly colony and discussion is captured in section 6.4 of this report. In addition, there was insufficient information provided on *Bactrocera tryoni* to calculate the ED and to fully evaluate the treatment.

[84] The panel discussed two options: (1) accept this treatment as a separate schedule but request additional information for a more accurate schedule; or (2) combine this treatment with Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* (2010-106) to create a submission with five varieties of mango.

[85] The panel did not recommend the treatment because of the lack of information on, for example, control mortalities, treatment temperature, treatment duration in confirmatory testing and infestation methodology.

[86] The panel agreed that a request for additional information should be sent to the submitter.

[87] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

6.6 High temperature forced air treatment for selected fruit fly species (Diptera: Tephritidae) on fruit (2009-105)

[88] The treatment lead presented the updated checklist and the panel reviewed the complex submission for this treatment. The treatment prescribes increasing air temperatures from room temperature to 48.5 °C at a minimum of 60% RH maintaining for at least 3 hours, or until the core temperature reaches 47.5 °C. This step is followed by 20 minutes in a forced air chamber at 60% RH and an air temperature of 48 °C, with fruit pulp temperature at a minimum of 47.5 °C. Finally, fruit is hydro-cooled in a shower of water at 24–26 °C for 70 minutes.

[89] To clarify the issues relating to this treatment, the review discussion focused on three questions:

Do the results of the confirmatory trials support the efficacy (99.99%) against Bactrocera melanotus as stated in the treatment schedule?

[90] The panel noted that the confirmatory testing for *Bactrocera melanotus* was undertaken on the most tolerant life stage as determined by both how water dipping (HWD) and high temperature forced air (HTFA) trials. The results of both trials were analysed statistically and translated to lethal times for 99 % mortality (LT99) and obtained or did not disagree with the overall life-stage tolerance results of eggs < third instar < first instar. The in-fruit HTFA results were not statistically different.

[91] The confirmatory trials were done on eggs as the most tolerant life stage and which were artificially inoculated. The number of eggs which were treated was estimated from pupal emergence from the controls and was re-calculated by the panel using the group control method. The efficacy of the treatment was calculated as $ED_{98.9892}$ at the 95% level of confidence (see Table 5 in Appendix 4 of this report).

Do the results show that B. melanotus is the most heat tolerant fly species and, therefore, can the treatment efficacy can be extended to other fruit fly species?

[92] The panel considers that the use of the HWD method to determine the most tolerant life stage for a species may not be consistent with in-fruit tests, and this has indeed been shown in comparative trials between HWD and vapour heat treatment (VHT) (Merino *et al.*, 1985) and between HWD and HTFA (Waddell *et al.*, 1993). Therefore, the panel considered that, although HWD testing would show differences in heat tolerances between species, the most tolerant life-stage within a species could be determined only on exposure to the proposed treatment schedule. This is because the fruit fly life stages occur in different areas of the fruit (e.g. eggs at the surface and third instar larvae towards the centre) and receive different doses (exposures to temperature) during the treatment.

[93] The panel considered that the comparative species tolerance testing between *B. melanotus* and *Bactrocera xanthodes* by Waddell *et al.* (1993) was carried out correctly and confirmed that *B. melanotus* is the more tolerant species.

[94] It was noted that there are variations in the way different the life-stages responded to the treatment as were determined in literature: by either increasing temperatures or increasing exposure times to a single temperature. Often no statistical analysis of the research data was provided to show that:

- the measured differences in life-stage responses were significant
- the relationships between the response curves at the tested conditions were the same under the treatment conditions (e.g. response curves were parallel or not).

[95] The panel considered that to determine the most tolerant life stage of all the target species, laboratory trials will need to:

- expose all life stages of the different target pests to increasing exposure times at the target temperature
- develop mortality response curves for each life stage and extrapolate these curves to the desired treatment schedule
- use appropriate statistical techniques to analyse results to show which life stage (or stages) of which targeted species is (are) the most tolerant to the desired treatment schedule.

[96] Operational (confirmatory) testing could then be undertaken on the most tolerant life stage(s) of all of the target species.

Do the results show that this heat treatment can be extended to all host commodities for these fruit flies?

[97] All of the tests were applied to *Carica papaya* only. No results for other fruit types could be found in the literature, so the panel considered the schedule could be recommended only for *C. papaya*. The panel considers that trials could be undertaken to show that the effect of the submitted treatment is not

significantly different from (less than) its effect on *C. papaya*. It is also possible that the treatment schedule (especially the heat-up time) may not be achievable for other fruit types (e.g. that are significantly bigger or smaller).

[98] The TPPT will provide guidance to the submitting country on the research required to extend the treatment to other fruit fly species and hosts of interest to them in international trade.

[99] The panel was concerned with the quality of data provided and whether it was possible to compare data from various laboratories from different countries and on different species of fruit flies. The current submission includes nine *Bactrocera* species, mostly of importance to the Pacific region and exports from countries of that region. It was noted that there may be difficulties with approval of this treatment: exporting countries may not accept a generic treatment for all fruit fly species from the Pacific region that has been tested only on *C. papaya* fruit.

[100] The TPPT agreed to restrict the treatment followed by 20 minutes at a minimum of 60% relative humidity in an air temperature of 48^{O}C and fruit pulp temperature at a minimum of 47.5^{O}C to papaya only and for *B. melanotus* and *B. xanthodes* only.

[101] The panel encouraged the submitter to continue experiments for other types of fruit.

[102] The Secretariat will inform the submitter that only *Carica papaya* and *B. melanotus* and *B. xanthodes* were accepted for this treatment.

[103] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[104] The TPPT:

(6) *recommended* High temperature forced air treatment for *Bactrocera melanotus* and *B. xanthodes* (Diptera: Tephritidae) on *Carica papaya* (2009-105) to the SC for member consultation.

6.7 SC e-decisions on cold treatments

[105] The panel noted that the SC had recently approved, via e-decision, the following five cold treatments for adoption by the CPM:

- Cold treatment for *Ceratitis capitata* on *Citrus sinensis* (2007-206A)
- Cold treatment for *Bactrocera tryoni* on *Citrus sinensis* (2007-206E)
- Cold treatment for *Bactrocera tryoni* on *Citrus reticulata* × *C. sinensis* (2007-206F)
- Cold treatment for *Ceratitis capitata* on *Citrus paradisi* (2007-210)
- Cold treatment for *Ceratitis capitata* on *Citrus reticulata* × *C. sinensis* (2007-206B).

[106] The following three treatments were also submitted to the SC, via e-decision, recommending the SC approve them for adoption by the CPM, but the SC requested more time to discuss them:

- Cold treatment for *Ceratitis capitata* on *Citrus limon* (2007-206C)
- Cold treatment for *Bactrocera tryoni* on *Citrus limon* (2007-206G)
- Cold treatment for *Ceratitis capitata* on *Citrus reticulata* cultivars and hybrids (2007-212).

[107] The panel agreed that, if the SC decided to send these three treatments back to the TPPT, the SC comments would be discussed at the next TPPT meeting.

6.8 Cold treatment tolerance of fruit flies

[108] The lead presented the discussion paper[4], which provides a literature review of cold treatments and examples of inconsistencies. He noted that a large and seemingly inconsistent list currently exists of approved and submitted cold treatments that are required for domestic and international market access

[4] TPPT_2013_Jul_19

of fresh fruits and vegetables. Quarantine schedules may vary for similar fruit types and identical pest fruit fly species depending from which country they are exported. IPPC members and two panels (the TPPT and the Technical Panel on Fruit Flies (TPFF)) have identified the need to harmonize methods used by member states in obtaining and reporting efficacy data for use in export submissions.

[109] The panel recommended that the discussion paper be provided to the Expert Consultation on Cold Treatments (ECCT) participants once they are selected, so they can prepare comments and discussion points before the ECCT. It was suggested that the paper should then be added to the ECCT agenda for further discussion and feedback.

6.9 Cold treatment for *Ceratitis capitata* on *Citrus reticulata and their hybrids* (2010-102)

[110] The treatment lead provided an update on this treatment based on information received from the submitter. The treatment prescribes the use of a temperature of 2 °C or below for 16 continuous days. There were concerns regarding the statement by the submitter that the variety *Clemenules* should be considered representative of all *Citrus reticulata* varieties and hybrids. The panel considered that the proper name for this variety (*Clemenules*) is *Citrus clementina* var. *Clemenules* based on Cottin (2002).[5] Therefore this cannot be considered as representative of all *Citrus reticulata* and that only the tested variety should be approved for this schedule.

[111] The submitter provided data on control fruit emergence, which the panel used for calculating the ED value. Using the combined control calculation, the control replicate estimates for treated fruit were calculated to be 29,940 exposed eggs or an ED of 99.99% at the 95% level of confidence (one survivor in 9,980 exposed eggs) (see Table 3 in Appendix 4 of this report).

[112] The Secretariat will inform the submitter that only the *Citrus clementina* var. *Clemenules* was accepted for this treatment.

[113] The panel agreed to recommend this proposed treatment.

[114] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[115] The TPPT:

(7) *recommended* Cold treatment for *Ceratitis capitata* on *Citrus clementina* var. *Clemenules* (2010-102) to the SC for member consultation.

6.10 Cold treatment for *Ceratitis capitata* on *Citrus sinensis* (2010-103)

[116] The treatment lead provided an update on this treatment based on information received from the submitter. This treatment prescribes the use of a temperature of 2 °C or below for 16 continuous days. There was concern that the experiments were performed in 1995 and 1997 (i.e. not in the same year). However, the panel agreed that this was not significant.

[117] The panel noted that the replicate treatment times are not the same (one replicate's treatment lasted an extra day due to a public holiday). The submitter requested that the 16 day length be used as shown by two replicates, which the TPPT agreed to, with the third (outlying) replicate's results not being included when calculating the ED. Using the combined control calculation, the control replicate estimates for treated fruit were calculated. The panel noted differences between varieties in pest response to the cold treatment. The analysis provided in response to the information request was not appropriate because it used an analysis of variance for non-independent data (dose curve) and compared results from multiple years (i.e. all results should be from the same year). The panel agreed that the treatment should be recommended for two of the three varieties only (Valencia and Navel). The panel agreed that the submitter should do lethal dose ratio testing (Robertson and Preisler, 1992,

[5] Citrus species and hybrids are named according to the nomenclature in Cottin, R. 2002. *Citrus of the world: A citrus directory*. Paris, INRA-CIRAD.

Pesticide bioassays with arthropods) to allow the variety *Salustiana* to be included in the treatment schedule.

[118] The panel discussed the data on the temperature of the treated fruit. Insufficient information was given; further details on the actual range will need to be provided by the submitter. The panel agreed that, if the data is not analysed using a biometric procedure, only the varieties Navel and Valencia should be included in the treatment schedule.

[119] The TPPT agreed that the submitter should be sent a request for a statistically correct comparison of the three varieties (*Navel, Valencia and Salustiana*) of fruit tested as well as for temperature details, and that the submitter analyse the data using a biometric procedure. Otherwise, the TPPT is able to recommend to SC the treatment only for varieties Navel and Valencia.

[120] The Secretariat will inform the submitter that only the varieties Navel and Valencia were accepted for this treatment.

[121] The TPPT evaluation of the treatment is included in Appendix 9 of this report.

[122] The TPPT:

(8) *recommended* Cold treatment for *Ceratitis capitata* on *Citrus sinensis* var. Navel and Valencia (2010-103) to the SC for member consultation.

7. Review of Soil and growing media in association with plants: Treatments (2009-006)

[123] The panel has not received any submission data for soil and growing media treatments since the topic (2009-006) was added to the *List of topics for IPPC standards*. One member noted that all soil and growing media treatments approved at the national level describe 100% sterilization. Therefore, it is not necessary to evaluate soil and growing media treatments against the requirements outlined in ISPM 28:2007. The panel also noted technical issues with meeting ISPM 28:2007 requirements given the lack of definition of pests in soil and understanding of efficacy needs.

[124] The panel discussed whether treatment schedules or lists of existing treatments could be developed as an appendix to the draft ISPM on *Movement of growing media in association with plants for planting in international trade* (2005-004). It was also suggested that this draft ISPM could include sterilizing treatments approved under other standards and bodies (e.g. World Organisation for Animal Health (OIE), medical and health organizations).

[125] It is for these reasons that the panel agreed that the topic Soil and growing media in association with plants: Treatments (2009-006) should be removed from the *List of topics for IPPC standards*.

[126] The TPPT:

(9) *recommended* to the SC that the topic *Soil and growing media in association with plants: Treatments* (2009-006) be removed from the *List of topics for IPPC standards*.

8. Proposed Submissions for Treatment Requirements Other than Irradiation (Similar to ISPM 18:2003)

[127] At its 2013 May meeting, the SC agreed that standards are required for various types of treatments. The panel drafted submission forms (justifications) and specifications for the following agenda items in response to the 2013 call for topics:

8.1 ISPM for requirements for the use of temperature treatments as a phytosanitary measure

[128] The panel finalized drafted by the lead the submission form with the justification and specification for the new ISPM for requirements for the use of temperature treatments as a phytosanitary measure and

agreed to submit it in response to the 2013 Call for topics. In was agreed that this standard should content both cold and heat treatments requirements.

