REPORT

Buenos Aires, Argentina
2-6 December 2013

Expert Consultation On Cold Treatments

December, 2013

Food and Agriculture Organization of the United Nations

CONTENTS

LIST OF APPENDIXES

1. Opening of the Meeting

[1] The International Plant Protection Convention (IPPC) Secretariat (hereafter Secretariat) welcomed the participants of the Expert Consultation on Cold Treatments (ECCT) meeting. The meeting was organized by the Secretariat and hosted by the National Plant Protection Organization (NPPO) of Argentina. The Secretariat recalled that the initial suggestion to hold a discussion forum for experts on cold treatments was raised at the Seventh Session of the Commission on Phytosanitary Measures (CPM-7 (2012))[1] and a concept note was presented during CPM-8 (2013). The Secretariat also noted that the NPPO of Australia had provided contribution to other phytosanitary treatment activities, which freed up funds for this meeting.

[2] The Standards Officer thanked the members of the ECCT steering group and explained how the experts had been selected for this meeting. He highlighted that this type of meeting was unusual for the IPPC, explaining that he expected the participants to provide scientific input into the development of phytosanitary treatments that are then national or regionally approved by a National or Regional Plant Protection Organization (NPPO or RPPO). This same date would provide a good foundation for submissions of phytosanitary treatments to be considered as International Standards for Phytosanitary Measures (ISPMs). He urged researchers to try to agree on the best experimental design and methods to determine efficacy as a common approach by researchers around the world that would allow data, that accompanies a phytosanitary treatment submission, to be collected and presented in a similar manner. This would also help the TPPT in their assessment of these submissions. He stressed that it is only once these phytosanitary treatments are adopted by the CPM that the world will be able to begin the international harmonization of cold treatments in the phytosanitary field. He also hoped that one of the outcomes of this meeting would be greater collaboration among the world cold treatment developers.

[3] Mr Diego QUIROGA, Head of the NPPO of Argentina, welcomed the participants. He pointed out that exporting and importing countries accept many cold treatments that are historically proved to be effective and provided for safe trading. Mr Ezequiel FERRO (Argentina) was selected as the Chair and Mr Scott MYERS (USA) as the Rapporteur.

[4] The agenda was adopted as presented in Appendix 1 of this report.

2. Administrative matters

[5] The participants list and documents list were presented (see Appendices 2 and 3).

3. Overview

[6] Participants and observers from the host NPPO introduced themselves and shared their expectations from the ECCT which are summarized as follows:

- identify common challenges in the development of cold treatments
- identify different treatment schedules available
- establish an acceptable protocol for research methodology, data analysis, evaluation and results
- strive to decrease duplication
- improve connections between researchers, industry and regulators
- create a network of cold treatment researchers and help facilitate future collaboration.

[7] The Secretariat presented an overview of the ten cold treatments under development on the work programme of the Technical Panel on Phytosanitary Treatments (TPPT) and that of these, seven are currently recommended to the CPM for adoption. All ten treatments apply only to two pests *Ceratitis*

[1] CPM-7 (2012) meeting report – page 10

capitata and *Bactrocera tryoni*. The Secretariat highlighted that the main concerns submitted during member consultation regarding cold treatments were mostly about terminology, references and methods of proving the treatments' efficacy, as well as concerns regarding the treatments' applicability and effect on the quality of the host commodity.

[8] Participants identified several areas of concern in regards to the development of cold treatment research and some details of the discussion are provided.

Terminology

[9] With regards to the terminology issues, the group recommended the treatment developers use the term "cold treatment" instead of "refrigeration" and refer to "consecutive days" in treatment schedules instead of "24 hours". In addition, treatment developers should describe the part of the plant (e.g. fruit) for which the treatment applies.

[10] The participants agreed that more clarification is needed in the description of some terms such as *replication, repetition, block, end point to determine treatment efficacy, precooling, validation, confirmatory trial, and large scale trials* and requested some participants to work on these terms further and report back to the participants.

References

[11] With regards to references supporting treatment data, the group agreed that one comprehensive quality scientific document is sufficient to support a treatment. Documentation used to support the treatment approval by a country is considered sufficient when only this information is available. Often this type of documents is written anonymously but must be publicly accessible.

History of cold treatments

[12] A brief history of quarantine cold disinfestation of commercial host fruit to control pest fruit flies was presented to the participants providing a comprehensive historical overview of cold treatments research from the 1850s.

[13] Historically each geographical region developed specific cold treatments based on fruit fly species, host fruit species, shipment duration and other conditions and it was felt that this expert consultation could help facilitate the sharing of this information. Participants were invited to contribute additional information which could be compiled and shared.

Sharing information on approved cold treatments

[14] It was noted that the approval process for many cold treatments is very resource intensive and lengthy. It is common practice for an exporter to submit data to different importing countries for evaluation and it may take several years to complete the evaluation and further research may be requested. Additional requests may also be made for data supporting the treatment for each variety. Most of these treatments are approved by National Plant Protection Organizations (NPPO) or Regional Plant Protection Organizations (RPPO). A small group was assigned to collect all existing cold treatment schedules approved by a NPPO or RPPO and review literature in order to develop a paper for further consideration and possible publication.

