2021 SECOND CONSULTATION

1 July – 30 September 2021

Compiled comments for Draft PT for Vapour heat - modified atmosphere treatment for *Cydia pomonella* and *Grapholita molesta* (2017-037/038) with Treatment Lead's response

Summary

Name	Summary
EPPO Σ	Comments from the EPPO countries
European Union	The comments on this draft standard have been entered into the OCS by the European Commission on behalf of the EU and its member States.
Singapore	Singapore is supportive of this draft.
South Africa	The NPPOZA is in agreement with this draft and has no further comments
Venezuela	No tenemos opinión alguna sobre la norma.

T (Type) - B = Bullet, C = Comment, P = Proposed Change, R = Rating

FAO sequential number	Para	Text	T	Comment	SC responses
1	G	(General Comment)	C	**Guyana** Guyana has no objection at this time. *Category : SUBSTANTIVE*	Noted
2	G	(General Comment)	C	**Costa Rica** No comment *Category : SUBSTANTIVE*	Noted
3	G	(General Comment)	C	**Nepal** Nepal has no comments on : Draft PT Vapour heat–modified atmosphere treatment for Cydia pomonella and Grapholita molesta on Malus pumila and Prunus persica *Category : EDITORIAL*	Noted
4	G	(General Comment)	C	**Japan** General comment -1: "Comment about efficacy level" Please make a response in the TPPT report to our comment below about efficacy level Japan put forward during the first consultation. - Quote - "According to the draft standard, the amount of treated insects for calculation of the efficacy is 25,882 and the efficacy level of the treatment is 99.9884%. However, many countries (including Japan) use a treatment in actual international trade for which the amount of treated insects is more than	**CONSIDERED BUT NOT INCORPORATED** 1. The level of efficacy required by countries for measures that may include treatments should reflect what that country has determined to be their appropriate level of protection (ALOP). While some countries have stipulated the level or protection (efficacy) they require for some pests or pest groups, many have not and as such may use a treatment that achieves an efficacy of 99.9884%. It should also be considered that a treatment may be adopted as part of a systems approach to the

				30,000 and the efficacy level is more than 99.99%. Japan would like to recommend that more than 30,000 be tested so that more countries will be able to adopt the treatment schedule. For reference, "Guidelines for the Development of Vapor Heat Disinfestation Treatments for Fruit Fly Host Commodities" published by Phytosanitary Measures Research Group (PMRG) in February 2019 mentions that "an example of a procedure (of large scale testing) that has been widely used is mortality trials testing 30,000". - Unquote – Minimum efficacy level for TPPT consideration. If this standard or other treatment standards with a similar or lower efficacy level are adopted one after another, a concern is that disputes might happen among contracting parties regarding the acceptance of use of the standards. In addition, ISPM28 3.3 "Feasibility and applicability" describes "versatility of the phytosanitary treatment (e.g. application to a wide range of countries, pests and commodities)" as one of the elements of evaluation for treatment. In order a wide range of countries to use the annexes of ISPM 28, we would like to suggest TPPT to discuss whether a minimum efficacy level can be decided for Annexes of ISPM 28. While it might be difficult to decide one single criteria for all treatment methods and pests, it may be possible and useful to decide the criteria for certain treatment methods and certain groups of pest. *Category : TECHNICAL*	management of pest risk, and the efficacy of the system as a whole including the treatment may be sufficient to meet the countries ALOP.
5	G	(General Comment)	C	**Japan** General comment -2: Differences in the responses of different populations of pests to heat treatments Regarding differences in the responses of different populations of pests to heat treatments, in comparative research between populations of Bactrocera dorsalis from three different regions (China, Kenya, and Thailand), the research indicated there were regional differences in heat tolerance among these populations (i.e. differences were observed at sub-lethal doses). But their differences were not significant at the levels required for phytosanitary treatments, so the TPPT concluded that the proposed treatment schedule might be broadly applicable geographically (TPPT Report, 2017; Hallman et al., 2018). However, Cydia pomonella (codling moth) is also widespread throughout the world, their habitats are wider and different from those of B. dorsalis.	**CONSIDERED BUT NOT INCORPORATED** Testing the tolerances of geographically separated populations of a single species is not something the TPPT has required for treatment development. The TPPT did request this for a species of Tephritidae that had recently had a range expansion due to changes in taxonomy. This range expansion resulted in research from different areas producing potentially conflicting results for treatment tolerances. A study to compare tolerances of geographically separated populations in a single laboratory was udertaken to resolve these conflicting results. No such conflicting results are evident for *Cydia pomonella* or *Grapholita molesta.*

