PHYTOSANITARY MEASURES RESEARCH GROUP (PMRG)

10-13 July 2017

Wageningen, Netherlands

MEETING REPORT

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A. OPENING OF THE MEETING

1. Welcome by the Chair of the PMRG

[1] Meeting participants were welcomed by the Chairperson of the Phytosanitary Measures Research Group (PMRG), Mr Guy HALLMAN (Joint Food and Agriculture Organization (FAO) /International Atomic Energy Agency (IAEA)). It was noted that this is the first meeting of the PMRG, following from the Phytosanitary Temperature Treatments Expert Group (PTTEG) meeting organized by the International Plant Protection Convention (IPPC) and held in Nelspruit, South Africa, in August 2015[1]. Mr HALLMAN noted the participation of 25 participants from 14 countries which represented a good geographical representation. He thanked Wageningen University and Research, The Netherlands, for hosting and co-organizing the meeting.

2. Welcome by local host

[2] Mr Jan VERSCHOOR (The Netherlands), researcher of Food and Biobased Research of Wageningen University, welcomed all participants. He provided an introduction to Wageningen University in a brief video presentation and outlined the two parts of the university's activity: first education and research activities and second, applied research focused on industry questions. He wished all a fruitful meeting.

3. Introduction of participants

[3] The PMRG Chairperson tabled the participants list[2] (see Appendix 1 of this report). Participants introduced themselves briefly.

4. Current PMRG Officers

[4] The PMRG Chairperson went through the PMRG Terms of Reference and Rules of Procedures[3] (see Appendix 2 of this report). He stressed the group's mission statement and emphasized the main functions of the group, especially the liaison between PMRG and the IPPC Technical Panel on Phytosanitary Treatments (TPPT). He also stressed that, rather than focus on presenting research results the PMRG group aims to provide analysis and review of global phytosanitary treatment issues as well as providing new information for the harmonization of research on phytosanitary treatments and other measures. He noted that the group identifies research needed although there are no funds to support execution of the research and such funds would need to be resourced by each researcher. He suggested that an agenda item about finances be included in the next PMRG meeting

[5] Mr HALLMAN outlined the current PMRG Executive Committee members[4] as provided below.

- Chairperson: Mr Guy HALLMAN (FAO/IAEA and TPPT member)
- Secretary: Ms Joanne WILSON (New Zealand)
- Research coordinator: Mr Scott MYERS (USA and TPPT member)
- Operations coordinator: Ms Beatriz STEIN (Argentina)

[6] Mr HALLMAN pointed out that their terms are ending at this current meeting and that election of new PMRG officers will be taken under agenda item "H. Election of New PMRG Officers; Overview and Conclusions of the Meeting", highlighting that according to the PMRG terms of reference, at least one

[1] Expert Consultation on Cold Treatments (ECCT) meeting main page: https://www.ippc.int/en/core-activities/standards-setting/expert-consultation-on-cold-treatments/

[2] 03_PMRG_2017_Jul

[3] 09_PMGR_2017_Jul

[4] 10_PMRG_2017_Jul

of the Executive Committee members must also be a TPPT member and that the Executive Committee members serve for a two face-to-face meetings term.

5. Election of chair of meeting

[7] Mr Jan VERSCHOOR was elected the meeting chairperson.

6. Election of rapporteur

[8] Ms Barbara WADDELL (New Zealand) was elected the rapporteur, as well as report writer.

7. Adoption of the agenda

[9] The agenda was modified, including new issues for consideration under agenda item F and G. The agenda was adopted (see Appendix 3 of this report).

B. ADMINISTRATIVE MATTERS

1. Documents list

[10] The meeting Chairperson, Mr VERSCHOOR, introduced the list of documents[5] as presented in Appendix 4.

2. Local information and Logistical arrangements

[11] The Wageningen hosts, Mr Jan VERSCHOOR and Ms Yu Tong QIU outlined local information and logistical arrangements.

C. BRIEF HISTORY OF THE PMRG

[12] The PMRG Chairperson introduced the paper[6] which outlined the history of the Phytosanitary Measures Research Group (PMRG) as provided in Appendix 5. The current membership of the PMRG is estimated at about 60 people and requested that the membership list be made available on the PMRG public webpage[7]. A show of hands indicated about five people currently present also attended the Expert Consultation on Cold treatments (ECCT) meeting in 2013 in Buenos Aires. It was noted that two members of International Forest Quarantine Research Group (IFQRG) are also members of PMRG however they were unable to attend this PMRG meeting. A further show of hands indicated that approximately half of the current participants attended the previous PMRG meeting in Nelspruit in August 2015.

[13] It was mentioned that there was an Expert Consultation meeting, sponsored and organized by the IPPC, on the *Bactrocera dor*salis complex treatments, and that this pest group is not a complex anymore but a single species. It was noted that a paper has been published with a list of treatments for *B. dorsalis* (see agenda item E.1 and Dohino et al., 2017[8]). It was identified that such issues could be readily addressed by the PMRG.

[14] It was highlighted that research to address the issue of possible differences in cold tolerance among different populations of Mediterranean fruit fly (*Ceratitis capitata*) was conducted at the International Atomic Energy Agency Laboratories in Seibersdorf by the FAO/IAEA with the help of collaborators

[5] 03_PMRG_2017_Jul

[6] 04_PMGR_2017_Jul

[7] Phytosanitary Measures Research Group webpage: https://www.ippc.int/en/external-cooperation/organizations-page-in-ipp/phytosanitarymeasuresresearchgroup/

[8] Dohino et al., 2017. Phytosanitary Treatments against *Bactrocera dorsalis* (Diptera: Tephritidae): Current Situation and Future. Journal of Economic Entomology, 110(1), 2017, 67–79p.

from Argentina, Australia, and Spain. Additionally, the review conducted by the PMRG, led by an Argentinian member, which addressed the issue of efficacy of cold treatments across cultivars/varieties of citrus fruits, concluded that cold treatments should be applicable across cultivars/varieties. These results were discussed and approved by the IPPC Technical Panel on Phytosanitary Treatments (TPPT) and by the IPPC Standards Committee (SC) and the Commission on Phytosanitary Measures (CPM) in its 12th Session (CPM-12, 2017), resulting in the adoption of several cold treatments annexes to ISPM 28 (*Phytosanitary treatments for regulated pests*)[9] . It was stressed that this was a clearly successful application of the PMRG from start to finish.

[15] The organization of a "mini-meeting" at the International Congress of Entomology in September 2016 in Orlando, Florida raised awareness of the PMRG activities adding several new members to the group. The PMRG Chairperson commented that while some work programme groups made good progress between meetings, this was not always the case due to participant's other commitments. Thus, he vowed that the PMRG progress intersessional with the tasks outlined in its work programme.

D. IPPC CALL FOR TREATMENT PROPOSALS

[16] The IPPC Secretariat, Ms Adriana G. MOREIRA, introduced the paper[10] announcing that the IPPC had opened a call for phytosanitary treatments proposals[11]. It was highlighted that the call is open and that the IPPC Secretariat is calling for two types of phytosanitary treatments:

- Phytosanitary treatments to be adopted as international standards, as annexes to ISPM 28 (*Phytosanitary treatments for regulated pests*).
- Phytosanitary treatments used in international trade, to be posted on the Phytosanitary Resources page[12] as contributed resources.

[17] She mentioned that all submissions for annexes to ISPM 28 should be made via the IPPC National Plant Protection Organization (NPPO) or Regional Plant Protection Organization (RPPO) official contact point. It was noted that the average time for a standard to develop from the submission until adoption was in the order of 5 years. She also mentioned that phytosanitary treatments used in international trade, to be posted on the Phytosanitary Resources page may take 6 months – 12 months, hence it does not become an IPPC adopted standard and follows another process. She pointed out that the next TPPT meeting (17 -21 July 2017) will begin considering the 25 submissions received for the round which closed on 5 June 2017.

[18] Ms MOREIRA highlighted that the IPPC call for phytosanitary treatments remains open and that submissions for the current call need to be submitted by 30 January 2018 for consideration by the TPPT at their next meeting in 2018. While the IPPC would prefer all supporting data in submissions to be freely available, it is possible for contracting parties to request that commercially sensitive data remain confidential – however, if essential confidential data are necessary for the adoption of the standard, its adoption may be affected. Thus, Ms MOREIRA encouraged that all data supporting treatment submissions be publically available.

[19] Clarification was sought by one participant as the how specific treatments needed to be. The guidance provided indicated it was up to the submitting party to determine the scope of the treatment. All submissions are reviewed on their scientific merit by the TPPT. For submissions to be annexes to ISPM 28, the TPPT then recommends to the IPPC Standards Committee whether the treatment should be included in the work programme. The Standards Committee, after further review along the IPPC

[9] ISPM 28 and adopted annexes are available at: https://www.ippc.int/en/core-activities/standards-setting/ispms/

[10] 06_PMRG_2017_Jul

[11] IPPC call for phytosanitary treatments: https://www.ippc.int/en/core-activities/standards-setting/calls-treatments/

[12] Phytosanitary Resources page: http://www.phytosanitary.info/

Standard setting process, then decides whether to recommend to the Commission on Phytosanitary Measures (CPM) the adoption of the treatment.

[20] Ms MOREIRA mentioned that various draft ISPMs are currently out for consultation period with closing date as 30 September 2017. PMRG members were encouraged to engage in the review process via their respective NPPO/RPPO contact points. Two draft standards of relevance to the PMRG were Requirements for the use of temperature treatments as a phytosanitary measure (2014-005) and Requirements for the use of fumigation as a phytosanitary measure (2014-004).

[21] Discussion ensued on acceptability of different efficacy levels, as for example Probit 9 vs 99.9%. It was stressed that under ISPM 28 Probit 9 is not a requirement. The PMRG Chairperson encouraged participants to consider new ways of looking at treatments and to use the independent expertise to be found in the PMRG to lead the development of scientifically defendable new treatment concepts (e.g. irradiation treatments result in 'live' but non-viable insects, thus to question if this concept could apply to other treatments).

[22] The PMRG:

1) *noted* the update and the information provided about the IPPC call for phytosanitary treatments.
2) *encouraged* the members to try contact their NPPOs/RPPOs official contact points for possible treatments submissions and possible contributions for the IPPC consultation period for draft ISPMs.

E. WORK PROGRAMME FROM 2015 MEETING

E.1. Existing Cold treatment schedules

[23] Mr HALLMAN introduced the document[13]. He described the background to this item as it was a task from previous meetings. He confirmed a list of existing cold treatment schedules had been provided to the group, as well as scientific papers published. The document outlined approved treatments for *B. dorsalis* as detailed in Dohino et al., 2017. Mr HALLMAN mentioned that this list could be extended for other species and other country protocols, noting that such lists are living documents; he pointed out that this agenda item can now be removed from the PMRG work programme.