Generic cold treatments

[15] The participants discussed the requirements for multiple experiments using different varieties as well as different pests. Some participants questioned if all these experiments were really needed. It was noted that in the existing literature there are commonalities between treatment schedules and with some further analysis these could be extracted to consolidate cold treatments across host fruit varieties and/or pest species. It was agreed that generic cold treatments could help harmonization of cold treatments and participants agreed to work together to review the existing data to provide a foundation for generic cold treatments.

4. Providing supporting evidence

[16] Cold treatment evaluation challenges in relation to the IPPC standard setting process and to bilateral agreements were discussed.

[17] The Secretariat provided an overview of the requirements set out in ISPM 28:2007 *(Phytosanitary treatments for regulated pests)*. In addition, the challenges the TPPT faced during the evaluation of treatment submissions were explained, specifically it was highlighted that although ISPM 28:2007 provides a list of requirements, many submissions do not address them all.

[18] This means that because some of the requirements for data presentation are not considered by treatment submitters, each treatment submission may be considered a new challenge for the TPPT to review. In this light, the following challenges were identified:

- Emphasis may be placed on statistical analyses of dose-response data although the models used cannot accurately predict the extreme levels of efficacy required of phytosanitary treatments without very large sample sizes.
- Mortality in the control group may be excessive.
- Infestation rate may be excessive.
- Publications provided to support submissions use conflicting methods for the statistical analysis.
- Variation in experimental conditions may result in questionable or inconsistent results.

[19] The participants noted that replications should be taken into account in the data analyses and not pooled.

[20] A concern was raised that there are two major taxonomy systems for grouping existing citrus varieties. The consensus was that researchers should clearly identify which system was used with preference given to the citrus taxonomy system[2] previously agreed on by the TPPT. For other fruits, it was agreed that more discussion was needed. However, at this stage it was agreed to use taxonomy systems currently used in the IPPC Standard Setting process and if no such taxonomy was available, internationally approved nomenclature should be used.

[21] The participants agreed that the host commodity conditions such as size and shape are important and should be taken into account during experiments. Therefore the quality of the commodity used for research should be provided with correct nomenclature including description of size, weight and shape.

[22] The Secretariat explained that ISPM 18:2003 *(Guidelines for the use of irradiation as a phytosanitary measure)*[3] provides specific guidance on how countries may implement phytosanitary irradiation treatments. It was felt that similar guidance on temperature treatments might also be helpful and it was noted that the Standards Committee (SC) has recommended to the CPM that a new topic on temperature treatment requirements be added to the *List of topics for IPPC standards*.

[23] The participants asked if the existence of ISPM 18:2003 facilitated the adoption of the irradiation treatments. The Secretariat noted that development of a standard on treatment requirements and evaluation of treatment submissions are two different processes. However, CPM members may have felt more comfortable adopting a treatment that already had clear requirements established.

[24] Cold treatment tolerance of fruit flies was discussed and the participants noted that the original published data showed that approved treatments sometimes had different schedules for similar fruit types and identical pests (fruit fly species). However, not only are there varying treatment schedules

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

[3] https://www.ippc.int/core-activities/standards-setting/ispms#block-agenda-items-list

but published literature is also divided on which immature pest life stage, likely to be found in products, is the most treatment tolerant.

[25] It was explained that in many experimental protocols for the development of phytosanitary treatments, a determination of the most treatment-tolerant life stage is used to facilitate the testing of the efficacy of the treatment to the required levels of quarantine security. It is therefore most likely that the variations are caused by laboratory conditions and differing experimental protocols between research agencies. For example, one paper shows eggs to be most tolerant stage of *C. capitata* but most of the others papers suggest that the 2nd instars are more tolerant compared to the eggs. One expert stated that some experiments had been carried out on mango where 30 000 insects were used to compare 2nd instar larvae with eggs of *C. capitata.* There it was demonstrated that the egg stage is the most tolerant. The data analysis provided in the paper showed that in most studies 3rd instar larvae were more tolerant than the 2nd larvae.

[26] In addition to the concerns highlighted in the paper, the following issues related to experimental protocols were raised:

- Some countries accept experiments carried out using only eggs and young larvae and it was explained that this is only acceptable for vapour heat treatments.
- The absence of conclusive results on whether larvae on an artificial diet and inserted into fruit differ in susceptibility compared to insects reared in fruit. This should be demonstrated experimentally whenever possible.
- Differences in susceptibility between fruit flies reared in a laboratory culture and those from wild population should also be addressed whenever possible.

[27] Some specific requirements that are needed to help ensure the vitality and quality of colony to keep it similar to a wild population of fruit flies were discussed. It was explained that some countries require colonies that are less than 12 months old to be used for experiments because of the possibility that a laboratory colony may be more susceptible to cold treatments. It was recalled that tolerance may vary between generations and some publications argue that they should be less than 12 months old to accurately reflect the effect of a cold treatment on a field population. Several methods of population renovation were presented:

- Replacement of the entire colony each 12 months
- Periodic introduction of wild population to the laboratory culture.
- Renovation after five generations and changing the population each year.