				Therefore, it is hard to deny the differences in the responses of populations of codling moths from different regions to heat treatments, as seen in populations of B. dorsalis. There is no information on the heat tolerance of codling moth, but it is considered that there is no data that can compare the differences between the populations because the heat treatment is not used for the codling moth. Similarly, there are no comparative studies between populations by combined treatment with MA. On the other hand, in the methyl-bromide fumigation treatment widely used for codling moth in apple fruits, it is known that there are differences in the responses of populations of codling moths from different regions to the treatment. Under this circumstance, we would like to have a detailed explanation why the proposed vaper heat–modified atmosphere treatment schedule may be applicable geographically broadly without considering the differences in heat tolerance between populations of codling moth from different habitats. *Category : TECHNICAL*	
6	G	(General Comment)	C	**Japan** General comment -3: The reason why the 4th instar larvae on apple fruits are considered to be the most tolerant stage In the examination of this draft treatment schedule, the data from Neven et al. (2006a) (apple) and Neven et al. (2006b) (peach and nectarine) are used as the basis for considering the draft treatment schedule. However, as shown below, it is considered that the treatment schedule is drafted not necessarily based on the data of both papers. - Both papers indicate eggs tend to be more heat-tolerant than 4th instar larvae, but we would like to have an explanation why the treatment schedule is drafted as 4th instar larvae as the most tolerant stage. - The data from both papers show that peaches tend to be more difficult to treat pests than apples. But we would like to have an explanation why TPPT evaluated this treatment schedule to be also effective to peaches though the draft schedule shows the effectiveness of apples' data only. (Reference information from Neven et al. (2006a) (apple) and Neven et al. (2006b) (peach and nectarine)) (a) As TPPT evaluates as "there is only a small	**Modified** The TPPT considered that the most tolerant life stage was determined from the life stage exposure trials on Cydia pomonella and Grapholita molesta on apples (Neven et al. 2006b) and peaches and nectarines (Neven et al. 2006c). Although there is only a small difference between life stage responses it was apparent that no life stages of the Cydia pomonella and Grapholita molesta on any of the fruit tested were significantly more tolerant to the treatment than 4th instar larvae of codling moth in apples. This is noted by the TPPT and deemed acceptable (see TPPT Report July 2019). The key word is "significantly". On statistical analysis the TPPT found that there was no statistically significant difference in tolerance for most of the life stages associated with the fruit, and nonewere more tolerant the 4th instar larvae of codling moth in apples. Also note that the numbers in Neven et al. (2006b) Table 3 for the blackhead egg stage are in error, as the confidence intervals do not align with the LT figures (confidence intervals should bound the mean).

