2019 FIRST CONSULTATION

1 July – 30 September 2019

Compiled comments for Draft PT: Irradiation treatment for the genus Anastrepha (2017-031)

Summary of comments

Name	Summary	SC Response
Cuba	No hay comentarios , estamos de acuerdo con la propuesta de tratamiento.	Noted
European Union	Comments submitted by the European Commission on behalf of the European Union and its 28 Member States.	Noted
Malawi	Malawi supports draft irradiation treatment for the genus Anastrepha (2017-031)	Noted
South Africa	The National Plant Protection Organisation of South Africa (NPPOZA) has no comments and therefore accepts this standard.	Noted

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

FAO sequential number	Para	Text	T	Comment	SC Response
1	G	(General Comment)	C	**Mexico** I support the document as it is and I have no comments *Category : SUBSTANTIVE*	Noted.
2	G	(General Comment)	C	**Guyana** We support the document in its entirety and have no objection with it moving forward. *Category : SUBSTANTIVE*	Noted.
3	G	(General Comment)	C	**European Union** The comments by the European Union and its 28 Member States are provided without prejudice to EU food safety legislation imposing limitations on the acceptance of irradiated goods. *Category : TECHNICAL*	Noted.
4	G	(General Comment)	C	**Indonesia** Indonesia asks the status of previous PT regarding irradiation for some species of Anastrepha. Moreover, The irradiation dose for Anastrepha serpentina (PT 3) is higher than the irradiation dose on this draft. *Category : SUBSTANTIVE*	Noted. Relevant *Anastrepha* irradiation schedules are currently specified under ISPM 28 annexes PT 1-3 (PT 1 [*Anastrepha ludens* – 70Gy], PT 2 [*A. obliqua* – 70Gy], PT 3 [*A. serpentina* – 100Gy]), with a generic 150Gy applying to all Anastrepha under PT 7 for management of all Tephritidae. The intention of the proposed draft annex for a generic Anastrepha irradiation treatment at 70Gy is not to supercede existing annex treatment schedules but to provide further flexibility in potential management options, particularly noting the difference in scope of the currect draft annex relative to PTs 1-3 and 7. However, given the intersection between this proposed standard and the existing Anastrepha annex standards, the TPPT agreed to propose to the SC to discuss if PT 3 was needed at all. They considered that as it has a higher level of efficacy (Probit 9) countries might still need to use those in case the generic efficacy is not accepted.
5	G	(General Comment)	C	**Barbados** Barbados has no changes to make to this draft. *Category : EDITORIAL*	Noted.

6	G	(General Comment)	C	**Slovenia** Slovenia would like to formally endorse the EPPO comments submitted via the IPPC Online Comment System. *Category : TECHNICAL*	Noted.
7	G	(General Comment)	C	**Bahrain** no comment *Category : TECHNICAL*	Noted.
8	G	(General Comment)	C	**Australia** Extrapolating from treatment efficacy of 70 Gy without the knowledge of the most-tolerant stage (MTS), commodity and pest species tested is a generalised approach which may not always work for all commodities. MTS needs to be confirmed even if it is not found frequently in the fruit. Identifying MTS provides complete safety against all of the life-stages. The MTS in another vegetable or fruit is different (as seen in Medfly in various commodities) and may require higher dose if not lower which would still fall within the proposed treatment schedule. *Category : TECHNICAL*	Modified. Separate responses to each of the respective issues raised by the commenter are detailed below. **A. Most tolerant stage** The TPPT agrees that phytosanitary treatments need to demonstrate efficacy of proposed schedules using the most tolerant treatment parameters, namely the most treatment tolerant pest developmental stage. For irradiation, it has been well established in the literature, and accepted by the TPPT, that insect radiotolerance increases with development. Relevantly, third instars of Anastrepha under this proposed treatment standard are considered to be the most radiotolerant stage, and was the stage tested by Hallman and Martinez (2001) in their supporting research. This has been further supported in the review by Hallman *et al*. (2010) on radiotolerance of arthropods based on published studies using three or more stages for comparison. The authors noted but only a few exceptions to this position – the most relevant being for *A. obliqua*. In that case Hallman *et al*. (2010) noted that confounding factors in the treatment methodology resulted in non-treatment mortality effects which skewed the outcomes of those research findings. It is worth noting also that third instars, as the most radiotolerant stage, formed the basis of the determination and finalisation of irradiation annexes PT 1-3 for *A. serpentina*, *A. obliqua* and *A. ludens*; and was the cause for rejection of annex treatment schedules proposed for A. suspensa by the TPPT which did not appropriately test thirds. Based on current knowledge, testing of third instars within the supporting research is deemed appropriate by the TPPT as being the most tolerant life stage treatment parameter. However, as is the case for all standards, should new information become available to suggest otherwise, the TPPT will review standards in context with any supporting information. **B. Most tolerant species** Regarding the extrapolation of data to all species in the genus, the TPPT did consider all available research on economically important

					species of Anastrepha in developing the draft annex. This included seven key species of economic importance identified under ISPM 27 Annex 9 [DP 9: Genus *Anastrepha* Schiner] - *A. fraterculus*, *A. grandis*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. striata* and *A. suspensa*. Hallman (2013) examined the relevant research in detail under table 2 of their review for 6 of the 7 species identified as being economically important – *A. fraterculus*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. suspensa* and *A. striata*. Dosages reported to prevent adult emergence in these six species were reported in the range of 25-50Gy. For *A. grandis*, comments on preliminary research outcomes under FAO/IAEA (2017) reported that irradiation at as little as 30-36Gy resulted in non-emergence in small-scale studies, again supporting *A. ludens* as a suitable proxy species for the proposed standard for all *Anastrepha*. The TPPT also discussed the higher 100Gy dose approved for the irradiation of *A. serpentina* under PT 3. It was noted that in the research by Bustos *et al*. (1992; 2004) which the TPPT used to support the approval of that standard, large scale confirmatory trials were undertaken at 100Gy despite smaller scale trials of third instars at 60Gy showing no adult emergence (n=4025) (Hallman 2013). In assessing the data, at that early time in the development of treatments, the TPPT took a conservative approach and finalised PT 3 at the higher 100Gy rate, noting that a lower dose could have also been effective. The TPPT also discussed any additional outlier studies for Anastrepha which suggested a dose of >70Gy is required to prevent adult emergence. Two such studies were discussed for *A. ludens* and *A. suspensa* but the research was determined not to be scientifically robust. For *A. ludens*, Hallman (2013) comments that the research of Wolfenbarger & Guenthner (1998) likely suffered from contamination issues with large variations observed in dose-response testing, as well as significant LD99 dosage estimates reported at 407,317Gy and 38,039Gy for larval and puparial stages respectively. For *A. suspensa*, there were concerns regaring insufficient insects tested at the most tolerant third instar stage. Ignoring these outliers, the data for different species of *Anastrepha* is relatively homogeneous. There is also the further contention that the dose determined for *A. ludens*, and consequently all Anastrepha, is conservative in nature. Initial dose-response testing by Hallman and Martinez (2001) showed 50Gy as the lowest dose to prevent adult emergence, with an upper fiducial estimate of 55 Gy at the 95% confidence level. In