[28] It was agreed that additional research should be done to compare wild and laboratory populations of fruit flies in order to make a more detailed review of literature to evaluate most tolerant life stage data from existing studies.

5. Efficacy session: Methods used to develop cold treatments

[29] Several overview papers were presented on cold treatment research methodology summarizing techniques that have been used to develop cold treatments[4]. It was agreed that the cold treatment research methodology is not consistent in its application and interpretation of results.

[30] Although it was agreed that it would not be possible to prescribe detailed, common cold treatment methodology at this meeting, there were some basic points that could be agreed to regarding effective methodology for cold treatment experiments and treatment development. Participants agreed that there is a need to evaluate differences in cold tolerance among different populations of the same species and decide if these differences could justify different treatment schedules. It was also agreed that data gathered from *in vitro* experiments should be explained and justified. Acclimation of pests to cold temperatures may affect their susceptibility to cold treatments. The age and precise developmental

[4] https://www.ippc.int/partners/international-organizations/phytosanitary-temperature-treatments-expert-group

stage of pests treated should also be indicated in the research methodology. Research supporting a cold treatment is often conducted with small quantities of fruit in small treatment facilities that may reach treatment temperatures quicker than it would in large commercial facilities where the treatment is applied. This should be taken into account during treatment development. Temperature monitoring of the cool down period and a description of start time conditions is crucial to understanding cold treatment conditions, and should be included in the research methodology. The different techniques used to measure treatment efficacy (end point) were also discussed, specifically from prevention of insect movement (after the treated sample is allowed to be warmed to ambient temperatures for a time period) to prevention of adult emergence from treated larvae. These differences may partly explain the variations in the length of the treatments.

[31] It was agreed that because phytosanitary inspectors usually consider any moving insects found as survivors at any time post-treatment, prevention of movement should be the measure of efficacy for cold treatments.

[32] Inoculation methods were also discussed. It was noted that artificial inoculation, introducing eggs with a syringe into the fruit, allows the larvae to develop to the desired larval instar. For the forced infestation it was explained that fruit fly females should preferably be used only once because some research has shown[5] that fruit flies females ovipositor can be trapped when experiments are carried out on thick skinned fruits. In addition, it was agreed that the quality of the food for the larvae can be one of the factors affecting if it may survive the cold treatment.

[33] Sealing cut fruits after inoculation during experiments was discussed. It was noted that this technique is mainly related to citrus and some thin skinned citrus species and that paraffin may be needed to seal it.

[34] Suggestions that surrogate species (closely related to the target organism) could be used to develop cold treatments were considered. However, given the example that *Anastrepha ludens* is thought considerably more cold-tolerant than other species in this genus, using surrogate species to determine cold treatments for other species is therefore not always justified. However, it was agreed that surrogate species could be used to develop broad generic treatments that would incorporate data from a number of species in the group for which the generic treatment is being developed.

[35] Phytosanitary treatment research is often done using standard statistical approaches of regression analysis and confidence intervals of 95% for means testing. The former is for predicting efficacious doses and the latter for determining most tolerant life stage and other factors that might affect efficacy.

[36] The larvae's tolerance to cold treatments in different host varieties of the same host species (all citrus species) demonstrates, in general, no differences in their tolerance level. This could mean that, at least for citrus species, there would be no need to test all varieties.

[37] It was noted that differences in cold treatment schedules developed in small scale laboratory experiments may be attributed to a number of factors related to the experimental protocol or design (e.g. how the larvae are fed). These differences, which may appear in small scale tests, may not always be replicated in a confirmatory test. In all cases, it was agreed that these differences should be explained and scientifically justified. In addition, the group agreed to collect data on the cold treatments applied to different varieties (cultivars) and analyze commonalities and conduct a statistical re-interpretation in order to provide a basis for a possible publication.

[38] The group agreed that for the treatment developers it is necessary to thoroughly describe the experimental design and statistical analysis used including efficacy data, operational conditions, confirmatory tests, and how the most tolerant life stage was determined. Also, it is preferable to use natural infestation whenever possible, and if artificial infestation is used, a justification should be provided. In addition, a colony description with information source, data collection, if applicable, and rearing conditions should be provided. Recording temperatures, from temperature probes at the

[5] https://www.ippc.int/partners/international-organizations/phytosanitary-temperature-treatments-expert-group

beginning of the experiment and periodically thereafter throughout the duration of the treatment, is necessary to accurately capture the conditions of the experiment. Insecticide-free host commodities should be used whenever possible.

[39] The group agreed to develop a research protocol to help address some of the challenges outlined above. It was noted that a good example has been developed by Japan and that it is currently used by several countries such as Australia, Argentina, Peru and South Africa. This new protocol should also provide guidance on how to incorporate trial data into a treatment schedule and help address issues relating to treatment temperature range (± issue).

6. Operational session: Large scale trials for cold treatments and practical aspects affecting implementation

[40] The practicalities of extending new cold treatment schedules developed from large scale trials into commercial application were discussed. It was noted that the basis of carrying out large scale confirmatory trials under semi-commercial to commercial conditions with lab-infested fruit is to simulate market conditions as closely as possible. This proximity to reality is designed to give assurances that the treatment that was developed under laboratory conditions is sufficiently robust to be able to work under commercial conditions.