[24] One PMRG member questioned the usefulness of the approved country schedules which may be more severe than what the science would support, in terms of minimum treatment conditions. The treatments listed would potentially be more severe than necessary, and so may not be a reliable indicator of the minimum efficacious treatment conditions. Mr HALLMAN indicated once the tabulated information was available it would be used to look for patterns of response. He recalled the PMRG studies conducted at the International Atomic Energy Agency Laboratories in Seibersdorf as a recent example of apparent differences in susceptibility to cold treatments of *C. capitata* populations from three countries - Spain, Australian and Argentina. Research provided to the TPPT for consideration showed no difference in responses to cold treatments in the three populations.

[25] One member suggested that it would be useful to have information on treatment failures, which would allow mathematical modelling of treatment efficacy and confidence. However, it was noted that publication of treatment failures was rare (see agenda item G. New Issues – 1a: New Operational issue on Quarantine Metrics).

[26] The PMRG:

3) *noted* the update and felt that such list would be very useful and should be made available.
4) *asked* Mr HALLMAN to contact the TPPT members (also PMRG members), Mr Scott MYERS (USA) and Mr Eduardo WILLINK (Argentina), to update this document, noting that this list

[13] 19_PMRG_2017_Jul and Link to Dohino et al. 2017[13]

will be a living document. Invited the team to consider Dohino et al., 2017 paper as a model to add other species and country protocols.

E.2. Cultivar/varietal effects

[27] Mr HALLMAN introduced the document[14]. He mentioned that this issue was considered and finalized at the first Phytosanitary Measures Research Group (PMRG) meeting in Nelspruit in 2015. A document with the rationale for this decision was presented in 2015 and was subsequently forwarded to the IPPC TPPT. During their 2016 meeting the TPPT[15] used this evidence to decide on cold treatment proposals that were not advancing because of the uncertainty about possible cultivar/varietal effects on *Citrus* spp. The outcome was the merging of two submissions and the consequent expansion of cold treatment for *C. capitata* to all *Citrus sinensis*. The Phytosanitary Treatment which is generic for all orange cultivars was adopted by the IPPC CPM at its 12th Session (2017) (PT 24: https://www.ippc.int/en/publications/84350/) along with other Phytosanitary Treatments[16]. This serves as an example of the usefulness and success of the PMRG.

[28] Some members noted that this could be done for heat treatments and for other commodities, such as mangoes however a similar rationale would have to be investigated.

[29] The PMRG:

5) *noted* the update and that this task was concluded. Consequently, removed this task from the PMRG work programme.
6) *acknowledged* that such an approach could be done for heat treatments and for other commodities.

E.3. Cold treatment database

[30] The IPPC Secretariat, Ms Adriana G. MOREIRA, summarized progress made in a tabled document[17] on the development of a cold treatment database tool. It was recalled that an endnote database was established by the PMRG in 2015 which included approximately 200 PDF references. She noted that the IPPC Secretariat was tasked by CPM-10 (2015) to explore options for a phytosanitary treatments database and that the Secretariat is finalizing it (for the adopted IPPC treatments at first) and that this database tool, a phytosanitary treatments search tool on the IPPC website, was nearing completion and would be available soon. It was pointed out that TPPT was going to provide oversight on the content of this search tool.

[31] Ms MOREIRA encouraged once again that PMRG members to submit treatment proposals in response to the IPPC call for phytosanitary treatments, as for example cold storage treatments identified from E.1. (Existing cold treatment schedules) so these treatments could be included in such a tool. She highlighted that submissions should be made in the call as either Phytosanitary treatments for adoption as international standards (annexes to ISPM 28) or as Phytosanitary treatments for use in international trade, so they can then be added to the database.

[32] One participant suggested that there may be resistance to listing all accepted treatments on the database. For example, an accepted treatment may be too restrictive or superseded by a better alternative. It was clarified that the TPPT has oversight on the content of the search tool and that the treatments listed there will be both adopted treatments (annexes to ISPM 28) and treatments available on the Phytosanitary Resources page of the IPPC website. The search tool would not include postings of scientific literature

[14] 05_PMRG_2017_Jul

[15] 2016-09 TPPT Meeting Report: https://www.ippc.int/en/publications/83489/

[16] IPPC adopted standards: https://www.ippc.int/core-activities/standards-setting/ispms/

[17] 07_PMRG_2017_Jul

describing treatments but will only include those two types of treatments as outlined before, recommended by the TPPT.

[33] The PMRG:

7) *noted* the update with enthusiasm and that this task was concluded. Consequently, removed this task from the PMRG work programme.

E.4. Cold Treatment Research Guidelines

[34] Mr Toshi DOHINO (Japan) introduced the document[18]. He mentioned the draft guidelines document was first discussed at the 2015 PTTEG meeting and has been further revised during intersessional discussions involving Mr Vincent MATHIEU-HURTIGER (France), Mr Ezequiel Felix QUENTA CHERRE (Peru), Mr Russell CANT (Australia) and Mr Vaughan HATTINGH (South Africa).

[35] The draft document was projected onto an overhead projector and the participants invited to comment as each section was reviewed. Where points were raised they were discussed and either resolved immediately, or delegated to a smaller working group tasked with revising the document and providing an updated version for further review by the meeting participants. The aim was to substantively finalize the document by the end of the meeting, leaving only minor editorial matters for later completion. This was achieved. The main points discussed were as follows:

- **Air temperature.** Regarding the section "Air temperature" one member queried if the measurement of the cold air delivery position and the other at the air return position were part of the treatment requirement. It was explained that fruit core temperature, not air temperature, is part of the treatment schedule specification.
- **Air temperature and the link with treatment failures.** One member queried how air temperature links to possible treatment failure. An example was cited where air temperatures were considered as part of the treatment specification which caused problems due to defrost cycle air fluctuations. This had resulted in treatment failures and impractical work-arounds where container fans were turned off. It also illustrated the consequences of incorporating unnecessary factors in treatment schedules. In contrast, another example was provided of the usefulness of measuring air temperatures. When individual fruit probes fail, air temperature readings can provide confirmation that the container/chamber remained at the target temperature. It was clarified that this document is a research guideline, not about the commercial treatment specifications, thus recording air temperature is a necessary and standard practice. The PMRG agreed to add a sentence to clarify this issue.
- **Infested fruits to simulate commercial practices.** The procedure for introducing infested fruit at incubation temperatures into a fruit stack in a cool store which is designed to simulate commercial practice raised a number of questions, such as should the filler fruit be at ambient or should it be precooled to the target temperature. It was explained that the rate of cooling will be influenced by the methods used which in turn affects the start time of the treatment. It was determined it is not practical to standardise this aspect since industry practice differs in each country. Even if efficacy research was designed to favour survival thereby reflecting the 'worse case' it was not possible to know what these conditions are (e.g. is a slow cooldown more favourable or less favourable for insect survival?). The conclusion and PMRG agreement was to record what is done during research trials so this can be taken into account during treatment evaluation.
- **Natural infestation vs artificial infestation.** It was suggested assigning the term "natural infestation" to field collected infested fruit and the terms "semi-natural" or "semi-artificial" to the laboratory techniques used to improve fruit infestation levels. In any event the materials and methods used should be recorded and written up in detail. It was suggested adding an introductory paragraph to acknowledge that there are alternative ways of conducting the research and that these are guidelines, not requirements for research. The PMRG agreed with the suggestions.

[18] 12_PMRG_2017_Jul

- **Natural infestation.** Views were expressed were that research should be conducted so as to be as close to natural infestation conditions as possible. If methods deviated from this ideal, it was important to explain to the extent possible, why the methods used were adopted. It was stressed that researchers need flexibility to take account of issues like poor host fruit status. Both natural and artificial infestations were acceptable as long as the infestation technique used was not demonstrated to make the insect easier to kill at the levels of efficacy required of treatments. The PMRG agreed with the suggestions.
- **Life table trials.** The life table trials, as detailed in the section called Preparation of infested fruit and investigation of the development of fruit fly in fruit, were used to determine the developmental times in specific host material. Treatments could then be applied at the correct time to target specific immature life stages. It was considered unnecessary to rear insects through to adults in these life table trials where the test insects, which would be the target life stage for the treatment were immature life stages. This was included in the guidelines.
- Discussion occurred on a range of methodological aspects such as:
    - How many replicates should be used to determine the life table data (e.g. should there be one replicate per population or cohort or more when confirmatory trials are undertaken over extended periods). It was determined that only one replicate is needed as rearing times are reasonably consistent and furthermore small batches of fruit are sometimes cut at the time of treatment to verify the correct stage of development has been achieved.
    - How practical is it to replenish colonies each year. This was deferred for later discussion (see agenda item G. New Issues – Part 2b: New research issues).
- **End point for mortality determination.** One member queried if the end point should be defined as the presence of moving larvae or the formation of puparia (in the case of fruit flies). Some considered pupariation to be sufficient and easier to establish, others however mentioned that rating larvae as live or dead is more practical as it is in line with importer inspection methods. It was pointed out that both are acceptable under the guidelines which specify that the mortality assessment should be conducted when the test insects have developed to a stage where mortality can be reliably ascertained. It was noted that different jurisdictions may have specific requirements on this issue. One member reported that a recent change in end point definition, more conservative from puparial formation to larval movement, invalidated a number of already completed trials where the former end point had been used and that the implication around such changes can be significant, as they may result in unnecessarily longer treatment times.
- **Cultivar/ varieties for *Citrus* spp.** It was agreed to remove any references to testing of separate cultivars since cold treatment effectiveness is independent of cultivar (see agenda item E.2. Cultivar/varietal effects). It is only necessary to describe the actual cultivar being used in the tests. It was mentioned that for recent citrus cultivars there is no cultivar/varietal differences in response to cold treatments. However, for other fruit species this may not be true. Regarding this specific document, the PMRG agreed to remove this section from this document. One person noted that consequential changes would need checking, as for instance under section "Test fruit" there is mention of varieties/cultivars in other sections of the document, which would also need revision.
- **Terminology.** After some discussion it was suggested that large scale tests should be renamed 'confirmatory testing' and small scale tests should be renamed 'exploratory testing' to be more descriptive and to better reflect the actual nature of the trials. The PMRG agreed that this should be under their work plan to have a common understanding on the usage of these concepts. It was noted that the draft ISPM on Requirements for the use of temperature treatments as phytosanitary measures (2014-005) has an appendix with research guidelines that deals with this, as it is an appendix on Guidance for temperature treatment efficacy studies.
- **Confirmatory tests.** Discussions were held on how the large number of individual insects in the confirmatory test may be accumulated and whether the individual 'replicates' were true replicates or merely batches of insects used to accumulate a total number of tested insects. There was general agreement that tests involving multiple batches of insects were a better measure of variability and

more practical (i.e. ease of handling smaller numbers of individuals) than a few large batches. By working to zero survivors in 30,000 Probit 8.72 efficacy was demonstrated, as mentioned by one member.

