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***[1]***DRAFT ANNEX to ISPM 37: Criteria for evaluation of available information for determining host status of fruit to fruit flies (2018-011)

***[2]*Status box**

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| ***[3]***This is not an official part of the standard and it will be modified by the IPPC Secretariat after adoption. | |
| ***[4]*Date of this document** | ***[5]***2022-05-16 |
| ***[6]*Document category** | ***[7]***Draft annex to ISPM 37 |
| ***[8]*Current document stage** | ***[9]****To* first consultation |
| ***[10]*Major stages** | ***[11]***2019-04 CPM-14 added topic *Criteria for the determination of host status of fruit to fruit flies based on available information (Annex to ISPM 37)* (2018-011) with priority 3.  ***[12]***2020-11 Standard Committee (SC) approved Specification 71 (*Criteria for determining host status of fruit to fruit flies based on available information*).  ***[13]***2022-01 Expert working group met virtually and drafted the annex.  ***[14]***2022-05 SC revised and approved for first consultation. |
| ***[15]*Steward history** | ***[16]***2019-05 Marina ZLOTINA (US, Lead Steward)  ***[17]***2019-05 Mariangela CIAMPITTI (IT, Assistant Steward)  ***[18]***2019-05 Sophie PETERSON (AU, Assistant Steward) |
| ***[19]*Notes** | ***[20]***This section will remain on the drafts going for consultation but deleted before adoption.  ***[21]***2022-02 Edited  ***[22]***2022-05 SC changed title to *Criteria for evaluation of available information for determining host status of fruit to fruit flies*  ***[23]***2022-05 Edited |

***[24]***This annex was adopted by the [XXX] Session of the Commission on Phytosanitary Measures in [XXX 20XX].

***[25]***This annex is a prescriptive part of the standard.

***[26]***ANNEX 1: Criteria for evaluation of available information for determining host status of fruit to fruit flies

***[27]***1. Introduction

***[28]***National plant protection organizations (NPPOs) use a variety of published information relating to fruit fly host status when they implement adopted ISPMs related to pest risk analysis (PRA), pest free areas, the design of import and export programmes, eradication, surveillance, pest records, and more. There is considerable inconsistency, however, in the interpretation of published information, and terms used in the literature to describe hosts do not always align with those defined in this standard. This can lead to disputes between NPPOs. This annex promotes harmonization to prevent future trade challenges. It outlines the criteria that should be used when evaluating evidence to determine the host status of fruit to fruit flies (Tephritidae) based on information that already exists, and provides guidance on assessing the uncertainty of the resulting host status determination. It also provides guidance to NPPOs on applying host status determinations in activities such as PRA.

***[29]***2. Host terminology in available literature and alignment with the host status categories used in this standard

***[30]***In addition to the terms for hosts defined in this standard, many other terms are used in published literature, including “potential host”, “artificial host”, “conditional non-host”, “preferred host”, “general host”, “wild host” and “alternative host”. When the host status of a plant species or cultivar is given using a term other than those defined in this standard, the host status should be reclassified into one of the three host status categories in this standard.

***[31]***A natural host is a plant species or cultivar:

* ***[32]***in which the target fruit fly develops completely from egg to viable adult, starting in attached fruit that is free from any mechanical or natural damage, under natural conditions.

***[33]***A conditional host is a plant species or cultivar:

* ***[34]***that shows evidence of infestation under semi-natural or certain, clearly described natural conditions (including field trials); and
* ***[35]***in which the target fruit fly develops completely from egg to viable adult, starting in attached fruit that is free from any mechanical or natural damage, under clearly described conditions.

***[36]***A non-host is a plant species or cultivar:

* ***[37]***in which the target fruit fly does not develop at all in attached fruit that is free from any mechanical or natural damage under natural conditions, or starts to develop in such fruit under natural conditions but does not complete its development to viable adult; or
* ***[38]***in which the target fruit fly does not develop from egg to viable adult in field trials, in trials conducted under semi-natural conditions as set out in this standard or in laboratory experiments.

***[39]***3. Criteria for determining host status

***[40]***3.1 General evaluation criteria

***[41]***When determining host status based on available information, NPPOs should assess the completeness, reliability and applicability of the information to establish whether it provides the following:

* ***[42]***an accurate identification of the plant species (scientific name and authority) or cultivar, with supporting evidence (e.g. references used for plant (including cultivar) identification, verification of plant material by a specialist taxonomist, molecular identification, voucher specimens);
* ***[43]***a description of the sampled area (e.g. management practices if in a commercial orchard, presence of other natural or conditional hosts in the area), details of location (e.g. geographic coordinates, climate, growing region, elevation) and details of collection dates (e.g. early or late season, multiple years);
* ***[44]***details of the fruit-collection conditions (e.g. commercial or non-commercial environment; picked from the plant or collected from the ground);
* ***[45]***a description of the fruit-sampling method (e.g. the number and distribution of plants and the number of fruits sampled per plant);
* ***[46]***details of the condition of the fruit, including the stage of its maturity (or other indicators of ripeness, such as dry matter content, colour, sugar content, ripeness scale) and the condition of its skin or rind (whether it is damaged or is free from any mechanical or natural damage);
* ***[47]***evidence of the presence of the target fruit fly species in the sampled area before and during sampling (e.g. trap records);
* ***[48]***a description of the fruit-dissection method (e.g. peeling and fruit cutting for detection of eggs or larvae) for determination of infestation and, where there is infestation, the fruit fly rearing method (e.g. fruit-holding conditions, including temperature, humidity, daylength, substrate for pupation including soil moisture) for development to adults (taking in consideration that eggs and larvae should not have been transferred from infested fruit to artificial diet for rearing); and
* ***[49]***a clear presentation of fruit fly rearing results, indicating absence of infestation (e.g. no eggs or larvae, no pupation), a lack of viable fruit fly adults reared from the plant species or cultivar under suitable conditions, or
* ***[50]***an accurate identification of the fruit fly species reared from the fruit together with supporting evidence (e.g. published keys used for fruit fly species identification, verification of fruit fly species by a specialist taxonomist, photographs, molecular identification, voucher specimens).

***[51]***In addition to these general evaluation criteria, which are applicable to all three host status categories, NPPOs should also establish whether the information provides the specific information applicable to the host status category under consideration as described in sections 3.2 to 3.4.

***[52]***3.2 Criteria for natural host

***[53]***The information used to determine natural host status should contain evidence of infestation under clearly described conditions and evidence of development to viable adults.

***[54]***When assessing the completeness, reliability and applicability of the information being used to determine host status, NPPOs should establish whether, in addition to the items listed in section 3.1, the information available also provides the following:

* ***[55]***a description of any phytosanitary treatments applied; and
* ***[56]***details of the viability of emergent adults in terms of their size, flight ability, longevity and fecundity.

***[57]***3.3 Criteria for conditional host

***[58]***The information used to determine conditional host status should contain both evidence of infestation under clearly described conditions and evidence of development to viable adults from either field trials or from trials under semi-natural conditions as set out in this standard, with published methodological details and results.

***[59]***When assessing the completeness, reliability and applicability of the information being used to determine host status, NPPOs should establish whether, in addition to the items listed in section 3.1, the information available also provides the following:

* ***[60]***details of the viability of emergent adults in terms of their size, flight ability, longevity and fecundity; and
* ***[61]***evidence of the presence of the target fruit fly species in fruit under semi-natural or certain, clearly described environmental conditions (e.g. under certain conditions of population pressure from conspecific fruit flies, presence of other fruit fly and insect species, fruit fly management measures, absence of other natural or conditional hosts in the area, temperature, humidity or rainfall).

***[62]***3.4 Criteria for non-host

***[63]***The information used to determine non-host status should contain evidence of the absence of infestation, or of the incomplete development to viable adults, derived from field surveillance by fruit sampling, field trials, or trials conducted under semi-natural conditions as set out in this standard, with published methodological details and results. If this information is not available, data from laboratory experiments may be used.

***[64]***If the information on non-host status is derived from field surveillance by fruit sampling, NPPOs should establish whether, in addition to the items listed in section 3.1, the information available also provides the following:

* ***[65]***evidence of the presence of reproductively mature adults of the target fruit fly species in the sampled area before and during sampling (e.g. from trap records); and
* ***[66]***a description of the fruit-handling procedures (e.g. harvesting procedures, post-harvest processing and treatment, and transportation procedures).

***[67]***If the information on non-host status is derived from field trials, there are no further criteria for evaluation of the information other than the general evaluation criteria listed in section 3.1.

***[68]***If the information on non-host status is derived from laboratory experiments, NPPOs should establish whether, in addition to the items listed in section 3.1, the information available also provides the following:

* ***[69]***details of the colony’s origin (e.g. date of collection and location of natural host for the parental line, number of generations reared by the start of the experiment (preferably not more than five generations), substrate used for egg collection (preferably fruit substrate);
* ***[70]***a description of the fruit fly rearing method used for maintenance of the colony (e.g. proven artificial diet used for larvae; conditions of the rearing room, such as temperature, humidity, light);
* ***[71]***details of the quality of the fruit fly colony used in the experiment (e.g. developmental rates and survival, mating period, oviposition period, fecundity);
* ***[72]***details of the physiological condition of the fruit fly females used (e.g. mating status, age; the fruit fly adult females used should be mated and should be at the peak of their reproductive potential);
* ***[73]***confirmation that the plant material used was free from pesticides and other products that could have negatively affected the oviposition behaviour of the fruit fly females used;
* ***[74]***details of the natural infestation rate of the plant species or cultivar used in the experiment (the fruit fly species reared and the number of fruit fly adults emerged per fruit or per weight of fruit, as determined by incubating a sample of the fruit used in each replicate of the experiment without exposing it to the target fruit fly); and
* ***[75]***a description of the method used in the laboratory experiment (e.g. cages used, exposure period, presence of food and water in cages, number of females used per cage, presence of males in cages, use of a natural host as a control in separate cages to demonstrate normal oviposition behaviour, time of conduct of experiment, conditions during experiment, number of replicates using different cohorts).