[41] It is commonly agreed that large-scale confirmatory trials should be as close as possible to commercial conditions. A concern was raised, as an example, that a 15-19% loading of a cold treatment chamber may effect the cooling rate which is considered a significant aspect during cold treatment implementation. It was questioned whether the loading factor may effect efficacy of the cold treatment and whether minimum requirements for pre-cooling should be prescribed in order to manage the cooling rate and the loading factor.

[42] It was explained that the loading factor may have an effect on the cooling rate.

[43] It was suggested that a standard approach should be developed. Acknowledging the fact that precooling is a very useful practice, it was agreed that this operational procedure is not part of the treatment protocol. Even though load factor or precooling may generate some scientific concerns, any additional requirements to consider all these issues during the experiments will decrease development of quarantine cold treatments. Therefore cold treatment operators should be able to decide whether to use precooling as an additional tool.

[44] It was noted that currently operators should control temperature peak and any additions related to the pre-treatment conditions may make the cold treatment development and implementation more complex.

[45] A question on how often temperature mapping is implemented in practice was raised. It was assumed that temperature mapping is most likely to be done only once when containers are new.

[46] The number of temperature probes and the treatment starting point were discussed. It was noted that in different experimental protocols and operational conditions, treatment starting points range from 50 to 100% for probes to reach target temperature. It was further noted that most importers have stipulated placement of temperature probes. Probe placement is usually determined by their location in the container or cold treatment chamber, it is most difficult to achieve target temperature.

[47] The treatment starting point also becomes an issue when the treatment schedule provides a temperature range (±). This causes problems during treatment evaluation by countries with bilateral agreements. It was agreed that a specified treatment temperature within the range is necessary and that it would be more appropriate to provide a duration of time and temperature that is to be equal to or below the prescription. There was agreement that additional research is needed on these issues. Also, where the load is placed inside of the chamber should be described, and temperature mapping carried out to have data from hotspots. This would provide more accurate data.

[48] The possibility of establishing a temperature threshold was discussed. It was suggested to use hourly or daily maximum probe readings to establish the upper treatment threshold temperature. However, it was agreed that additional work is needed in order to agree to how the upper and lower temperature thresholds are established and how these thresholds are converted into a commercial applications.

[49] The issue of chilling injury which sometimes occurs during transportation was discussed. It was a concern that sometimes the fruit was not of good quality at destination, following the voyage (including the treatment time). Several reasons were given including fruit temperature that is maintained below the target temperature in order to make certain the temperature does not rise above the acceptable upper limit or the temperature varied outside the prescribed range of treatment temperatures during voyages, both of these cases may contribute to phytotoxic effects. The participants noted, that in these cased the treatment schedule was not followed. In response to these concerns regarding quality of the fruit, the participants agreed the practical implementation of the treatment protocol should be considered separately. In addition, it was noted that in some cases there is a lack of temperature control following the treatment period when transit time exceeds the treatment duration. The participants noted that it is critical that the shipping company maintains fruit under ideal storage conditions following the treatment period to avoid any damage that may later be unfairly attributed to the cold treatment.

[50] More attention should be paid to maintaining temperature during the voyage and to the ability of cooling and temperature measuring equipment to maintain the desired conditions for long periods of time.

[51] There was agreement to cooperate on the scientific analysis and on collecting information in order to produce recommendations covering the whole process from experiments to the commercial application.

[52] In addition it was agreed to collect established treatments that are using higher temperatures and make this information publicly available. It was also agreed to identify knowledge gaps and try to establish upper thresholds for effective treatments.

[53] Finally the group agreed that operational requirements for implementation of cold treatments should be based on sound scientific justification and that they should be analysed with that purpose in mind, and non-essential steps be removed.

7. Conclusions

[54] Cold treatment research should focus on the sound scientific reasoning behind each step of development of the treatments. A number of issues to be addressed by cold treatment researchers were identified (Appendix 4).

[55] The participants agreed that collaborative work on cold treatments and networking among researchers was useful and decided to form a group (the "Phytosanitary Temperature Treatments Expert Group") that would cover cold treatments as well as all temperature related phytosanitary treatments (A Terms of References and Rules of Procedures for such a group were discussed and agreed (see Appendix 5 to this report). In the future, the scope of this group could be extended to cover all phytosanitary treatments in order to provide a forum where critical phytosanitary treatment issues can be addressed through discussion and collaborative research, and where scientific analysis and review of global phytosanitary treatments issues and new information can be provided.

[56] The Phytosanitary Temperature Treatments Expert Group established an Executive Committee, which will be composed of a Chair, two Coordinators (one research and one operations) and a Secretary. One of the Executive Committee members should also be a TPPT member. There was some concern regarding participation of TPPT members in this group, however, participants agreed that it was being established to provide science on which phytosanitary treatments are based on and it was not intended to draft standards. The group agreed to ask the Secretariat to request the SC to consider the possibility

of exchanging information with the TPPT to support of development of international phytosanitary treatments.