8.2 ISPM for requirements for the use of fumigation treatments as a phytosanitary measure

[129] The panel concluded that this should be separate ISPM for guidelines on fumigation and with submission for, justification and specification drafted position papers (see agenda item 8.5 of this report) on proposals for the development of two separate ISPMs for requirements on fumigation and chemical treatments as it was requested by the SC at May 2013 meeting.

8.3 ISPM for requirements for the use of chemical treatments as a phytosanitary measure

[130] Refer to the agenda items 8.2 and 8.5 of this report.

8.4 ISPM for requirements for the use of modified atmosphere treatments as a phytosanitary measure.

[131] The panel discussed that modified atmosphere phytosanitary treatments are among the most complicated of all treatments that have achieved any level of application because several factors (e.g., atmospheric components, temperature, humidity) must be measured and controlled. The panel agreed that because the treatments are rather complex efforts to develop them have been difficult. Guidance and standardization would aid greatly. The TPPT finalized drafted by the lead the submission form with the justification and specification for the new ISPM

[132] Several IPPC members had expressed interest in supporting these four proposals above, so the panel agreed to submit the treatments to the NPPOs of Indonesia, the European Union, Australia, the United States of America and all the RPPOs by 19 July 2013, asking for a confirmation of support by 5 August 2013. The panel agreed to review the support confirmations to ensure that the submissions and specifications were submitted by 31 August 2013.

8.5 TPPT position paper[6] on proposals for the development of two separate ISPMs for requirements on fumigation and chemical treatments

[133] At its May 2013 meeting the SC had a concern relating to the TPPT proposal to have two separate standards on chemicals and fumigants (refer to Appendix 6 of this report for the position paper). The SC had requested the panel to consider whether two separate ISPMs, for fumigation and chemical treatments, are indeed needed.

[134] The panel noted that chemical treatments usually act either on contact (directly or after diffusion into the pest) or on consumption (directly or as part of the pest's food (e.g. wood)), whereas fumigation usually acts on respiration (the pest breathing in the fumigant). The panel noted that combining the two treatment types into one ISPM would likely be overly complicated and would necessitate the standard being split into two sections with little text common to them.

[135] The panel concluded that there should be two separate ISPMs for guidelines on fumigation and chemical treatments to provide a more effective platform for achieving the desired outcomes.

[136] The TPPT:

(10) *recommended* that the SC consider the TPPT position paper proposing separation of fumigation and chemical treatments which will be attached to the respective submissions

[6] TPPT_2013_Jul_33

9. Proposed New Topics in Response to the 2013 Call for Topics

[137] In anticipation of the 2013 IPPC call for topics, the panel discussed proposals at the December 2012 TPPT meeting and in a 2013 January forum discussion. Several topics were identified. As it was agreed previously, TPPT members presented draft submissions for topics for this meeting.

9.1 Revision to ISPM 18:2003

[138] The panel drafted the submission form (justification) and specification for the revision of ISPM 18:2003 (*Guidelines for the use of irradiation as a phytosanitary measure*) in response to the 2013 call for topics. Several IPPC members had expressed interest in supporting this proposal, so the panel agreed to submit the treatments to the NPPOs of Indonesia, the European Union, Australia, the United States of America and all the RPPOs by 19 July 2013, asking for a confirmation of support by 5 August 2013. The panel agreed to review the support confirmations in mid-August, to ensure that the submissions and specifications were submitted to the Secretariat by 31 August 2013.

[139] The panel agreed that the proposed revision of ISPM 18:2003 could benefit from an IPPC Implementation Review and Support System (IRSS) survey.

[140] The TPPT:

(11) *recommended* that the SC consider proposing an IPPC Implementation Review and Support System (IRSS) survey similar to ISPM 6 be carried out for the implementation of ISPM 18:2003 (*Guidelines for the use of irradiation as a phytosanitary measure*).

9.2 Pest other than fruit flies treatments

[141] The panel drafted the submission form (justification) for this treatment topic and agreed to submit it in response to the 2013 call for topics.

9.3 Wood and wood products treatments

[142] The panel drafted the submission form (justification) for this treatment topic and agreed to submit it in response to the 2013 call for topics.

9.4 Plants for planting treatments

[143] The panel drafted the submission form (justification) for this treatment topic and agreed to submit it in response to the 2013 call for topics.

9.5 Sea containers treatments

[144] The panel discussed the necessity for the topic sea container treatments. The panel agreed that this should not be submitted in response to the 2013 call for topics, and should be reconsidered during a future call for topics.

9.6 Used equipment treatments

[145] The panel discussed the urgent need for the topic used equipment treatments. The panel agreed that this should not be submitted in response to the 2013 call for topics, and should be reconsidered during a future call for topics.

9.7 TPPT position paper on proposal for elimination of treatment topics from the *List of topics for IPPC standards*[7]

[146] There was a proposal from the TPPT members to eliminate all treatment topics from the *List of topics for IPPC standards* because, with the exception of irradiation, the existing topics are too specific and very narrow in scope considering the wide range of pests limiting trade, diverse commodities exported

[7] TPPT_2013_Jul_30

and imported, and variety of treatment methods that could be considered (refer to Appendix 7 for the position paper).

[147] As a result of these limitations, there have been few treatments submitted to the Secretariat in response to calls for treatments. In addition, there are treatments being used in international trade that cannot be submitted because they do not fall under the existing topics (categories) for treatments. Eliminating treatment topics could expand the number of treatments submitted for review and, in turn, broaden and harmonize their use among NPPOs to effectively mitigate pest risk.

[148] It was proposed that if the topics (categories) are eliminated, all types of phytosanitary treatment schedules could be submitted during a call for treatments. The panel would evaluate each submission to determine whether the treatment fits the criteria of ISPM 28:2007 and whether to recommend to the SC that the treatment be placed on the *List of topics for IPPC standards*.

[149] The TPPT:

(12) *recommended* that the SC consider removing all treatment topics from the *List of topics for IPPC standards.*

10. Other Business

10.1 Virtual tools

International Phytosanitary Portal (IPP)

[150] The Secretariat gave the panel an overview of the IPP public and restricted areas that are relevant to the panel's work, including the new forum discussion tools, and the locations of meeting documents and information frequently referred to by the panel.

Adobe Connect

[151] The Secretariat requested feedback on the new virtual meeting tool Adobe Connect. Most members had no problems with the new software, but one member had Internet connection problems when accessing the meeting from home (at work, connection was not a problem). The Secretariat agreed to consider the possibility of members being able to join the virtual meeting room via telephone connection to resolve this issue.

Searchable database

[152] The Secretariat provided the panel with a searchable PDF database of all public IPPC documents, including ISPMs and meeting reports from the CPM, SC and TPPT. The panel thanked the Secretariat for the overview of the database, which they found very useful.

IPPC Online Comment System

[153] The Secretariat informed the panel that it will need to respond to members comments on the treatments out for member consultation using the IPPC Online Comment System (OCS). Member consultation will close on 1 December, so the Secretariat advised it will train members in the OCS in late November 2013.

10.2 Instructions to assist in preparing complete submissions

[154] The panel agreed to reconsider the development instruction for preparing complete submissions after the CPM-9 (2014) approves the *List of topics for IPPC standards*.

10.3 Review of the process for requesting additional information from treatment submitters

[155] The Secretariat explained the existing procedure for requesting additional information from submitters. There have been concerns in the past that submitters do not respond to such requests, so the panel discussed possibilities to improve this procedure. The panel recommended that it would be

useful to bullet-point each specific request for information and add a statement to all request for information letters asking the submitter to ensure they address each bullet-pointed issue. The panel also agreed that once the new submission is received by the Secretariat the Secretariat lead for the TPPT will assign the treatment lead (TPPT member expertise) and should forward immediately to the newly assigned treatment lead to review whether the submission is appropriate. If the submission is not deemed appropriate, then the treatment lead will identify what information is not included, and the Secretariat will notify the submitter.

10.4 List of phytosanitary terms to be added to the glossary

[156] The panel reviewed the current definitions in ISPM 5 (*Glossary of phytosanitary terms*) related to the work of the TPPT. The TPPT noted the need for clarity in the definition of effective dose (see Table A below). The panel also considered that definitions for *fumigation*, *chemical treatment* and *atmospheric treatment* will need to be carefully considered when the ISPMs for these treatments are drafted (provided these topics are added to the *List of topics for IPPC standards*). The task of defining the terms will be added to the specifications for drafting these ISPMs.

Table A. Definitions of effective dose (ED) and related terms

dose (common use definitions)	A measured amount of something such as medicine (Cambridge) A portion of a substance added during a process (Merriam-Webster)
efficacy (treatment)	A defined, measurable, and reproducible effect by a prescribed treatment (ISPM 18:2003)
Treatment	Official procedure for the killing, inactivation or removal of pests, or for rendering pests infertile or for devitalization (FAO, 1990, revised FAO, 1995; ISPM 15:2002; ISPM 18:2003; ICPM, 2005)
treatment schedule	The critical parameters of a treatment which need to be met to achieve the intended outcome (i.e. the killing, inactivation or removal of pests, or rendering pests infertile, or devitalization) at a stated efficacy (ISPM 28:2007)
effective dose (TPPT-proposed definition)	The level of efficacy achieved by a stated treatment schedule. The level of efficacy is described as both a level of reliability and confidence. The effective dose (ED) should be presented in the following manner: $ED_{[level\ of\ reliability]}$ at the *[level of confidence]* (e.g. $ED_{99.99}$ at the 95% level of confidence)

[157] The proposed definition will go to the SC to consider for inclusion in ISPM 5. The panel also agreed to draft a paper to further support the TPPT definition, which will be reviewed at the next TPPT meeting or during a TPPT forum discussion on the IPP.

[158] The TPPT:

(13) *recommended* that the SC add the term *effective dose (ED)* to the *List of topics for IPPC standards* as a subject under the Technical Panel for the Glossary (TPG) work programme, and requested the TPG to consider the above definition for inclusion in ISPM 5 (*Glossary of phytosanitary terms*).

10.5 Adoption of virtual meeting reports and procedure for future adoption

[159] The Secretariat explained the existing procedure for approving meeting reports. One member expressed concern that meeting reports were not formally adopted (i.e. during the following face-to-face or virtual meeting). The panel agreed that, for virtual meetings, a one week discussion forum and one week approval period was needed. For the face-to-face meeting reports, a two week discussion forum and a one week approval period was appropriate. The Secretariat agreed to take these into consideration when posting future reports for review and approval.

10.6 Update of *Working TPPT criteria for treatment evaluation*

[160] The TPPT reviewed and updated its document titled *Working TPPT criteria for treatment evaluation* (see Appendix 5 of this report) to add guidance on:

- saving voucher specimens during trials
- placing the burden on the submitter to provide complete and accurate submission information
- removing replicates with different load factor when calculated
- age of colony
- pest source
- recording measurements and providing data on emergence for each replication
- providing temperature data
- including most tolerant life-stage testing
- accepting HWD for most tolerant life stages
- accepting artificial inoculation.

11. Follow-up Actions for the Next TPPT Meeting

11.1 Review of the *List of topics for IPPC standards*

[161] The panel reviewed in detail each phytosanitary treatment on the TPPT work programme. It assigned treatment leads, reviewed the priority and strategic objectives assigned, and updated the status of each treatment. The Secretariat will update this information to the master version of the *List of topics for IPPC standards*.

11.2 TPPT work programme and medium term plan

[162] The TPPT reviewed, adjusted and updated its work programme and medium term plan (see Appendix 8 of this report).

12. Recommendations to the SC

[163] The TPPT:

(1) *recommended* that the SC consider whether the TPPT should be provided the opportunity to review all treatment guidelines before approval by the CDC to ensure the guidelines are of the highest standard. The TPPT review would take into account any new data that may have become available regarding the treatment guideline.

(2) *recommended* Irradiation for *Ostrinia nubilalis* (2012-009) to the SC for member consultation

(3) *recommended* Vapour heat treatment for *Bactrocera cucurbitae* on *Cucumis melo* var. *reticulatus* (2006-110) to the SC for adoption by the CPM

(4) *recommended* Vapour heat treatment for *Bactrocera dorsalis* on *Carica papaya* var. Solo (2009-109) to the SC for member consultation

(5) *recommended* Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* (2010-106) to the SC for member consultation

(6) *recommended* High temperature forced air treatment for *Bactrocera melanotus* and *B. xanthodes* (Diptera: Tephritidae) on *Carica papaya* (2009-105) to the SC for member consultation

(7) *recommended* Cold treatment for *Ceratitis capitata* on *Citrus clementina* var. *Clemenules* (2010-102) to the SC for member consultation

(8) *recommended* Cold treatment for *Ceratitis capitata* on *Citrus sinensis* var. Navel and Valencia (2010-103) to SC for member consultation

(9) *recommended* to the SC that the topic Soil and growing media in association with plants: Treatments (2009-006) be removed from the *List of topics for IPPC standards*

(10) *recommended* that the SC consider the TPPT position paper proposing separation of fumigation and chemical treatments

(11) *recommended* that the SC consider proposing an IPPC Implementation Review and Support System (IRSS) survey similar to ISPM 6 be carried out for the implementation of ISPM 18:2003 (*Guidelines for the use of irradiation as a phytosanitary measure*)

(12) *recommended* that the SC consider removing all treatment topics from the *List of topics for IPPC standards*

(13) *recommended* that the SC add the term *effective dose (ED)* to the *List of topics for IPPC standards* as a subject under the Technical Panel for the Glossary (TPG) work programme, and request the TPG to consider the above definition for inclusion in ISPM 5 (*Glossary of phytosanitary terms*)

13. Close of the Meeting

[164] The Secretariat thanked the previous steward and member whose memberships are ending in 2014 for all their hard work and dedication to the panel:

- Mr Antarjo DIKIN (Steward, Indonesia)
- Mr Min-Goo PARK (Member, Republic of Korea)

[165] The Secretariat thanked the participants for their excellent work during the meeting and thanked the host and organizer for their hospitality and the logistical arrangements. The next TPPT meeting will take place in Indonesia, tentatively during the second week of July 2014.

