Food and Agriculture Organization of the United Nations

International Plant Protection Convention

REPORT

Technical Panel on Phytosanitary Treatments

January, 2018

Virtual meeting

25 January 2018

IPPC Secretariat

CONTENTS

1. Opening of the Meeting

1.1 Welcome by the IPPC Secretariat and introductions

[1] The International Plant Protection Convention (IPPC) Secretariat (hereafter referred to as "Secretariat") lead for Technical Panel on Phytosanitary Treatments (TPPT) chaired the meeting and welcomed the following participants:

1. Mr Glenn BOWMAN (Australia)
2. Mr Toshiyuki DOHINO (Japan)
3. Mr Scott MYERS (USA)
4. Mr Michael ORMSBY (New Zealand)
5. Mr Andrew PARKER (FAO/IAEA)
6. Mr Eduardo WILLINK (Argentina)
7. Mr Daojian YU (China)
8. Mr Guy HALLMAN (Invited expert)
9. Ms Adriana G. MOREIRA (IPPC Secretariat, lead)
10. Ms Janka KISS (IPPC Secretariat, support)
11. Ms Sandra GORITSCHNIG (IPPC Secretariat, support)

[2] The full list of TPPT members and their contact details can be found on the International Phytosanitary Portal (IPP)[1].

1.2 Adoption of the agenda and election of the rapporteur

[3] The Secretariat introduced the agenda and it was adopted as presented in Appendix 1 to this report.

[4] Mr Eduardo WILLINK was elected as the rapporteur.

2. TPPT Work Programme: Evaluation of Phytosanitary Treatment Submissions

[5] The Secretariat informed the TPPT of the ongoing Call for phytosanitary treatments and that the next cut-off date was 30 January 2018. Since the previous cut-off date of 5 June, the following three new submissions had been received, making a total of 28 submissions.

[6] One submission had been received from the Philippines: the Irradiation treatment for *Sternochetus frigidus* (2017-036).

[7] Two submissions had been received from the USA:

- CATTS (Controlled Atmosphere/Temperature Treatment System) treatments against codling moth (*Cydia pomonella*) and western cherry fruit fly (*Rhagoletis indifferens*) in cherry (2017-037)
- CATTS (Controlled Atmosphere/Temperature Treatment System) treatments against codling moth (*Cydia pomonella*) and oriental fruit moth (*Grapholita molesta*) in apple (2017-038).

[8] All the submissions and the non-confidential supporting documents are publicly available on the IPP[2].

[9] The List of submitted treatments[3] was presented to the TPPT, and the Secretariat explained that it had been updated with the three recent submissions. Mr Michael ORMSBY was selected as the Lead for the evaluation of the two CATTS treatments and Mr Andrew PARKER as the Lead for the Irradiation treatment for *Sternochetus frigidus*, taking into consideration the TPPT members' areas of expertise and the distribution of the workload.

[1] TPPT membership list: https://www.ippc.int/en/publications/81655/

[2] Calls for treatments: https://www.ippc.int/en/core-activities/standards-setting/calls-treatments/

[3] 03_TPPT_2018_Jan

2.1 Irradiation treatment for oriental fruit fly *Bactrocera dorsalis* on all fresh commodities (2017-015)

[10] The Lead for the submission, Mr Andrew PARKER, introduced the Checklist for evaluating treatment submissions and Prioritization score sheet[4] for the Irradiation treatment for oriental fruit fly *Bactrocera dorsalis* on all fresh commodities (2017-015).

[11] The treatment proposal is based on two published studies[5] supplied with the proposal and one unpublished study that was not supplied. The two published studies produce similar results and are compatible with the proposal. However, questions remain about the equivalence of artificial and natural infestation as Follet and Armstrong (2004) seem to show a significant difference. Zhao *et al.* (2017) do not address this issue directly. The submitter should be invited to supply the unpublished study to support the equivalence of artificial and natural infestation for further consideration.