[57] It was agreed that the first meeting of the Phytosanitary Temperature Treatments Expert Group should be held in South Africa in August 2015. Mr Hattingh offered to host the meeting in Nelspruit, South Africa and the participants thanked Mr Hattingh for the invitation.

[58] Many of the items that need to be followed up from the ECCT were formulated into a work programme for the Phytosanitary Temperature Treatments Expert Group (Appendix 6). The deadline to provide papers to the Secretary of the group, addressing the various items on the work programme, is 30 June 2015.

8. Recommendations

[59] The group agreed that it would be premature to make any recommendation for further collaboration at this time and that they would be discussed during the meeting in August 2015.

9. Close of the meeting

[60] The Secretariat thanked the participants for their excellent work during the meeting, wished further success in this work and thanked the host and organizer for their hospitality and logistical arrangements. The host also thanked the Secretariat for facilitating the meeting and the participants for their hard work on such an important topic.

Appendix 1 - Agenda

AGENDA ITEM	DOCUMENT NO.	PRESENTER
1. Opening of the meeting		IPPC SECTRETRIAT
· Welcome by the IPPC Secretariat		LARSON
· Election of the Chair		LARSON
· Election of the Rapporteur		CHAIR
· Adoption of the Agenda	01_ECCT_2013_Dec	CHAIR
2. Administrative Matters		CHAIR
· Documents List	02_ECCT_2013_Dec	SHAMILOV
· Participants List	03_ECCT_2013_Dec	SHAMILOV
· Local Information	04_ECCT_2013_Dec	HOST
3. Overview		CHAIR
1.1 Overview of the development of phytosanitary treatments under the IPPC framework	Presentation	SHAMILOV
3.2 History of cold treatments in general and overview of cold treatments used internationally	18_ECCT_2013_Dec .	JESSUP
4. Providing supporting evidence (presentations followed up by discussion)		CHAIR
4.1 Requirements in ISPM 28. 2007 - Phytosanitary treatments for regulated pests and the IPPC standard setting process	Presentation	SHAMIOV
4.2 Challenges with the data review and evaluation process	No paper	HALLMAN
4.3 Critical requirements for successful operation of cold treatments (e.g. for an ISPM on cold treatments based on ISPM 18 and ISPM 28	ISPM 18:2003	JESSUP
4.4 Cold treatments tolerance of fruit flies	05_ECCT_2013_Dec	JESSUP/HALLMAN
5. Efficacy session: Methods used to develop cold treatments (Experimental design and factors to be taken into account) (presentations followed up by discussion)		CHAIR
5.1 A brief overview of cold treatment research methodology	13_ECCT_2013_Dec	HALLMAN
5.2 Argentine citrus species and varieties variability to develop cold quarantine treatments for Ceratitis capitata	11_ECCT_2013_Dec_Rev	GASTAMINZA
5.3 Cold treatment as a phytosanitary measure for the management of Drosophila suzukii	06_ECCT_2013_Dec 07_ECCT_2013_Dec	WILSON
5.4 Quarantine cold-storage treatment on Satsuma mandarin Citrus unshiu for export to Japan	08_ECCT_2013_Dec	QUENTA CHERRE
5.5 Rapid development of phytosanitary cold treatments for exotic Tephritid fruit flies using small scale comparisons across multiple species	17_ECCT_2013_Dec	MYERS
5.6 Alternatives to evaluate the effect of Life Stage and Varieties on Cold Treatment: Confidence intervals and Odds-Ratio measure	presentation	ARGANARAZ

AGENDA ITEM	DOCUMENT NO.	PRESENTER
6. Operational session: Large scale trials for cold treatments and practical aspects affecting implementation (presentations followed up by discussion)		CHAIR
6.1 Practicalities of extending new cold treatment schedules developed from large scale trials into commercial application	19_ECCT_2013_Dec	JESSUP
6.2 Lemon fruits export to Japan under cold treatment: the Argentinean experience	09_ECCT_2013_Dec_Rev	STEIN
6.3 Need of harmonized cold treatment scheme for fruit fly in fresh fruits	14_ECCT_2013_Dec	JEON/ PARK
6.4 Complex Challenges of Monitoring and Managing a Global Cold Chain	16_ECCT_2013_Dec	PONCE
6.5 Cold treatment for French Apple industry	15_ECCT_2013_Dec	MATHIEU-HURTIGER
6.6 The development and use of cold treatment in the export of fresh citrus from South Africa	12_ECCT_2013_Dec	HATTINGH
6.7 Operational processes for cold treatment of fruit fly host commodities	10_ECCT_2013_Dec	CANT
7. Conclusions		CHAIR
7.1 General and specific conclusions		CHAIR
7.2 ECCT statement/agreement		CHAIR
7.3 Next steps ・ Future meetings ・ Administrative organization ・ Rule of procedure of ECCT ・ Term of references of ECCT		CHAIR
8. Recommendations		CHAIR
8.1 Possibility for further international collaboration		CHAIR
9. Close of the meeting		CHAIR