					the large scale studies, no adult emergence was observed at 60Gy from an estimate 94,400 treated insects. Accounting for the dosimetry results which suggested the tested grapefruit commodities received a dose of about 15% higher at the fruit surface than centreline doses, a dose of 69Gy was determined, rounded to 70Gy for the draft annex. In addition, there is a reasonable buffer in the proposed generic 70Gy dose for all Anastrepha to account for any uncertainty when considering the reported doses of 25-50Gy for *A. fraterculus*, 50-60Gy for *A. obliqua*, 25-50Gy for *A. suspensa* and 40Gy for *A. striata* as per Hallman (2013). TPPT added explanation to the text of the PT to clarify that the efficacy is determined based on studies using the most tolerant economically important species in the genus. **C. Extrapolation to commodities** The extrapolation of irradiation schedules across commodities is an internationally recognised position such that efficacious treatments apply to all fruits and vegetables given that dosimetry systems measure the actual dose absorbed by the target pest independent of the commodity. Restrictions under irradiation annex treatment schedules apply only around the utilisation of modified atmosphere conditions as this may introduce artificial parameters which could adversely impact treatment efficacy at the prescribed dose. This approach is consistent with all existing irradiation PTs under ISPM 28 and accordingly, has been adopted for this proposed annex treatment standard also. As is standard, should new information become available to suggest otherwise, the TPPT will review relevant PTs in context with any supporting information. The draft annex includes wording to this effect under [40].
9	G	(General Comment)	C	**Australia** Please provide the species name of Anastrepha in which studies were done suggesting an effective dose of 70 Gy prevented development to adults of 99.9968% eggs and larvae. Did the studies being considered for this treatment have >30,000 individuals tested? Which commodity was tested? Mention the	Modified. Establishing a treatment schedule for a group of pests was discussed by the TPPT in context with the proposed standard for all *Anastrepha*. The consensus was to follow the approach adopted for finalisation of the generic 150Gy dose for all Tephritidae under PT 7 and base the efficacy calculation on data generated for the most radiotolerant species alone i.e. no aggregation of data across species. Based on a review of the available literature for economically important species of *Anastrepha*, *A. ludens* was established as the most radiotolerant species in the genus - see response to comment 8 for more detail. Accordingly, the efficacy calculations were

				fruit (and cultivar) to maintain consistency with other ISPMs that mention the commodity tested. *Category : TECHNICAL*	estimated from the large scale confirmatory trials by Hallman and Martinez (2001) where 94,400 estimated insects of *A. ludens* were treated at a target dose of 60Gy, meeting the Probit 9 standard. It is worth noting that Hallman and Martinez (2001) also treated an estimated 52,000 insects at 50Gy which resulted in a single emerged adult female. A single survivor in 52,000 treated insects exceeds Probit 8.7 requirements (Probit 8.742; 99.99% efficacy), a standard published through the APPPC and accepted internationally. However, in finalising the draft annex for *Anastrepha*, the TPPT based the dose and efficacy on the more conservative 60Gy disinfestation trial work. The commodity tested by Hallman and Martinez (2001) was grapefruit (*Citrus paradisi*) but as stated in the response to comment [8] above, irradiation schedules recognise the dose as efficacious in all fruit and vegetable commodities as dosimetry systems measure the actual dose absorbed by the target pest independent of the commodity. The draft annex does list the relevant pest and host commodity combinations considered in drafting the standard for all *Anastrepha* (as per [40]) in which *Citrus paradisi* is listed. The TPPT amended the proposed annex for Anastrepha to specifcally reference the species and host used for calculating the estimated treatment efficacy to provide additional clarity.
10	G	(General Comment)	C	**Thailand** Thailand has no objection on the proposed draft irradiation treatment for the genus Anastrepha *Category : SUBSTANTIVE*	Noted.
11	G	(General Comment)	C	**Uruguay** We have no comments on this draft. We agree with the porposal as it is *Category : TECHNICAL*	Noted.
12	G	(General Comment)	C	**China** The references only provides data on 4 species. Can these 4 species on behalf the whole genus? The data provided includes only four species and does not cover all economically important species. *Category : SUBSTANTIVE*	Modified. Regarding the comment that the '*references only provides data on 4 species*', this appears to reference species and commodity listings under section [40] of the draft annex which mentions only *A. fraterculus*, *A. ludens*, *A. obliqua* and *A. suspensa*. However, section [40] denotes relevant pest/commodity combinations and publications used to support extrapolation of treatment efficacy to all fruits and vegetables generally, the rationale appearing to include only relevant studies where more than a single commodity has been tested by pest. For *Anastrepha*, at face value data for *A. striata* is based on only guava, *A. serpentina* on only mango, an *A. grandis* on only zucchini and presumably this is the basis for their exclusion under section [40]. This approach appears to be largely consistent with that adopted under PT 7 for all Tephritidae at 150Gy.