- Since the importing NPPO determines what target number of insects is required in confirmatory tests, it was agreed by the PMRG to change the wording to better reflect this, for example 'The mortality of a large number e.g. 30,000 individual fruit flies, will be used'. This better reflects the purpose of the document which is to be a guideline for research and not a prescriptive set of rules.
- **From research to commercial practices.** The general approach used in describing the principle being proposed, giving an example and indicating that there may be deviations in how this would be executed, was applied in how trial target temperatures translate from research to commercial practice. It was suggested that a note be included, to state that the examples provided are just examples, and that they could be taken into consideration when determining the feasibility and applicability of the trial.
- **Fruit injury tests.** It was agreed to add some text to explain that this component of fruit injury caused by the treatment is not part of efficacy testing, although it is advisable to evaluate different cultivars for their response to the treatment because of the potential for cultivar differences.
- **Number of insects per fruit.** One member questioned how many insects should be in a fruit in research trials and if the efficacy would differ based on the number of insects present. The PMRG noted that there is not an optimal minimum and maximum number and that because of this it might be advantageous to vary the number of insects per fruit to cover the possibility of density-related effects.
- **Measurement of temperature in fruits.** It was agreed measurements of pulp temperatures could be made in both infested and non-infested or filler fruit.
- **Evaluation of mortality data and temperature data conversion to phytosanitary treatment schedule.** It was suggested to take the same approach as other sections, as conversion from research to commercial application will vary from system to system and from trading partner to trading partner. Thus, this section would outline the principles and provide examples, noting the examples provided are just examples that could be taken into consideration when determining the feasibility and applicability of the trial.
- **Loading factor.** Some members noted that a loading factor for the stacking of fruit in the cold treatment chamber should not be included in this guideline since this was very variable in commercial practice. Hence it could not be reliably simulated in the research, but more importantly was immaterial to the efficacy outcome, since the critical measurement is fruit pulp temperature. A query was raised regarding the possibility of cooling rate affecting efficacy.
- **Methodology in bilateral agreements.** It was noted by the regulators present at the PMRG meeting that it is advisable to confirm any individual country preferences on methodological aspects, during bilateral discussions prior to undertaking research.

[36] The PMRG:

8) *agreed* with the text in the Cold Treatment Research Guidelines and that the Guidelines were now complete, requiring minor editorial changes only.
9) *acknowledged* that the information in the Cold Treatment Research Guidelines will be useful model for the other research guidelines under development.
10) *thanked* the project team for their considerable work in completing this important guideline document.
11) *asked* the team (Mr Toshi DOHINO (lead), Mr Peter LEACH (Australia), Mr Vaughn HATTINGH, Mr Woody BAILEY (USA) , Ms Barbara WADDELL and Mr Peter FOLLETT (USA)) to finalize the Cold Treatment Research Guidelines (editorials and read-proofing) and forward it to the PMRG Executive Committee.

12) *asked* the Executive Committee to make this Cold Treatment Research Guidelines available on the PMRG webpage and to share it with the leads of the other Research Guidelines.

E.5. Possibility of "generic" cold treatments

[37] Ms Barbara WADDELL introduced the document[19]. It was mentioned that generic treatments are defined as those where one specific treatment schedule is used for a group of pests and/or commodities although not all were tested for efficacy. In addition to treatment efficacy, other issues that have a bearing on the potential of generic treatments from a regulatory, commercial and implementation perspective would need to be considered.

[38] Ms WADDELL provided a presentation outlining a current Plant Biosecurity Cooperative Research Centre (PBCRC) project[20] which has the objective to 'improve postharvest market access treatments for horticultural commodities'. She pointed out that the PBCRC project involves scientific collaboration between research groups in three countries. The project participants invited other PMRG members to contribute results to the project. The 4-year project is reviewing and investigating quarantine cold treatments for controlling a range of fruit flies. Ms WADDELL mentioned that the project has different phases whereby initially a comprehensive review was undertaken to collate information on postharvest technologies and existing research results to identify gaps in the current knowledge for cold treatments. Second, cold treatment dose-response data was being organized into a carefully documented database for comparison and analysis. The database will be available for bringing additional data together from multiple sources. Third, the project will generate new data to identify cold treatments that immediately protect fresh produce industries and their economically important markets.

[39] The results, and the database created by this work, will provide the foundation for future international market access negotiations. It is hoped the PBCRC project will be a useful model for future exercises and will assist in the coordination of disinfestation research at an international level, leading to greater consistency in experimental procedures and in the recording of data.

[40] The discussion that followed the presentation considered the merits of different generic treatment possibilities. Some members questioned the feasibility of developing generic treatments for cold disinfestation due to the large variability found in responses among fruit flies in terms of most tolerant life stage, species and genus. It was noted that, while for irradiation it was possible, for cold treatment it is not practical to have a single treatment for all species because many commodities would not tolerate the treatment.

[41] One member queried if it is indeed useful to have a generic cold treatment in its extremes while another argued that there could be value in having a 'fall-back' protocol based on the longest treatment time needed to kill all high risk tephritids. This could be used in the event of an incursion, especially for countries like New Zealand where economic fruit fly species are not present, or when minor fruit sectors with limited resources would not otherwise have access to treatment protocols. Such a generic treatment would readily fit in with current industry practice of storing fruit at low temperatures to maintain fruit quality.

[42] The FAO/IAEA Seiberdorf Laboratory, with its extensive range of fruit fly species in colony, was identified as a unique resource for undertaking cold treatment studies. A number of different fruit fly species could be studied under controlled laboratory conditions using standardised methods thus providing the best opportunity for comparative studies which are needed to build the case for generic treatment approaches.

[43] One member questioned if the research results presented as a generic cold treatment could be incorporated into the IPPC treatments search tool. It was stressed that inclusion of PTs into the search tool would need to be submitted via the call for PTs, either for inclusion to ISPM 28 (via IPPC official

[19] 12_PMRG_2017_Jul

[20] http://www.pbcrc.com.au/research/project/3097

contact points) or for contributed resources (for the Phytosanitary resources page), the latter could be done via the PMRG.

[44] The PMRG:

12) *noted* the update on the research and *thanked* the participants of the Plant Biosecurity Cooperative Research Centre (PBCRC) project.

13) *agreed* that an update on the research outcomes to be presented at the next PMRG meeting for further considerations on how to move forward on a generic cold treatment.

14) *asked* the team (Mr Peter LEACH (lead) and Ms Barbara WADDELL) to develop such a paper (the Plant Biosecurity Cooperative Research Centre (PBCRC) project outcomes) for the next PMRG meeting.

E.6. Controlled atmosphere / heat research guidelines

[45] Ms Lisa NEVEN (USA) mentioned that research guidelines have not been developed yet. Ms NEVEN introduced the document[21] and provided a presentation summary on the project "Combination Hot Forced Air Treatments and Controlled Atmosphere Treatments: CATTS – Controlled Atmosphere Temperature Treatment System". The presentation detailed various aspects of the CATTS research program that was undertaken over a number of years and resulted in several treatments being developed. She mentioned that these treatments will be relisted in the USDA Treatments manual in the future. The presentation described the comprehensive approach taken by Ms NEVEN's group, and included a number of the key findings and suggestions on how to approach this type of research while not being prescriptive. It was emphasized that the commodity tolerance is the most important factor in the development of successful CATTS treatments.

[46] Following the presentation the discussion covered a range of topics with contributions from a number of researchers present who had also evaluated CATTS technology. Reasons for the lack of uptake in the US of CATTS technology since it was published in 2006 were discussed. The main engineering challenge was identified as air-flow. It was suggested to consider looking to commercial vapour heat treatment facilities which have been scaled-up or adopting engineering from forced-air cooling systems.

[47] It was explained by several members that, indeed the engineering is still a challenge but overall CATTS was considered feasible and scalable (to packing-house size facilities). It was mentioned that at fast heating rates and short treatment times there is little tolerance for error. One member pointed out that in the Netherlands a 12-pallet convective heating CATTS system (rather than forced air) is used to treat some products (e.g. flowers). Longer treatments at lower temperatures were feasible for some pests (Strawberry mites and strawberry root nematodes). It was also mentioned that new facilities at Wageningen University are being set-up to allow different treatment to be researched on a large-scale. It was noted there are currently 2 commercial CATTS facilities in the Netherlands with several treatment rooms, although none apply phytosanitary treatments. Another member mentioned that commercial CATTS was applied in New Zealand for apple treatments during one season to mitigate the risk of pest interception (not as a phytosanitary treatment).

[48] One member queried whether CATTS was practical for papaya, melons etc to be treated. The response suggested so long as the commodity tolerance was known it was feasible.

[49] It was noted that difficulties in retro-fitting chambers to ensure gas-tightness for low oxygen mango treatments was reported as the reason for lack of progress even after 3 years in Australia.

[50] It was recommended by one member that, when applying CATTS, first the controlled atmosphere conditions should be established and then the temperature increased. It was mentioned that observations show that low oxygen prevents the insects from producing heat shock proteins thereby preventing increased tolerance to elevated temperatures.

[21] 15_PMRG_2017_Jul

[51] It was noted that currently no country is using CATTS for phytosanitary purposes; however, there are examples for commercial purposes, and confirmatory testing would be required before these treatments would have the rigor required of phytosanitary treatments.

[52] The PMRG:

15) *Noted* that the the Controlled atmosphere / heat research guidelines has not been innitiated due to the few examples for CATTS in use.
16) *agreed* to merge the Controlled Atmosphere research guidelines and the Controlled atmosphere heat research guidelines in one document (see agenda item E.10).
17) *asked* the team (Ms Lisa NEVEN (lead), Mr Vincent MATHIEU-HURTIGERHurtiger (pending confirmation), Ms Shelley JOHNSON, Mr Jan VERSCHOOR and Ms Yu Tong QIU) to develop the Controlled atmosphere research guidelines, including CATTS Treatments.
18) *strongly encouraged* project leads to submit exisitng CATTS treatments in response to the IPPC call for phytosanitary treatments, by 30 January 2018 through an official IPPC contact point.
19) *agreed* that a virtual meeting to be held in October 2017 (after the Cold Treatment Research Guideline is finished) for the development of the Controlled atmosphere research guidelines and forward it to the PMRG Executive Committee by 31 October 2018.
20) *agreed* that a revised version of the Controlled atmosphere research guidelines be presented at the next PMRG meeting.

E.7. Modelling Phytosanitary Treatments

[53] Ms Lisa NEVEN provided a presentation on mathematical modelling. It was recalled that this topic was identified at the PTTEG 2015 meeting as a need for new research for modelling to support more rapid development of quarantine treatments (physiological determination of host and species).

[54] The presentation showed the benefit in modelling insect and fruit responses using a number of studies aimed at developing CATTS treatments. In this instance, modelling helped identify where there were areas of opportunity between insect kill and preserving fruit quality that could be further explored in research trials. Ms NEVEN also introduced two treatment technologies, described as model systems, for the development of efficacy data under precise treatment conditions. The first was a controlled atmosphere water bath where insects are simultaneously exposed to controlled atmospheres while being heated in tubes in a water bath. The second was a controlled atmosphere heating block which allowed the application of controlled atmosphere while simultaneously heating the insects on a metal plate.