				difference between life stage responses", the data on Neven et al. (2006a) and Neven et al. (2006b) indicate that eggs tend to be more heat-tolerant than 4th instar larvae. Effect of CATTS treatments on mortality of the different growing stages of codling moth. The figures in the parenthesis is lethal times in hours with 95% CL. Apple (LT99): 4th instar larvae (3.05 hrs) < red ring eggs (3.86 hrs) Peach (LT99): 4th instar larvae (3.14 hrs) < blackhead eggs (4.06 hrs) (Neven et al. (2006a) (apple) and Neven et al. (2006b) (peach and nectarine)) In addition, Neven et al. (2006b) indicates that a part of 480 eggs of codling moths laid in peaches survived after treated under the similar condition of the draft treatment schedule (Fig 3 of the paper), even though 480 of 4th instar larvae were killed 100% (Fig 4 of the paper). These results also suggest that the mortality of eggs is lower than that of 4th instar larvae. (b) Apples and peaches were treated under the same conditions at both studies, Neven et al. (2006a) and Neven et al. (2006b). Comparing the data from both studies, the mortality rate in peaches is likely to be lower than one in apples in both egg and 4th instar larval stages. Effect of CATTS treatments on mortality of the different life stages of codling moth in apples and peaches. The figures in the parenthesis are lethal times in hours with 95% CL. 4th instar larval (LT99): apples (3.05 hrs) < peaches (3.14 hrs) Egg (LT99): apples (3.22 hrs) < peaches (4.06 hrs) (c) Despite there are the data such as (a) and (b), TPPT concluded the 4th instar larvae on apple fruits are the most tolerant stage. *Category : TECHNICAL*	The corrected table received from the submitter is available at the 2021 October TPPT meeting report. Additionally, publications below also support the conslusion that 4th and 5th instars are the life stage of codling moth that is most tolerant to heat treatment. Yokoyama, V. Y., and G. T. Miller. 1987. High temperature for control of oriental fruit moth (Lepidoptera: Tortricidae) in stone fruit. J. Econ. Entomol. 80: 641-645. Yokoyama, V. Y., G. T. Miller, and R. V. Dowell. 1991. Response of codling moth (Lepidoptera: Tortricidae) to high temperature, a potential quarantine treatment for exported commodities. J. Econ. Entomol. 84: 528-531.
7	G	(General Comment)	C	**Japan** General comment -4: The level of efficacy of the treatment schedule should be shown by each commodity. As described in "Issues associated with phytosanitary treatments" in "7.6 Technical Panel on Phytosanitary Treatments (TPPT)" in the Procedure manual, contracting parties should consider the level of efficacy of a phytosanitary treatment in determining	**Considered but not incorporated** All supporting evidence is provided in the reference list. The draft treatment is for the pest and fruit types used in the research supporting the treatment. The TPPT did not consider it necessary to provide separate schedules for each of the fruit types supported by this treatment (apple and peach/nectarine).

				whether the treatment can be used as a phytosanitary measure. In such case, contracting parties need to evaluate the level of efficacy for each commodity (i.e., pathway). Therefore, the level of effectiveness should be shown by each targeted commodity (i.e., each by peach and apple) on the treatment schedule. According to the TPPT report (July 2019), the level of efficacy on this treatment schedule is 99.9884% based on apples' data from Neven et al. (2006b) and supplementary data. However, as Japan points out in the general comment -2, the mortality in peaches tends to be lower than the one in apples. The level of efficacy in peaches may be a different figure (i.e., it may be less percentage than 99.9884%). Even if peaches and apples indicate the same level, it should show each commodity's figures with the rationale. It is considered that contracting parties can evaluate the effectiveness of treatment schedules for each commodity only by comparing the figures based on the data. *Category : TECHNICAL*	(For the efficacy calculation see Appendix 7 of the 2019-07 TPPT Meeting Report: https://www.ippc.int/en/publications/87681/)
8	G	(General Comment)	C	**Japan** General comment -5: About the effect of treatment schedule on fruits of different sizes In the draft treatment schedule, even if the heat-up time is within 2.5 hours, the treatment process can be completed as long as the temperature of the fruit core reaches 44.5 ° C, and then the temperature can be maintained for 30 minutes. However, since the heat capacity varies depending on the size of fruits, the time to reach the specified fruit core temperature is different between the small size and the large size of fruits under the same internal temperature at the chamber. In actual commercial treatment, when fruits of a size smaller than the fruit size used in the studies (i.e., fruit size considered to be implemented in this treatment schedule) by Neven et al. (2006a) and Neven et al. (2006b) are used, the time to reach the specified temperature (44.5 ℃ of fruits core) may be shorter than 2.5 hours even if the temperature and condition are the same at the chamber. In that case, even if it is maintained for 30 minutes after that, the total processing time is less than 3 hours, and there is a possibility that it does not finally reach the amount of heat and the exposure time of the modified atmosphere required to kill the target pests in the fruits thoroughly.	**Modified** The TPPT considers the level of efficacy achieved by the schedule is mostly a result of the fruit being at 44.5°C for 30 minutes. However the TPPT could not be certain that the heat shock from the heating up period did not also play a role in treatment efficacy. As such the TPPT deemed it necessary to include a maximum heating up period of 2.5 hours. Heating up periods achieve in less time than this would be expected to have achieved or exceeded the necessary "heat shock". The TPPT could not be certain, however, that heating up periods exceeding 2.5 hours would have achieved the necessary "heat shock". The TPPT however agrees that the treatment should not last for less than 3 hours and thus added additional text to the treatment schedule to clarify that.