					Regarding the extrapolation of data to all species in the genus, the TPPT did consider all available research on economically important species of *Anastrepha* in developing the draft annex. This included seven key species of economic importance identified under ISPM 27 Annex 9 [DP 9: Genus *Anastrepha* Schiner] - *A. fraterculus*, *A. grandis*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. striata* and *A. suspensa*. Hallman (2013) examined the relevant research in detail under table 2 of their review for 6 of the 7 species identified as being economically important – *A. fraterculus*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. suspensa* and *A. striata*. Dosages reported to prevent adult emergence in these six species were reported in the range of 25-50Gy. For *A. grandis*, comments on preliminary research outcomes under FAO/IAEA (2017) reported that irradiation at as little as 30-36Gy resulted in non-emergence in small-scale studies, again supporting *A. ludens* as a suitable proxy species for the proposed standard for all *Anastrepha*. The TPPT also discussed the higher 100Gy dose approved for the irradiation of *A. serpentina* under PT 3. It was noted that in the research by Bustos *et al*. (1992; 2004) which the TPPT used to support the approval of that standard, large scale confirmatory trials were undertaken at 100Gy despite smaller scale trials of third instars at 60Gy showing no adult emergence (n=4025) (Hallman 2013). In assessing the data, at that early time in the development of treatments, the TPPT took a conservative approach and finalised PT 3 at the higher 100Gy rate, noting however that a lower dose could have also been effective. The TPPT also discussed any additional outlier studies for *Anastrepha* which suggested a dose of >70Gy is required to prevent adult emergence. Two such studies were identified for *A. ludens* and *A. suspensa* but the research was determined not to be scientifically robust. For *A. ludens*, Hallman (2013) comments that the research of Wolfenbarger & Guenthner (1998) likely suffered from contamination issues with large variations observed in dose-response testing, as well as significant LD99 dosage estimates reported at 407,317Gy and 38,039Gy for larval and puparial stages respectively. For *A. suspensa*, there were concerns regaring insufficient insects tested at the most tolerant third instar stage. Ignoring these outliers, the data for different species of Anastrepha is relatively homogeneous. There is also the further contention that the dose determined for *A. ludens*, and consequently all *Anastrepha*, is conservative in nature. Initial dose-response testing by Hallman and Martinez (2001) showed 50Gy as the lowest dose to prevent adult emergence, with an upper fiducial estimate of 55 Gy at the 95% confidence level. In the large scale studies, no adult emergence was observed at 60Gy from an estimate 94,400 treated insects. Accounting for the dosimetry results which suggested the tested grapefruit commodities received a dose of about 15% higher at the fruit surface than centreline

					doses, a dose of 69Gy was determined, rounded to 70Gy for the draft annex. In addition, there is a reasonable buffer in the proposed generic 70Gy dose for all Anastrepha to account for any uncertainty when considering the reported doses of 25-50Gy for *A. fraterculus*, 50-60Gy for *A. obliqua*, 25-50Gy for *A. suspensa* and 40Gy for *A. striata* in Hallman (2013). TPPT added explanation to the text of the PT to clarify that the efficacy is determined based on studies using the most tolerant economically important species in the genus.
13	G	(General Comment)	C	**Malawi** Malawi supports the draft Irradiation treatment for the genus Anastrepha(2017-031) *Category : SUBSTANTIVE*	Noted..
14	G	(General Comment)	C	**New Zealand** New Zealand supports the standard. Given the efficacy information was extrapolated to cover all hosts we encourage the panel to review the standard should evidence become available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect. *Category : SUBSTANTIVE*	Noted. As commented, approved irradiation schedules are applied to all fruits and vegetables given that dosimetry systems measure the actual dose absorbed by the target pest independent of the commodity. Restrictions apply only to the utilisation of modified atmosphere conditions. However, consistent with the comment, should new information become available to suggest this is incorrect, the TPPT will review relevant PTs in context with any supporting information. The draft annex includes wording to this effect under [40].
15	G	(General Comment)	C	**Cuba** Estamos de acuerdo con la propuesta de tratamiento. *Category : TECHNICAL*	Noted.
				DRAFT ANNEX TO ISPM 28: Irradiation treatment for the genus Anastrepha (2017-031)	
16	1	**DRAFT ANNEX TO ISPM 28: IRRADIATION TREATMENT FOR THE GENUS *ANASTREPHA* (2017-031)**	C	**Korea, Republic of** The Republic of Korea suggests ISPM 28 Phytosanitary treaments for regulated pest. PT 3: Irradiation treatment for Anastrepha serpentina shoule be revoked. According PT 3, minimum absorbed dose is 100 Gy for Anastrepha serpentina, which is not consistant with new generic dosage for Anastrepha spp. " *Category : TECHNICAL*	Noted. Relevant *Anastrepha* irradiation schedules are currently specified under ISPM 28 annexes PT 1-3 (PT 1 [*Anastrepha ludens* – 70Gy], PT 2 [*A. obliqua* – 70Gy], PT 3 [*A. serpentina* – 100Gy]), with a generic 150Gy applying to all Anastrepha under PT 7 for management of all Tephritidae. The intention of the proposed draft annex for a generic Anastrepha irradiation treatment at 70Gy is not to supercede existing annex treatment schedules but to provide further flexibility in potential management options, particularly noting the difference in scope of the currect draft annex relative to PTs 1-3 and 7. However, given the intersection between this proposed standard and the existing Anastrepha annex standards, the TPPT agreed to propose to the SC

					to discuss if PT 3 was needed at all. They considered that as it has a higher level of efficacy (Probit 9) countries might still need to use those in case the generic efficacy is not accepted.
17	11	2017-06 Treatment submitted in response to 2017-02 Call for treatments.	C	**Botswana** no comment *Category : EDITORIAL*	Noted.
18	13	2018-05 SC added topic *Irradiation treatment for the genus* Anastrepha (2017-031) to the TPPT work programme with priority 1.	C	**Botswana** we agree *Category : SUBSTANTIVE*	Noted.
19	13	2018-05 SC added topic *Irradiation treatment for the genus* Anastrepha (2017-031) to the TPPT work programme with priority 1.	C	**Botswana** we agree *Category : EDITORIAL*	Noted.
20	13	2018-05 SC added topic *Irradiation treatment for the genus* Anastrepha (2017-031) to the TPPT work programme with priority 1.	C	**Botswana** we agree *Category : TECHNICAL*	Noted.
21	13	2018-05 SC added topic *Irradiation treatment for the genus* Anastrepha (2017-031) to the TPPT work programme with priority 1.	C	**Botswana** we agree *Category : EDITORIAL*	Noted.
22	20	**Notes**	C	**China** Adding the related reference for “2018-06 TPPT: efficacy was calculated based on data for A. ludens (most tolerant species within the genus)” Why A. ludens is the most tolerant species within Anastrepha? The scientific reference should be noted.	Modified. Regarding the extrapolation of data to all species in the genus, the TPPT considered all available research on economically important species of *Anastrepha* in developing the draft annex. This included seven key species of economic importance identified under ISPM 27 Annex 9 [DP 9: Genus *Anastrepha* Schiner] - *A. fraterculus*, *A. grandis*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. striata* and *A. suspensa*. Hallman (2013) examined the relevant research in detail under table 2 of their review for 6 of the 7 species