[55] Ms NEVEN presented an example of a 3D-printed multi-cell insect holder designed for treating groups of insects in re-purposed thermo-cyclers. This was proposed as a low-cost method for developing thermo-tolerance efficacy data for modelling. If thermos-cyclers were not readily available these could also be provided at no charge in order to support research effort in different territories.

[56] The PMRG Chairperson suggested that in order to demonstrate the benefits of modeling, the group should consider starting with a simple model system to illustrate the principle, such as cold treatments that contained two parameters: temperature and exposure duration. One member suggested that a possible starting point would be to develop a model to help avert possible treatment failures, such as when the target temperature and the actual temperature differ or a cold treatment is temporarily interrupted, noting that this would have a big commercial impact and that indeed it would need to be addressed.

[57] One member pointed out that a model based on methyl bromide (MB) fumigation parameters could be developed quite quickly, as there was already information available. It was pointed out that MB modelling is being used for trade purposes for some commodities, and that modelling, even though for MB and for external pests only, had the potential to contribute to reducing MB use, and reducing the cost of developing new MB treatments. It was mentioned that there is a project that will explore the mathematical relationships between MB concentration, treatment time, and treatment efficacy. It was further explained that in this project a tool will be developed which uses MB applied dose and fumigation duration at a given minimum temperature to model concentration-time (CT) levels in a load. So, long as

sorption losses are within acceptable limits, untested cultivars, commodities or new packing configurations could be used with without compromising treatment efficacy.

[58] It was recalled that the IPPC has a recommendation on the replacement or reduction of the use of MB as a phytosanitary measure[22]. A discussion about the continuing reliance on MB for emergency responses or under the QPS exemption rules supported the position that modeling of MB research was consistent with the aims of optimizing use of this fumigant in the immediate term.

[59] Some members questioned how these model systems could be fed into the IPPC treatment framework. It was explained that, if countries are using these models for trade purposes they can be submitted as contributed resources to be available on the Phytosanitary Resources page.

[60] The PMRG:

21) *noted* the update.
22) *asked* the team (Mr Spencer WALSE (lead), Mr Peter LEACH and Ms Barbara WADDELL) to develop a paper on "fumigation tool for predicting efficacious treatment conditions" for the next PMRG meeting.
23) *agreed* that Mr Spencer WALSE will try contact Mr Scott MYERS to be part of this drafting team.

E. 8. Heat treatment research guidelines

[61] Mr Toshi DOHINO introduced the document[23] which contained a draft Heat treatment research guidelines. As the PMRG had previously agreed that "Cold Treatments Research Guidelines" be used as a model for the development of the other research guidelines, the PMRG agreed that the Heat treatment research guidelines be revised by the project team accordingly. The Heat treatment research guidelines, should include hot water treatment and will be progressed in virtual meetings to be arranged by the team leader.

[62] The PMRG:

24) *thanked* the project team for the work done so far on the development of the Heat treatment research guidelines.

25) *asked* the team (Mr Toshi DOHINO (lead), Mr Guy HALLMAN, Mr Peter LEACH, Mr Emilio HERNANDEZ and Mr Mamoun ALAKRI) to finalize the Heat Treatment Research Guidelines based on the Cold Treatment Research Guidelines and forward it to the PMRG Executive Committee by 31 October 2018.

26) *agreed* that a revised version of the Heat treatment research guidelines be presented at the next PMRG meeting.

E.9. Fumigation research guidelines

[63] The project team will draft fumigation research guidelines using the recently finalised Guidelines for the development of cold disinfestation treatments of fruit fly host commodities as a model. Progress will be made in virtual meetings, to be arranged by the team leader.

[64] The PMRG:

27) *asked* the team (Mr Spencer WALSE (lead), Mr Peter LEACH, Mr Tim GROUT (South Africa), Mr Scott MYERS and Mr Naito) to develop the Fumigation research guidelines based on the Cold Treatment Research Guidelines.

[22] CPM recommendation 03: https://www.ippc.int/en/publications/84230/

[23] 16_PMRG_2017_Jul

28) *agreed* that a virtual meeting to be held in October 2017 (after the Cold Treatment Research Guideline is finished) for the development of the Fumigation research guidelines and forward it to the PMRG Executive Committee by 31 October 2018.

29) *agreed* that a revised version of the Fumigation research guidelines be presented at the next PMRG meeting.

E.10. Controlled atmosphere research guidelines

[65] The PMRG agreed to merge Items E.6 and E.10 into a single Controlled atmosphere research guidelines document. New guidelines will be drafted using the recently finalised Cold Treatments Research Guidelines as a model. Progress will be made in virtual meetings, to be arranged by the team leader. The draft Controlled atmosphere research guidelines will be presented at next PMRG meeting (see agenda item E.6).

E.11. Existing phytosanitary systems

[66] Ms Lisa NEVEN introduced the document[24]. It was noted that this document lists 21 phytosanitary systems and that it is not an exhaustive list, but just the information collated to date. It was mentioned that this document lists published phytosanitary systems, regardless of their status, i.e. whether they are accepted by the target market or not; whether they are commercially implemented or not; and whether they are proving successful as a phytosanitary measure. A more comprehensive analysis of these systems is therefore required in order to obtain a full understanding of their efficacy and acceptance and the role they can play in phytosanitary regulations.

[67] The PMRG Chairperson pointed out there is an ISPM for Systems approaches (ISPM 14 (2002)) and questioned if there is anything the PMRG needed to do. One member spoke of the need expressed by industry groups for systems approaches. Another highlighted the basis for phytosanitary systems which included such factors as poor host status, low pest prevalence and low risk of pest establishment; however, a key issue was defining the acceptable level of pest prevalence (ALOP) further noting a threshold for acceptance is missing from the current system standard. It was commented that because a system will be intrinsic to the operations of individual production entities it would be difficult to generalize and define a standard ALOP. One member suggested adding an example to the PMRG website to illustrate the principle of systems approaches.

[68] The Meeting Chairperson noted that, according to the relatively high number of existing phytosanitary systems, this was indeed a feasible solution for pest control. No specific outcomes were noted from the discussion.

[69] The PMRG:

30) *thanked* the team for the information gathered and provided.
31) *asked* the original project team, Mr Sean MOORE (South Africa, lead – to be confirmed), Ms Lisa NEVEN, Mr Spencer WALSE, Mr Russell CANT, Mr Eduardo WILLINK and Mr Aruna MANRAKHAN (South Africa) to update this paper highlighting that phytosanitary treatments are part of a larger phytosanitary system.
32) *asked* the team to submit this updated paper to the PMRG for peer review by 31 October 2018.
33) *asked* the team to strongly consider submitting this updated paper, after being a peered reviewed by the PMRG, for publication in a scientific journal.
34) *agreed* to discuss the revised paper at the next PMRG meeting.

E.12. Literature review of treatment endpoints

[70] Ms Lisa NEVEN provided an update. She mentioned that compilation of endpoint data from the literature is being collected but not yet finalized. She mentioned that there is extensive literature that could be considered when looking at this question. It was mentioned that common endpoints in heat/cold

[24] 18_PMRG_2017_Jul

treatments are lack of moving larvae or absence of pupae. Endpoints in irradiation treatments include the acceptance of wigglers. The tight certification of the irradiation process gives confidence that any risk associated with the presence of wrigglers is accepted.

[71] It was noted wigglers can be observed following heat/cold treatments. One member questioned why the presence of wigglers cannot be accepted in treatments other than irradiation. It was pointed out that, attaching confidence to the acceptance of wigglers for non-irradiation treatment requires research quantifying the cumulative effect of the treatment on the survivorship of the different life stages.

[72] One member noted that there is an Israeli study with medfly-infested citrus where samples were split and some examined at intervals after removal from the cold storage treatment, while the remainder was left to pupate. It was mentioned that such studies could provide insight in to the question of treatment endpoints.

[73] The PMRG discussed if the group would be in a position to state if detection of live larvae is a matter or not of treatment failure. It was acknowledged that for fumigation detection of moving insects will often happen if mortality observations are made too soon after treatment, but this does not constitute treatment failure. However, for other types of treatments this needs further research. It was noted that there are some studies for other treatments (e.g. cold treatments) that show live larvae detection but again, it was stressed that this is not treatment failure, because the larvae do not continue development (i.e. do not pupariate). Alternative observations were also reported where survivors did continue to develop.

[74] One member noted that lack of puparial development is a reliable and accurate indicator of treatment efficacy that has been used extensively in determining cold treatment parameters in research trials. In some jurisdictions this aligns with operational practice while in others, lack of moving larvae is the indicator used to confirm treatment efficacy if/when insects are detected following fruit cutting at the port of entry. It was noted that this mismatch between research and operational methods when determining treatment efficacy has the potential to lead to rejection of consignments that are at an acceptable level of risk to the importing country, i.e. no survivors. Typically pest prevalence on the pathway can be so low that this eventuality does not occur in practice. In other instances wiggles were reported to have caused problems. It was suggested the only feasible way to manage this issue is to design treatments that result in dead larvae.

[75] Another consideration noted was the considerable added expense in confirmatory trials of cutting fruits as opposed to observing non-formation of puparia. Ultimately treatments should be balanced to take into account the risks to fruit and commodity – if it is possible to lighten treatment conditions without increasing risk, this should be done. The discussion highlighted the importance of agreeing endpoint criteria at the time of bilateral discussions, and also illustrated the potential impact of changes to endpoint criteria on the transferability of research across markets i.e. on phytosanitary treatments harmonization.

[76] It was noted that ISPM 28 does not define a recommended endpoint. Also that the revised cold treatment guidelines similarly allow for determinations to be made at the point when mortality can reliably be ascertained. Given the fact that endpoints are ultimately determined by the importing country, it was agreed to remove this issue from the PMRG work programme.

[77] The PMRG:

35) *noted* the updated.
36) *noted* that some members have extensive data on endpoints and asked that this be shared with the team of this paper, but acknowledged that this would be included in the research guidelines (in general terms).
37) *asked* the team (Ms Lisa NEVEN (lead), Mr Guy HALLMAN, Mr Yoav GAZIT and Mr Aruna MANRAKHAN) to finalize the literature review on endpoints, fruit quality and statistical issues to be shared with the Executive Commitee for subsequently sharing with the PMRG to be considered for the development of the Research Guidelines.
38) *agreed* to remove this task from the PMRG work programme as it will not be discussed further at future meetings.

E.13. Treatment of mixed loads

[78] Mr James ALLAN (Australia) introduced the paper[25] and provided a presentation[26] on this subject from an operational perspective. He described the procedure for pre-cooling because of the importance of loading containers or cool chambers with product that was already at the target temperature. This was necessary because of the limited capacity of container cooling systems to actively reduce temperature as opposed to just maintaining temperature. Mixed consignments can be treated using the same methodologies as single commodity treatments as long as monitoring suitably covers all commodities within the treated consignments. In addition, the lowest temperature for the longest duration is applied to ensure the treatment is effective for all commodities involved. Mr ALLAN posed the question if mixed loads are acceptable from a scientific perspective, and are currently successfully used in Australia for imports and for exports of fruit commodities to Japan (targeting medfly cold treatments using the most stringent schedules), then how can wider adoption be encouraged. He pointed out that the packaging configuration for in-transit cold treatment requires consistent packaging. Further examples showing the acceptability of mixed consignments were described by two members of the group.