Appendix 1: Agenda

AGENDA ITEM	DOCUMENT NO.	PRESENTER
1. Opening of the meeting		IPPC SECTRETRIAT
• Welcome by the IPPC Secretariat • Election of the Chair • Election of the Rapporteur • Adoption of the Agenda	 TPPT_2013_Jul_01	DUBON/ SHAMILOV DUBON CHAIR CHAIR
2. Administrative Matters		CHAIR
• Documents List • Participants List • Local Information	TPPT_2013_Jul_02 TPPT_2013_Jul_03 TPPT_2013_Jul_04	SHAMILOV SHAMILOV SHAMILOV
3. Updates from relevant Bodies	TPPT_2013_Jul_05	CHAIR
3.1 2013 May SC • Calls for Experts • Call for Treatments	TPPT_2013_Jul_05	DUBON/ SHAMILOV
3.2 Other Technical Panels • Update form the TPFQ	TPPT_2013_Jul_05	ORMSBY
3.3 IPPC Secretariat • Standard Setting Procedure Manual • Call for Topics (see also agenda items 8 and 9) • Member Consultation (see also agenda items 5.2) • Expert Consultation on Cold Treatments • Phytosanitary treatments portfolio • Status chart of Phytosanitary treatments under the TPPT work programme • • Phytosanitary Treatments Numbering and Naming Convention proposals • TPPT Lead and Support	TPPT_2013_Jul_05	DUBON/ SHAMILOV
4. Review of treatments under the topic Wood packaging material treatments (2006-015)	TPPT_2013_Jul_08 2007_102_SubmitterResponse	CHAIR
4.1 Sulfuryl fluoride fumigation of wood packaging material (2007-101)	TPPT_2013_Jul_06	ORMSBY
4.2 Heat treatment of wood packaging material using dielectric heating (2007-114)	TPPT_2013_Jul_07	ORMSBY
5. Review of treatments under the topic Irradiation treatments (2006-014)		CHAIR

AGENDA ITEM	DOCUMENT NO.	PRESENTER
5.1 Irradiation for *Ostrinia nubilalis* (2012-009)	TPPT_2013_Jul_09 2012-009_SubmitterResponse 2012-009_Reference_Hallman2000 2012-009_Reference_HallmanEtAl2010	JESSUP
5.2 Irradiation *for Dysmicoccus neobrevipes* Beardsley, *Planococcus lilacinus* (Cockerell) and *Planococcus minor* (Maskell) (Hemiptera: Pseudococcidae) (2012-011) (Currently in member consultation)	TPPT_2013_Jul_05 TPPT_2013_Jul_10	PARKER/ DUBON
6. Review of treatments under the topic Fruit fly treatments (2006-024)		CHAIR
6.1 Vapour heat treatment for *Bactrocera cucurbitae* on *Cucumis melo* var. reticulatus (2006-110)	TPPT_2013_Jul_11 2006-110_Submitter Response	WANG/ ORMSBY
6.2 Vapour heat treatment for *Mangifera indica* var. Manila Super (2009-108)	TPPT_2013_Jul_12 2009-108_References 2009-108 Updated Checklist	WILLINK
6.3 Vapour heat treatment for *Carica papaya* var. Solo (2009-109)	TPPT_2013_Jul_13 2009-109_Reference	HALLMAN
6.4 Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* (2010-106)	TPPT_2013_Jul_14 2010-106_Submitter Response	HALLMAN
6.5 Vapour heat treatment for *Bactrocera tryoni* on *Mangifera indica* (2010-107)	TPPT_2013_Jul_15 2010-107_Submitter Response	PARK
6.6 High temperature forced air treatment for selected fruit fly species (Diptera: Tephritidae) on fruit (2009-105)	TPPT_2013_Jul_16 2009-105_References	JESSUP
6.7 SC e-decision on eight Cold treatments	TPPT_2013_Jul_05	SHAMILOV
6.8 Cold treatment tolerance of fruit flies	TPPT_2013_Jul_19	JESSUP/ GOMES
6.9 Cold treatment for *Ceratitis capitata* on *Citrus reticulata* and their hybrids (2010-102)	TPPT_2013_Jul_17 2010-102_ Submitter Response	JESSUP
6.10 Cold treatment for *Ceratitis capitata* on *Citrus sinensis* (2010-103)	TPPT_2013_Jul_18 2010-103_Submitter Response	JESSUP
7. Review of treatments under the topic soil and growing media (2009-006)		CHAIR
8. Proposed submissions for treatment requirements other than irradiation (similar to ISPM 18:2003)	TPPT_2013_Jul_05	CHAIR
8.1 ISPM XX:20XX Requirements for the use of temperature treatments as a phytosanitary measure	TPPT_2013_Jul_20	JESSUP
8.2 ISPM XX:20XX Requirements for the use of fumigation treatments as a phytosanitary measure	TPPT_2013_Jul_21	ORMSBY

AGENDA ITEM	DOCUMENT NO.	PRESENTER
8.3 ISPM XX:20XX Requirements for the use of chemicals treatments as a phytosanitary measure	TPPT_2013_Jul_22	GOMES
8.4 ISPM XX:20XX Requirements for the use of modified atmosphere treatments as a phytosanitary measure	TPPT_2013_Jul_23	HALLMAN
8.5 TPPT position paper on proposals for the development of two separate ISPMs on fumigation and chemicals	TPPT_2013_Jul_33	ORMSBY
9. Proposed new topics in response to the 2013 Call for topics	TPPT_2013_Jul_05	CHAIR
9.1 Revision to ISPM 18:2003	TPPT_2013_Jul_24	HALLMAN/ORMSBY
9.2 Pests other than fruit flies treatments	TPPT_2013_Jul_25	GOMES/WANG
9.3 Wood treatments	TPPT_2013_Jul_26	GOMES
9.4 Plants for planting treatments	TPPT_2013_Jul_27	WILLINK/PARK
9.5 Sea containers treatments	TPPT_2013_Jul_28	WILLINK
9.6 Used Equipment treatments	TPPT_2013_Jul_29	JESSUP
9.7 Elimination of Topics for treatments from the List of topics for IPPC Standards	TPPT_2013_Jul_30	DUBON/ HALLMAN/ GOMES
10. Other business	TPPT_2013_Jul_05	CHAIR
10.1 Virtual Tools • IPP (www.ippc.int) • Sharepoint • Adobe Connect		DUBON
10.2 Instruction to assist in proper and complete submissions		DUBON/ ORMSBY
10.3 Review of the process of requesting additional information from submitter	TPPT_2013_Jul_05	DUBON/ HALLMAN
10.4 List of phytosanitary terms to be added to the glossary	TPPT_2013_Jul_05	SHAMILOV
10.5 Adoption of virtual meeting reports and procedure for future report adoptions	TPPT_2013_Jul_05	SHAMILOV
11. Follow-up Actions for next TPPT Meeting		CHAIR
11.1 Review of List of Topics (treatment leads and vacancies, prioritization, etc.)	TPPT_2013_Jul_31	DUBON
11.2 TPPT Work Programme and Medium Term Plan	TPPT_2013_Jul_32	SHAMILOV
12. Recommendations to the SC		CHAIR
13. Close of the meeting		CHAIR

AGENDA ITEM	DOCUMENT NO.	PRESENTER
• Date and venue of the next TPPT meeting • Date and number of further virtual meetings • Evaluation of the meeting process • Adoption of the report • Close		

Appendix 2: Documents list

DOCUMENT NUMBER	AGENDA ITEM	DOCUMENT TITLE (PREPARED BY)	DATE POSTED / DISTRIBUTED
		Draft treatments	
TPPT_2013_Jul_06	**4.1**	2007-101_TreatmentPortfolio_Sulfuryl fluoride fumigation of wood packaging material (ORMSBY)	2013-06-27
TPPT_2013_Jul_07	**4.2**	2007-114_ TreatmentPortfolio _Heat treatment of wood packaging material using dielectric heating (ORMSBY)	2013-06-27
TPPT_2013_Jul_09	**5.1**	2012-009_TreatmentPortfolio _Irradiation for *Ostrinia nubilalis*	2013-07-02
2012-009_Submitter Response	**5.1**	2012-009_Submitter Response_ Irradiation for *Ostrinia nubilalis*	2013-05-13
2012-009_Reference	**5.1**	2012-009_Reference_Hallman 2000	2013-05-13
2012-009_Reference	**5.1**	2012-009_Reference_Hallman et al . 2010	2013-05-13
TPPT_2013_Jul_10	**5.2**	2012-011_TreatmentPortfolio _Irradiation for Mealybugs	2013-06-27
TPPT_2013_Jul_11	**6.1**	2006-110_TreatmentPortfolio _Vapour heat treatment for *Bactrocera cucurbitae* on *Cucumis melo* var. *reticulatus*	2013-06-27
2006-110_Submitter Response	**6.1**	2006-110_Submitter Response_Vapour heat treatment for *Bactrocera cucurbitae* on *Cucumis melo* var. *reticulatus*	2013-05-13
TPPT_2013_Jul_12	**6.2**	2009-108_ TreatmentPortfolio_Vapour heat treatment for *Mangifera indica* var. Manila Super	2013-06-27
2009-108_References	**6.2**	2009-108_Reference_FF_Disinfestation_Vapour heat treatment for *Mangifera indica* var. Manila Super https://www.ippc.int/work-area-publications/2009-108referenceffdisinfestationmangovht2013-05-01-0	2013-05-13
2009-108_ChecklistUpdated	**6.2**	Checklist	2013-06-27
TPPT_2013_Jul_13	**6.3**	2009-109_ TreatmentPortfolio_Vapour heat treatment for *Carica papaya* var. Solo	2013-06-27
2009-109_Reference	**6.3**	2009-109_ Reference_ConfimatoryTest_Vapour heat treatment for *Carica papaya* var. Solo https://www.ippc.int/work-area-publications/2009-109referenceconfirmatorytestpapaya-vht2013-05-01-0	2013-05-13
TPPT_2013_Jul_14	**6.4**	2010-106_ TreatmentPortfolio_Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica*	2013-06-27

DOCUMENT NUMBER	AGENDA ITEM	DOCUMENT TITLE (PREPARED BY)	DATE POSTED / DISTRIBUTED
2010-106_ Submitter Response	**6.4**	2010-106_ Submitter Response _Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* https://www.ippc.int/work-area-publications/2010-106submitterresponse2013-05-07c-capitata-compressed-final2013-05-07	2013-05-13
TPPT_2013_Jul_15	**6.5**	2010-107_TreatmentPortfolio_Vapour heat treatment for *Bactrocera tryoni* on *Mangifera indica*	2013-06-27
2010-107_ Submitter Response	**6.5**	2010-107_ Submitter Response_Vapour heat treatment for *Bactrocera tryoni* on *Mangifera indica* https://www.ippc.int/work-area-publications/2010-107submitterresponse2013-05-07bactrocera-tryonicompressed-final2013-05-0	2013-05-13
TPPT_2013_Jul_16	**6.6**	2009-105_ TreatmentPortfolio_High temperature forced air treatment for selected fruit fly species (Diptera: Tephritidae) on fruit	2013-07-02
2009-105_ References	**6.6**	https://www.ippc.int/work-area-publications/high-temperature-forced-air-treatment-selected-fruit-fly-species-diptera-0	2013-05-14
2009-105_HTFA_ review	**6.6**		2013-07-12 During the meeting
TPPT_2013_Jul_17	**6.9**	2010-102_ TreatmentPortfolio_Cold treatment for *Ceratitis capitata* on *Citrus reticulata* and their hybrids	2013-07-02
2010-102_ Submitter Response	**6.9**	2010-102_ Submitter Response_Cold treatment for *Ceratitis capitata* on *Citrus reticulata* and their hybrids https://www.ippc.int/work-area-publications/2010-102submitterresponse2013-04-30spain-creticulata-0	2013-05-13
TPPT_2013_Jul_18	**6.10**	2010-103_ TreatmentPortfolio_Cold treatment for *Ceratitis capitata* on *Citrus sinensis*	2013-07-02
2010-103_ Submitter Response	**6.10**	2010-103_ Submitter Response_Cold treatment for *Ceratitis capitata* on *Citrus sinensis*	2013-05-13
Information papers			
2007-102_SubmitterResponse	**4.0**	2007-102_SubmitterResponse_RejectTreatmSubmission_Methyl isothiocyanate and sulfuryl fluoride (Ecotwin mixture) fumigation for *Bursaphelenchus xylophilus*, Coleoptera: Cerambycidae, and Coleoptera: Scolytinae of wood packaging material (SHAMILOV)	2013-05-13
TPPT_2013_Jul_08 Hard copy will be presented on the meeting	**4.2**	Italian NPPO Guidelines for the application and verification of dielectric heating as a phytosanitary measure (for information) (SHAMILOV)	2013-07-08
All other meeting documents (including checklists)			