[12] No commercial justification is given in the proposal and the proposed treatment of 125 Gy is only a little below the generic dose for all Tephritidae, that is 150 Gy (ISPM 28 (*Phytosanitary treatments for regulated pests*) PT 7 (Irradiation treatment for fruit flies of the family Tephritidae (generic)). It is assumed that there might be a commodity that is sensitive to 150 but not at 125, but this was not detailed in the submission.

[13] The TPPT discussed the submission and one member suggested changing the dose to 116 Gy as this is supported by the research of Zhao *et al.* (2017) and produces high efficacy. This proposed lower dose warrants consideration of the treatment for addition to the TPPT work programme, as the difference to PT 7 is more significant.

[14] The TPPT agreed to recommend the proposal to the Standards Committee (SC) for inclusion in the *List of topics for IPPC standards* (i.e. for inclusion in the work programme), with 116 Gy based on the research by Zhao *et al.* (2017), and requested the submitter to consider the above mentioned issues, supply the unpublished study to support the equivalence of artificial and natural infestation for further consideration, and provide commercial justification for the need for the dose reduction. The TPPT also decided to recommend priority 3 for this treatment to match the small benefit it would bring in reducing the irradiation dose for only one fruit fly species.

[15] The TPPT:

(1) *recommended* the "Irradiation treatment for oriental fruit fly *Bactrocera dorsalis* on all fresh commodities (2017-015)" to the Standards Committee (SC) for inclusion in the *List of topics for IPPC standards* (i.e. for inclusion in the TPPT work programme), with priority 3 and Mr Andrew PARKER as the Treatment Lead, so that the TPPT can better assess the information from the submitter

(2) *asked* the submitter to provide the unpublished study to support the equivalence of artificial and natural infestation and provide commercial justification for the need for the dose reduction.

2.2 Irradiation treatment for ants (Hymenoptera: Formicidae) hitchhiking on fresh commodities (2017-014)

[16] The Lead for the submission, Mr Scott MYERS, introduced the Checklist for evaluating treatment submissions and Prioritization score sheet[6] for the Irradiation treatment for ants (Hymenoptera:

[4] 04_TPPT_2018_Jan

[5] Follett, P.A. & Armstrong, J.W. 2004. Revised irradiation doses to control melon fly, Mediterranean fruit fly, and oriental fruit fly (Diptera: Tephritidae) and a generic dose for tephritid fruit flies. *Journal of Economic Entomology*, 97 (4): 1254–1262.

Zhao, J., Ma, J., Wu, M., Jiao, X., Wang, Z., Liang, F. & Zhan, G. 2017. Gamma radiation as a phytosanitary treatment against larvae and pupae of *Bactrocera dorsalis* (Diptera: Tephritidae) in guava fruits. *Food Control*, 72: 360–366.

[6] 05_TPPT_2018_Jan

Formicidae) hitchhiking on fresh commodities (2017-014). Four reference papers[7] were submitted along with the submission, and an irradiation dose of 150 Gy was proposed.

[17] The Lead explained that the irradiation dose response studies were conducted with four species of invasive ants: big-headed ant, *Pheidole megacephala*; little fire ant, *Wasmannia auropunctata*; Argentine ant, *Linepithema humile*; and red imported fire ant, *Solenopsis invicta*. The goal of the irradiation treatment was to produce sterility in reproductive females (queens).

[18] In total for the four species, 152 fertile queens in microcolonies were irradiated. Doses ranging from 25 to 190 Gy were used, depending on species and study. Results found that the four species responded fairly similarly, and that queens of all species were sterilized at ≤90 Gy.

[19] In some species, queens continued to lay eggs that hatched and larvae developed, but were not able to reach maturity and reproduce. The treatment proposal is a radiation dose of 150 Gy, to include a "safety factor" to account for low numbers in the treatment group.

[20] For two of the species, doses as high as 150 Gy were not tested. The highest dose evaluated with little fire ant (*Wasmannia auropunctata*) and Argentine ant (*Linepithema humile*) was 100 and 90 Gy, respectively, so it is not known what additional impact 150 Gy would have on reproductive females of these two species.