Appendix 2 - Participants list

	Participant role	Region	Name, mailing, address, telephone	Email address
✓	Expert	Africa	Mr Vaughan HATTINGH Chief Executive of Citrus Research International and coordinator of research programme of SPS relevance to the southern African citrus industry, including the coordination of scientific support to new and revised South African citrus fruit export protocols SOUTH AFRICA Tel:+ 27 824167274	vh@cri.co.za
✓	Expert	North America	Mr Scott W. MYERS USDA APHIS Center for Plant Health Science and Technology Otis Laboratory 1398 W. Truck Rd. Buzzards Bay, MA 02542 USA Tel: 508 563-0959	scott.w.myers@aphis.usda.gov
✓	Expert/Facilitator	North America	Mr Guy HALLMAN Research Entomologist Stored Product Insect Research Unit Center for Grain & Animal Health Research 1515 College Ave. Manhattan, KS 66502 USA Tel: +1 185 776 2705	Guy.Hallman@ars.usda.gov
✓	Expert/Facilitator	Pacific	Mr Andrew JESSUP Senior Research Horticulturist NSW Department of Primary Industries Locked Bag 26, GOSFORD NSW 2250 AUSTRALIA Tel: +61 243481965	andrew.jessup@dpi.nsw.gov.au
✓	Expert	Latin America and Caribbean	Mr Ezequiel Félix QUENTA CHERRE Agronomist CIP No. 29596 Plant Protection Specialist SENASA Avenida La Molina N º 1915, Lima 12 PERU Tel: + 3133300-2042	equenta@senasa.gob.pe
✓	Expert	Pacific	Ms Joanne WILSON New Zealand Ministry for Primary Industries (NZ MPI) PO Box 2526, Wellington 6140, NEW ZEALAND Tel: +64 4 894-0528	Joanne.Wilson@maf.govt.nz

	Participant role	Region	Name, mailing, address, telephone	Email address
✓	Expert	Latin America and Caribbean	Mr Eduardo WILLINK Estación Experimental Agroindustrial Obispo Colombres, P.O.Box 9, Las Talitas (4101) Tucumán ARGENTINA Tel: +54 381-4276561 ext. 154	ewillink@eeaoc.org.ar ewillink@arnet.com.ar
✓	Expert	Asia	Mr Toshiyuki DOHINO Senior Researcher, Disinfestation Technology Section, Research Center, Yokohama Plant Protection Station, Ministry of Agriculture, Forestry and Fisheries MAFF 1-16-10, Shin-yamashita, Naka-ku, Yokohama 231-0801 JAPAN Phone: (+81) 45 622 8893 Fax: (+81) 45 621 7560	dohinot@pps.maff.go.jp
✓	Expert	Europe	Mr Vincent MATHIEU-HURTIGER Ctifl – Centre technique interprofessionnel des fruits et légumes (Technical institute for fruit and vegetables) F-13210 SAINT-REMY-DE-PROVENCE FRANCE Tel: +33 4.90.92.05.82 Fax : +33 4.90.92.48.87	mathieu-hurtiger@ctifl.fr
✓	Expert	Pacific	Mr Russell CANT Director Horticulture Exports Program Plant Export Operations Branch P.O. Box 858Canbarra, ACT, 2601 AUSTRALIA Tel: +61 2 62724216	Russell.cant@daff.gov.au
✓	Expert	Latin America and Caribbean	Ms Beatriz STEIN EEAOC (Estacion Experimental Agroindustrial Obispo Colombres) Av. William Cross 3150 4101 Las Talitas, Tucumán ARGENTINA Tel: 381-521000 ext 250	saneamiento@eeaoc.org.ar bstein@scientis.com.ar
✓	Expert	Latin America and Caribbean	Mr Gerardo GASTAMINZA EEAOC (Estacion Experimental Agroindustrial Obispo Colombres) C.C. 9, Las Talitas, (4101) Tucumán. ARGENTINA Tel: 0381 4521013	ggastaminza@eeaoc.org.ar

	Participant role	Region	Name, mailing, address, telephone	Email address
✓	Expert	Asia	Mr Young Su JEON Risk Management Division Department of Plant Quarantine, Animal and Plant Quarantine Agency Anyang -Ro 178, Anyang-Si, Gyeonggi-Do REPUBLIC OF KOREA Tel +82-31-420-7642 Fax +82-31-420-7606	pest1217@korea.kr
✓	Expert	Asia	Ms Hong Sook PARK Export Management Division Department of Plant Quarantine, Animal and Plant Quarantine Agency Anyang -Ro 178, Anyang-Si, Gyeonggi-Do REPUBLIC OF KOREA Tel: +82-31-420-7670, Fax :+82-31-420-7605	hspark101@korea.kr
✓	Expert	Latin America and Caribbean	Mr Luis Manuel ARGAÑARAZ Ledesma S.A.A.I ARGENTINA Tel:+ 5493886 - 429824	lmarganaraz@ledesma.com.ar
✓	Expert	Latin America and Caribbean	Jesús Ponce Sensitech United, Argentina MEXICO	jponce@sensitech.com
✓	Host	Latin America and Caribbean	Mr Ezequiel FERRO Dirección Nacional de Protección Vegetal - SENASA Av, Paeso Colón 315 C.A. de Buenos Aires ARGENTINA Tel/Fax : (+5411) 4121-5350	eferro@senasa.gov.ar
	Observers			
	Observer	SENASA	Martin DELUCIS Argentina	mdelucis@senasa.gov.ar
	Observer	SENASA	Maria Elena GATTI Argentina	megatti@senasa.gov.ar
	Observer	SENASA	Lisandro MILLAN Argentina	lmillan@senasa.gov.ar
	Observer	SENASA	Adriana CERIANI Argentina	aceriani@senasa.gov.ar
	Observer	SENASA	Diego ABAIGAR Argentina	dabaigar@senasa.gov.ar
	Observer	SENASA	Ariel SPLENSER Argentina	asplenser@senasa.gov.ar
	Observer	SENASA	Gustavo ROLFO Argentina	wrolfo@senasa.gov.ar
	IPPC Secretariat			