DOCUMENT NUMBER	AGENDA ITEM	DOCUMENT TITLE (PREPARED BY)	DATE POSTED / DISTRIBUTED
TPPT_2013_Jul_01	**1.0**	Agenda (SHAMILOV)	2013-06-27
TPPT_2013_Jul_02	**2.0**	Documents List (SHAMILOV)	2013-06-27
TPPT_2013_Jul_03	**2.0**	Participants List (SHAMILOV)	2013-05-13
TPPT_2013_Jul_04	**2.0**	Local Information (DUBON)	2013-05-13
TPPT_2013_Jul_05	**3; 3.1; 3.2; 3.3; 5.2; 6.7; 8; 9; 10; 10.3;10.4; 10.5;**	TPPT Consideration (DUBON)/ (SHAMILOV)	2013-06-27
TPPT_2013_Jul_19	**6.8**	Cold treatment tolerance paper	2013-07-03
TPPT_2013_Jul_20	**8.1**	Submission form and Draft Specification for ISPM XX:20XX Requirements for the use of temperature treatments as a phytosanitary measure	2013-07-03
TPPT_2013_Jul_21	**8.2**	Submission form Draft Specification for ISPM XX:20XX Requirements for the use of fumigation treatments as a phytosanitary measure	2013-06-27
TPPT_2013_Jul_22	**8.3**	Submission form Draft Specification for ISPM XX:20XX Requirements for the use of chemicals treatments as a phytosanitary measure	2013-07-03
TPPT_2013_Jul_23	**8.4**	Submission form Draft Specification for ISPM XX:20XX Requirements for the use of modified atmosphere treatments as a phytosanitary measure	2013-06-27
TPPT_2013_Jul_24	**9.1**	Submission form and Draft Specification for Revision to ISPM 18:2003	2013-06-27
TPPT_2013_Jul_25	**9.2**	Submission form for Pests other than fruit flies treatments	2013-07-03
TPPT_2013_Jul_26	**9.3**	Submission form for Wood treatments	2013-07-03
TPPT_2013_Jul_27	**9.4**	Submission form for Plants for planting treatments	2013-06-27
TPPT_2013_Jul_28	**9.5**	Submission form for Sea containers treatments	2013-06-27
TPPT_2013_Jul_29	**9.6**	Submission form for Used Equipment treatments	2013-07-04
TPPT_2013_Jul_30	**9.7**	Elimination of Topics for treatments from the List of topics for IPPC Standards	2013-05-13
TPPT_2013_Jul_31	**11.1**	List of Topics (treatment leads and vacancies, prioritization, etc.)	2013-06-27
TPPT_2013_Jul_32	**11.2**	TPPT Work Programme and Medium Term Plan	2013-06-27
TPPT_2013_Jul_33	**8.5**	TPPT Position paper on proposals for development two separate ISPMs on fumigation and chemicals	2013-06-27

DOCUMENT NUMBER	AGENDA ITEM	DOCUMENT TITLE (PREPARED BY)	DATE POSTED / DISTRIBUTED
TPPT_2013_Jul_34		TPPT Position paper on adult emergence after irradiation	2013-07-11 During the meeting

Appendix 3: Participants list

Participant role	Name, mailing, address, telephone	Email address	Term expires
Steward	**Mr Jan Bart ROSSEL** Director International Plant Health Program Office of the Australia Chief Plant Protection Officer Australian Government Department of Agriculture, Fisheries and Forestry **AUSTRALIA** Tel: +61 2 6272 5056 / 0408625413	bart.rossel@daff.gov.au	NA
Previous Steward	**Mr Antario DIKIN** Director Plant Quarantine and Biosafety Indonesia Agricultural Quarantine Agency Building E 5th floor JL. Harsone RM 83 Jakarta 12550 **INDONESIA** Mob: +62 813 99155774 Tel: +62 21 7816482	antarjo.dikin@yahoo.com	NA
Member	**Mr Patrick GOMES** Fruit Fly Coordinator Science and Technology USDA-APHIS-PPQ 920 Main Campus Dr – Suite 200 Raleigh, North Carolina **USA** Tel: +1 919 855 7313	Patrick.J.Gomes@aphis.usda.gov	2017 – 1st Term
Member	**Mr Guy HALLMAN** Research Entomologist Stored Product Insect Research Unit Center for Grain & Animal Health Research 1515 College Ave. Manhattan, KS 66502 **USA** Tel: +1 785 776 27 05	Guy.Hallman@ars.usda.gov	2017 – 1st Term
Member	**Mr Andrew JESSUP** Senior Research Horticulturist NSW Department of Primary Industries Locked Bag 26, GOSFORD NSW 2250 **AUSTRALIA** Tel: +02 4348 1965	andrew.jessup@dpi.nsw.gov.au	2014 – 1st Term 2019– 2nd Term

Participant role	Name, mailing, address, telephone	Email address	Term expires
Member	**Mr Michael ORMSBY** Senior Adviser, Plant Risk Analysis Ministry for Primary Industries P.O Box 2526, Wellington, **NEW ZEALAND** Tel: +64 4 8940486	Michael.Ormsby@mpi.govt.nz	2016 – 2nd Term
Member	**Mr Min-Goo PARK** Inspector Animal and Plant Quarantine Agency 129 Junaro Nongn Inchoo **REPUBLIC OF KOREA** Tel: +82 10 1676 7178	pmg@korea.kr	2014 – 1st Term
Member	**Mr Eduardo WILLINK** Estación Experimental Agroindustrial Obispo Colombres, P.O.Box 9, Las Talitas (4101) Tucumán **ARGENTINA** Tel: +54 381-4521010 Mob: +54 381 469 2512	ewillink@eeaoc.org.ar ewillink@arnet.com.ar	2016 – 2nd Term
Member	**Mr Yuejin WANG** Institute of Inspection Technology and Equipment Chinese Academy of Inspection and Quarantine No. 241 Huixinli, Chaoyang District, Beijing 100029 **CHINA** Tel: +86 10 64934647	wangyuejin@263.net.cn wangyj@caiq.gov.cn	2016 – 2nd Term
Secretariat Lead	**Mr Artur SHAMILOV** International Plant Protection Convention Food and Agriculture Organization of the United Nations VialedelleTerme di Caracalla 00153 Rome ITALY Tel: + 39 06 570 56 073	Artur.shamilov@fao.org	NA

Participant role	Name, mailing, address, telephone	Email address	Term expires
Secretariat Support	**Ms Stephanie DUBON** International Plant Protection Convention Food and Agriculture Organization of the United Nations 4700 River Road Riverdale, MD 20737 USA Tel: +1 301 851 2108	Stephanie.Dubon@fao.org	NA

Appendix 4: ED calculations

Table 1. ED calculation for 2009-109

VHT	46°C/70 mins	Confirmatory Controls - OFF		
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae	TOTAL # PUPAE	AVERAGE / FRUIT
1	1	332	332	332.00
2	1	354	354	354.00
3	1	304	304	304.00
4	1	338	338	338.00
5	1	312	312	312.00
6	1	286	286	286.00
7	1	246	246	246.00
8	1	393	393	393.00
9	1	309	309	309.00
10	1	232	232	232.00
11	1	330	330	330.00
12	1	325	325	325.00
13	1	293	293	293.00
14	1	295	295	295.00
15	1	370	370	370.00
16	1	293	293	293.00
17	1	326	326	326.00
18	1	436	436	436.00
19	1	241	241	241.00
20	1	318	318	318.00
Total	**20**	**6333**	**6333**	**316.65**
~~**Average (± SE x (SQR(1+1/r)) =**~~		~~**316.65 ±**~~	~~**50.41 =**~~	~~**266.24**~~
Average (± SE x 1.645) =		**316.65 ±**	**50.41 =**	**235.72**
			Number Tested Fruit =	**80**
		~~**Estimated Number of Treated FF (95% confidence) =**~~		~~**21,299**~~
		Estimated No. of Treated FF (95% confidence SE) =		**18,857**

Table 2a. ED calculations for 2010-106

VHT	46°C/70 mins	Confirmatory Controls - MedFly (14/01/93)				
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae			TOTAL # PUPAE	AVERAGE / FRUIT
		1st Count	2nd Count	3rd Count		
1	26	1639	51	0	1690	65.00
2	26	1424	67	4	1495	57.50
3	25	2154	30	2	2186	87.44
4	27	3114	46	3	3163	117.15
Total	**104**	**8331**	**194**	**9**	**8534**	**81.77**
			Average (± SE x (SQR(1+1/r)) =	**81.77 ±**	**29.96 =**	**51.81**
			~~**Average (± SE x 1.645) =**~~	~~**81.77 ±**~~	~~**29.96 =**~~	~~**37.69**~~
					Number of Tested Fruit =	**249**
					Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**12,901**
					~~**Estimated Number of Treated Pests from Individual Controls (95% confidence) =**~~	~~**9,385**~~

Table 2b. ED calculations for 2010-106

VHT	46°C/70 mins	Confirmatory Controls - MedFly (19/01/93)				
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae			TOTAL # PUPAE	AVERAGE / FRUIT
		1st Count	2nd Count	3rd Count		
1	7	869	154	1	1024	146.29
2	38	4829	437	3	5269	138.66
Total	**45**	**5698**	**591**	**4**	**6293**	**142.47**
			Average (± SE x (SQR(1+1/r)) =	**142.47 ±**	**6.61 =**	**135.86**
			~~**Average (± SE x 1.645) =**~~	~~**142.47 ±**~~	~~**6.61 =**~~	~~**133.60**~~
					Number of Tested Fruit =	**223**
					Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**30,298**
					~~**Estimated Number of Treated Pests from Individual Controls (95% confidence) =**~~	~~**29,792**~~

Table 2c. ED calculations for 2010-106

VHT	46°C/70 mins	Confirmatory Controls - MedFly (04/02/93)				
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae			TOTAL # PUPAE	AVERAGE / FRUIT
		1st Count	2nd Count	3rd Count		
1	36	12141	4292	31	16464	457.33
2	36	6684	2677	88	9449	262.47
Total	**72**	**18825**	**6969**	**119**	**25913**	**359.90**
			Average (± SE x (SQR(1+1/r)) =	**359.90 ±**	**168.75 =**	**191.15**
			~~**Average (± SE x 1.645) =**~~	~~**359.90 ±**~~	~~**168.75 =**~~	~~**133.24**~~
					Number of Tested Fruit =	**180**
					Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**34,406**
					~~**Estimated Number of Treated Pests from Individual Controls (95% confidence) =**~~	~~**23,983**~~

Table 2d. ED calculations for 2010-106

VHT	46°C/70 mins	Confirmatory Controls - MedFly (05/02/93)				
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae			TOTAL # PUPAE	AVERAGE / FRUIT
		1st Count	2nd Count	3rd Count		
1	36	3374	616	41	4031	111.97
2	36	5195	1264	134	6593	183.14
Total	**72**	**8569**	**1880**	**175**	**10624**	**147.56**
			Average (± SE x (SQR(1+1/r)) =	**147.56 ±**	**61.63 =**	**85.93**
			~~**Average (± SE x 1.645) =**~~	~~**147.56 ±**~~	~~**61.63 =**~~	~~**64.78**~~
					Number of Tested Fruit =	**180**
					Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**15,467**
					~~**Estimated Number of Treated Pests from Individual Controls (95% confidence) =**~~	~~**11,660**~~

Table 2e. ED calculations for 2010-106

VHT	**46°C/70 mins**	**Confirmatory Controls - MedFly (14/01/93)**	
		Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**12,901**
VHT	**46°C/70 mins**	**Confirmatory Controls - MedFly (19/01/93)**	
		Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**30,298**
VHT	**46°C/70 mins**	**Confirmatory Controls - MedFly (04/02/93)**	
		Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**34,406**
VHT	**46°C/70 mins**	**Confirmatory Controls - MedFly (05/02/93)**	
		Estimated Number of Treated Pests from Combined Controls (95% confidence) =	**15,467**
		TOTAL =	**93,072**

Table 3. ED calculations for 2010-102

Cold	2°C/16 days	Confirmatory Controls - MedFly		
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae 1st Count	TOTAL # PUPAE	AVERAGE / FRUIT
1	294	4527	4527	15.40
2	286	4118	4118	14.40
3	302	4167	4167	13.80
Total	**882**	**12812**	**12812**	**14.53**
Average (± SE x (SQR(1+1/r)) =		**14.53 ±**	**0.93 =**	**13.60**
~~**Average (± SE x 1.645) =**~~		~~**14.53 ±**~~	~~**0.93 =**~~	~~**13.20**~~
Number Tested Fruit =				**2202**
Estimated Number of Treated FF (95% confidence) =				**29,940**
~~**Estimated No. of Treated FF (95% confidence SE) =**~~				~~**29,067**~~

Table 4a. ED calculations for 2010-103

Cold	2°C/16 days	Confirmatory Controls - MedFly – Valencia - Wooden Box		
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae 1st Count	TOTAL # PUPAE	AVERAGE / FRUIT
1	240	4149	4149	17.29
3	243	3654	3654	15.04
Total	**483**	**7803**	**7803**	**16.16**
Average (± SE x (SQR(1+1/r)) =		**16.16 ±**	**1.84 =**	**14.32**
~~**Average (± SE x 1.645) =**~~		~~**16.16 ±**~~	~~**1.84 =**~~	~~**13.54**~~
			Number Tested Fruit =	**1,498**
			Estimated Number of Treated FF (95% confidence) =	**21,455**
			~~**Estimated No. of Treated FF (95% confidence SE) =**~~	~~**20,286**~~

Table 4b.