[21] One member queried what practical application of this treatment would be possible, and the TPPT discussed that small sized and higher risk commodities could be treated according to this schedule. Another member pointed out that the schedule is proposed for fresh commodities such as fruits and vegetables and the dose is the same as the generic fruit fly treatment (PT 7), so the treatment could be applied for both pest groups at the same time. Another member pointed out that a generic treatment for all insects was recommended for the work programme of the TPPT, and pointed out that it would cover ants as well.

[22] Some members clarified that ants are of concern to the Pacific islands, and mentioned Hawaii in particular. New Zealand also conducts specific surveillance activities for ants. The Secretariat mentioned that invasive ants are one of the groups of pests in the "IPPC surveillance pilot project".

[23] Experiments appear to have been conducted properly to support the treatment and the results are interpreted accurately; however, the TPPT was concerned about whether the experimental evidence is adequate to approve this treatment for all species in this large family. One member pointed out that the researchers might face difficulty providing more information, considering the time-consuming nature of the experiments due to the biology of ants (one queen per colony).

[24] One TPPT member queried whether the sterility of the queen is an appropriate phytosanitary measure to stop the invasive ant species from establishing. He also queried whether surviving females could take over the role of the queen.

[25] The TPPT agreed to recommend this treatment to the SC for inclusion in the *List of topics for IPPC standards* (i.e. for inclusion in the TPPT work programme) with priority 3, so that the information from

[7] Follett, P.A. & Taniguchi, G. 2007. Effect of irradiation on the longevity and reproduction of *Pheidole megacephala* (Hymenoptera: Formicidae) queens. *Proceedings of the Hawaiian Entomological Society*, 39: 43–47.

Calcaterra, L., Coulin, C., Briano, J. & Follett, P.A. 2012. Acute exposure to low dose radiation disrupts reproduction and reduces longevity in *Wasmannia auropunctata* (Hymenoptera: Formicidae) queens. *Journal of Economic Entomology*, 105: 817–822.

Coulin, C., Calcaterra, L. & Follett, P.A. 2014. Fecundity and longevity of Argentine ant (Hymenoptera: Formicidae) queens in response to irradiation. *Journal of Applied Entomology*, 138 (5): 355–360.

Follett, P.A., Porcel, S. & Calcaterra, L.C. 2016. Effects of irradiation on queen survivorship and reproduction in the invasive fire ant *Solenopsis invicta* (Hymenoptera: Formicidae) and a proposed phytosanitary irradiation treatment for ants. *Journal of Economic Entomology*, 109 (6): 2348–2354.

the submitter could be further assessed, and decided to ask the submitter to provide further available studies and justification of the low numbers of insects tested.

[26] The TPPT:

(3) *recommended* the "Irradiation treatment for ants (Hymenoptera: Formicidae) hitch-hiking on fresh commodities (2017-014)" to the Standards Committee (SC) for inclusion in the *List of topics for IPPC standards* (i.e. for inclusion in the TPPT work programme), with priority 3 and Mr Scott MYERS as the Treatment Lead, so that the TPPT can better assess the information from the submitter

(4) *asked* the submitter to provide further available studies and justification for the low number of insects tested, and to confirm whether the ant colonies lose their reproductive capacity once the queen is sterilized.

2.3 Irradiation treatment for *Bactrocera tau* (2017-025)

[27] The Lead for the submission, Mr Andrew PARKER, introduced the Checklist for evaluating treatment submissions and Prioritization score sheet[8] for the Irradiation treatment for *Bactrocera tau* (2017-025).

[28] The Lead explained that the proposed schedule is a dose of 85 Gy to prevent the emergence of adults of *Bactrocera tau*, with 95% confidence that the treatment according to this schedule prevents the development of not less than 99.9972% of adults of *Bactrocera tau*. The submission is supported by one study by Zhan *et al.* (2015)[9].

[29] He pointed out that the proposal was well presented, with data and efficacy calculations. However, species identification and retention of voucher specimens should be clarified.

[30] The TPPT briefly discussed the economic importance of this fruit fly. One member mentioned that *B. tau* is unresponsive to traps, therefore such information may be more difficult to obtain. It was noted that there is a generic treatment approved for all fruit flies already (PT 7) and thus priority 3 was agreed.