***[76]***4. Assessing the uncertainty of the host status determination

***[77]***Available information relating to the host status of plant species or cultivars to fruit flies has varying levels of quality, completeness, reliability and applicability, and these will, in turn, influence the level of uncertainty associated with the host status determination.

***[78]***The quality of the information should be assessed based on the design of the method used to determine the type of host, the sample size, the extent of replication, the presentation of results and the expertise of the contributors.

***[79]***The completeness of the information should be assessed against the criteria listed in this standard for the determination of host status in relation to the plant species or cultivar and the fruit fly species being evaluated. Of these criteria, NPPOs should consider the key elements for the determination of natural host status and non-host status to be the identification of the plant species or cultivar and the fruit fly species by a taxonomist or trained specialist, the deposition of voucher specimens, and the details provided of the fruit origin and condition.

***[80]***The quality, completeness, reliability and applicability of the information sources used will dictate the level of uncertainty associated with the resulting host status determination: the greater these are, the lower the uncertainty. A host status determination based on multiple reports from independent sources, particularly those of higher reliability, has a low level of uncertainty. Using less reliable sources can increase the level of uncertainty.

***[81]***The following cases are examples of situations where there can be particular uncertainty associated with the host status determination because of inadequate information:

* ***[82]***A new plant species or cultivar is introduced into an area where a fruit fly species is present, or where a fruit fly establishes in a new area and encounters new plant species.
* ***[83]***One or both parent species of a newly developed hybrid or cultivar are known natural or conditional hosts (in which case the host status of the hybrid should be considered for its potential as a natural or conditional host until its host status can be confirmed otherwise).
* ***[84]***There is a taxonomic change in a plant or fruit fly species.
* ***[85]***A new interception record lacks relevant information or contains unconfirmed information (e.g. life stage not mentioned, not clear whether the fruit fly or larvae was found infesting the fruit, quality of fruit not mentioned).

***[86]***If there is a taxonomic change that splits a fruit fly species into two or more species, the host range of each component species is likely to be different. Similarly, if two or more fruit fly species that were thought to be different are synonymized, the species as it is now understood is likely to have a different host range. Particular attention should be paid to taxonomic changes when evaluating host records.

***[87]***The result of an analysis of host status should be accompanied by a determination of the level and nature of the associated uncertainty.

***[88]***5. Application of the host status of a fruit to a fruit fly

***[89]***When conducting a PRA for a fruit commodity, the following requirements apply:

* ***[90]***The host status of a fruit to a fruit fly should be considered in the initiation stage of PRA; in the evaluation of the probability of introduction and spread and in the assessment of impacts; in the evaluation and selection of pest risk management options to mitigate the pest risk (e.g. pre-inspection, inspection, phytosanitary treatment); and in risk communication (e.g. consultation and sharing of information).
* ***[91]***Even if plant species or cultivars are categorized as natural hosts, they may not all pose the same pest risk. Therefore, when conducting a PRA for import of fruit from a plant species or cultivar categorized as a natural host for a particular fruit fly species, the evidence that led to the decision of natural host status should be analysed in detail so that phytosanitary measures can be selected that are appropriate for the level of pest risk posed.
* ***[92]***When a PRA is conducted for import of fruit from a plant species or cultivar categorized as a non-host for a particular fruit fly species, that fruit fly species should be eliminated from further consideration at the initiation or pest categorization stages.
* ***[93]***When a PRA is conducted for import of fruit from a plant species or cultivar categorized as a conditional host, the pest risk of the conditional host should be considered as being lower than that of a natural host (when infested by the same species of fruit fly). Phytosanitary measures should be appropriate for the pest risk posed by the conditional host.

***[94]***The use of the host status of a fruit to a fruit fly in the establishment and maintenance of pest free areas should be in accordance with ISPM 4 (*Requirements for the establishment of pest free areas*) and ISPM 26 (*Establishment of pest free areas for fruit flies (Tephritidae)*).

***[95]*Potential implementation issues**

***[96]***This section is not part of the standard. The Standards Committee in May 2016 requested the secretariat to gather information on any potential implementation issues related to this draft. Please provide details and proposals on how to address these potential implementation issues.