Cold	2°C/16 days	Confirmatory Controls - MedFly – Valencia - Cardboard Box		
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae 1st Count	TOTAL # PUPAE	AVERAGE / FRUIT
1	240	4320	4320	18.00
3	238	4165	4165	17.50
Total	**478**	**8485**	**8485**	**17.75**
Average (± SE x (SQR(1+1/r)) =		**17.75 ±**	**0.41 =**	**17.34**
~~**Average (± SE x 1.645) =**~~		~~**17.75 ±**~~	~~**0.41 =**~~	~~**17.17**~~
			Number Tested Fruit =	**1,498**
			Estimated Number of Treated FF (95% confidence) =	**25,978**
			~~**Estimated No. of Treated FF (95% confidence SE) =**~~	~~**25,718**~~

Total =	**47,433**

Table 5. ED calculations for 2009-105

HTFA	**47.5°C/20 mins (3.5hr)**		**Confirmatory Controls - *B melanotus***			
TREATMENT UNIT	No.FRUIT / TRAY	No. Pupae			TOTAL # PUPAE	AVERAGE / FRUIT
		1st Count				
1	12	3127			3127	260.58
2	10	2494			2494	249.40
3	12	2484			2484	207.00
4	14	2940			2940	210.00
5	8	1908			1908	238.50
6	6	1664			1664	277.33
7	6	1838			1838	306.33
Total	**68**	**16455**	**0**	**0**	**16455**	**249.88**
			Average (± SE x (SQR(1+1/r)) =	**249.88 ±**	**38.08 =**	**211.80**
			~~Average (± SE x 1.645) =~~	**~~249.88 ±~~**	**~~38.08 =~~**	**~~191.28~~**
					Number of Tested Fruit =	**165**
Estimated Number of Treated Pests from Combined Controls (95% confidence) =						**34,947**
~~Estimated Number of Treated Pests from Individual Controls (95% confidence) =~~						**~~31,561~~**

From tables 12 and 13 (pages 31 and 32) of Waddell, B. C. Clare, G. K. Maindonald, J. H. Petry R. J. (1993) Postharvest disinfection of *Bactocera melanotus* and *B. xanthodes* in the Cook Islands: Report 3. *HortResearch Client Report* No. 93/270. 70p.

Table 6. ED calculations for 2010-106

Replicate 1 Excluded

45°C for 30 minutes		**Confirmatory Controls - Melon fly 1 day old eggs**			
TREATMENT REPLICATE	No.FRUIT / TRAY	NUMBER OF PUPAE		TOTAL # PUPAE	AVERAGE / FRUIT
		SURVIVORS			
2	5	14,990		14,990	2,998.00
3	5	6,411		6,411	1,282.20
4	5	7,655		7,655	1,531.00
Total	**15**	**29,056**	**0**	**29,056**	**1,937.07**
		Average (± SE x (SQR(1+1/r)) =	**1,937.07 ±**	**1,036.62 =**	**900.45**
				Number Tested Fruit =	**30**
				Estimated Number of Treated FF (Average) =	**27,014**
				ED (at the 95% level of confidence) =	**99.9889**

Appendix 5: Working TPPT criteria for treatment evaluation

1. Introduction

This document provides a description of the agreed procedure for the evaluation of phytosanitary treatments for inclusion in an International Standard for Phytosanitary Measures (ISPM). The procedures and processes documented here have been agreed to and applied by the Technical Panel for Phytosanitary Treatments (TPPT) for the evaluation of phytosanitary treatments against the requirements of ISPM 28:2007 *Phytosanitary treatments for regulated pests*.

It is important to note that the burden is on the submitter to provide a complete and accurate submission and information in support of their proposed treatment. This includes the appropriate statistical analysis of the research results, including efficacy.

2. Procedure for the production of phytosanitary treatments

2.1 Call for submissions for phytosanitary treatments on topics approved by the CPM

- The IPPC Secretariat issues a call for submissions for phytosanitary treatments as approved by the Standards Committee (SC). Phytosanitary treatments are submitted by NPPOs or RPPOs for evaluation as an international standard in response to a call for submissions by the Secretariat.
- The "Submission Form for Phytosanitary treatments" should be used by NPPOs or RPPOs to submit information on phytosanitary treatments.
- The submission forms are collated by the Secretariat and sent to the Technical Panel on Phytosanitary Treatments (TPPT) for review.

2.2 Evaluation of treatment submissions

- The TPPT prioritize submissions for development of phytosanitary treatments, taking into account guidance from the SC and the "Procedure and criteria for identifying topics for inclusion in the IPPC standard setting work programme" (adopted by the CPM-3 in 2008) and using the score definitions (see IPPC procedural manual). The TPPT will also take into account recommendations by other CPM bodies.
- Submissions will be evaluated for their suitability as an international treatment by the TPPT in line with guidance provided in ISPM No. 28 (*Phytosanitary treatments for regulated pests*) and Section A. The submitted treatments will be determined to be:
  - an acceptable treatment;
  - a treatment requiring more information or research in order to evaluate its efficacy; or
  - a treatment not accepted for inclusion in ISPM 28:2007.
- Acceptable treatments will be recommended to the SC. For treatments requiring more information, or unacceptable treatments, the NPPO or RPPO, with a copy to the contact person for the submission will be notified by the Secretariat and additional information will be requested or the reasons for the rejection will be given. In addition, the submitter of treatments that are being recommended to the SC will be advised accordingly.

Section A: Process for the evaluation of treatment submissions by experts

One expert for each treatment submission is selected as its "lead" by the TPPT to evaluate the submission;

- The lead will review the data to ensure it supports the stated efficacy based on ISPM No. 28 (*Phytosanitary treatments for regulated pests*) and additional instructions from the TPPT if needed;
- The lead completes a "checklist" and an "evaluation sheet" developed by the TPPT;

- In some cases, for example where more than one submission is received for a particular treatment/commodity/pest combination, the lead may need to resolve differences between data sets and to prevent duplication of near identical treatments;
- The lead may be able to accumulate further data to support a treatment submission. Where incomplete submissions are received, leads will liaise with the submitter to help progress the submission;
- The treatment is then submitted to the TPPT for assessment.

3. Overview of a Good Research Protocol

A number of authors have published comprehensive guides on what good research methodologies should cover when developing phytosanitary treatments. Hallman and Mangan (1998), Hallman (2000), Heather (2004), and Heather and Hallman (2008) provide comprehensive overviews of sound research protocols, while Sgrillo (2002) provides some background and guidance on quantitative parameters for phytosanitary measures.

From these papers and ISPM 28 it can be surmised that a sound research protocol should ensure that:

- there is an unambiguous description of the target pest and commodity, and the nature of the association of the two in trade and how this relates to the mode of action of the treatment;
- the condition of the target pest, host and environment at the time of testing is equivalent to the likely condition or range of conditions found in trade. For example, laboratory colonies of test pests should be representative of what is most likely to be encountered in trade and should be replenished with wild types periodically;
- the effectiveness of the treatment is tested against the most tolerant life stage or condition of the target pest likely to be found at the time of treatment application in trade;
- For generic treatments, effectiveness of the treatment is tested against the most tolerant species within the target group;
- the treatment outcome is appropriate to the phytosanitary needs of trade; and
- the publication or reporting of the research outcomes is suitably transparent for assessment by regulatory organisations.
- the specimens are identified to the species level by a specialist, including detailed information of how the species was determined. Refer to ISPM 8:1998 (section 2.1 Pest records) for further guidance.
- with regards to voucher specimens, submitters should ensure to preserve sample specimens in appropriate media for future reference.
- when doing replicates or when repeating laboratory trials for comparison in a different location or time, conditions should be as similar as possible on each occasion, such as pests, commodities, load factors, testing equipment, experimental protocols, etc.
- the methods used to measure the experimental parameters of the treatment are appropriate and that records are provided with submissions. This may include calibration of equipment and records indicating, over time, temperature ranges, treatment duration (including heat up, cool down and dwell time), dosimetry, etc.
- statistical analyses are completed using the most appropriate methods. Experts in statistics should be consulted.

3.1 Use of historical records

Historical data should be utilized only where there is a statistical basis for determining the level of efficacy, e.g. when efficacy data exist in relation to sampling under operational conditions. In most, if not all, cases it will not be known with any degree of accuracy, how many target pests were present prior to treatment; additionally, the accuracy of the inspection methods to detect the pest(s) at a certain

level (or even the confidence with which one could detect an organism) needs to be known. In particular, five specific difficulties were identified in the paper[8]:

- The condition of the target regulated article may vary over time;
- The life stage of the target pest may change over time;
- Environmental conditions critical to treatment efficacy may vary over time;
- The number of live target organisms infesting the regulated article may not be known at the time;
    - The number of surviving target organisms post-treatment may not have been determined (with any degree of accuracy).

4. General considerations when calculating the effective dose (ED)

The panel has recommended a number of principles that they should apply when calculating the ED for each treatment at the 95% confidence level, based on the total number of target pests treated. Further information on the calculation of the ED is provided in a publication by Couey and Chew (1986). These agreed principles include:

- The level of mortality in the controls must be accounted for when calculating treatment efficacy from counts of dead treated pests. The recorded mortality of treated target pests should be adjusted for natural mortality recorded in controls e.g. if there is a 10% level of mortality in the control sample, 10% of the deaths in the treated sample should be attributed to causes other than the treatment.
- Greater than expected natural mortality levels (in controls) should be treated with care because they may indicate a target pest population under stress. A population under stress may be more susceptible to the treatment than a natural population.
- Sample sizes and repetitions should be sufficient to account both for natural variation and achieve significant regressions when extrapolating treatment efficacy. A small number of treatment repetitions can, on analysis, result in statistical errors giving meaningless conclusions (if the SD at 95% is greater than the mean, the lower (worst case) result may be a negative dose e.g. 10 ± 12 gives a range from -2 to 22).
- When the population of treated pests is estimated from control pest populations, the estimation must be based on a statistical analysis of the controls. Where possible, control data should not be grouped together, but should be recorded for each individual test commodity or target pest. Pseudo-replication[9] should be avoided or minimized, as much as possible.
- Researchers need to apply the same statistical rigour to control data as they do to treatment data. Where the infestation rate for each regulated article in the control is known, the estimated treated regulated article infestation rate would be:

$$\text{Average per treated regulated article} = \boldsymbol{\mu - (STD \times 1.645)}$$

- Where the control infestation rate is based on the mean of grouped commodities, as the number of controls increases so does the level of confidence in the estimation of the population mean. A

[8] Reference paper: will be added after 2013 September Virtual meeting

[9] Pseudoreplication is used to test for treatment effects with data from experiments where either treatments are not replicated (though samples may be) or replicates are not statistically independent. The error described by this term arises when treatments are assigned to units that are subsampled and the treatment F-ratio in an analysis of variance (ANOVA) table is formed with respect to the residual mean square rather than with respect to the among unit mean square. The F-ratio relative to the within unit mean square is vulnerable to the confounding of treatment and unit effects, especially when unit number is small (*e.g.* four tank units, two tanks treated, two not treated, several subsamples per tank). The error is avoided by forming the F-ratio relative to the among unit mean square in the ANOVA table (tank MS in the example above). Pseudoreplication, as originally defined, is a special case of inadequate specification of random factors where both random and fixed factors are present: http://en.wikipedia.org/wiki/Pseudoreplication

suitable formula for estimating the average number of exposed pests per treated regulated article would therefore be:

$$\text{Average per treated regulated article} = \boldsymbol{\mu - (STD \times \sqrt{(1+1/r)})}$$

Note: **r** is equal to the number of control replicates used to estimate the mean (**μ**) and standard deviation (**STD**) of the control means.

5. Choosing Surrogate Species for the Development of Phytosanitary Treatments

Note: In the context of the TPPT, discussion on choosing a surrogate species is confined to the use of insect pest species to substitute for target species when the target species is difficult or impossible to obtain or use in research on developing a phytosanitary treatment.

Target species: The species that is of quarantine concern to an importing country.

Surrogate species: The species that is tested instead of the target species.

A suitable surrogate species may be as tolerant or preferably more tolerant than the target species and must respond as closely as possible to the treatment as the target species.. When a surrogate species is used in developing a phytosanitary treatment the TPPT needs to see justification that the surrogate species is a suitable substitute for the target species.