				It is necessary to adjust the maintenance time according to the length of the heat-up time so that the difference in fruit size does not affect the treatment result, i.e. the total treatment time should constantly keep 3 hours by adjusting the heat-up time and the maintenance time to each length. If you think that it is not necessary to revise the current treatment schedule (i.e., if you think that the maintenance time of the treatment does not need to consider the difference in fruit size), we would like you to explain the reason. Please also see the comment for para 38. *Category : TECHNICAL*	
9	G	(General Comment)	C	**Mexico** I support the document as it is and I have no comments *Category : SUBSTANTIVE*	Noted
10	G	(General Comment)	C	**Russian Federation** The Russian Federation would like to formally endorse the EPPO comments submitted via the IPPC Online Comment System *Category : SUBSTANTIVE*	Noted
11	G	(General Comment)	C	**Canada** Canada supports the draft Annex to ISPM 28 *Category : SUBSTANTIVE*	Noted
12	G	(General Comment)	C	**Malawi** We support the draft annex to ISPM 28 :vapour heat-modified atmosphere for Cydia pomonella and Grapholita on Malus punila and Prunus persica (2017-037 and 2017-038) *Category : SUBSTANTIVE*	Noted
13	G	(General Comment)	C	**United States of America** • The majority of our concerns with the first draft were not addressed. It appears to be the choice of the panel to provide the minimum requirements for the treatment and to let the treatment applicator handle the details of the treatment (ramp up rate, humidity, etc). the draft treatment for apples. • the proposed treatment is not yet adopted, approved, or used as a domestic or export phytosanitary treatment for any country, and there is no practical experience and guidance for applicators on how to conduct it in a proper manner, both providing pests mortality and preserving the quality of the commodity. • It also fails to meet the following feasibility requirements of section 3.3 of ISPM 28: • is cost prohibitive and not feasible due to lack of commercial equipment or facilities to use	**Considered but not incorporated** 1 It has been the practice for ISPM 28 annexes to provide the minimum requirements necessary to achieve the stated level of efficacy. All operational details related to achieving those minimum requirements are left to other ISPMs (e.g. ISPM 18, 42, 43 and in this case 44) and any associated guidance material. 2 While it would be preferable to have commercial systems available to implement all approved treatments, the urgent need to identify alternative treatment options to Methyl bromide fumigation and the signal to investors that a treatment would be used if commercial systems were developed is also considered when reviewing treatment