	Participant role	Region	Name, mailing, address, telephone	Email address
✓	IPPC Secretariat		Mr Brent LARSON Standards Officer International Plant Protection Convention Food and Agriculture Organization of the United Nations VialedelleTerme di Caracalla 00153 Rome ITALY Tel: +39 06 570 54915	Brent.Larson@fao.org
✓	IPPC Secretariat		Ms Adriana MOREIRA Support International Plant Protection Convention Food and Agriculture Organization of the United Nations VialedelleTerme di Caracalla 00153 Rome ITALY Tel: + 39 06 570 55809	Adriana.Moreira@fao.org
✓	IPPC Secretariat		Mr Artur SHAMILOV Support / Report writer International Plant Protection Convention Food and Agriculture Organization of the United Nations VialedelleTerme di Caracalla 00153 Rome ITALY Tel: + 39 06 570 56073	Artur.Shamilov@fao.org

Appendix 3 – Documents list

(last updated 29 November 2013)

DOCUMENT NUMBER	AGENDA ITEM	DOCUMENT TITLE (PREPARED BY)
Discussion papers		
01_ECCT_2013_Dec	1.	Provisional Agenda
02_ECCT_2013_Dec	2.	Documents List
03_ECCT_2013_Dec	2.	Participants List
04_ECCT_2013_Dec	2.	Local Information
05_ECCT_2013_Dec	4.4	Cold treatments tolerance of fruit flies - JESSUP/HALLMAN
06_ECCT_2013_Dec	5.3	Cold treatment as a phytosanitary measure for the management of Drosophila suzukii - WILSON
07_ECCT_2013_Dec	5.3	Cold treatment as a phytosanitary measure for the management of Drosophila suzukii - WILSON
08_ECCT_2013_Dec	5.4	Quarantine cold-storage treatment on Satsuma mandarin Citrus unshiu for export to Japan - QUENTA CHERRE
09_ECCT_2013_Dec 09_ECCT_2013_Dec_Rev	6.2	Lemon fruits export to Japan under cold treatment: the Argentinean experience - STEIN
10_ECCT_2013_Dec	6.7	Operational processes for cold treatment of fruit fly host commodities - CANT
11_ECCT_2013_Dec 11_ECCT_2013_Dec_Rev	5.2	Argentine citrus species and varieties variability to develop cold quarantine treatments for Ceratitis capitata - GASTAMINZA
12_ECCT_2013_Dec	6.6	The development and use of cold treatment in the export of fresh citrus from South Africa – HATTINGH
13_ECCT_2013_Dec	5.1	A brief overview of cold treatment research methodology - HALLMAN
14_ECCT_2013_Dec	6.3	Need of harmonized cold treatment scheme for fruit fly in fresh fruits - JEON/ PARK
15_ECCT_2013_Dec	6.5	Cold treatment for French Apple industry - MATHIEU-HURTIGER
16_ECCT_2013_Dec	6.4	Complex Challenges of Monitoring and Managing a Global Cold Chain • Components of a Good Cold Chain Management - Argentinian industry
17_ECCT_2013_Dec	5.5	Rapid Development of Phytosanitary Cold Treatments for Exotic Tephritid Fruit Flies Using Small Scale Comparisons across Multiple Species MYERS
18_ECCT_2013_Dec	3.2	History of cold treatments in general and overview of cold treatments used internationally JESSUP
19_ECCT_2013_Dec	6.1	Practicalities of extending new cold treatment schedules developed from large scale trials into commercial application JESSUP

Appendix 4 - Issues to be addressed by cold treatment researchers

Treatment requirements are described in ISPM 28:2007 *(Phytosanitary treatments for regulated pests)*. These requirements should be followed in order for a treatment submission to be considered by the IPPC Secretariat. Below is additional guidance developed by the ECCT to provide more specific considerations.