The following attributes may be used in providing such a justification. Similarity between the target species and the surrogate species in:

- Order, Family, Genus, Species (different strain, sub-species, variant, etc) ["taxonomic distance"]
- Host (i.e. target product) and host range
- Life history, phenology, size
- Feeding regime
- Reaction to treatment
- Tolerance to treatment (preferably less tolerant at same temperature, duration of exposure, dose concentration, etc) ["toxicologically representative"]
- Habitat type (e.g. tropical, temperate)
- Level of damage to target product and the part/s of target product damaged
- Published supporting scientific literature and/or existing international / bilateral approvals

5.1 Selected references

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6. Determination of a suitable treatment end-point

As stated in ISPM 18 (2003) but which is equally applicable to all treatments: "The objective of using irradiation as a phytosanitary measure is to prevent the introduction or spread of regulated pests. This may be realized by achieving certain responses in the targeted pest(s) such as:

- mortality
- preventing successful development (e.g. non-emergence of adults)
- inability to reproduce (e.g. sterility), or
- inactivation".

Typically, the most advanced developmental stage of the insect occurring in the commodity is the most tolerant when the measure of efficacy is preventing further development or reproduction (Hallman *et al.* 2010). In the case of tephritid fruit flies, preventing adult emergence could be considered the desired response required for regulatory purposes because it prevents the emergence of adult flies that could be trapped and trigger regulatory actions (ISPM 28 Annex 7, 2009). However, when the insect pupates in the host, preventing adult emergence may require an excessive treatment dose as is the case with irradiation, so prevention of development of the F_1 generation may be a more achievable measure of efficacy (Hallman *et al.* 2010).

From the very beginnings of the idea of using irradiation as a phytosanitary treatment, Koidsumi (1930) proposed that the measure of efficacy should be prevention of adult emergence rather than mortality to previous stages. This would satisfy the phytosanitary requirement of preventing the establishment of invasive species without necessarily acute mortality of the stages treated. The advantage would be that treatment would be more economical and less damaging to product quality. Unfortunately this means that live, though sterile, insects might be found in the product by inspectors and mistaken for fertile quarantine pests.

It therefore makes the independent verification of treatment efficacy used by other phytosanitary treatments, acute mortality of the treated lifestage, unusable for treatments that prevent adult emergence or result in adult sterility. An alternative form of verification could test the detected lifestage for evidence of treatment application e.g. treatment residues or chemical changes in the pest. In the case of irradiation, there is currently no easy procedure available to identify whether or not an adult insect is irradiated or not, sterile or fertile, so if such adults were trapped subsequently costly regulatory actions would be instigated.

Considerations:

Treatment must prevent successful development.

If pupation occurs in the treated commodity then treatment must prevent the eclosion of adults. If adults typically occur in the product then treatment must cause 100% mortality of the adults. In the case of irradiation, to satisfy these requirements the necessary irradiation dose would be too high for the product being treated to tolerate.

Treatment must prevent adult emergence.

It is possible that live immature life stages of the target insect may be present in the treated product. These insects would be sterile and there is sufficient published evidence for this assertion.

This requirement is the 'traditional' criterion for treatment efficacy for irradiation treatments and also, at least in some jurisdictions, other quarantine treatments such as cold disinfestation and fumigation.

There are currently no simple methods available which can be used to identify whether or not treatment has been carried out correctly by testing the recovered insect. While there are dosimeters and coloured labels (e.g. "Rad Tags") that change colour when correctly dosed, pre-coloured tags may be misused.

Suitably robust certification of the application of the quarantine treatment could cover concerns that immature insects found inside the fruit will be sterile.

Treatment must cause sterility of target insect pests.

Again there is the likelihood that live immature pest life stages will be found in treated product.

However an additional complication is that live, but sterile adults may escape into the importing locality and be trapped thereby triggering exotic pest incursion activities and restrictions.

Until simple and reliable techniques are readily available with which to identify insects found in quarantine traps as being treated and sterile, it will be difficult for importing authorities to accept sterility as a suitable end-point for a phytosanitary treatment.

If a researcher can prove to the satisfaction of importing authorities that insects surviving treatment will be sterile, and will not be able to survive long enough or migrate far enough to be a problem in trapping grids, then the treatment efficacy end-point of adult sterility could be used with phytosanitary certification.

While some research has shown that these insects may not be able to mate, or if they do mate their eggs are 100% infertile. These facts, while acting to ensure quarantine security, should the insects escape into the environment, will not be acceptable to importing authorities if these insects can fly or otherwise move to surveillance traps.

6.1 Selected references

Hallman *et al.* 2010

Koidsumi (1930)

TPPT Position paper on adult emergence after irradiation (2013)[10]

7. General considerations for temperature treatments

The panel considered issues associated with treatments based on temperature, taking into account the work of Hallman and Mangan (1997). In 2009 the panel recommended a number of principles that should be applied when evaluating temperature treatments for adoption as international standards (outlined below).

7.1 Mortality assessments

When assessing mortality, any larvae that are found alive should be considered survivors whether or not they subsequently fail to pupate or survive to adults. This takes account of the fact that in practice on phytosanitary inspection any live insect found will be considered a survivor.

7.2 Genotype of insect

It is possible that laboratory-bred colonies of insects may become more susceptible to temperature-based treatments over time. The panel is not aware of any research having been undertaken to demonstrate whether this is an issue in reality. The panel considers that as long as the colonies used in the research have been established or reinvigorated before the research, issues such as these should not be considered significant subject to research showing otherwise.

7.3 Pre-treatment acclimation

Insects may be less susceptible to temperature treatments depending on the conditions they are exposed to immediately prior to treatment. The panel considers that where this may be an issue, pre-treatment requirements should be included in any recommended treatment schedule.

[10] 2013 September TPPT Virtual meeting report

7.4 Commodity variability

To provide confidence that temperature treatments are applicable internationally, host material used in research should be sampled from as wide a geographic area as possible and unexpected results should be considered with care.

7.5 Scale of treatment application

The panel should consider any possible reduction in effectiveness of temperature treatments that may occur when treatments are scaled up and applied in commercial conditions.

7.6 Rate of temperature change

Where the rate of temperature change of the commodity may be considered significant to the effectiveness of a temperature treatment, this should be specified in the treatment schedule.

7.7 Determining the most tolerant life stage

The most tolerant life stage should be determined using hosts and pests under normal conditions of infestation and treatment parameters, using a common measure of efficacy. If conditions are different, it should be demonstrated that these differences are equivalent to normal conditions. For instance, if artificial inoculation is used, this should be similar to the host and pest found in nature, e.g. depth in commodity and level of infestation.

When developing mortality curves, life stages should be exposed to as close to the target temperature as possible for different periods.

8. General considerations for wood packaging material heat treatments

The panel considered the following issues when evaluating wood packaging material heat treatments for adoption as international standards (outlined below).

8.1 Mortality assessments

When assessing mortality, the target life stage should be that most likely to be present in the wood at the time of treatment. Any target life stage found alive should be considered a survivor whether or not it subsequently fails to survive to adulthood or produce offspring. This takes account of the fact that in practice on phytosanitary inspection any live life stage found will be considered a survivor.

8.2 Environmental factors

Consideration should be taken of potential environmental effect on the efficacy of the treatment under conditions expected to be encountered at the time of treatment (such as wood moisture content or density). Unexpected results should be considered with care.

8.3 Pre-treatment acclimation

Target pests may be less susceptible to temperature treatments depending on the conditions they are exposed to immediately prior to treatment. The panel considers that where this may be an issue, pre-treatment requirements should be included in any recommended treatment schedule.

8.4 Scale of treatment application

The panel should consider any possible reduction in effectiveness of temperature treatments that may occur when treatments are scaled up and applied in commercial conditions.

8.5 Rate of temperature change

Where the rate of temperature change of the commodity may be considered significant to the effectiveness of a temperature treatment, this should be specified in the treatment schedule.

8.6 Heating process

Consideration should be taken of the heating process (e.g. heating from inside out or outside in) and the conditions that need to be met before the treatment can commence.

9. General considerations for wood fumigation treatments

The panel considered the following issues when evaluating wood fumigation treatments for adoption as international standards (outlined below).

9.1 Mortality assessments

When assessing mortality, the target life stage should be that most likely to be present in the wood at the time of treatment. Any target life stage found alive should be considered a survivor whether or not it subsequently fails to survive to adulthood or produce offspring. This takes account of the fact that in practice on phytosanitary inspection any live life stage found will be considered a survivor.

9.2 Environmental factors

Consideration should be taken of potential environmental effects on the efficacy of the treatment under conditions expected to be encountered at the time of treatment. Wood factors such as moisture content, density, porosity and presence of bark should be considered along with temperature. Unexpected results should be considered with care.

9.3 Scale of treatment application

The panel should consider any possible reduction in effectiveness of fumigation treatments that may occur when treatments are scaled up and applied in commercial conditions.

10. General considerations for cold treatments

The panel considered the issues associated with treatments based on temperature, taking into account the work of Hallman and Mangan (1997). The panel recommended a number of principles that they should apply when evaluating temperature treatments for adoption as international standards (outlined below).

10.1 Mortality assessments

When assessing mortality, any larvae that are found alive should be considered survivors whether or not they subsequently fail to pupate or survive to adults. This takes account of the fact that in practice on phytosanitary inspection any live insect found will be considered a survivor.

10.2 Genotype of insect

It is possible that laboratory-bred colonies may become more susceptible to temperature-based treatments over time. The panel is not aware of any research having been undertaken to demonstrate whether this is an issue in reality. The panel considers that as long as the colonies used in the research have been established or reinvigorated before the research, issues such as these should not be considered significant subject to research showing otherwise.

10.3 Pre-treatment acclimation

Insects may be less susceptible to temperature treatments depending on the conditions they are exposed to immediately prior to treatment. The panel considers that where this may be an issue pre-treatment requirements should be included in any recommended treatment schedule.

10.4 Commodity variability

To provide confidence that temperature treatments are applicable internationally, host material used in research should be sampled from as wide a geographic area as possible and unexpected results should be considered with care.

10.5 Scale of treatment application

The panel should consider any possible reduction in effectiveness of temperature treatments that may occur when they are scaled up and applied in commercial conditions.

10.6 Rate of temperature change

Where the rate of temperature change of the commodity may be considered significant to the effectiveness of a temperature treatment, this should be specified in the treatment schedule.

10.7 Issues associated with drafting of the treatment descriptions for cold treatments

When drafting the treatment descriptions from the different submissions, the TPPT noted that one submission related to two fruit flies on a number of different hosts. Other submissions were for the same fruit fly species and host commodity. The TPPT therefore made the following decisions regarding the treatment descriptions:

- Each treatment should be for an individual fruit fly species.
- For fruit fly hosts, the TPPT were aware that several countries had found different *Citrus* species responded to cold treatment differently. Treatments should therefore be produced for separate *Citrus* species.
- Regarding cultivars of *Citrus* species, the TPPT was aware that certain research had shown different cultivars of *Citrus sinensis* (orange) responded differently to cold treatments and they decided to quote the treatment efficacies for the different cultivars of *C. sinensis* separately in the treatment description. For the other *Citrus* species, the TPPT was not aware of different responses by cultivars and therefore there was no differentiation according to cultivar for these species.
- Treatments involving the same fruit fly species and host (for example *Ceratitis capitata* on *Citrus sinensis*) were included as different schedules in the same treatment description.
- Regarding temperatures sensitivities (e.g. $2^{o}C$ +/- $0.5^{o}C$), these were not added to the treatment schedules. In some submissions the temperature limits were quoted, but the TPPT noted that experimental probes were often more sensitive than commercial probes. The TPPT therefore decided to include a sentence in the treatment descriptions indicating that 'the stated temperatures should not be exceeded'. Commercial operators would need to take into account the normal working range of their equipment in order to meet this requirement.

11. General considerations for irradiation treatments

The panel considered the issues associated with treatments based on irradiation, taking into account the work of Hallman and Mangan (1997). The panel recommended a number of principles that they should apply when evaluating irradiation treatments for adoption as international standards (outlined below).

11.1 Extension of treatments to all fruits and vegetables

The efficacy of irradiation treatments can be extrapolated to all fruits and vegetables. Confidence was based on experience in the application of irradiation treatments and evidence from studies on *Anastrepha ludens, A. suspensa* and *Bactrocera tryoni* (Bustos *et al*., 2004; Gould & von Windeguth, 1991; Hallman & Martinez, 2001; Jessup *et al*., 1992; von Windeguth 1986; von Windeguth & Ismail, 1987).

The panel recognised, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the submitted target pests. If evidence becomes available to show that the extrapolation of treatments to cover all hosts of the target pests is incorrect, then the treatments should be reviewed.

11.2 Extension of treatments to all populations within a species

The panel considered whether the scope of submitted irradiation treatments could be extended to cover all strains and biotypes of the target pests concerned.

The panel was confident that the extrapolation of efficacy to all strains and biotypes of the target pests could be made for the irradiation treatments that had been submitted. This confidence was based on the absence of published evidence for significant differences between subspecies and biotypes in their radiation tolerance, including a study comparing strains of one target pest by Hallman (2003). The panel also recognised that recommended minimum doses are higher than otherwise required and should account for any minor differences in intra-species tolerances that may exist.

The panel recognised, however, that treatment efficacy has not been tested for all potential strains and biotypes of the submitted target pests. If evidence becomes available to show extrapolation of treatments to cover all strains and biotypes is incorrect, then the treatments should be reviewed.