[79] The PMRG discussed potential implementation issues, for example, the need for adequate pre-cooling, fast transfer of product to containers and avoiding delays in the wharf, possible phytosanitary certification requirements for each product in a load maybe with 600 unit sample required for each product, probe placement, etc.

[80] The group recommended providing a practical example(s) of use of this approach, with supporting data from a number of consignments to demonstrate the successful operational implementation of mixed loads. One member commented that the data could be considered for publication. It was noted that the Cold treatment research guidelines finalized at this meeting covered some aspects of the transfer of treatments to industry.

[81] The PMRG:

39) *noted* the paper and thanked the team for discussions.
40) *asked* Mr James ALLAN (lead) and Mr Woody BAILEY, with contributions from Mr Peleanto FONOTI (Samoa) and Mr Mamoun ALBAKRI, to develop a paper on the science and practicalities of mixed load by 31 July 2018 for consultation and comment by the PMRG.
41) *agreed* to discuss the paper at the next PMRG meeting

E.14. Miscellaneous treatments

[82] Ms Lisa NEVEN recalled that this task was originally named "New and novel technologies" and provided a summary of a wide range of postharvest treatment technologies that have been evaluated in recent times by various researchers. These included technologies such as high pressure, Metabolic Stress for Disinfestation and Disinfection (MSDD), plasma, high pressure washing both with and without surfactants, essential oils, synthetic oils, joule heating etc. Other members added technologies they were aware of or had experience with which showed varying levels of potential for application to horticultural products. For example, hot water high-pressure washing was progressing for citrus, high pressure and steam for the external surfaces of containers, while radio frequency heating showed promise for durable products.

[83] The PMRG briefly discussed this issue and determined that there was little evidence that any alternative in this miscellaneous category was promising or a 'silver bullet' for horticultural products generally. The group felt it was reasonable in removing this topic from the PMRG work programme.

[84] The PMRG:

[25] 13_PMRG_2017_Jul

[26] 14_PMRG_2017_Jul

42) *agreed* to remove this topic "Miscellaneous treatments" from the PMRG work programme.

E.15. Heat treatment and non-target organisms

[85] Mr Guy HALLMAN introduced the paper[27] on behalf of Ms Joanne WILSON (New Zealand) who was unable to attend this meeting.

[86] He mentioned that in instances where high risk regulated organisms such as tephritid fruit flies may be present on plant hosts being imported to New Zealand, phytosanitary treatments involving elevated temperatures are applied prior to the product entering New Zealand. The approved heat treatments by the New Zealand Ministry for Primary Industries (MPI) are designed to provide the high level of assurance required to ensure live viable fruit flies will not enter undetected in host fruit. On occasion, even though the fruit fly phytosanitary treatment conditions are met, pests such as aphids, beetles, mites, moths, scales and thrips can be intercepted alive on papaya and mango imports resulting, in most instances, in the fruit being fumigated with methyl bromide.

[87] It was mentioned that the MPI considers a number of factors when making decisions on actions to be taken when live pests are intercepted. These include biological characteristic and operational compliance issues. For example, in 2015 a trend was detected by MPI when live insects were found on a number of high temperature forced air (HTFA) treated eggplants. Following investigation, operational issues were suggested as potentially affecting treatment efficacy.

[88] The paper outlined that MPI is investigating operational factors affecting the efficacy of HTFA treatment for killing non-target mealybugs and other pests. MPI aims to understand whether the presences of live pests can be used as an indicator of heat treatment failure for fruit flies and build knowledge to make informed decisions on the fate of potentially ineffectively treated consignments.

[89] One member reported an identical concern with imported produce, where the detection on arrival of live non-target pests, called into question the treatment efficacy or possible problems with operational implementation.

[90] The PMRG queried whether non-target pests would be expected to be killed by a vapour heat treatment (VHT) designed to kill fruit flies. This suggests efficacy of a VHT for fruit fly is called into question because there is something alive on the pathway although the thermotolerance of the pests may not be known.

[91] The PMRG expressed an interest in learning what MPI discovers in the follow up work proposed.

[92] The PMRG:

43) *thanked* Ms WILSON for developing the paper.
44) *agreed* to discuss this topic further at next PMRG meeting pending a report back on the "Next steps" proposed in the document.
45) *agreed* to include information on the impact of 'Mixed pests in consignments' under the topic "Heat treatment and non-target organism", now with a broader scope.
46) *asked* Mr Peter FOLLETT, Mr Momoun ALBAKRI, Mr Toshi DOHINO and Ms Lisa NEVEN, who have additional data for other commodities, to support the development of such paper
47) *asked* Ms Joanne WILSON (lead) and Mr Guy HALLMAN, with contributions from Mr Peter FOLLETT, Mr Mamoun ALBAKRI, Mr Toshi DOHINO and Ms Lisa NEVEN to develop a paper with further information on the results from the current investigation into

[27] 11_PMRG_2017_Jul

operational factors affecting high temperature forced air (HTFA) effectiveness to be presented at the next PMRG meeting).

E.16. Newsletter

[93] The PMRG Chairperson questioned if a newsletter would be useful and if it is a priority for the group. With regards to communications and advocacy of the group, it was acknowledged that the PMRG Chairperson has been providing written reports to the IPPC Commission for Phytosanitary Measures (CPM)[28] on the activities of the group. This was a means of informing other organizations or partners of the group's work. The PMRG Chairperson also prepared an article for the FAO/IAEA newsletter (http://www.fao.org/ag/portal/index_en.html).

[94] It was widely agreed that the PMRG needs to enhance its outreach, especially at the national level. The group determined that a newsletter would not produce much impact and would be laborious to maintain. It was agreed that social media was an obvious method to increase engagement in the group's members, particularly between face-to-face meetings.

[95] The PMRG:

48) *agreed* to remove this topic from its work programme.
49) *agreed* a Facebook page will be set up for the group and invited all to join.

F. OTHER BUSINESS

F.1. Workshop "Clean Corridor and Integrated Quarantine Risk Management"

[96] The PMRG was invited by Mr Jan VERSCHOOR to participate in a Workshop at Wageningen University on phytosanitary systems and innovation in phytosanitary measures entitled "Clean Corridor and Integrated Quarantine Risk Management" (see Appendix 6).

[97] The workshop involved a discussion on the opportunities to recognize additional, voluntary measures that supply chains build into their operations that ultimately reduce the risk to importing countries. The concept of a "Clean corridor and integrated quarantine risk management" was outlined using an actual example of an operational commercial supply chain involving multiple countries with hundreds of suppliers and with a turnover of 4.5m euros pa. No pest interceptions had been detected in produce produced and handled by this supply chain in over 5 years of importing to the Netherlands. The contention was that if phytosanitary measures were treated the same as food safety and other issues, by focusing on defined supply chains, then clean corridors could potentially be rewarded for their investment and the reduced risk they pose to importing countries by continuity of access. Currently the weakest link can cause closure of a market.

[98] During the discussion it was apparent that some aspects of differentiated supply chains already exist in some countries. For example, where a supply chain has developed a reliable reputation, different rates of inspection can be applied. Large programs like the export of cherries from the US to British Columbia rely on a multi-step production system that is negotiated as a bilateral arrangement. Similarly, Taiwan accepts apples from the US and in the event of non-compliance a trace-back can result in the exclusion of a single orchard block or a farm. The system is defined in a country/commodity workplan which is regulated by the industry and gives assurance to the importing country via extensive documentation of practices, audits, inspections etc. The notion of government regulatory agencies accrediting individual supply chain entities, albeit large ones, was not considered practical in the opinion of one of the regulators present. Moreover the capacity within some countries would preclude dealing with multiple entities. In any event it was at the discretion of regulatory agencies, whether to recognize elements of quality assurance programs, which could possibly include phytosanitary measures, in their bilateral

[28] CPM-12 (2017): CRP/05 "Written reports from international organizations - Report from the Phytosanitary Measures Research Group (PMRG) activities for 2016" available at https://www.ippc.int/en/publications/84166/

arrangements. The European Union open market was unique and as such was perhaps more challenging when product could be moved from one country to another. Considering new changes proposed within the next two years in the EU whereby NPPOs will be required to issue e-phyto certificates for imports, trans-shipping is likely to become more complex.

[99] The workshop was followed by the field trip in which several technical presentations were made by Wageningen University and Research scientists. Laboratory visits enabled the PMRG members to observe practical examples of biosecurity and pest management science being undertaken at the university The PMRG thanked the host for organizing an informative program together with an enjoyable social event at the end of the day.

F.2. Ozone Secretariat: Methyl Bromide Technical Options Committee (MBTOC)

[100] Mr Fred BERGWERFF (MBTOC, The Netherlands) provided a presentation[29] on recent developments by the Methyl Bromide Technical Options Committee (MBTOC), reported at their meeting earlier this year. As of 1 January 2005 (developed countries) and 2015 (developing countries) methyl bromide (MB) use is only permitted under the Critical Use Exemptions. Quarantine and Pre-shipment (QPS) applications of MB are exempted from controls at this stage. It was reported that over 90% of present global MB consumption is for QPS applications, consumption of which has remained relatively stable for some years (see http://ozone.unep.org/en/data-reporting/data-centre for further information). Alternatives for these uses have been reviewed by the MBTOC with an estimate that about 40% reduction could occur with existing technologies. It was mentioned that in order to promote and facilitate collaboration between the Montreal Protocol and the IPPC, joint participation of technical experts of both treaties occurs. Cooperation between PMRG and MBTOC occurs in relation to identifying research across a range of technologies that are potential MB alternatives particularly in the QPS sector.

[101] Mr BERGWERFF invited PMRG members to join the MBTOC, noting that this could enhance the collaboration. He also noted that the nominations to join the MBTOC are at discretion of the MBTOC selection.

[102] A brief discussion followed the presentation which included the following observations:

- MBTOC's initial 60 members are now just 16 due to the success in their objective to phase out MB
- Current recapture technologies were reporting as having problems making uptake challenging
- MB supply costs have increased resulting in improved economic cases for MB alternatives
- The Netherland experience was described, whereby the threat of MB withdrawal was real, notice was given of the imminent change and it occurred.
- Critical Use Exemptions means MB will be here for a few years yet although there is increasing incentive to move away from MB.
- Pacific Island Countries were more challenged by the MB withdrawal as most of the alternatives are very expensive.
- MB flexibility, when needed to treat infested import goods at the border, is still very important
- A commonly advanced argument for MB use over available alternatives is the relatively short treatment time of MB of maybe 24h. However, when considered in the overall freighting times where a consignment may be 4 weeks in transit plus a further 10 days on the wharf waiting clearance procedures, then a further 3-day for an alternative QPS treatment is not unreasonable.
- The next MBTOC meeting is March 2018 in Belgium.