[31] The TPPT agreed to ask the submitter to provide information on species identification and retention of voucher specimens, and to provide data to establish the economic importance of the treatment.

[32] The TPPT:

(5) *recommended* the "Irradiation treatment for *Bactrocera tau* (2017-025)" to the Standards Committee (SC) for inclusion in the *List of topics for IPPC standards* (i.e. for inclusion in the TPPT work programme), with priority 3 and Mr Andrew PARKER as the Treatment Lead, so that the TPPT can better assess the information from the submitter

(6) *asked* the submitter to provide the missing information on species identification and voucher specimen retention, and justify the economic importance of the treatment.

2.4 Hydrogen cyanide fumigation treatment for pine wood nematode and wood boring beetles in debarked wood (2017-034)

[33] The Lead for the submission, Mr Matthew SMYTH, was unable to attend the meeting, thus Mr Glenn BOWMAN introduced the Checklist for evaluating treatment submissions and Prioritization score sheet[10] for the Hydrogen cyanide fumigation treatment for pine wood nematode and wood boring beetles in debarked wood (2017-034).

[8] 06_TPPT_2018_Jan

[9] Guoping, Z., Lili, R., Ying, S., Qiaoling, W., Daojian, Y., Yuejin, W. & Tianxiu, L. 2015. Gamma irradiation as a phytosanitary treatment of *Bactrocera tau* (Diptera: Tephritidae) in pumpkin fruits. *Journal of Economic Entomology*, 108(1):88–94.

[10] 07_TPPT_2018_Jan

[34] The target regulated articles according to the submissions are wood and wooden furniture, wood packaging material and other wooden objects. The proposed schedule is 20 g/m^3 hydrogen cyanide (HCN) at 12 °C and above for 24 hours or more. The maximum thickness of wood (debarked) to be treated is 9 cm. No moisture content is specified. Two main references[11] are cited.

[35] This application has been submitted to show that HCN shows promise as an alternative fumigant. However, the data presented in the application do not identify key parameters that would be expected to affect treatment efficacy. Deficiencies in the data include the following:

- The most tolerant life stage for *Bursaphelenchus xylophilus* (the pine wood nematode, PWN) and for *Anoplophora glabripennis* (the Asian long horned beetle) is not identified. For *Hylotrupes bajulus* (the house long-horned beetle), pupae were identified as the most tolerant life-stage associated with wood, with efficacy trials conducted on larvae.
- The temperature used during the fumigation is not given in all cases.
- The wood moisture content is not clearly identified in all cases.
- The volume of commodity treated relative to the size of the fumigation chamber (chamber load) is not given.
- The size of wooden blocks (infested with pests during efficacy trials) are smaller than requested in the proposed treatment.
- No sampling is presented to show HCN disperses evenly throughout the chamber.
- There is no testing of wood to represent commercial loads, such as stacks of timber where fumigant concentration and penetration may vary.
- The wooden blocks used for PWN trials were not *Pinus*, the preferred host. Spruce (a lesser host) was used, infested with PWN in a pinewood sawdust mixture. Spruce was demonstrated to have a significantly higher rate of sorption and penetration by HCN that resulted in higher concentrations throughout a spruce block compared to a pine block. Mortality of PWN achieved in the spruce model system is likely to be higher than in *Pinus* hosts.
- Minimum requirements for replication were not met. (Normally at least three replicates would be necessary but in the trials for PWN, for example, there is no replication in the trial with the highest number of individuals treated.)
- The number of individual pests treated is low: <20 wood-boring beetles with 100% mortality at the schedules used, and 1200 PWN with two survivors at the most stringent schedule tested.

[36] The authors of the main papers support HCN as a fumigant and note "initial results are promising" (for wood borers and PWN) and "research on naturally infested wood should be desirable" (for PWN).

[37] Given the above points of discussion, the TPPT did not recommend that this treatment be included in its work programme, but recommended that the submitter resubmit the proposal for phytosanitary treatment. However, before an application is resubmitted, the issues identified above need to be addressed and significantly more testing under conditions that replicate commercial and natural conditions is required. The TPPT noted that PT 23 (Sulphuryl fluoride fumigation treatment for nematodes and insects in debarked wood) provides an example on what kind of references and information are suitable to support a phytosanitary treatment.