				such a treatment (Neven and Johnson 2018), • has a detrimental effect on apple quality (Neven, et al, 2000; Klein and Lurie, 1992; Klein, et al., 1990) • is irrelevant to the world-wide movement of commercial apples as it is not used as a phytosanitary measure for codling moth and oriental fruit moth, • and would not be used in commercial trade even if adopted. • The language used in the "Other Relevant Information" section that reads "The air humidity is lower at the beginning of the treatment to prevent condensation on the fruit and hence maintain fruit quality. To minimize effects on commodity quality, users should refer to Neven & Rehfield-Ray (2006) and Neven, Rehfield-Ray & Obenland (2006)." appears to serve as a warning to the treatment applicator that there are challenges to applying this treatment without commodity damage. • We have consulted with the scientist, Dr. Lisa Neven, who developed this treatment. Dr. Neven indicated that too-rapid heating rate and the use of a water-saturated atmosphere will result in commodity damage. It was also suggested to develop two separate treatments for apple and peach as these commodities have different tolerances to the conditions of the treatment. Dr. Neven also mentioned that the use of the term "Vapour heat" is misleading. The supporting literature does not use a vapour heat system in which water-saturated air is used to heat the commodity. Use of water-saturated air in the presence of the modified atmosphere will damage the commodity. The literature supports these assessments and the draft annex to ISPM 28 does not address these concerns. • Neven et al., (2001) reports fifty percent of the varieties treated did not tolerate the treatment and were rendered unmarketable (Fuji and Gala). Neven & Rehfield-Ray (2006) interpret the changed brix to acid ratio as a positive factor. We disagree, changing natural fruit flavor in a sweet-tart apple ruins its appeal to consumers, i.e. it tastes 'off'; apples of such tasting are not commercially viable. • If the purpose of the draft annex to ISPM 28 is to provide treatment applicators with the bare minimum conditions needed to sufficiently kill the target insects, then the draft provided is sufficient.	submissions. Many commercially available treatments are cost prohibitive while other less costly alternatives are availabe such as methyl bromide fumigation. 3 Almost all treatments cause some degree of damage to the product being treated. The commercial feasibility of a treatment is complicated by issees such as the availability of market acceptable alternative treatments, the value and competition of the product at market, and effect of the treatment on that value. The statements related to humidity and condensation relate to this being a "high temperature forced air" treatment subset of a vapour heat treatment, a category commonly used in international trade. 4 The TPPT has not previously separated treatment schedules for hosts based on potential differences in host quality. The TPPT considers all heated air treatments that include vapour as "vapour heat treatments". Differences in the level of vapour in the air (e.g., above or below saturation) is a part of the treatment schedule. 5 As is often the case, not all fruit varieties available in international trade can tolerate a treatment commonly used in international trade (e.g., mangoes and irradition, citrus and cold treatment, etc.). We agree that product tolerances need to be considered before use, and include in the text of the draft annex contains (in a footer note) the following statement: "In addition, potential effects of treatments on product quality are considered for some host commodities before their international adoption. However, evaluation of any effects of a treatment on the quality of commodities may require additional consideration."

				The data supporting the treatment is sound; whether the applicator can be expected to achieve the target atmospheric and temperature requirements without damaging the commodity is an open question. *Category : SUBSTANTIVE*	
14	G	(General Comment)	C	**Barbados** Barbados agrees with the proposal. *Category : SUBSTANTIVE*	Noted
15	G	(General Comment)	C	**Thailand** Thailand has no objection on the Draft PT: Vapour heat-modified atmosphere treatment for Cydia pomonella and Grapholita molesta on Malus pumila and Prunus persica. *Category : SUBSTANTIVE*	Noted
DRAFT ANNEX TO ISPM 28: Vapour heat–modified atmosphere treatment for Cydia pomonella and Grapholita molesta on Malus pumila and Prunus persica (2017-037 and 2017-038)					
16	1	**DRAFT ANNEX TO ISPM 28: VAPOUR HEAT–MODIFIED ATMOSPHERE TREATMENT FOR *CYDIA POMONELLA* AND *GRAPHOLITA MOLESTA* ON *MALUS PUMILA* AND *PRUNUS PERSICA* (2017-037 AND 2017-038)**	C	**Uruguay** We agree with the document as it is, no comments *Category : TECHNICAL*	Noted
Scope of the treatment					
17	24	**Scope of the treatment**	C	**United States of America** Formatting issue *Category : EDITORIAL*	**INCORPORATED**
Treatment description					
18	30	**Treatment type** Physical (vapour ~~heat)~~ heat and modified atmosphere) and modified atmosphere	P	**China** The treatment types of vapour heat and modified atmosphere belong to physical treatment *Category : SUBSTANTIVE*	**FOR CONSIDERATION BY TPPT**
Treatment schedule					
19	33	**Treatment schedule**	C	**United States of America** • The proposed treatment time (25 min) is shorter than the heat-up time (2.5 h) to reach the required fruit core temperature. This may affect fruit quality. • The heating rate used for Malus pumila was 12°C/hour (Neven and Rehfield-Ray 2006). This would raise the temperature to 30°C in 2.5 h. Therefore, to accomplish an apple treatment core temperature of 44.5°C, the starting temperature of the apples would have to be 14.5°C. Warming of the commodity may have implications for commercial applications of the system. • Reducing atmospheric oxygen concentrations from 21% to 1% or below may be	**Modified** 1 The proposed treatment time is 30 minutes with a 2.5 hour heating up period. 2 No specified heating rate is included in the schedule 3 Noted 4 Noted 5 The commercial development of a treatment system is not necessarily coupled to the researchers efforts in that regard. It is hoped that approval of a schedule such as this would promote investment in this type of treatment system development.