[103] The PMRG:

50) *thanked* Mr BERGWERFF on behalf of the Ozone Secretariat: Methyl Bromide Technical Options Committee (MBTOC).

[29] 17_PMRG_2017_Jul

51) *noted* the update provided.
52) *strongly encouraged* the development of phytosanitary treatments alternatives to methyl bromide.

F.3. Phytosanitary Systems - Systems approach: Japan case study

[104] Mr Takashi KAWAII (Japan) provided a presentation on a case study on the use of a phytosanitary system in the production of export peaches and apples for Taiwan. It was mentioned that peach fruit moth (PFM) is found in Japan and is a potential pest of both fruits. Japanese production is managed using a recently introduced phytosanitary system involving both conventional chemical control and mating disruption techniques. Research trials involving adult trapping and fruit inspections were reported from a number of sites. It was mentioned that trapping data showed the presence of adult PFM in orchards without mating disruption hence mating disruption is recommended for commercial export production. It was noted that large numbers of fruits were cut just before harvest which confirmed the absence of PFM in both peaches and apples. It was highlighted that in 15 years of exports to Taiwan under the supervision of a Taiwanese inspector, no PFM have been detected in Japanese export fruit.

[105] Issues such as interpreting zero catches in monitoring traps and how to assess possible edge effects in orchard blocks were discussed by the group. The risk profile of different pest is an important consideration in the applications of phytosanitary systems, e.g. fruit flies versus codling moth. Ms NEVEN offered to share an example of a similar system established for US apple exports to Taiwan.

[106] The PMRG:

53) *thanked* Mr KAWAII for the presentation provided on the case on the use of a Phytosanitary Systems used in the production of export peaches and apples for Taiwan.

G. NEW ISSUES

[107] The following new issues/projects were identified and agreed by the PMRG:

1. New operational issues

a. Quarantine metrics and estimated number of treated insects in confirmatory trial

2. New research issues

a. Interruption of temperature treatments vs. efficacy
b. Necessity of replenishment insect colonies for phytosanitary treatment research

[108] Discussions concerning new issues are included below. Not all issues raised progressed to new project ideas. The PMRG also categorized the existing tasks its work programme in two categories: 1) research issues, and 2) operational issues (see Appendix 7). This was in order to facilitate the work development and to better define the roles and responsibilities on the Executive Committee.

Quarantine Metrics (Operational issue)

[109] A general question that impacts phytosanitary treatment research is the determination of the estimated number of treated insects in confirmatory tests. This was raised during the discussion on the research guidelines and will be relevant for all types of treatments for which guidelines are under development.

[110] It was agreed that the acceptability of different approaches to quarantine metrics can be addressed in the wording in the research guidelines including modifying the format of confirmatory trials results tables to better illustrate cumulative counts of control and treated insect totals.

[111] The PMRG noted that this issue can have a big impact when developing and negotiating phytosanitary treatments research plans. While various levels of demonstrated efficacy are accepted by different NPPOs, further discussion needs to be undertaken.

[112] It was noted that information from treatment failures would provide valuable data for analysis. This is more relevant in research trials, when few survivors are detected, than commercial applications.

[113] The group discussed some of the factors that are taken into consideration when moving from dose-mortality studies where the mortality response is modeled, through to predictions of efficacious treatment conditions including the influence of different statistical models. It was evident from the discussion that both researchers and regulators may add safety margins to treatments or not, when recommending or formulating efficacious treatment protocols.

[114] It was stressed that research needs to be performed to ensure that the efficacy level is compatible with the confidence level needed by the importing country and that the confidence level is not overestimated. Ultimately risk of failure is quantified during laboratory evaluations so safe food is traded and industry has access to practical treatments that are not excessive.

[115] The PMRG:

54) *agreed* that Mr Peter LEACH (lead), Ms Barbara WADDELL, Mr Peter FOLLETT, Mr Woodward BAILEY, Ms Yu Tong QUI and Mr Yova GAZIT to develop a draft paper on "Quarantine Matrics" to be presented at the next PMRG meeting.
55) *asked* all members to provide information on data sets including treatment failure data sets to the lead by 31 October 2017.
56) *agreed* that "predictability issue" is a new topic linked to the quarantine metrics, however this discussion was postponed until a later time.

Interruption of temperature treatments vs. Efficacy (Research issue)

[116] Cold storage protocols can fail and currently need to be restarted when the temperature exceeds the allowable threshold. If there is greater risk of pest survival when interruption occurs in commercial practice or in tests then an understanding of this risk would be useful.

[117] The aim in investigating this issue is to be able to make a decision if a start-over of the treatment is needed. In terms of research, is was suggested to just report the temperatures as observed, even if the temperature goes high, so long as mortality is still 100%.

[118] It was mentioned that in commercial practice it was estimated that deviations can be above the maximum threshold by 3-5°C, for anything from 1-5 days. Furthermore the deviation can occur at any time during the cold storage treatment e.g. 1h or 2 days into a treatment time of 14 days. Therefore this is potentially a complex question to research because of the many permutations that can occur in the way treatments can be interrupted.

[119] Discussions by the group questioned how experiments could be designed to advance this issue. Could modelling help? Would insect developmental thresholds be useful? It was agreed to begin with a literature review which would be used, together with actual examples of failed treatments, to design a study using a one insect species e.g. medfly as an example.

[120] The PMRG:

57) *agreed* that Mr Tim GROUT (lead) and Mr Vaughan HATTINGH will develop a paper on "Interruption of temperature treatments vs. efficacy" to be presented at the next PMRG meeting.
58) *agreed that* and Mr James ALLAN and Mr Mamoun ALBAKRI would review actual examples and contribute data for the review and *invited* the team to prepare a literature review to help the development experimental trials to research this issue.
59) *asked* all members to provide information on literature review to the lead by 31 October 2017.

Necessity of replenishment of insect colonies for phytosanitary treatments research (Research issue)

[121] One member pointed out that the genetic variability after 1 to 2 generations from the wild insects is no longer available. Another member mentioned that this has a link to most tolerant life stage research. One queried if colony replenishment is just a best practice or if it is something to be considered as a research question. It was pointed out that the aim would be to know if this influences the tolerance to the treatment.

[122] The group acknowledged that laboratory colonies can be more tolerant than the wild individuals (examples from Mexico for *Anastrepha* species for heat treatments and the USA for codling moth treatments).

[123] The PMRG:

60) *agreed* that Mr Peter FOLLET (lead), Mr Emilio HERNANDEZ and Mr Peter LEACH will develop a paper on "Necessity of replenishment of colonies for phytosanitary treatments research" based on literature review to be presented at the next PMRG meeting.

End-points for cold treatments

[124] Discussion occurred on the End-points for mortality determination (refer E.4. above).

[125] The PMRG:

61) *noted* the discussion and *agreed* that this issue requires no action for now.

Cultivar / varietal possible differences for VHT

[126] Discussion occurred on the possible influence of cultivar/varietal differences in VHT. Data supported the removal of cultivar differences in cold treatment (refer E.2. above) however this approach cannot be assumed for other treatment types without investigation.

[127] The PMRG:

62) *agreed* that this issue will be addressed in the Heat Treatments Research Guidelines (refer to agenda item E.8). Thus, no further action for now.

H. ELECTION OF NEW PMRG OFFICERS AND OVERVIEW AND CONCLUSIONS OF THE MEETING

[128] The PMRG Chairperson recalled the PMRG Terms of Reference outlining the tasks of the Executive Committee and that at least one member should be a TPPT member.

[129] The PMRG elected the new following members for the Executive Committee to serve for the next two face-to-face meetings, starting in 2017, as outlined in the PMRG Terms of Reference:

- **Chairperson:** Mr Peter LEACH (Australia)
- **Secretary:** Ms Joanne WILSON (New Zealand)
- **Operations Coordinator:** Mr Vaughan HATTINGH (South Africa)
- **Research Coordinator:** Mr Scott Myers (USA and TPPT member)

[130] The PMRG wished all the best for the new Executive Committee.

H.1 Evaluation of the meeting:

[131] An on line survey will be send out to the meeting participants for future improvements. The results will be forwarded to the new Executive Committee.

H.2 Next meeting date and location:

[132] The tentative date and venue agreed were to Cairns, Australia for August 2019.

H.3 Close of the meeting:

[133] The Meeting Chairperson thanked all the participants for their active engagement. He also thanked the IPPC Secretariat for her participation at the meeting.

[134] The PMRG thanked the PMRG Chairperson, Mr Guy HALLMAN, for his active participation, engagement and knowledge over the last years.

[135] Mr HALLMAN stressed the objectives of this group outlined in the Terms or Reference of the PMRG and wished all the best for the new Executive Committee.

[136] The PMRG thanked the host, the Meeting Chairperson and the rapporteur.

[137] The meeting was closed.

APPENDIX 1: Participant List

Name	Organisation	Country	Email
ALBAKRI, Mamoun	Ministry of Agriculture, Amman	Jordan	mambakri@email.com
ALLAN, James	Plant Export Operations, Department of Agriculture and Water Resources	Australia	James.Allan@agriculture.gov.au
BAILEY, Woodward	USDA-APHIS-CPHST, Miami	USA	Woodward.D.Bailey@aphis.usda.gov
BERGWERFF, Fred	Methyl Bromide Technical Options Committee, MBTOC	The Netherlands	fb@oxylow.com
DOHINO, Toshiyuki	Yokohama Plant Protection Station, Ministry of Agriculture, Forestry and Fisheries MAFF	Japan	dohinot@pps.maff.go.jp
FOLLETT, Peter	USDA-ARS, U.S. Pacific Basin Agricultural Research Center, Hawaii	USA	peter.follett@ars.usda.gov
FONOTI, Pelenato	Samoa Quarantine, Government of Samoa	Samoa	aceo@samoaquarantine.gov.ws
GAZIT, Yoav	The "Israel Cohen" Institute for Biological Control, Plants Production and Marketing Board	Israel	yoav@jaffa.co.il; yogazit@netvision.net.il
GROUT, Tim	Research & Technical, Citrus Research International, Nelspruit	South Africa	tg@cri.co.za
HALLMAN, Guy	Insect Pest Control Laboratory, IAEA, Seibersdorf, Austria	FAO/IAEA	N5551212@yahoo.com
HATTINGH, Vaughan	Citrus Research International	South Africa	vh@cri.co.za
HERNANDEZ, Emilio	Programa Moscafruit, Camino a Cacahotales s/n, Metapa de Dominguez, Chiapas	Mexico	emilioho@prodigy.net.m
JOHNSON, Shelley	Department of Conservation Ecology and Entomology, Hortgro Science and University of Stellenbosch	South Africa	sjohnson@sun.ac.za
KAWAII, Takashi	Yokohama Plant Protection Station, Ministry of Agriculture, Forestry and Fisheries (MAFF)	Japan	kawait@pps.maff.go.jp
LEACH, Peter	Department of Agriculture and Fisheries	Australia	Peter.Leach@daf.qld.gov.au
MIZRAHI, Amit	Plant Protection and Inspection Services (PPIS)	Israel	Amitm@moag.gov.il
MOREIRA G., Adriana	International Plant Protection Convention Secretariat (IPPC), Food and Agriculture Organisation of the United Nations, Rome	IPPC / FAO	Adriana.Moreira@fao.org
NEVEN, Lisa	USDA-ARS, Yakima Agricultural Research Laboratory, Wapato	USA	Lisa.Neven@ARS.USDA.GOV
QIU, Yu Tong	Wageningen UR – Wageningen Plant Research	The Netherlands	yutong.qiu@wur.nl
VERSCHOOR, Jan	Wageningen UR Wageningen Food & Biobased Research	The Netherlands	jan.verschoor@wur.nl
WADDELL, Barbara	Plant and Food Research, Auckland	New Zealand	barbara.waddell@plantandfood.co.nz
WALSE, Spencer	USDA-ARS, Parlier, California	USA	Spencer.Walse@ARS.USDA.GOV

APPENDIX 2: Terms of reference and rules of procedures

Phytosanitary Measures Research Group

Terms of reference and rules of procedures[30]

Mission

Harmonize research on phytosanitary treatments and other measures with application to international trade of horticultural commodities to support IPPC Technical Panels, plant protection organizations, and researchers.