				Category : SUBSTANTIVE	identified as being economically important – *A. fraterculus*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. suspensa* and *A. striata*. Dosages reported to prevent adult emergence in these six species were reported in the range of 25-50Gy. For *A. grandis*, comments on preliminary research outcomes under FAO/IAEA (2017) reported that irradiation at as little as 30-36Gy resulted in non-emergence in small-scale studies, again supporting *A. ludens* as a suitable proxy species for the proposed standard for all *Anastrepha*. The TPPT also discussed the higher 100Gy dose approved for the irradiation of *A. serpentina* under PT 3. It was noted that in the research by Bustos *et al*. (1992; 2004) which the TPPT used to support the approval of that standard, large scale confirmatory trials were undertaken at 100Gy despite smaller scale trials of third instars at 60Gy showing no adult emergence (n=4025) (Hallman 2013). In assessing the data, at that early time in the development of treatments, the TPPT took a conservative approach and finalised PT 3 at the higher 100Gy rate, noting however that a lower dose could have also been effective. The TPPT also discussed any additional outlie studies for *Anastrepha* which suggested a dose of >70Gy is required to prevent adult emergence. Two such studies were identified for *A. ludens* and *A. suspensa* but the research was determined not to be scientifically robust. For *A. ludens*, Hallman (2013) comments that the research of Wolfenbarger & Guenthner (1998) likely suffered from contamination issues with large variations observed in dose-response testing, as well as significant LD99 dosage estimates reported at 407,317Gy and 38,039Gy for larval and puparial stages respectively. For *A. suspensa*, there were concerns regaring insufficient insects tested at the most tolerant third instar stage. Ignoring these outliers, the data for different species of *Anastrepha* is relatively homogeneous. There is also the further contention that the dose determined for *A. ludens*, and consequently all *Anastrepha*, is conservative in nature. Initial dose-response testing by Hallman and Martinez (2001) showed 50Gy as the lowest dose to prevent adult emergence, with an upper fiducial estimate of 55 Gy at the 95% confidence level. In the large scale studies, no adult emergence was observed at 60Gy from an estimate 94,400 treated insects. Accounting for the dosimetry results which suggested the tested grapefruit commodities received a dose of about 15% higher at the fruit surface than centreline doses, a dose of 69Gy was determined, rounded to 70Gy for the draft annex. In addition, there is a reasonable buffer in the proposed generic 70Gy dose for all Anastrepha to account for any uncertainty when considering the reported doses of 25-50Gy for *A. fraterculus*, 50-60Gy for *A. obliqua*, 25-50Gy for *A. suspensa* and 40Gy for *A. striata* in Hallman (2013).

					With respect to the inclusion of references as raised by the commenter, a number of these references outlined above are included under section [40] – see Hallman et al. (2010), Hallman and Martinez (2001) and Hallman (2013) being the most relevant to the current proposed standard. The TPPT amended the proposed annex for Anastrepha to specifcally reference the species and host used for calculating the estimated treatment efficacy to provide additional clarity. The TPPT agreed to propose to the SC to discuss if PT 3 was needed at all. They considered that as it has a higher level of efficacy (Probit 9) countries might still need to use.
23	24	This treatment describes the irradiation of fruits and vegetables at 70 Gy minimum absorbed dose to prevent the emergence of adults of *Anastrepha* spp. at the stated efficacy.[1].	P	**European Union** Typo. *Category : EDITORIAL*	Incorporated.
24	24	This treatment describes the irradiation of fruits and vegetables at 70 Gy minimum absorbed dose to prevent the emergence of adults of *Anastrepha* spp. at the stated efficacy.[1].	P	**EPPO** Typo. *Category : EDITORIAL*	Incorporated.
25	24	This treatment describes the irradiation of fruits and vegetables at 70 Gy minimum absorbed dose to prevent the emergence of adults of *Anastrepha* spp. at the stated efficacy.[1].	C	**Botswana** we agree *Category : EDITORIAL*	Noted.
				Treatment description	
26	27	**Name of treatment** Irradiation treatment for the genus *Anastrepha* (generic)	C	**Botswana** we concur *Category : EDITORIAL*	Noted.

27	29	**Treatment type** Irradiation	C	**Botswana** we concur *Category : EDITORIAL*	Noted.
28	30	**Target pest** Fruit flies of the genus *Anastrepha* (Schiner, 1868) (Diptera: Tephritidae)	C	**Botswana** we concur *Category : EDITORIAL*	Noted.
29	31	**Target regulated articles** All fruits and vegetables that are hosts of the genus *Anastrepha*	C	**Botswana** we concur *Category : EDITORIAL*	Noted.
				Treatment schedule	
30	32	**Treatment schedule**	P	**United States of America** The proposed treatment standard is a 70 gray dose for all members of the fruit fly genus Anastrepha. APHIS accepts a 70 gray dose for A. ludens, A. obliqua and A. suspensa. A 100 gray dose is required by APHIS for A. serpentina. Thus the primary concern for APHIS is efficacy against A. serpentina and all remaining Anastrepha species outside those previously mentioned. The justification for a 70 gray dose comes from a review by Hallman (2013) which synthesizes prior studies on the phytosanitary irradiation of commodities infested with Anastrepha larvae. According to Hallman (2013), the literature suggests that Anastrepha ludens is the most radio-tolerant member of the genus (Bustos et al. 1992, Bustos et al. 2004) and that confirmatory testing of 94,400 A. ludens done by Hallman and Martinez (2001) justifies the minimum dose of 70 Gy. Our comments are as follows: 1. The recommended dose would apply to >230 species of Anastrepha. As stated in Hallman (2013), there are 7 Anastrepha species of primary quarantine concern: A. ludens, A. obliqua, A. serpentina, A.	Modified. Separate responses to each of the respective issues raised by the commenter are detailed below. **1 – Species extrapolation** This concern has been raised by a number of commenters. Some preliminary responses have been developed to this concern (see comments [8, 9, 12, 22] as examples). The TPPT considered all available research on economically important species of *Anastrepha* in developing the draft annex. This included seven key species of economic importance identified under ISPM 27 Annex 9 [DP 9: Genus *Anastrepha* Schiner] - *A. fraterculus*, *A. grandis*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. striata* and *A. suspensa*. Hallman (2013) examined the relevant research in detail under table 2 of their review for 6 of the 7 species identified as being economically important – *A. fraterculus*, *A. ludens*, *A. obliqua*, *A. serpentina*, *A. suspensa* and *A. striata*. Dosages reported to prevent adult emergence in these six species were reported in the range of 25-69Gy (or 25-60Gy excluding *A. ludens*). For *A. grandis*, comments on preliminary research outcomes under FAO/IAEA (2017) reported that irradiation at as little as 30-36Gy resulted in non-emergence in small-scale studies, again supporting *A. ludens* as a suitable proxy species for the proposed standard for all *Anastrepha*. Even with excluding the non-peer reviewed publication for *A. grandis*, there remains signficant coverage of the key species of economic concern. Also, while treated insect number estimates in some of those publications are relatively low, there is a reasonable buffer in the proposed generic 70Gy dose for all Anastrepha to account for any uncertainty when considering the reported doses of 25-50Gy for *A. fraterculus*, 50-60Gy for *A. obliqua*, 25-50Gy for *A. suspensa* and 40Gy for *A. striata* as per Hallman (2013).