				difficult, as it will require tight sealing of the treatment chamber throughout the treatment. • It is questionable how easily the treatment system is scalable for commercial applications. The commercial Controlled Atmosphere/Temperature Treatment System (CATTS) chamber used only holds 4 bins of 1000 lbs of apples each. This does not appear adequate for large amounts of apple requiring treatment under commercial settings. • Neven et al. (2006) indicated that the groups is "…working with industry to construct a special commercial CATTS unit, which could treat a pallet of boxed fruit. We expect this chamber to be completed some time in 2006." We recommend contacting the submitter, Dr. Lisa Neven, and inquire about the status of this commercial chamber and commercial viability of this treatment. *Category : TECHNICAL*	
20	34	Exposure of fruit in a vapour heat and modified atmosphere chamber:	P	**Australia** Clarifies the target of the treatment *Category : EDITORIAL*	**INCORPORATED**
21	35	with air temperature held at ~~45~~ 46 °C or above;	P	**Japan** In the reference papers, the temperature at the chamber was raised to 46 ° C. The fruit core temperature, the heat-up time and the maintenance time of the treatment schedule are established based on the reference papers. Therefore, it is considered that the prescribed treatment schedule cannot be achieved unless the temperature at the chamber is set to 46 ° C according to the papers. *Category : TECHNICAL*	**Considered but nit incorporated** The air temperature in the actual trials varied from 45°C, and was dependent on the required heating rate (related to fruit size etc.). As such what the air temperature will need to be will vary based on fruit type and size. The minimum requirement to achieve a core temperature on 44.5°C is 45°C air temperature.
22	36	in a normal atmosphere with the concentration of oxygen (O2) reduced to 1% or below, the concentration of carbon dioxide (CO2) raised to 15% ± 1%, and the balance maintained with added nitrogen (N2);	C	**Colombia** When reviewing the methodology applied in the reference document, it is found that nitrogen is not used in this document, however, in the document of this annex, nitrogen is included as part of the modified atmosphere, so the reason for its use is not clear. The gases to be used within a modified atmosphere and the proportions of each of them must be specified. *Category : TECHNICAL*	**Considered but not incorporated** While the referenced documents do not reference nitrogen, the TPPT considered that to ensure positive or negative air presseures did not result from changing oxygen and carbon dioxide levels, nitrogen (the other major consitituent of air) rather than other gases may need to be added to maintain the balance.
23	36	in a normal atmosphere with the concentration of oxygen (O2) reduced to 1% or below, the concentration of carbon dioxide (CO2) raised to 15% ± 1%, and the balance maintained with added nitrogen (N2);	C	**Kenya** There should be provision of example on how to use carbon dioxide (raised to 15%±1%) in treatment to avoid the spillage into the atmosphere. *Category : TECHNICAL*	**Considered but not incorporated** More substantial guidance on the application of this treatment is outside the scope of this PT and would need to be provided in separate guidance material. ISPM 44 and 42 adress environmental concerns please refer to these.