Functions

The main functions of the group are to:

a. liaise with the TPPT to support the development of international phytosanitary treatments to be considered and approved by the Standards Committee.

b. serve as a forum for discussion, information exchange, and clarification of key scientific issues related to phytosanitary treatment application in global trade.

c. provide scientific analysis and review of global phytosanitary treatment issues and new information.

d. identify and undertake collaborative scientific research aimed at high priority phytosanitary treatments.

e. liaise with the International Forestry Quarantine Research Group (IFQRG) to avoid duplication.

Membership

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

Meeting participation

The Executive Committee of the PMRG may limit participation at the PMRG 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 must also be a TPPT member. The Executive Committee members are elected during a face-to-face meeting and serve for the 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.

…/…

[30] Approved by PMRG members at the 2015 PTTEG meeting.

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 PMRG 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 PMRG 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 PMRG meeting activities voluntarily fund their travel and subsistence to attend.

APPENDIX 3: Agenda

PHYTOSANITARY MEASURES RESEARCH GROUP (PMRG)

10 – 13 July 2017

Wageningen, the Netherlands,

Meeting Schedule: 09:00 AM to 5:00 PM

Wednesday (12 July): 15:00 – 17:00: Field visit / 17:00 – 20:00: Dinner

AGENDA

AGENDA ITEM	DOCUMENT NO.	PRESENTER
A. Opening of the Meeting		
1. Welcome by the Chair of the PTTEG	-	HALLMAN
2. Welcome by local host	-	VERSCHOOR
3. Introduction of participants	03_PMRG_2017_Jul	HALLMAN
4. Current PMRG officers - PMRG Terms of reference and rules of procedures - Current PMRG officers	09_PMRG_2017_Jul 10_PMRG_2017_Jul	HALLMAN
5. Election of Chair of meeting	-	HALLMAN
6. Election of Rapporteur	-	MEETING CHAIR
7. Adoption of the Agenda	01_PMRG_2017_Jul	MEETING CHAIR
B. Administrative Matters		MEETING CHAIR
1. Documents List	02_PMRG_2017_Jul	MEETING CHAIR
2. Local Information	Link to hotel information Link to transportation information	VERSCHOOR
3. Logistical Arrangements	-	VERSCHOOR
C. Brief history of the PMRG		MEETING CHAIR
1. Expert Consultation on Cold Treatments, 2013 2. Phytosanitary Temperature Treatment Expert Group 3. 1st meeting in Nelspruit, 2015	04_PMRG_2017_Jul PMRG webpage	HALLMAN
D. IPPC Call for Treatment Proposals	06_PMRG_2017_Jul	MOREIRA
E. Work Programme from the 2015 Meeting		MEETING CHAIR
1. Existing cold treatment schedules	19_PMRG_2017_Jul Link to Dohino *et al.* 2017[31]	HALLMAN
2. Consideration of cultivar/varietal effects on efficacy	05_PMRG_2017_Jul	HALLMAN
3. Cold treatment database	07_PMRG_2017_Jul	MOREIRA

[31] https://academic.oup.com/jee/article-abstract/110/1/67/2744806/Phytosanitary-Treatments-Against-Bactrocera?redirectedFrom=fulltext

AGENDA ITEM	DOCUMENT NO.	PRESENTER
4. Cold treatment research guidelines	08_PMRG_2017_Jul	DOHINO
5. Possibility of “generic” cold treatments	12_PMRG_2017_Jul	WADDELL / LEACH
6. Controlled atmosphere/7heat research guidelines	15_PMRG_2017_Jul	NEVEN
7. Modelling phytosanitary treatments	-	NEVEN
8. Heat treatment research guidelines	16_PMRG_2017_Jul	DOHINO
9. Fumigation research guidelines	-	WALSE
10. Controlled atmosphere research guidelines	-	NEVEN
11. Existing phytosanitary systems	18_PMRG_2017_Jul	NEVEN
12. Literature review of treatment endpoints	-	NEVEN
13. Treatment of mixed loads – Cold treatment of mixed consignments (presentation)	13_PMRG_2017_Jul 14_PMRG_2017_Jul	ALLAN
14. Miscellaneous treatments	-	NEVEN
15. Heat treatment and non-target organisms	11_PMRG_2017_Jul	HALLMAN
16. Newsletter	-	HALLMAN
F. Other business		MEETING CHAIR
F.1. Workshop "Clean Corridor and Integrated Quarantine Risk Management"	-	YU
F.2. Ozone Secretariat: Methyl Bromide Technical Options Committee (MBTOC)	17_PMRG_2017_Jul	BERGWEFF
F.3 Systems approach: Japan case study	-	KAWAII
G. New Issues	(to be developed during the meeting)	MEETING CHAIR
1. New research issues	-	MEETING CHAIR
2. New operational issues	-	MEETING CHAIR
3. New issues in commercial application	-	MEETING CHAIR
H. Election of New PMRG Officers; Overview and Conclusions of the Meeting	09_PMRG_2017_Jul	MEETING CHAIR
1. Evaluation of the meeting	Survey	MEETING CHAIR
2. Next meeting date and location	-	NEW PMRG CHAIR
3. Close of the meeting	-	NEW PMRG CHAIR/MEETING CHAIR

APPENDIX 4: PHYTOSANITARY MEASURES RESEARCH GROUP (PMRG)

10 – 13 July 2017

Wageningen, the Netherlands,

DOCUMENTS LIST

DOCUMENT NO.	AGENDA ITEM	DOCUMENT TITLE	DATE POSTED
MEETING DOCUMENTS			
01_PMRG_2017_Jul	A.7	Agenda	2017-07-08 (latest version)
02_PMRG_2017_Jul	B.1	Document List	2017-07-08 (latest version)
03_PMRG_2017_Jul	A.3	Participants List	2017-07-07 (latest version)
04_PMRG_2017_Jul	C	Brief history of the PMRG	2017-06-25
05_PMRG_2017_Jul	E.2	Consideration of cultivar/varietal effects on efficacy	2017-06-29
06_PMRG_2017_Jul	D	IPPC Call for Treatment Proposals	2017-06-29
07_PMRG_2017_Jul	E.3	Cold treatment database	2017-06-29
08_PMRG_2017_Jul	E.4	Cold treatment research guidelines	2017-06-30
09_PMRG_2017_Jul	A.4 / H.1	PMRG Terms of reference and rules of procedures	2017-06-29
10_PMRG_2017_Jul	A.4	Current PMRG officers	2017-07-06
11_PMRG_2017_Jul	E.15	Heat treatment and non-target organisms	2017-07-05
12_PMRG_2017_Jul	E.5	Possibility of “generic” cold treatments	2017-07-06
13_PMRG_2017_Jul	E.13	Treatment of mixed loads	2017-07-06
14_PMRG_2017_Jul	E.13	Cold treatment of mixed consignments (presentation)	2017-07-06
15_PMRG_2017_Jul	E.6	Controlled atmosphere/heat research guidelines	2017-07-06
16_PMRG_2017_Jul	E.8	Heat treatment research guidelines	2017-07-07
17_PMRG_2017_Jul	F.2	Ozone Secretariat: Methyl Bromide Technical Options Committee (MBTOC) (presentation)	2017-07-07
18_PMRG_2017_Jul	E.11	Existing phytosanitary systems	2017-07-07
19_PMRG_2017_Jul	E.1	Existing cold treatment schedules	2017-07-08

Links:

CONTENT	AGENDA ITEM	LINKS:
Phytosanitary Measures Research Group (PMRG)	-	Link to PMRG page[32] (see also report of the PTTEG: click here)

[32] https://www.ippc.int/en/external-cooperation/organizations-page-in-ipp/phytosanitarymeasuresresearchgroup/

CONTENT	AGENDA ITEM	LINKS:
PMRG 2017 Hotel Information	B.2	Link to hotel information
PMRG 2017 Transportation	B.2	Link to transportation information
Existing cold treatment schedules	E.1	Link to Dohino *et al.* 2017[33]
IPPC Call for Treatments Page	D	Link to IPPC Call for treatments[34]
IPPC Roster of Consultants	-	Link to IPPC Roster of Consultants[35]
Ozone Secretariat: Methyl Bromide Technical Options Committee (MBTOC)	F.2	Link to Ozone Secretariat website Link to Ozone Secretariat page on the IPPC website

[33] https://academic.oup.com/jee/article-abstract/110/1/67/2744806/Phytosanitary-Treatments-Against-Bactrocera?redirectedFrom=fulltext

[34] https://www.ippc.int/en/core-activities/standards-setting/calls-treatments/ or https://www.ippc.int/en/calls/call-for-phytosanitary-treatments-1/

[35] http://www.phytosanitary.info/consultants

APPENDIX 5: Brief History of the Phytosaniory Measures Research Group

Brief History of the Phytosanitary Measures Research Group (PMRG)

(Prepared by Mr Guy Hallman)

[1] The Phytosanitary Measures Research Group (PMRG) was born out of the Food & Agriculture Organization, International Plant Protection Convention (IPPC)-Sponsored Expert Consultation on Cold Treatments (ECCT)[36] held in Buenos Aires in December 2013. The initial suggestion to hold a discussion forum on cold treatments was raised at the 7th Session of the Commission on Phytosanitary Measures (CPM) in 2012. Formal objections to proposed phytosanitary cold treatments raised by three contracting parties to the IPPC resulted in the proposals being returned to the IPPC Standards Committee (SC).

[2] The SC discussed how to tackle the issue and whether a meeting of experts should be convened to discuss the objections raised. The SC agreed that a meeting of relevant experts be organized under the auspices of the IPPC Secretariat. The SC further discussed that development of similar guidance for other treatments, e.g. vapour heat treatments, should also be considered in the future to facilitate the adoption process of phytosanitary treatment proposals.