[38] The TPPT:

(7) *recommended* to the Standards Committee (SC) that the "Hydrogen cyanide fumigation treatment for pine wood nematode and wood boring beetles in debarked wood (2017-034)" not be included

[11] Douda, O. *et al.* (2015). Hydrogen cyanide for treating wood against pine wood nematode (*Bursaphelenchus xylophilus*): Results of a model study. *Journal of Wood Science*, doi:10.1007/s10086-014-1452-9.

Stejskal, V. *et al.* (2014). Wood penetration ability of hydrogen cyanide and its efficacy for fumigation of *Anoplophora glabripennis*, *Hylotrupes bajulus* (Coleoptera), and *Bursaphelenchus xylophilus* (Nematoda). *International Biodeterioration & Biodegradation*, 86: 189–195.

in the *List of topics for IPPC standards* (i.e. not be in the TPPT work programme), as significantly more testing is required.

2.5 Ethanedinitrile (EDN) treatment of wood for insect pests (2017-035)

[39] The Lead for the submission, Mr Scott MYERS, introduced the Checklist for evaluating treatment submissions and Prioritization score sheet[12] for the Ethanedinitrile (EDN) treatment of wood for insect pests (2017-035).

[40] Multiple schedules are proposed in the submission, based on efficacy data from a number of studies[13] evaluating efficacy of EDN in a variety of applications. Supporting data consist of *in vitro* studies of wood-boring beetles in various life stages. The studies are conducted with naturally and artificially infested wood, using wood-boring insects along with some unrelated stored produce insects.

[41] The most applicable study to the treatment is a fumigation of pine logs targeting *Monochamus alternatus*, a cerambycid wood-boring beetle (Lee *et al*. 2017). This study appears to be the basis for the broad, recommended wood treatment at 10 °C targeting "insect pests".

[42] The concentration–time product (CT) values reported by the study of Lee *et al*. (2017) do not align with the dose and duration of the fumigation experiment. For example, a 100 mg per litre initial dose in a 24 hour fumigation reportedly yielded a mean CT value of 284.5 mg h per litre. For this to occur, there would have to have been an extremely rapid and sharp decline in the gas concentration during the treatment. The mean concentration would have had to have been around 11 mg per litre (from an initial dose of 100).

[43] The low number of insects treated (even for studies of wood borers) reported by Lee *et al*. (2017) does not yield a high level of confidence. The treatment at 10 °C was based on a total of 157 larvae killed.

[44] The efficacy of EDN is provided for five species of stored product insects that are not associated with wood or wood products.

[45] The efficacy of EDN is provided for wood-inhabiting insects tested *in vitro*, which does not support the efficacy of the treatment that is proposed which includes wood up to 20 cm thick.

[46] Given the above points of discussion, the TPPT did not recommend this treatment be included in its work programme as it is currently written. The TPPT also noted that the efficacy data provided do not support the phytosanitary use of the treatment, and it was not appropriate to extrapolate efficacy of a treatment tested on naked insects *in vitro* to a wood commodity like logs or sawn timbers.

[47] The TPPT considered the evaluation of the submission and recommended that the submitter consider resubmission of the treatment focused on a well-defined commodity or pathway (e.g. pine logs of particular species or groups, sawn lumber of defined dimensions and moisture content, species or

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[12] 08_TPPT_2018_Jan

[13] Emery, R.N, Ren, Y.L, Newman, J. & Thalavaisundaram, S. (2014). Evaluation of ethanedinitrile (EDN) as a methyl bromide alternative for eradication of European House Borer (EHB). 11th International Working Conference on Stored Product Protection.

Najar-Rodriguez, A.J, Hall, M.K.D, Adlam, A.R., Hall, A.J, Burgess, S.B. & Somerfield, K.G. (2015). Developing new fumigation schedules for the phytosanitary treatment of New Zealand export logs: Comparative toxicity of two fumigants to the burnt pine longhorn beetle, *Arhopalus ferus*. *New Zealand Plant Protection*, 68: 19‑25.