24	37	to reach a fruit core temperature of 44.5 °C or above within not more than 2.5 ~~hours~~hours(heat-up time);	P	**Japan** See the comment to paragraph 38 from Japan *Category : TECHNICAL*	**CONSIDERED BUT NOT INCORPORATED** Text is not required as it is self evident that the 2.5 hours is a heat-up time (e.g., "to reach").
25	38	continuously, to maintain a fruit core temperature of 44.5 °C or above and relative humidity 90% or ~~above for at least 30 minutes~~until a total of 3 hours including the actual heat-up time is reached.	P	**Japan** Please also see the general comment 5. Even if treatment is conducted according to the proposed treatment schedule, it may not achieve the same mortality level as the studies conducted by Neven et al. (2006a) and Neven et al. (2006b), when smaller size fruits than those used in the studies are used and the time to reach the specified temperature (44.5 ℃ of fruits core) is shorter than 2.5 hours. So, there is a need to set up a total treatment time required to achieve the mortality. *Category : TECHNICAL*	**MODIFIED** The 2.5 hour heat-up time is a maximum not a required amount. However the inclusin of the word "continuous" before "minutes" would ensure no disruption to the treatment was considered acceptable. Additionally the following was included to provide a minimum duration: "to heat the fruit for at least three hours in total."
26	38	to maintain a fruit core temperature of 44.5 °C or above and relative humidity 90% or above for at least 30 minutes.	C	**Korea, Republic of** Proposed change the treatment schedule as below: : "Fruit core temperature should rise at least 12°C per hour and maintain of 44.5 °C or above with relative humidity 90% or above for at least 30 minutes." In the study of Neven et al., the experiment was conducted under the condition of a temperature increase of 12°C per hour. if initial fruit core temperature is high, sufficient heat shock cannot be achieved because temperature rise rate is low. *Category : TECHNICAL*	**Modified** No specific heating rate is included in the schedule as this will vary depending on fruit size. While some degree of "heat shock" is expected to play a part in the treatmentr efficacy, it is expected that the target temperature (44.5°C) plays the greated role. Hence the focus of the treatment schedule is on the target core temperature rather than the heating rate.
Other relevant information					
27	41	The Technical Panel on Phytosanitary Treatments (TPPT) based its evaluation of this treatment on the research reported by ~~Neven, Rehfield-Ray & Obenland~~ Neven *et al.*, (2006), which determined the efficacy of vapour heat and modified atmosphere on *Cydia pomonella* and *Grapholita molesta* in peaches and nectarines, and Neven and Rehfield-Ray (2006), which determined the efficacy of vapour heat and modified atmosphere on *Cydia pomonella* and *Grapholita molesta* in apples. The TPPT also considered information on the effect of vapour heat and modified atmosphere on *Cydia pomonella* in Neven and Hansen	P	**European Union** Typos. *Category : EDITORIAL*	**INCORPORATED**

		(2010) and ~~Neven,~~ Neven *et al.*,~~Lehrman & Hansen~~ (2014).			
28	41	The Technical Panel on Phytosanitary Treatments (TPPT) based its evaluation of this treatment on the research reported by ~~Neven, Rehfield-Ray & Obenland~~ Neven *et al.* (2006), which determined the efficacy of vapour heat and modified atmosphere on *Cydia pomonella* and *Grapholita molesta* in peaches and nectarines, and Neven and Rehfield-Ray (2006), which determined the efficacy of vapour heat and modified atmosphere on *Cydia pomonella* and *Grapholita molesta* in apples. The TPPT also considered information on the effect of vapour heat and modified atmosphere on *Cydia pomonella* in Neven and Hansen (2010) and ~~Neven,~~ Neven *et al.*~~Lehrman & Hansen~~ (2014).	P	**EPPO** Typos. *Category : EDITORIAL*	**INCORPORATED**
29	42	The efficacy of this schedule was calculated based on a total of 25 882 fourth- and fifth-instar larvae of *Cydia pomonella* treated with no survivors; the control survival was 89.6%.	C	**Colombia** Although according to the following information: "The efficacy of this schedule was calculated based on a total of 25,882 fourth- and fifth-instar larvae of Cydia pomonella treated with no survivors; the control survival was 89.6%", the treatment shows high efficacy, it is suggested to review the base number of treated individuals, since they do not coincide with those reported in the reference studies, since in these treated populations of 30,861 larvae are reported. The cited references must be used in a coherent and correct manner with the proposed standard that is to be established as an annex to ISPM 28. *Category : TECHNICAL*	**CONSIDERED BUT NOT INCORPORATED** Neven & Rehfield-Ray (2006) estimated the mean number of insects treated at 31,331. The TPPT noted in their 2019 report that they estimated the number of insects treated to a 95% level of confidence. All supporting evidence is provided in the reference list. The draft treatment is for the pest and fruit types used in the research supporting the treatment. The TPPT did nt consider it necessary to provide separate schedules for each of the fruit types supported by this treatment (apple and peach/nectarine).
30	43	The air humidity is lower at the beginning of the treatment to prevent condensation on the fruit and hence maintain fruit quality. To minimize effects on commodity quality, users should refer to Neven ~~&~~ and Rehfield-Ray (2006) and ~~Neven, Rehfield-Ray & Obenland~~ Neven *et al.*, (2006).	P	**European Union** Typos. *Category : EDITORIAL*	**INCORPORATED**