11.3 Extension of species to the whole genus

The panel considered whether the scope of submitted irradiation treatments could be extended to cover all species in a genus of the target pests concerned.

The panel noted that Bakri *et al*. (2005) had indicated that, with few exceptions, there was no need to develop radiation biology data for all species within the same genus. The panel considered that a case for extrapolating irradiation doses to all species within a genus would need to be explored more fully in any submission.

11.4 Extending beyond genus to family

The panel considered whether the scope of submitted irradiation treatments could be extended to cover all genera in a family of the target pests concerned.

The TPPT noted that within Tephritidae a wide range of genera has been tested and this had supported extending irradiation treatments to the Family level in this case (report of 2006 meeting).

It was noted that for other insect families it would be impossible to get sufficient data to confirm that all genera within a family conform to the same treatment dose. This would be an enormous undertaking, which is unlikely to happen. The panel considered that a case for extrapolating irradiation doses to all genera within a family would need to be explored more fully in any submission.

11.5 Determination of the most tolerant life stage of the target pest(s)

The panel noted that the insect life stage that is most tolerant to irradiation is the most advanced stage when identical objectives are measured (e.g. prevention of adult emergence). The treatments only need to be effective for those life stages likely to be encountered in the traded commodity.

11.6 Effect of environmental conditions

The panel considered whether the scope of submitted irradiation treatments could be extended to cover treatments undertaken in all environmental conditions likely to be encountered under commercial conditions.

The panel was confident that the extrapolation of efficacy to all likely temperatures could be made for the irradiation treatments that had been submitted. Confidence was based on experience in the operation of irradiation treatments and evidence from studies on *Rhagoletis pomonella* (Hallman, 2004).

The panel noted that lowered oxygen conditions (hypoxia) may affect the efficacy of irradiation treatments. Unless the treatment has been determined to be effective under hypoxic conditions, the panel considers that to achieve the stated treatment efficacy the irradiation treatment should not be applied to fruit and vegetables stored in modified atmospheres.

11.7 Non-target effects of irradiation

The panel considered that the only potentially significant non-target effects of the irradiation treatments that were reviewed at the meeting were those affecting commodity quality. The research presented indicated that there would be minimal adverse effects at the prescribed dosages to the commodities tested. In some circumstances the research indicated that the irradiation treatments may enhance product quality through extending shelf life. However, the panel has recommended extending the treatments to all fruits and vegetables, including those that have not been tested or have been shown to be negatively impacted by relatively low irradiation doses. The panel therefore recommends that, prior to approving an irradiation treatment; NPPOs may wish to take account of any potential non-target effects of the treatment.

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Appendix 6: TPPT position paper on proposals for the development of two separate ISPMs for requirements on fumigation and chemical treatments

Chemical treatments can be simply defined as treatments that use chemicals (rather than heat, cold or irradiation). The USDA Treatment Manual (2013) lists all chemical treatments in Chapter 2, separating fumigants from aerosols, smokes, mists, dips, sprays, dusts and fogs. They define fumigation as "*the act of releasing and dispersing a toxic chemical so it reaches the target organism in a gaseous state. Chemicals applied as aerosols, smokes, mists, and fogs are suspensions of particulate matter in air and are not fumigants.*"

From the perspective of the chemical reactions that occur to achieve the desired outcome, in this case almost always pest mortality or devitalisation, all chemical treatments and be grouped based on their mode of action rather than their form of application. From an operational perspective however, chemicals applied in a gaseous state rather than as solids present unique implementation and evaluation issues.

As noted in the USDA Treatment Manual (2013), the *"toxicity of a fumigant depends on the respiration rate of the target organism. Generally, the lower the temperature, the lower the respiration rate of the organism which tends to make the pest less susceptible. Fumigation at lower temperatures requires a higher dosage rate for a longer exposure period than fumigation at higher temperatures."* Fumigants disperse relatively quickly due to their gaseous nature and for reasons of human safety.

In contrast, non-fumigant chemical treatments usually act on contact (directly or after diffusion into the pest (plant)),on consumption (directly or as part of the pests food e.g. wood), respiration or ingestion. These treatments often persist for some time or may be permanent. They are usually more easily applied and managed than fumigants, however can have more limited versatility.

Standards for the evaluation and implementation of these two groups of chemical treatments, gaseous and solid, could be presented in a single ISPM. However the ISPM would likely be overly complicated and necessitate being split into two sections with little common text between them.

Two separate ISPMs would provide a more effective platform for achieving the desired outcomes:

In the same manner as ISPM 18:2003 *Guidelines for irradiation as a phytosanitary measure*, two separate ISPMs for chemical treatments and fumigation would enhance harmonisation of the implementation (development, approval, safety and application) of this treatment types by member countries. There are a large number of chemical treatments and fumigation treatments used in international trade, and several submissions of treatment data to the IPPC Secretariat for this type of treatment. Therefore, it is acknowledged that guidelines are needed.

Enhancing the effective and efficient use of fumigants and another chemicals as a phytosanitary treatment would reduce unwanted environmentally impacts and identify replacements for more problematic fumigation treatments (such as methyl bromide) that have significant unwanted environmental impacts. Enhancing and harmonising the implementation of fumigation and chemical treatments internationally would reduce both the phytosanitary risks of international trade and the economic impacts of phytosanitary measures.

This ISPM would secure common and effective actions to prevent the spread and introduction of pests of plants and plant products, and would promote appropriate measures for their control.

These standards are to provide technical guidance for the evaluation, adoption, and use of fumigants and another chemicals as a phytosanitary treatment. It is designed to encourage consistency by providing essential information concerning the technical and operational aspects of using fumigants and chemicals as a treatment for plant pests.

These ISPMs should cover common fumigation and chemical treatment parameters, with each treatment type to be covered separately with specific guidance on dosage, duration, commodity tolerance, type of equipment, monitoring, application, chemical volume and other aspects and components deemed essential.

Appendix 7: TPPT position paper on proposal for elimination of treatment topics from the List of topics for IPPC standards

The IPPC Secretariat manages the work programme for new or revised standards using the *List of topics for IPPC standards*. Items on the list are categorized as technical areas, topics or subjects. The Technical Panel on Phytosanitary Treatments (TPPT) is considered a technical area and there are currently four treatment topic categories (irradiation, fruit flies, soil and growing media, and wood packaging material). All treatment schedules (known as subjects) on which the TPPT may work must fit under one of these four categories, or it is rejected by the panel.

In the past, it was thought that organizing the treatments in such a manner would focus the work of the panel and ensure that all treatment schedules submitted to the Secretariat would be covered under ISPM 28 and the IPPC. With the exception of irradiation, the existing topics are too specific and very narrow in scope compared to the wide range of pests limiting trade, diverse commodities exported and imported, and variety of treatment methods that could be considered. For example, there are many lepidopterous pests for which treatments are needed that could be considered. Other types of treatments include: heat, controlled atmosphere/temperature treatment systems, use of dips or dusts, sprays, and fumigants. In addition, treatments are needed for means of conveyance.

As a result of these limitations, there have been low numbers of treatments submitted to the Secretariat in response to calls for treatments. In addition, there are treatments being used in international trade that cannot be submitted because they do not fall under the four topic categories for treatments. Eliminating treatment topics could expand the number of treatments submitted for review and, in turn, broaden and harmonize their use among NPPOs to mitigate pest risk effectively.

It is proposed that if the topic categories are eliminated all types of phytosanitary treatment schedules could be submitted during a call for treatments. The TPPT would evaluate each submission to determine whether the treatment fits the criteria of ISPM 28, the IPPC, etc. The TPPT would then decide whether to recommend to the SC that the treatment be placed on the *List of topics*.

Appendix 8: TPPT Work programme 2013-2014 and Medium Term Plan

2013 DUE DATE	RESPONSIBLE	ACTION
Ongoing	**SHAMILOV**	Investigate storage location for for TPPT relevant docs, templates, working docs, etc.
19 Jul	**SHAMILOV**	Share proposed ISPMs for guidelines for treatments with Indonesia, AU, EU, USA, RPPOs asking for support by 5 August
26 Jul	**ALL MEMBERS**	Schedules coming out of the 2013 TPPT meeting
31 Jul	**JESSUP**	Revision of TPPT position paper on adult emergence in irradiation treatments posted on IPP forum for TPPT discussion
31 Jul	**ALL MEMBERS**	Treatment Evaluations for 2013 TPPT meeting report
1-15 Aug	**SHAMILOV/ ALL MEMBERS**	Forum: TPPT working criteria for evaluating treatments – forum discussion and approval (All members)
1-15 Aug	**ALL MEMBERs**	Forum: for schedules coming out of 2013 TPPT meeting
1-21 Aug	**ALL MEMBERS**	Forum: 2013 TPPT meeting report open for discussion
15 Aug	**All members**	TPPT virtual meeting (Adobe Connect)
31 Aug	**SHAMILOV**	Send requests for information to submitters
31 Aug	**SHAMILOV**	Submissions for Call for Topics due
15-30 Sep	**SHAMILOV**	Forum: TPPT June Virtual meeting report discussion
1-7 Oct	**ALL MEMBERS**	Forum: 2013 TPPT meeting report open for approval
15 Oct	**SHAMILOV**	2013 TPPT meeting report posted
17 Oct	**All members**	TPPT virtual meeting (Adobe Connect)
1 Nov	**ALL MEMBERS**	Update treatment portfolio from 2013 Meeting
2-6 Dec	**SOME MEMBERS**	ECCT meeting in Buenos Aires, Argentina
20 Dec	**SHAMILOV/ ALL MEMBERS**	Training on IPPC Online Comment System
2014 DUE DATE	**RESPONSIBLE**	**ACTION**
16 Jan	**All members**	TPPT virtual meeting (Adobe Connect)
1 Apr	**ORMSBY**	Instruction to assist in proper and complete submissions
1 Apr	**SHAMILOV**	Send reminder for requests for information
1 May	**ALL MEMBERS**	Submissions of Data due for 2014 TPPT meeting
1 Jun	**ALL MEMBERS**	Treatment portfolios, checklists, etc. due for 2014 TPPT meeting
15 Jun	**ALL MEMBERS**	All discussion papers due for 2014 TPPT meeting
21 Jun	**SHAMILOV**	All documents posted for 2014 TPPT meeting
7-11 Jul	**All members**	2014 TPPT Meeting (Indonesia)

TPPT Medium Term Workplan

2013	Meeting Call for treatments: irradiation, soil and growing media, fruit flies? Call for experts
2014	Meeting Call for treatments (if added to List of topics) pests other than fruit flies, wood treatments, plants for planting, containers Jessup/Park membership terms end Some new members
2015	Meeting Discuss wood treatments, plants for planting, containers Call for topics? Call for treatments? Call for experts?

Appendix 9: Treatment evaluations

TPPT evaluation of Vapour heat treatment for *Bactrocera cucurbitae* on *Cucumis melo* var. *reticulatus* (2006-110)

Treatment lead: Mr Wang Yuejin

At its 2013 July meeting the IPPC Technical Panel on Phytosanitary Treatments (TPPT) reviewed the additional information submitted on the original proposal entitled: *Vapour heat treatment for* Bactrocera cucurbitae *on* Cucumis melo *var. reticulatus (2006-110).*

In evaluating this treatment the TPPT considered the technical justification for extending the treatment to further host fruit. The panel agreed that, as long as the schedule specifies temperature and time (rather than just time), there is no evidence that the type of host will increase pest tolerance to the treatment. It was noted, however, that hosts (or host suitability to the pest) can reduce pest tolerance to a heat treatment, and stages exposed in artificial environments may also be more susceptible to heat. The panel considered that netted melons are a favoured host for melon flies and, as such, the host would not reduce pest tolerance in this case. The panel agreed that the treatment could be extended across other cultivars of the tested melon species, however, not to other fruit species or genera. In this case, however, the panel noted that there was not a great body of research to support this, and the submitter had not requested it, so the single cultivar would be put forward.

The treatment schedule as recommended by the TPPT is based largely on the publication: Iwata, M., Sunagawa, K., Kume, K. & Ishikawa, A. 1990. Efficacy of vapour heat treatment on netted melon infested with melon fly, Dacus cucurbitae, Coquillett (Diptera: Tephritidae). Research Bulletin of the Plant Protection Service, Japan, 26: 45–49.

The proposed treatment is based on exposure in a vapour heat chamber:

- at a minimum of 95% relative humidity;
- to air temperatures increasing from room temperature to above 46OC;
- for between 3 to 5 hours until fruit core temperatures reach 45OC;
- followed by 30 minutes at a minimum of 95% relative humidity in an air temperature of 46OC and fruit pulp temperature at a minimum of 45OC;

Once the treatment is completed, the melons should be cooled at ambient air temperatures to allow the core temperature to drop below 30°C.

The efficacy and confidence level of the treatment is ED99.9889 at the 95% confidence level.

The commodity temperature and relative humidity should be monitored continuously at <1 minute intervals during treatment and should not fall below the stated level.

The panel agreed to recommend this treatment to SC for member consultation.