Issues to be addressed by cold treatment researchers	
1	Terminology
	Use the term “Cold treatment” Refer to consecutive days in treatments schedules In treatment descriptions, describe the plant part (e.g. fruit)
2	Introduction (also reference ISPM 28 section 3.2.1)
2.1	Taxonomy (correct nomenclature): TPPT agreed nomenclature for citrus, (for other fruit more discussion needed). Internationally approved nomenclature should be used.
2.2	Quality of commodities used for research including description of size, weight, shape, etc. Use insecticide free commodities when cold treatments are developed.
2.3	Effect of cultivar or variety on treatment efficacy (including rearing medium). Provide scientific justification.
3	Materials and Methods (also refer to ISPM 28:2007 section 3.2.1)
3.1	Data presentation and analyses Describe experimental design and statistical analyses including efficacy data using operational conditions, confirmatory tests and how the most tolerant life stage was determined.
3.2	Infestation technique use natural infestation or if artificial provide justification.
3.3	Colony description accuracy: complete description of colony source and rearing conditions.
3.4	Cooling period: record temperatures of all the probes when experiment begins and periodically throughout the treatment. Precooling is not part of cold treatment research and schedule.
4	Results (also refer to ISPM 28:2007 sections 3.2.1 and 3.2.2)
4.1	Data analyses and presentation: Data for efficacy is analysed and presented.
4.2	One quality comprehensive scientific document is considered sufficient to support treatment. Documentation used to support treatment approval by a country is considered sufficient when this is the only information available. Often this type of documents is written anonymously but must be publicly accessible.
5	Discussion
	No issues identified

Appendix 5 - Phytosanitary Temperature Treatments Expert Group

Terms of Reference and Rules of Procedures

Mission

The mission of the Phytosanitary Temperature Treatments Expert Group (PTTEG) is to provide a mechanism where critical phytosanitary temperature treatment issues can be addressed through discussion and collaborative research. To foster multi-disciplinary approaches to temperature treatment-related problems of global significance, this forum serves to bring together scientists, researchers, and other interested parties

Functions

The main functions of the PTTEG are to:

- provide scientific analysis and review of global phytosanitary temperature treatments issues and new information.
- serve as a forum for discussion and clarification of key issues related to phytosanitary temperature treatment implementation in global trade.
- identify and undertake collaborative scientific research aimed at high priority phytosanitary temperature treatments.
- ensure liaison with International Forest Quarantine Research Group (IFQRG) to avoid duplication
- exchange information with the Technical Panel on Phytosanitary Treatments (TPPT) of the International Plant Protection Convention (IPPC) to support the development of international phytosanitary treatments. [to be considered and confirmed by Standards Committee (SC)]

Membership

The PTTEG draws its membership from the scientific and research community, from industry and from the phytosanitary regulatory community, as appropriate. Membership will be reviewed and approved by a membership committee appointed by the Executive Committee.

Meeting participation

The Executive Committee of the PTTEG may limit participation at the PTTEG meetings.

Executive committee

The Executive Committee will be composed of a Chair, two Coordinators (one research and one operations) and a Secretary. At least one of the Executive Committee members should also be a TPPT member. The Executive Committee members are elected during a face-to-face meeting and serve for next two face-to-face meetings.

Decision making

Decisions will be made by consensus during face-to-face meetings. In urgent situations, intercessional decisions will be taken by the Executive Committee.

Roles of executive members

Chair: provides overall guidance to coordinate the work of two sections (research and operations).

Sections coordinators: oversee the work of the two sections and coordinate with the PTTEG chair. Sections members will be experts in their field and carry out the tasks assigned to their sections.

Secretary: ensure records of the meetings and other decisions are prepared, adopted and made publicly available.

Meetings

The PTTEG meetings will be held approximately every two years.

Provision of resources

Funding for participation in the meeting is provided by the host of the meeting. Participants in PTTEG meeting activities voluntarily fund their travel and subsistence to attend meetings.

Appendix 6 – Work programme of the Physanitary Temperature Treatment Expert Groups

Work Programme of the Phytosanitary Temperature Treatments Expert Group	Responsible	Priority*
1. Terminology		
· Clearly describe replication, repetition, block, end point to determine treatment efficacy, Precooling · validation, confirmatory trial, large scale trials	Scott\lead, Eduardo;	3
1. Introduction		
Large number of treatments schedules. Collect all existing cold treatment schedules approved by a country and make publicly available.	Andrew/ lead, Eduardo, Scott, Guy	1
Consideration of cultivars and\or variety effects on efficacy. Collect data on cultivars and\or variety and analyze commonalities (statistical re-interpretation). ECCT to consider further and prepare publication.	Gerardo / lead, Eduardo, Scott, Andrew	1
Consideration of higher temperatures Collect established treatments that are using higher temperatures, identify knowledge gaps and establish upper thresholds for the effective treatments. Make publicly available.	Beatriz\lead, Vaughan, Guy	2
Compile all collected information in a database to be shared.	Scott\lead with input from other leads	2
1. Materials and Methods		
To develop a research guideline (probably based on Japanese protocol). Issue of plus minus to be addressed. Make recommendation on how to convert trial data into a treatment schedule.	Dohino\lead, Ezequiel Felix, Vincent, Russell, Luis, Vaughan	1
1. Results		
No issues identified	-	-
1. Discussion		
Explore the possibility of developing generic cold treatments for pests species and\or hosts species. Review literature, develop a publication for review by ECCT.	Park, Jeon/ lead, Eduardo, Scott, Guy, Andrew,	1

* Priorities: 1-5 (1 = high; 5= low)