Lee, B.H, Park, C.G. & Ren, Y.L (2017). Evaluation of different applications of ethanedinitrile (C2N2) in various fumigation chambers for control of *Monochamus alternatus* (Coleoptera: Cerambycidae) in naturally infested logs. *Journal of Economic Entomology*, 110(2): 502–506.

Ren, Y., Wang, Y., Barak, A.V., Wang, X., Liu, Y. & Dowsett, H.A. (2006). Toxicity of ethanedinitrile to *Anoplophora glabripennis* (Coleoptera: Cerambycidae) larvae. *Journal of Economic Entomology* 99(2): 306–312.

Ren, Y., Agarwal, M., Newman, J. & Du, B. (2014). Comparison of ethanedinitrile (EDN) with methyl bromide (MB) as a biosecurity treatment for timber and log. A PBCRC Report prepared for BOC limited. 42 pp.

groups), providing data that support the efficacy of the treatment for the target pests on the defined commodity.

[48] The TPPT:

(8) *recommended* to the Standards Committee (SC) that the "Ethanedinitrile (EDN) treatment of wood for insect pests (2017-035)" not be included in the *List of topics for IPPC standards* (i.e. not be in the TPPT work programme), as significantly more testing under conditions that replicate commercial and natural conditions is required.

3. Other Business

[49] No other business was discussed.

4. Close of the Meeting

[50] The Secretariat informed the TPPT that the next virtual meeting is planned for 20 February 2018 and will be dedicated to discussing and finalizing the draft ISPM on the Requirements for the use of modified atmosphere treatments as a phytosanitary measure (2014-006). This ISPM would be presented at the May 2018 SC meeting pending the final approval of the TPPT.

[51] The Secretariat explained that the November SC assigned a new lead steward to the draft, Mr Nicolaas HORN, who will attend the virtual meeting.

[52] A further virtual meeting is planned for 21 March 2018 to discuss further treatment submissions from the Call for treatments.

[53] The Secretariat thanked the TPPT members for their participation and closed the meeting.

Attachment 1: Agenda

2018 JANUARY VIRTUAL MEETING OF THE TECHNICAL PANEL ON PHYTOSANITARY TREATMENTS (TPPT)

25 January 2018

AGENDA

	AGENDA ITEM	DOCUMENT NO.	PRESENTER
1.	**Opening of the meeting**		
1.1	Welcome by the IPPC Secretariat and introductions	02_TPPT_2018_Jan	MOREIRA / ALL
1.2	Adoption of the agenda and election of the rapporteur	01_TPPT_2018_Jan	MOREIRA / ALL
2.	**TPPT work programme: Evaluation of treatment submissions** ❖ List of submitted treatments ❖ Submissions and supporting documents	03_TPPT_2018_Jan Link to the treatments submission forms and supporting data	KISS
2.1	Irradiation treatment for oriental fruit fly *Bactrocera dorsalis* on all fresh commodities (2017-015) ❖ Checklist for evaluating treatment submissions and Prioritization score sheet	04_TPPT_2018_Jan	PARKER
2.2	Irradiation treatment for ants (Hymenoptera: Formicidae) hitchhiking on fresh commodities (2017-014) ❖ Checklist for evaluating treatment submissions and Prioritization score sheet	05_TPPT_2018_Jan	MYERS
2.3	Irradiation treatment for *Bactrocera tau* (2017-025) ❖ Checklist for evaluating treatment submissions and Prioritization score sheet	06_TPPT_2018_Jan	PARKER
2.4	Hydrogen cyanide fumigation treatment for pine wood nematode and wood boring beetles in debarked wood (2017-034) ❖ Checklist for evaluating treatment submissions and Prioritization score sheet	07_TPPT_2018_Jan	BOWMAN
2.5	Ethanedinitrile (EDN) treatment of wood for insect pests (2017-035) ❖ Checklist for evaluating treatment submissions and Prioritization score sheet	08_TPPT_2018_Jan	MYERS
3.	**Other business**	-	MOREIRA
4.	**Close of the meeting**	-	MOREIRA