31	43	The air humidity is lower at the beginning of the treatment to prevent condensation on the fruit and hence maintain fruit quality. To minimize effects on commodity quality, users should refer to Neven ~~&~~ and Rehfield-Ray (2006) and ~~Neven, Rehfield-Ray & Obenland~~ Neven *et al.* (2006).	P	**EPPO** Typos. *Category : EDITORIAL*	**INCORPORATED**
References					
32	45	The present annex ~~may refer~~ refers to ISPMs. ISPMs are available on the International Phytosanitary Portal (IPP) at .	P	**European Union** The present annex refers to ISPM 28. There is no reason to write "may refer". We understand that this is a general statement for all PTs and this comment may apply to other already adopted PTs. *Category : EDITORIAL*	**INCORPORATED**
33	45	The present annex refers to ISPMs. ISPMs are available on the International Phytosanitary Portal (IPP) at ~~The present annex may refer to ISPMs. ISPMs are available on the International Phytosanitary Portal (IPP) at~~ .	P	**EPPO** The present annex refers to ISPM 28. There is no reason to write "may refer". We understand that this is a general statement for all PTs and this comment may apply to other already adopted PTs. *Category : EDITORIAL*	**INCORPORATED**
34	46	L.G. Neven, S.R. Drake, and K.C. Shellie. (2001). Development of a High Temperature Controlled Atmosphere Quarantine Treatment for Pome and Stone Fruits. Acta Hort. 553, ISHS**Neven, L.G. & Hansen, L.D.** 2010. Effects of temperature and controlled atmospheres on codling moth metabolism. *Annals of the Entomological Society of America*, 103: 418–423.	P	**United States of America** *Category : TECHNICAL*	**CONSIDERED BUT NOT INCORPORATED** While this reference was reviewed by the TPPT in developing this schedule, it was not considered a necessary reference to the development of this schedule.
35	47	Lisa Neven and Shelly Johnson. 2018. Chapter 21 Combination Hot Forced Air Treatments and Controlled Atmosphere Treatments: CATTS – Controlled Atmosphere Temperature Treatment System**Neven, L.G., Lehrman, N.J. & Hansen, L.D.** 2014. Effects of temperature and modified atmospheres on diapausing 5th instar codling moth metabolism. *Journal of Thermal Biology*, 42: 9–14.	P	**United States of America** *Category : TECHNICAL*	**CONSIDERED BUT NOT INCORPORATED** While this reference was reviewed by the TPPT in developing this schedule, it was not considered a necessary reference to the development of this schedule.
36	48	**Neven, L.G. & Rehfield-Ray, L.** 2006. Confirmation and efficacy tests against	P	**United States of America** *Category : TECHNICAL*	**CONSIDERED BUT NOT INCORPORATED** While these references were reviewed by the TPPT in developing this schedule, they were not

		codling moth and oriental fruit moth in apples using combination heat and controlled atmosphere treatments. *Journal of Economic Entomology*, 99: 1620–1627.**Klein, Lurie, Ben-Arie. 1990** Quality and Cell Wall Components of 'Anna' and 'Granny Smith' Apples Treated with Heat, Calcium, and Ethylene. Journal American Horticultural Science 115(5): 954-958.**Joshua D. Klein and Susan Lurie. 1992**. Prestorage heating of Apple Fruit for Enhanced Postharvest Quality: Interaction of Time and Temperature. HortScience 27(4):326-328**L.G. Neven, S.R. Drake and H.J. Fergusson. 2000**. Effects of the Rate of Heating on Apple and Pear Fruit Quality. Journal of Food Quality 23 (2000) 317-325.			considered necessary references to the development of this schedule.