For further information regarding this evaluation, please contact wangyuejin@263.net.cn

TPPT evaluation of High temperature forced air treatment for *Bactrocera melanotus* and *B. xanthodes* (Diptera: Tephritidae) on *Carica papaya* (2009-105)

Treatment lead: Mr Andrew Jessup

At its 2013 July meeting the IPPC Technical Panel on Phytosanitary Treatments (TPPT) reviewed the additional information submitted on the original proposal entitled: *High temperature forced air treatment for selected fruit fly species (Diptera: Tephritidae) in fruit (2009-105).*

In evaluating this treatment the TPPT considered the technical justification for including other pest Tephritid fruit flies (*Anastrepha ludens* (Loew), *Anastrepha suspensa* (Loew), *Bactrocera cucurbitae* (Coquillett), *Bactrocera dorsalis* (Hendel), *Bactrocera facialis* (Coquillett), *Bactrocera kirki* (Froggatt), *Bactrocera melanotus* (Coquillett), *Bactrocera passiflorae* (Froggatt), *Bactrocera psidii* (Froggatt), *Bactrocera tryoni* (Froggatt), *Bactrocera xanthodes* (Broun) and *Ceratitis capitata* (Wiedemann)) and other fruit crops (all fruit hosts of Tephritid fruit flies) in the treatment description as originally submitted. The TPPT is recommending including only the two pest Tephritid fruit flies, *Bactrocera melanotus* and *B. xanthodes* for only one fruit crop, *Carica papaya*, based on the work presented, in this treatment.

The treatment schedule as recommended by the TPPT is based largely on the publication: **Waddell, B.C. Clare, G.K. Petry, R.J. Maindonald, J.H. Purra, M. Wigmore, W. Joseph, P. Fullerton, R.A. Batchelor, T.A. Lay-Yee, M.** (1997) Quarantine heat treatment for *Bactrocera melanotus* (Coquillett) and *B. xanthodes* (Broun) (Diptera: Tephritidae) in Waimanalo papaya in the Cook Islands. In: Management of Fruit Flies in the Pacific. A regional symposium, Nadi, Fiji. Ed A. J . Allwood and R. A. Drew. *ACIAR Proceedings* No. 76: pgs 251-255.

The proposed treatment is based on Exposure in a forced air chamber:
At a minimum of 60% relative humidity;
To air temperatures increasing from room temperature to 48.5°C;
For at least 3 hours or until core temperature reaches 47.5°C;
Followed by 20 minutes in a forced air chamber at 60% relative humidity and an air temperature of 48°C and fruit pulp temperature at a minimum of 47.5°C
After which fruit are hydro-cooled in a shower of water at 24-26°C for 70 minutes with an Effective Dose $(ED)_{99.9914}$ at a confidence level of 95%.

For further information regarding this evaluation, please contact andrew.jessup@dpi.nsw.gov.au

TPPT evaluation of Vapour heat treatment for Mangifera indica var.Manila Super (2009 – 108)

Treatment lead: Mr Eduardo Willink

The TPPT received the supporting data (Merino *et al*. 1985. Report on Fruit fly disinfestations of mangoes by vapour heat treatment) and re-evaluated the submission at its 2013 July meeting.
The TPPT noted some inconsistencies in the determination of the most tolerant stage. The most tolerant stage was determined by hot water dip, which is not considered an appropriate method.
Eggs and larvae in fruit are exposed to different temperatures because they are situated at different depths within the fruit. Eggs and larvae in water are exposed to the same temperatures as each other. This is illustrated in tables 13 and 14 (small scale tests) where one surviving L3 larva was found at 46ºC whereas, in tables 15 and 16, 100% mortality was achieved at the same temperature and for all stages, while at 45ºC the 2nd instar larvae seemed to be the most tolerant to VHT.
In addition, an extensive literature review of the most tolerant stage of fruit flies treated by VHT was made, concluding that eggs or the L3 were the most tolerant stages.

The efficacy level submitted was 100% mortality at ED99.9968 for L1. When considering only 63,000 L1 insects were treated with no survivors, this actually equates to less than Probit 9. Therefore, the TPPT considers the most appropriate test is the egg stage. Therefore,the effective dose (ED) for eggs would be ED99.9553 which is less than what would be expected for an appropriate treatment in international trade. The panel recommends that if artificial inoculation is used, it should be demonstrated that this does not decrease the tolerance of the pest to the treatment.
The TPPT requests the submitter to carry out one of the three following options: a) submit more data showing evidence that L1 insects were most tolerant or at least not significantly different from eggs and L3 insects, b) re-determine which life stage is most tolerant when in fruit treated with VHT or c) conduct tests on more eggs or L3 insects to produce a larger set of confirmatory data which is more appropriate for export submissions.
For further information regarding this evaluation, please contact ewillink@eeaoc.org.ar; ewillink@arnet.com.ar

TPPT evaluation of Vapour heat treatment for *Bactrocera dorsalis* on *Carica papaya* var. Solo (2009-109)

Treatment lead: Mr Guy Hallman

At its 2013 July meeting the IPPC Technical Panel on Phytosanitary Treatments (TPPT) reviewed the additional information submitted and concluded that this finding was consistent with the panel position on the most thermotolerant stage of the fruit fly.
The panel agreed that the calculated ED value needed to take into account the error in the estimated treated population from the control fruit. Because the control fruit infestation data is known for each individual fruit, the standard error can be used. This calculates out to be 18,857 exposed eggs or an ED of 99.9841% at the 95% level of confidence (or 1 survivor in 6286 exposed eggs). It was noted that this treatment is currently used in international trade.
The panel agreed to recommend this treatment to SC for member consultation.

For further information regarding this evaluation, please contact Guy.Hallman@ARS.USDA.GOV

TPPT evaluation of Cold Treatment for *Ceratitis capitata* on *Citrus clementina* var. Clemenules (2010-102)

Treatment lead: Mr Andrew Jessup

At its 2013 July meeting the IPPC Technical Panel on Phytosanitary Treatments (TPPT) reviewed the additional information submitted on the original proposal entitled: *Cold Treatment of* Citrus reticulata *and their Hybrids for Medfly (*Ceratitis capitata *Wied) (2010-102).*

In evaluating this treatment the TPPT considered the technical justification for including other citrus varieties in the treatment description as originally submitted but recommended including only the one variety, *Citrus clementina* var. Clemenules, based on the work presented in Santaballa, E., Laborda, R., and Cerdá, M. (2009) [Quarantine cold treatment against *Ceratitis capitata* (Wiedemann) (Diptera:Tephritidae) to export clementine mandarins to Japan. *Bol. San. Veg. Plagas*. Vol.**35:** 501-512].

The proposed treatment is based on storage at 2 °C or below for 16 consecutive days with an Effective Dose $(ED)_{99.9906}$ at a confidence level of 95%.

The fruit must reach the treatment temperature before treatment commences. The fruit temperature

should be monitored and recorded, and temperatures should not exceed the stated level throughout the duration of the treatment. Pre-cooling of the commodity to treatment temperature may be required.

For further information regarding this evaluation, please contact andrew.jessup@dpi.nsw.gov.au

TPPT evaluation of Cold treatment *Ceratitis capitata* on *Citrus sinensis* var. Navel and Valencia (2010-103)

Treatment lead: Mr Andrew Jessup

At its 2013 July meeting the IPPC Technical Panel on Phytosanitary Treatments (TPPT) reviewed the additional information submitted on the original proposal entitled: *Cold Treatment of* Citrus sinensis *for Medfly (*Ceratitis capitata *Wied) (2010-103).*

In evaluating this treatment the TPPT considered the technical justification for including another citrus variety, cvar 'Salustiana' in the treatment description as originally submitted but recommended including only the two varieties, *Citrus sinensis* var. 'Navel' and *C. sinensis* var. 'Valencia-late', based on the work cited below. Additionally there was discussion on recommending a treatment time of 17 days rather than the originally submitted 16 days but the original recommendation for the 16 day treatment is made by the TPPT based on the work cited below.

Santaballa, E., Laborda, R., and Dalmau, A. (1995). Report of Quarantine Cold Treatment to Control *Ceratitis capitata* (Wied) to Export Oranges to Japan. Universidad Politécnica de Valencia.

The proposed treatment is based on storage at 2 °C or below for 16 consecutive days with an Effective Dose $(ED)_{99.9959}$ at a confidence level of 95%.

The fruit must reach the treatment temperature before treatment commences. The fruit temperature should be monitored and recorded, and temperatures should not exceed the stated level throughout the duration of the treatment. Pre-cooling of the commodity to treatment temperature may be required.

For further information regarding this evaluation, please contact andrew.jessup@dpi.nsw.gov.au

TPPT Evaluation of Vapour heat treatment for *Ceratitis capitata* on *Mangifera indica* (2010-106)

Treatment lead: Mr Guy Hallman

At its 2013 July meeting the TPPT recommended this treatment to the SC for member consultation because the research was adequately conducted, sufficient numbers of insects were used, and no outstanding issues were left unanswered. Three issues were discussed: 1) the insect colony used for the research was ~20 years old, 2) the egg stage (used for confirmatory testing) was not the most tolerant stage at 45°C. 3) Efficacy was based on prevention of pupariation, not prevention of larval movement.

Regarding these issues the Panel concluded that no information showing that long-term laboratory colonies are easier to kill with heat than feral flies, although the Panel recommended that future research be conducted with colonies replaced yearly with feral insects. The panel also concluded that a comprehensive review of the literature of heat tolerance in tephritids shows that the egg stage is the most heat tolerant. The Panel concluded that although basing efficacy on prevention of pupariation

allows for some larvae to be alive when the commodity is inspected the large number of insects used to confirm the treatment (165,615 eggs) plus the fact that few larvae can be expected to be moving upon inspection if none subsequently pupariate.

Table B. T-test results

Data (from 2010-106_Submitter Response)	Test 1	Brisbane A = 26 Fruit, 1690 larvae Brisbane B = 26 Fruit, 1495 larvae Perth A = 25 fruit, 2186 larvae Perth B = 27 fruit, 3163 larvae
	Test 2	Brisbane A = 7 Fruit, 1024 larvae Brisbane B = 38 fruit, 5269 larvae
	Test 3	Brisbane = 36 Fruit, 16464 larvae Perth = 36 fruit, 9449 larvae
	Test 4	Brisbane = 36 Fruit, 4031 larvae Perth = 36 fruit, 6593 larvae
Data description		Mean of insects/fruit for Brisbane = 167.6, SD = 165.9, SEM = 74.2 Mean of insects/fruit for Perth = 157.8, SD = 68.1, SEM = 30.4
T-test results[11]		The 2-tailed probability value = 0.84 (not significant; not close) t value = 0.20 degrees of freedom = 4

For further information regarding this evaluation, please contact Guy.Hallman@ARS.USDA.GOV

TPPT evaluation of *Vapour heat treatment for* Bactrocera tryoni *on* Mangifera indica (2010-107)

Treatment lead: Mr Guy Hallman

At its 2013 July meeting the TPPT reviewed the additional information submitted on the *Vapour heat treatment for* Bactrocera tryoni *on* Mangifera indica (2010-107). The panel was unable to recommend these treatments for approval because the requested information on each replicate was not provided. This should include additional detailed information on:

1. control mortalities
2. duration of the confirmatory test
3. individual replicates, including the results
4. number of infested fruit both in the control and treatment
5. number of survivors in each of the control fruit
6. infestation methodology
7. how the most resistant life stage was determined

The TPPT concluded that previous request to the submitter for clarification of these issues has not been answered yet. The lead for this treatment has rotated out of the panel and a new lead will solicit further information.

For further information regarding this evaluation, please contactGuy.Hallman@ARS.USDA.GOV

[11] T-test calculated using: http://www.graphpad.com/quickcalcs/ttest1/

TPPT evaluation of Irradiation for *Ostrinia nubilalis* (2012-009)

Treatment lead: Mr Andrew Jessup

At its 2013 July meeting the IPPC Technical Panel on Phytosanitary Treatments (TPPT) reviewed the additional information submitted on *Irradiation Treatment of* Ostrinia nubilalis *(2012-009)*.

In evaluating this treatment the TPPT considered issues associated with the possibility for the survival of sufficient numbers of sterile adults that would escape from irradiated infested produce and fly into exotic pest traps thereby causing costs and trade restrictions. The TPPT considered that, based on the work described in the two papers mentioned below that numbers of fit survivors would be negligible and would not pose quarantine concerns.

This schedule was based on the work of **Hallman, G.J. & Hellmich, R.L.** 2009 [Ionizing radiation as a phytosanitary treatment against European corn borer (Lepidoptera: Crambidae) in ambient, low oxygen, and cold conditions. *Journal of Economic Entomology* **102**: 64-68] and **Hallman, G.J., Levang-Brilz, N.M., Zettler, L. and Winborne, I.C.** 2010 [Factors affecting ionizing radiation phytosanitary treatments and implications for research and generic treatments. *Journal of Economic Entomology* **103** (6): 1950-1963].

The proposed treatment is based on a minimum absorbed dose of 289Gy with an Effective Dose $(ED)_{99.9918}$ at a confidence level of 95%. The treatment should be applied in accordance with the requirements of ISPM 18:2003.

Because irradiation may not result in outright mortality, inspectors may encounter live, but non-viable *Ostrinia nubilalis* (larvae, pupae and/or adults) during the inspection process. This does not imply a failure of the treatment.

For further information regarding this evaluation, please contact andrew.jessup@dpi.nsw.gov.au