				suspensa, A. grandis, A. fraterculus and A. striata. If possible, it would be useful to have research conducted on all 7 species of primary quarantine concern, with at least a few thousand insects tested for each species. Specifically, data are lacking for both A. grandis (sparse data, n=170) and A. fraterculus (sparse data, n=218). Furthermore, several of the large-scale studies on Anastrepha spp. used a dose of 100 Gy in their confirmatory trials. We recommend the IPPC-TPPT consider requiring a higher generic dose for Anastrepha (e.g., 80-100 Gy), to account for the lack of data on 2 important quarantine species, and because of other limitations in the supporting research as listed below. 2. Information on insect colony history and taxonomic identifications is missing in some key publications used in support of this treatment standard. While the proposed standard is based on several independent studies, several studies do not provide information on the number of generations the test colonies were held prior to treatment. Additionally, APHIS guidelines for irradiation research ask that information on the species identification and deposition of voucher specimens be given. Such information is not present in several of the key studies cited. While it is unlikely that species level misidentification occurred during the study, the need for voucher specimens and thorough reporting of the method of identification is crucial for a genus like Anastrepha. 3. There is a minor concern about the specificity of the claims made in the standard. The draft standard claims "There is 95% confidence that the treatment	Regarding the comment around the existence of large-scale confirmatory data at 100Gy, these were also addressed in Hallman (2013) and discussed by the TPPT as per ealier responses above. For *A. serpentina*, the research by Bustos *et al*. (1992; 2004) which the TPPT used to support the approval of PT3, large scale confirmatory trials were undertaken at 100Gy despite smaller scale trials of third instars at 60Gy showing no adult emergence (n=4025) (Hallman 2013). In assessing the data, at that early time in the development of treatments, the TPPT took a conservative approach and finalised PT 3 at the higher 100Gy rate, noting however that a lower dose could have also been effective. The TPPT also discussed any additional outlier studies for *Anastrepha* which suggested a dose of >70Gy is required to prevent adult emergence. Two such studies were identified for *A. ludens* and *A. suspensa* but the research was determined not to be scientifically robust. For *A. ludens*, Hallman (2013) comments that the research of Wolfenbarger & Guenthner (1998) likely suffered from contamination issues with large variations observed in dose-response testing, as well as significant LD99 dosage estimates reported at 407,317Gy and 38,039Gy for larval and puparial stages respectively. For *A. suspensa*, there were concerns regaring insufficient insects tested at the most tolerant third instar stage. Ignoring these outliers, the data for different species of Anastrepha is relatively homogeneous. **2 – Insect colony** As per above, the TPPT determined that *A. ludens* was a suitable proxy species for *Anastrepha* in developing the draft annex and based the dose and efficacy calculations on the research by Hallman and Martinez (2001). In that publication, the concerns raised by the commenter are addressed with information on rearing, number of generations and placement of voucher specimens outlined under section 2.1 of that paper. We noted that some of the cited papers from Hallman (2013) which are used to support *A. ludens* as the most radiotolerant species do not have a full complement of colony information, consistent with the comment. **3 – Efficacy calculation** The TPPT amended the draft annex to include an additional clarifying statement on how the efficacy calculation was determined (species, commodity and estimated treated insects). The references cited under section [39] of the draft annex in its original form pertains to relevant research used to inform the extropalation to all species. **4 – Raw data and suitability of publications**

				according to this schedule prevents the development to the adult stage of not less than 99.9968% of eggs and larvae of Anastrepha spp.”. The use of the 95% confidence interval for probit-9 level mortality implies there was experimental evidence, followed by statistical analysis, which supported this claim. While this statement is true for several important Anastrepha species, the language may give the false impression that there is direct evidence for the specific efficacy claim for all Anastrepha spp. We recommend adding a footnote that explains how the 95% confidence was calculated for a generic dose. Did you sum the research numbers from multiple studies, or base this on only the most tolerant species? 4. “Raw” data is not included or available in the supporting data. The strength of the studies that form the basis of this generic treatment could not be independently verified. These studies have been published previously, and have been used as the basis for irradiation doses already accepted by the IPPC and the USDA, and thus a thorough review of the work is not entirely necessary. However, the proposal does cite work presented in an FAO/IAEA newsletter as being used to support the treatment. The FAO/IAEA newsletter was not included in the attached references, nor was it peer reviewed. The newsletter does not present sufficient information to evaluate its reliability as a justification for the proposed treatment. References: Gould, W. P., & Hallman, G. J. (2004). Irradiation disinfestation of Diaprepes root weevil (Coleoptera:	As discussed above, this issue is referred to the TPPT for discussion around minimum requirements for generic standard development. However, as per the response to 1) above, peer reviewed publication data was considered by the TPPT for 6 of the 7 economic species of Anastrepha identified from ISPM 27 DP 9 and so there remains signficant coverage of the key species of concern if the preliminary reporting for *A. grandis* in the FAO non-scientific article is excluded.

				Curculionidae) and papaya fruit fly (Diptera: Tephritidae). Florida entomologist, 87(3), 391-393. Hallman, G. J., & Martinez, L. R. (2001). Ionizing irradiation quarantine treatment against Mexican fruit fly (Diptera: Tephritidae) in citrus fruits. Postharvest Biology and Technology, 23(1), 71-77. Norrbom, A. L., Barr, N. B., Kerr, P., & Mengual, X. (2018). Case 3772– Anastrepha Schiner, 1868 (Insecta, Diptera, Tephritidae): Proposed precedence over Toxotrypana Gerstaecker, 1860. The Bulletin of Zoological Nomenclature, 75(1), 165-170. Norrbom, A. L., Barr, N. B., Kerr, P., Mengual, X., Nolazco, N., Rodriguez, E. J., ... & Zucchi, R. A. (2018). Synonymy of Toxotrypana Gerstaecker with Anastrepha Schiner (Diptera: Tephritidae). Proceedings of the Entomological Society of Washington, 120(4), 834-842. *Category : TECHNICAL*	
31	32	**Treatment schedule**	C	**Botswana** 70 Gy within the range recommended by ISPM 18; we concur *Category : TECHNICAL*	Noted.
32	33	Minimum absorbed dose of 70 Gy to prevent the emergence of adults of *Anastrepha* spp~~. when irradiated as eggs and larvae~~..	P	**European Union** Because redundant with paragraph 34 and for consistency with the draft PTs 2017-015, 2017-025 and 2017-026. *Category : EDITORIAL*	Incorporated
33	33	Minimum absorbed dose of 70 Gy to prevent the emergence of adults of *Anastrepha* spp~~. when irradiated as eggs and larvae~~..	P	**EPPO** Because redundant with paragraph 34 and for consistency with the draft PTs 2017-015, 2017-025 and 2017-026. *Category : EDITORIAL*	Incorporated.
34	33	Minimum absorbed dose of 70 Gy to prevent the emergence of adults	P	**Botswana** we concur *Category : TECHNICAL*	Noted.