[3] It was noted that one problem with phytosanitary treatments is that the data used to support the treatments are often difficult to openly obtain. Approaches used in the International Forestry Quarantine Research Group (IFQRG)[37], where members coordinate necessary research that may be useful toward addressing issues with cold treatments. Note that the PMRG coordinates with the IFQRG to avoid duplication of efforts; i.e., the PMRG does not become involved with phytosanitary issues related to wood products.

[4] The participants at the ECCT agreed that collaborative work on cold treatments and networking among researchers was useful and decided to form a group that would cover cold treatments as well as heat treatments. The group was called the Phytosanitary Temperature Treatments Expert Group (PTTEG), although final discussions during the ECCT were already leading to the realization that this group would continue to expand beyond temperature treatments as it already had beyond cold treatments to cover phytosanitary measures in general.

[5] A work program for the new PTTEG was developed and the first meeting planned for Nelspruit in August 2015. The Executive Committee of the PTTEG consists of a Chair, two Coordinators (one each for research and operations) and a Secretary who serve for two meetings (approximately four years).

[6] In 2014 an IPPC-sponsored Expert Consultation on Phytosanitary Treatments for the *Bactrocera dorsalis* Complex[38] discussed the feasibility of forming a group to address this issue and concluded that future efforts toward addressing problems with this pest complex could best be handled by the new PTTEG.

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[36] Expert Consultation on Cold Treatments (ECCT): https://www.ippc.int/en/core-activities/standards-setting/expert-consultation-on-cold-treatments/

[37] International Forestry Quarantine Research Group: https://www.ippc.int/en/external-cooperation/organizations-page-in-ipp/internationalforestryquarantineresearchgroup/

[38] Expert Consultation on Phytosanitary Treatments for the *Bactrocera dorsalis* complex: https://www.ippc.int/en/core-activities/standard-settings/expert-consultation-phytosanitary-treatments-bactrocera-dorsalis-complex/

[7] Between the ECCT and the first meeting of the PTTEG in Nelspruit in 2015[39] some progress toward the work program established at the ECCT had been advanced and reported in Nelspruit. For example, definitions of some terms were adopted and further effort on developing higher temperature cold treatments (≥ 4°C) was not pursued as it was considered unpromising.

[8] At the first meeting of the PTTEG in Nelspruit in 2015 the name was officially changed to the PMRG. Other tasks were discussed and added to the work program, including modelling treatments, research guidelines for various treatment types, and a compilation of existing phytosanitary systems.

[9] At the margins of the International Congress of Entomology in September of 2016 in Orlando, USA, a "mini-meeting" of the PMRG, with eight PMRG members, was held after a symposium on the Role of National, Regional and International Plant Protection Organizations to Prevent the Introduction and Spread of Plant Pests, with the dual objective of attracting new members and discussing any issues that had been advanced in the interim. A handful of members were present, and one brought a summary of the issue "Heat treatments and non-target organisms".

[10] Meanwhile research to address the issue of possible differences in cold tolerance among different populations of Mediterranean fruit fly (*Ceratitis capitata*) was conducted at the International Atomic Energy Agency Laboratories in Seibersdorf with the help of collaborators from Argentina, Australia, and Spain. Additionally, the review conducted by the PMRG, led by an Argentinian member, in which addressed the issue of efficacy of cold treatments across cultivars/varieties of citrus fruits, concluded that cold treatments should be applicable across cultivars/varieties. These results were discussed and approved by the IPPC Technical Panel on Phytosanitary Treatments (TPPT) and by the IPPC SC and the CPM, resulting in the adoption of several cold treatment proposals to the IPPC. This is a clearly successful application of the PMRG concept from start to finish.

[11] Wageningen 2017 is the second time that the PMRG meets and an ambitious agenda has been developed to advance the solution of issues related to phytosanitary measure. Membership has grown to approximately 60 persons, representing an increase of 20% since the PTTEG meeting in 2015. To note that the membership is open to researchers and regulators working in the area of phytosanitary treatments.

[39] 2015 August PTTEG Meeting Report: https://www.ippc.int/en/partners/phytosanitarymeasuresresearchgroup/publications/2016/02/ptteg-meeting-report-2015

APPENDIX 6: Programme - Systems approach and innovation in phytosanitary and field trip to Wageningen University

12 July 2017

10:00- 12:30 Workshop Clean Corridor concept. (People from PMRG and other stakeholders)

- Presentation Clean Corridor (Mr Gert Mulder, GroentenFruitHuis)
- System approach, American experience (Ms Lisa Neven, USDA)
- Discussion plenary (Mr Jan Verschoor, WUR)
- Discussion in groups

Summary group discussions

12:30-14:00 Lunch

Field trip Programme:

14:00-15:00 Theme discussion: current research post-harvest phytosanitary technology in the Netherlands CATT

- Introduction project Phytotec (Yu Tong Qiu, WUR)
- New Technologies (Esther Hogeveen, WUR)
- *Tuta absoluta*-tomato (Klaas van Rozen, WUR)
- *Frankliniella occidentalis* (Kees Booij, WUR)
- Presentations from participants from PMRG (Peter Follett, USDA)

15:00-17:00 WUR campus visits:

- WUR imaging (Jos Ruizendaal or Erik Pekkeriet)
- LAMP (Odette Mendes)
- CATT-facilities (Jan Verschoor)

17:00-20:00 Diner: buffet World Food

APPENDIX 7: PMRG 2017-2019 Work plan

ISSUE	Team	Status	Outcome	Timeline/Notes
E.1. Existing Cold Treatment Schedules (OPERATIONAL) Large number of treatments schedules: Collect all existing cold treatment schedules approved by a country and make publicly available.	Myers (lead), Neven, Willink, Hallman	Concluded	Large list assembled and posted on PMRG website by Feb 2018	More data to be collected?
E.2. Consideration of cultivars and\or variety effects on efficacy. (RESEARCH) Collect data on cultivars and\or variety and analyze commonalities (statistical re-interpretation).	Gastaminza (lead), Willink, Myers, Jessup	Concluded	Phytosanitary Cold Treatments adopted by the IPPC Commission on Phytosanitary Measures	
E.3. Compile all collected information (Cold Treatments) in a database to be shared. (OPERATIONAL)	Myers (lead) with input from other leads	Concluded	Searchable database sheet presented to PMRG & posted on website	
E.4. Cold treatment Research Guidelines (RESEARCH) To develop a research guideline for CT (probably based on Japanese protocol). Issue of plus minus to be addressed. Make recommendation on how to convert trial data into a treatment schedule. Large scale tests should be renamed 'confirmatory testing' and small scale tests should be renamed 'exploratory testing' to be more descriptive and to better reflect the actual nature of the trials	Dohino (lead), Quenta Cheere, Mathieu-Hurtiger, Cant, Hattingh Plus additional input from Leach, Bailey, Waddell, Follett	Concluded	Finalised Guidelines. Once finalised & reviewed by PMRG Executive Committee – to be posted in PMRG website as soon as practicable	

ISSUE	Team	Status	Outcome	Timeline/Notes
E.5. Possibility of "Generic" cold treatments (RESEARCH) Explore the possibility of developing generic cold treatments for pest species and\or hosts species.	Leach (lead), Hallman , Jeon, Park, Willink, Myers, Jessup, Waddell	On going	Prepare update on the Plant Biosecurity Cooperative Research Centre (PBCRC) project outcomes Update presented at next PMRG meeting	One month prior to next PMRG meeting
E.6. Controlled Atmosphere Research Guidelines (RESEARCH) Development of Controlled Atmosphere (w/ or w/o heat) research guideline	Neven (lead), Verschoor, Qiu, Mathieu-Hurtiger, Johnson	On going	Document ("guidelines")	First intersession: virtual meeting by October 2017) & provide to PMRG members, via the Executive Committee, by 31 October 2018
E.7. Modelling for more rapid development of quarantine treatments (RESEARCH)	Walse (Lead), Leach, Waddell, Myers	On going	Fumigation tool developed Discussion paper on fumigation tool for predicting efficacious MB treatment conditions to next PMRG meeting	31 October 2018 One month prior to next PMRG meeting
E.8. Development of Heat treatment research guidelines (RESEARCH)	Dohino (lead), Hallman, Leach, Hernandez, Albarkri	On going	Draft document to be presented to next PMRG meeting	Team to revise the current document (first intersession virtual meeting by October 2017) & provide to PMRG by 31 October 2018. Draft document to be circulated one month prior to next PMRG meeting
E.9. Development of fumigation research guideline (RESEARCH)	Walse (lead), Leach, Grout, Myers, Naito	On going	Draft document to be presented to next PMRG meeting	Team to revise the current document (first intersession virtual meeting by October 2017) & provide to PMRG by 31 October 2018
E.10. Treatments approach to researchers: controlled atmosphere		Merged with E.6.		

ISSUE	Team	Status	Outcome	Timeline/Notes
E.11. Existing Phytosanitary Systems (OPERATIONAL) Revision of phytosanitary systems used and accepted by regulators published	Moore (lead – TO BE CONFIRMED), Manrakhan, Neven, Walse, Willink, Cant	On going	Draft document to be presented to next PMRG meeting	One month prior next PMRG meeting
E.12. Literature Review of Treatment Endpoints (OPREATIONAL) Larvae vs pupae vs adult endpoint determinations	Neven (lead), Hallman, Gazit, Manrakhan	Concluded	Literature listing shared with Executive Committee	
E.13. Mixed loads. (OPERATIONAL) Different species and different varieties in same shipment: how to treat? (air movement and cooling distribution effects)	Allen (lead), Bailey, with contributions from Fonoti, Albakri	On going	Revised draft document to be presented to next PMRG meeting	Draft document developed by 31 October 2018
E.14. Other treatments, e.g. low/high pressure, microwave (Operational)	Neven (lead), Qiu	Concluded		
E.15. Heat treatments and non-target organisms (mealybugs, mites / tropical fruits) – indicators for the treatment effectiveness (OPERATIONAL)	Wilson (lead), Hallman with contributions from Follett, Albakri, Dohino, Neven	On going	Draft document to be presented to next PMRG meeting	One month prior next PMRG meeting
Quarantine Metrics (OPERATIONAL)	Leach (lead), Waddell, Follett, Bailey, Qiu, Gazit	New	Draft document to be presented to next PMRG meeting	One month prior next PMRG meeting
Interrupted temperature treatments versus efficacy (RESEARCH)	Grout (lead) , Hattingh with contributions from Allan, Albabakri, and all members to provide information where possible	New	Draft document to be presented to next PMRG meeting	Data to be provided to lead by 31 October 2017 One month prior next PMRG meeting
Replenishing insect colonies (RESEARCH)	Follett (lead), Hernandez, Leach	New	Draft document to be presented to next PMRG meeting	

ISSUE	Team	Status	Outcome	Timeline/Notes
Action Points				
PMRG members are encouraged to submit phytosanitary treatments in response to the IPPC call for treatments via the NPPO or RPPO official contact points	All PMRG members	As soon as practicable or by 30 January 2018		30 January 2018
PMRG Facebook page set up	Gazit	New		a.s.a.p.