		of *Anastrepha* spp. when irradiated as eggs and larvae.			
35	34	There is 95% confidence that the treatment according to this schedule prevents the development to the adult stage of not less than 99.9968% of eggs and larvae of *Anastrepha* spp.	C	**Botswana** we concur *Category : TECHNICAL*	Noted.
36	35	This treatment should be applied in accordance with the requirements of ISPM 18 (*Guidelines for the use of irradiation as a phytosanitary measure*).	C	**Botswana** we agree *Category : TECHNICAL*	Noted.
37	36	This irradiation treatment should not be applied to fruits and vegetables stored in modified atmospheres because modified atmospheres may affect the treatment efficacy.	C	**China** These sentence needs to check or add the related reference. Modified atmospheres may or may not affect irradiation treatment efficacy. The related reference should be noted. *Category : SUBSTANTIVE*	Considered but not incorporated. This statement is consistent with other irradiation PTs, all of which do not permit the application of approved irradiation dosages under modified atmosphere conditions. However this issue was reviewed by the TPPT and the Standards Commmittee agreed to propose the removal of the statemment to the Comission on Phytosnitary Measures.
38	36	This irradiation treatment should not be applied to fruits and vegetables stored in modified atmospheres because modified atmospheres may affect the treatment efficacy.	C	**Botswana** we agree *Category : TECHNICAL*	Noted.
				Other relevant information	
39	37	**Other relevant information**	C	**Botswana** in agreement as it can be reviewed *Category : TECHNICAL*	Noted.

40	37	**Other relevant information**	C	**Botswana** no comment *Category : EDITORIAL*	Noted.
41	38	Since irradiation may not result in outright mortality, inspectors may encounter live, but non-viable *Anastrepha* spp. (larvae or puparia) during the inspection process. This does not imply a failure of the treatment.	C	**Kenya** This leave the treatment without an independent verification of efficacy and places a greater burden for assuring quarantine security on the research supporting the treatment *Category : TECHNICAL*	Considered but not incorporated. Consistent with existing irradiation annex PTs under ISPM 28 and provisions under ISPM 18, irradiation treatment objectives allow for outcomes other than mortality – specifically the prevention of successful development, sterility and inactivation. While the prevention of reproduction could be achieved at lower doses, the position adopted for standard development through the TPPT process is to target treatments so as to achieve the prevention of successful development through non-emergence of adults. This provides an additional layer of confidence to NPPOs during at-border clearance procedures by minimising the risk of regulatory actions being triggered by released live insects being caught in surveillance traps.
42	38	Since irradiation may not result in outright mortality, inspectors may encounter live, but non-viable *Anastrepha* spp. (larvae or puparia) during the inspection process. This does not imply a failure of the treatment.	C	**Kenya** This leave the treatment without an independent verification of efficacy and places a greater burden for assuring quarantine security on the research supporting the treatment *Category : TECHNICAL*	Considered but not incorporated. Consistent with existing irradiation annex PTs under ISPM 28 and provisions under ISPM 18, irradiation treatment objectives allow for outcomes other than mortality – specifically the prevention of successful development, sterility and inactivation. While the prevention of reproduction could be achieved at lower doses, the position adopted for standard development through the TPPT process is to target treatments so as to achieve the prevention of successful development through non-emergence of adults. This provides an additional layer of confidence to NPPOs during at-border clearance procedures by minimising the risk of regulatory actions being triggered by released live insects being caught in surveillance traps.
43	38	Since irradiation may not result in outright mortality, inspectors may encounter live, but non-viable *Anastrepha* spp. (larvae or puparia) during the inspection process. This does not imply a failure of the treatment.	C	**Botswana** we concur *Category : EDITORIAL*	Noted.
44	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in	P	**European Union** This type of information is given for the other PTs. The relevant information was found in table 2 and paragraph 88 of the 2018-06 TPPT report, and is to be checked by the TPPT. *Category : SUBSTANTIVE*	Modified. The TPPT amneded the draft annex to include an additional clarifying statement on how the efficacy calculation was determined (species, commodity and estimated treated insects). The references cited under section [39] of the draft annex in its original form pertains to relevant research used to inform the extropalation to all species.

		FAO/IAEA (2017).The efficacy of this schedule was calculated based on a total of 94 400 third-instar larvae of A. ludens treated in Citrus paradisi at 69 Gy with no viable adult emergence.			
45	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).The efficacy of this schedule was calculated based on a total of 94 400 third-instar larvae of *A. ludens* treated in *Citrus paradisi* at 69 Gy with no viable adult emergence.	P	**EPPO** This type of information is given for the other PTs. The relevant information was found in table 2 and paragraph 88 of the 2018-06 TPPT report, and is to be checked by the TPPT. *Category : SUBSTANTIVE*	Modified. The TPPT amended the draft annex to include an additional clarifying statement on how the efficacy calculation was determined (species, commodity and estimated treated insects). The references cited under section [39] of the draft annex in its original form pertains to relevant research used to inform the extropalation to all species.
46	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).	C	**Botswana** noted *Category : TECHNICAL*	Noted.
47	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).	C	**Botswana** noted *Category : EDITORIAL*	Noted.
48	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the	C	**Botswana** noted *Category : EDITORIAL*	Noted.

		research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).			
49	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).	C	**Botswana** noted *Category : EDITORIAL*	Noted.
50	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).	C	**Botswana** noted *Category : SUBSTANTIVE*	Noted.
51	39	The Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on the research reviewed in Hallman (2013) and research reported in FAO/IAEA (2017).	C	**Botswana** noted *Category : EDITORIAL*	Noted.
52	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include	P	**European Union** Typos. *Category : EDITORIAL*	Noted. The issue will be addressed by the IPPC editor in alignment with the FAO and IPPC Style Guide. Considered but not incorporated Changing *Malus pulima* to *Malus indica* is not incorporated, as *Mangifera indica* is meant there.

		studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha, Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis*, *M. indica* and artificial diet), *A. obliqua* (*Averrhoa* ~~*carambola*~~ *carambola, C. sinensis*,, and *Psidium guajaba); A. suspensa* (*A. carambola*, *C. paradisi* and *M. indica*), *Bactrocera tryoni* (*C. sinensis*, *Solanum lycopersicum*, *Malus* ~~*pumila*~~*indica*, ~~*M. indica*~~*M. pumila*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi* (*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum*, *Hordium vulgare* and *Zea mays*), *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991; Hallman, 2004a, ~~b,~~ b and 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is			

		recognized, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			
53	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha, Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis, M. indica* and artificial diet), *A. obliqua* (*Averrhoa ~~carambola C. sinensis~~carambola*, ~~–~~ *C. sinensis* and *Psidium guajaba);* *A. suspensa* (*A. carambola, C. paradisi* and *M. indica*), *Bactrocera tryoni* (*C. sinensis,*	P	**EPPO** Typos. *Category : EDITORIAL*	Noted. The issue will be addressed by the IPPC editor in alignment with the FAO and IPPC Style Guide. Considered but not incorporated Changing *Malus pulima* to *Malus indica* is not incorporated, as *Mangifera indica* is meant there.

		Solanum lycopersicum, *Malus* ~~*pumila*~~*indica*, *M.* ~~*indica*~~*pumila*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi* (*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum*, *Hordium vulgare* and *Zea mays*), *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991; Hallman, 2004a, ~~b,~~ b and 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is recognized, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			
54	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on	C	**Kenya** Further evidence possibly through a review paper needed to justify extrapolation of	Considered but not incorporated. Regarding the extrapolation of irradiation schedules across commodities, it is the internationally recognised position that efficacious treatments apply to all fruits and vegetables given that dosimetry systems measure the actual dose

		knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha*, *Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis*, *M. indica* and artificial diet), *A. obliqua* (*Averrhoa carambola C. sinensis*,, and *Psidium guajaba); A. suspensa* (*A. carambola*, *C. paradisi* and *M. indica*), *Bactrocera tryoni* (*C. sinensis*, *Solanum lycopersicum*, *Malus pumila*, *M. indica*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi* (*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum*, *Hordium vulgare* and *Zea mays*), *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991;		treatment efficacy to all fruits and vegetables. *Category : TECHNICAL*	absorbed by the target pest independent of the commodity. Restrictions under irradiation annex treatment schedules apply only around the utilisation of modified atmosphere conditions as this may introduce artificial parameters which could adversely impact treatment efficacy at the prescribed dose. This approach is consistent with all existing irradiation PTs under ISPM 28 and accordingly, has been adopted for this proposed annex treatment standard also. A number of pest/commodoity combinations along with the relevant published research to support extrapolation to all fruits and vegetables are already stipulated under section [40] of the draft annex. As is standard however, should new information become available to suggest otherwise, the TPPT will review relevant PTs in context with any supporting information. The draft annex includes wording to this effect under [40] also.

		Hallman, 2004a, b, 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is recognized, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			
55	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha, Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis*,	P	**China** These researches are suggested adding to this paragraph and relevant references are added. Theys have been published and adopted for developing the draft Annexes to ISPM 28. *Category : SUBSTANTIVE*	Considered but not incorporated. The rationale adopted in the proposed standard appears to be for the inclusion of pests where more than one host commodity justifies the extrapolation. The inclusions proposed by the commenter are for three pests (*Bactrocera dorsalis*, *B. tau* and *Carposina sasakii*) which have only single commodity references. Their inclusion is not consistent with the other pests stipulated under section [40] of the draft PT.

		M. indica and artificial diet), *A. obliqua* (*Averrhoa carambola C. sinensis*,, and *Psidium guajaba);* *A. suspensa* (*A. carambola*, *C. paradisi* and *M. indica*), *Bactrocera dorsalis (Psidium guajava), B. tau (Cucurbita maxima),* *Bactrocera tryoni* (*C. sinensis*, *Solanum lycopersicum*, *Malus pumila*, *M. indica*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi* (*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum*, *Hordium vulgare* and *Zea mays*), *Carposina sasakii (Malus pumila),* *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991; Hallman, 2004a, b, 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is recognized, however, that treatment efficacy has not been tested for all potential fruit and			

		vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			
56	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha, Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis, M. indica* and artificial diet), *A. obliqua* (*Averrhoa carambola C. sinensis,,* and *Psidium guajaba); A. suspensa* (*A. carambola, C. paradisi* and *M. indica*), *Bactrocera tryoni* (*C. sinensis, Solanum lycopersicum, Malus pumila, M. indica*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi*	C	**Botswana** noted *Category : TECHNICAL*	Noted.

		(*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum, Hordium vulgare* and *Zea mays*), *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991; Hallman, 2004a, b, 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is recognized, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			
57	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest	C	**Botswana** in agreement as it can be reviewed as and when necessary *Category : TECHNICAL*	Noted.

		independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha*, *Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis*, *M. indica* and artificial diet), *A. obliqua* (*Averrhoa carambola C. sinensis*,, and *Psidium guajaba);* *A. suspensa* (*A. carambola*, *C. paradisi* and *M. indica*), *Bactrocera tryoni* (*C. sinensis*, *Solanum lycopersicum*, *Malus pumila*, *M. indica*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi* (*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum*, *Hordium vulgare* and *Zea mays*), *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991; Hallman, 2004a, b, 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and			

		Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is recognized, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			
58	40	Extrapolation of treatment efficacy to all fruits and vegetables was based on knowledge and experience that radiation dosimetry systems measure the actual radiation dose absorbed by the target pest independent of host commodity, and evidence from research studies on a variety of pests and commodities. These include studies on the following pests and hosts: *Anastrepha fraterculus (Eugenia uvalha*, *Malus pumila* and *Mangifera indica); A. ludens* (*Citrus paradisi*, *Citrus sinensis, M. indica* and artificial diet), *A. obliqua* (*Averrhoa carambola C. sinensis,*, and *Psidium guajaba); A. suspensa* (*A. carambola,*	C	**Botswana** in agreement as it can be reviewed *Category : TECHNICAL*	Noted.

		C. paradisi and *M. indica*), *Bactrocera tryoni* (*C. sinensis*, *Solanum lycopersicum*, *Malus pumila*, *M. indica*, *Persea americana* and *Prunus avium*), *Pseudococcus jackbeardsleyi* (*Cucurbita* sp. and *Solanum tuberosum*), *Tribolium confusum* (*Triticum aestivum, Hordium vulgare* and *Zea mays*), *Cydia pomonella* (*M. pumila* and artificial diet) and *Grapholita molesta* (*M. pumila* and artificial diet) (Bustos *et al.*, 2004; Gould and von Windeguth, 1991; Hallman, 2004a, b, 2013; Hallman and Martinez, 2001; Hallman *et al*., 2010; Jessup *et al.*, 1992; Mansour, 2003; Tuncbilek and Kansu, 1966; von Windeguth, 1986; von Windeguth and Ismail, 1987; Zhan *et al*., 2016). It is recognized, however, that treatment efficacy has not been tested for all potential fruit and vegetable hosts of the target pest. If evidence becomes available to show that the extrapolation of the treatment to cover all hosts of this pest is incorrect, the treatment will be reviewed.			

	References

59	49	~~**Hallman, G.J. & Martinez, L.R.** 2001. Ionizing irradiation quarantine treatment against Mexican fruit fly (Diptera: Tephritidae) in citrus fruits. *Postharvest Biology and Technology*, 23: 71–77.~~	P	**European Union** To be moved after Hallman, Levang-Brilz et al. (alphabetical order). *Category : EDITORIAL*	Incorporated.
60	49	~~**Hallman, G.J. & Martinez, L.R.** 2001. Ionizing irradiation quarantine treatment against Mexican fruit fly (Diptera: Tephritidae) in citrus fruits. *Postharvest Biology and Technology*, 23: 71–77.~~	P	**EPPO** To be moved after Hallman, Levang-Brilz et al. (alphabetical order). *Category : EDITORIAL*	Incorporated
61	50	**Hallman, G.J., Levang-Brilz, N.M., Zettler, J.L. & Winborne, I.C.** 2010. Factors affecting ionizing radiation phytosanitary treatments, and implications for research and generic treatments. *Journal of Economic Entomology*, 103:~~1950-1963~~1950–1963.	P	**European Union** Typo. *Category : EDITORIAL*	Incorporated.
62	50	**Hallman, G.J., Levang-Brilz, N.M., Zettler, J.L. & Winborne, I.C.** 2010. Factors affecting ionizing radiation phytosanitary treatments, and implications for research and generic treatments. *Journal of Economic Entomology*, 103:1950-1963.**Hallman, G.J. & Martinez, L.R.** 2001. Ionizing irradiation quarantine treatment	P	**European Union** Moved from above (alphabetical order). *Category : EDITORIAL*	Incorporated.

		against Mexican fruit fly (Diptera: Tephritidae) in citrus fruits. Postharvest Biology and Technology, 23: 71−77.			
63	50	**Hallman, G.J., Levang-Brilz, N.M., Zettler, J.L. & Winborne, I.C.** 2010. Factors affecting ionizing radiation phytosanitary treatments, and implications for research and generic treatments. *Journal of Economic Entomology*, 103:~~1950-1963~~1950–1963.**Hallman, G.J. & Martinez, L.R.** 2001. Ionizing irradiation quarantine treatment against Mexican fruit fly (Diptera: Tephritidae) in citrus fruits. Postharvest Biology and Technology, 23: 71−77.	P	**EPPO** Moved after Hallman, Levang-Brilz et al. (alphabetical order). Typo. *Category : EDITORIAL*	Incorporated.
64	53	**Tuncbilek, A.S. & Kansu, I.A.** 1966. The influence of rearing medium on the irradiation sensitivity of eggs and larvae of the flour beetle, *Tribolium confusum* J. du Val. *Journal of Stored Products Research* 32: ~~1-6~~1–6.	P	**European Union** Typo. *Category : EDITORIAL*	Incorporated.
65	53	**Tuncbilek, A.S. & Kansu, I.A.** 1966. The influence of rearing medium on the irradiation sensitivity of eggs and larvae of the flour beetle, *Tribolium*	P	**EPPO** Typo. *Category : EDITORIAL*	Incorporated.

		confusum J. du Val. *Journal of Stored Products Research* 32: ~~1–6~~1–6.			
66	56	**Zhan, G.P., Shao, Y., Yu, Q., Xu, L., Liu, B., Wang, Y.J. & Wang, Q.L.** 2016.	P	**European Union** Typo. *Category : EDITORIAL*	Noted. The issue will be addressed by the IPPC editor in alignment with the FAO and IPPC Style Guide.
67	56	**Zhan, G.P., Shao, Y., Yu, Q., Xu, L., Liu, B., Wang, Y.J. & Wang, Q.L.** 2016.	P	**EPPO** Typo. *Category : EDITORIAL*	Noted. The issue will be addressed by the IPPC editor in alignment with the FAO and IPPC Style Guide.
68	56	**Zhao, J.P., Ma, J., Wu, M.T, Jiao, X.G., Wang, Z.G, Liang, F. & Zhan, G.P. 2017.** Gamma radiation as a phytosanitary treatment against larvae and pupae of Bactrocera dorsalis (Diptera: Tephritidae) .**Zhan, G.P., Li, B.S., Gao, M.X, Liu, B., Wang, Y.J., Liu, T. & Ren, L.L. 2014.** Phytosanitary irradiation of peach fruit moth (Lepidoptera: Carposinidae) in apple fruits. Radiation Physics and Chemistry, 103: 153–157.**Zhan, G.P., Ren, L.L., Shao, Y., Wang, Q.L., Yu, D.J., Wang, Y.J. & Li, T.X. 2015.** Gamma irradiation as a phytosanitary treatment of Bactrocera tau (Diptera: Tephritidae) in pumpkin fruits. Journal of Economic Entomology, 108(1): 88–94.**Zhan, G.P., Shao, Y., Yu, Q., Xu, L., Liu, B., Wang, Y.J. & Wang, Q.L.** 2016.	P	**China** These researches are suggested adding to this paragraph and relevant references are added. Theys have been published and adopted for developing the draft Annexes to ISPM 28. *Category : EDITORIAL*	Considered, but not incorporated. This proposed inclusion is a follow-on from comment (55) made by the same commenter. However, that proposed inclusion was not considered further as the rationale adopted in the standard for inclusing pests under section [40] is for circumstances where more than one host commodity justifies the extrapolation.