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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 (*Tephritidae*) (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]***2023-05-25 |
| ***[6]*Document category** | ***[7]***Draft annex to ISPM 37 |
| ***[8]*Current document stage** | ***[9]****To* second 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 Standards 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]***2022-07 First consultation.  ***[16]***2023-05 SC-7 revised and approved for second consultation. |
| ***[17]*Steward history** | ***[18]***2019-05 Marina ZLOTINA (US, Lead Steward)  ***[19]***2019-05 Mariangela CIAMPITTI (IT, Assistant Steward)  ***[20]***2019-05 Sophie PETERSON (AU, Assistant Steward) |
| ***[21]*Notes** | ***[22]***This section will remain on the drafts going for consultation but deleted before adoption.  ***[23]***2022-02 Edited  ***[24]***2022-05 SC changed title to *Criteria for evaluation of available information for determining host status of fruit to fruit flies*  ***[25]***2022-05 Edited  ***[26]***2022-05 SC-7 changed title to *Criteria for evaluation of available information for determining host status of fruit to fruit flies (Tephritidae)*  ***[27]***2022-05 Edited |

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

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

***[30]***ANNEX 1: Criteria for evaluation of available information for determining host status of fruit to fruit flies (*Tephritidae*)

***[31]***1. Introduction

***[32]***National plant protection organizations (NPPOs) use a variety of available information (e.g. scientific literature, NPPO reports, pest records) related to the host status of fruit to fruit flies 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 available information, and the terms used in such information to describe hosts do not always align with those defined in the core text of this standard, which can lead to trade disruption. This annex promotes harmonization by outlining the criteria that should be used when evaluating available information to determine the host status of fruit to fruit flies (*Tephritidae*) 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. The annex provides guidance on interpretation of available information only in relation to undamaged fruit, based on the definitions and requirements set out in the core text of this standard.

***[33]***2. Terms for the host status categories used in this standard

***[34]***Many terms are used in published literature to describe the host status of fruit-to-fruit flies including “potential host”, “artificial host”, “conditional non-host”, “preferred host”, “general host”, “wild host” and “alternative host”. National plant protection organizations should, however, use one of the three host status categories described in the Definitions section of this standard: natural host, conditional host, and non-host.

***[35]***3. Criteria for evaluating available information

***[36]***3.1 General criteria

***[37]***When determining host status based on available information, NPPOs should assess the quality (i.e. completeness, reliability and relevance) of the information by considering whether it provides the following:

* ***[38]***an accurate identification of the plant species (scientific name and authority) or cultivar, with supporting evidence (e.g. published keys and taxonomic publications used for plant (including cultivar) identification, verification of plant material by a specialist taxonomist, molecular identification, voucher specimens);
* ***[39]***a description of the sampled area (e.g. any pest-control measures applied in the area, any phytosanitary measures applied in the area, 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);
* ***[40]***evidence of the presence of the target fruit fly, or other fruit fly species, or both, in the sampled area before and during sampling (e.g. trap records);
* ***[41]***details of the fruit-collection conditions (e.g. commercial or non-commercial environment, harvested from the plant or collected after falling to the ground);
* ***[42]***a description of the fruit-handling procedures (e.g. harvesting procedures, post-harvest processing and treatment, transportation procedures);
* ***[43]***a description of the fruit-sampling method (e.g. number and distribution of plants sampled and number of fruits sampled per plant);
* ***[44]***details of the condition of the skin or rind (e.g. rind thickness);
* ***[45]***details of whether the fruit is damaged or not, the cause of any damage (e.g. mechanical or natural damage), and the extent of the damage;
* ***[46]***details of the stage of fruit maturity (or other indicators of ripeness, such as dry matter content, colour, sugar content, standardized or objective ripeness scale);
* ***[47]***if used, a description of the fruit-dissection method (e.g. peeling and fruit cutting for detection of eggs or larvae);
* ***[48]***if used, a description of the fruit-holding method (e.g. maturity of fruits, temperature, humidity, day length, substrate for pupation including soil moisture) for determination of infestation;
* ***[49]***where there is infestation, a description of the fruit fly rearing method for development to adults (taking into consideration that eggs and larvae should not have been transferred from infested fruit to artificial diet for rearing);
* ***[50]***where there is infestation, a clear presentation of fruit fly rearing results, indicating the number of fruit fly adults reared per fruit or per weight of fruit and the total number and weight of the fruit sample under suitable conditions;
* ***[51]***an accurate identification of the fruit fly species (scientific name and authority) reared from the fruit together with supporting evidence (e.g. published keys and taxonomic publications used for fruit fly species identification, verification of fruit fly species by a specialist taxonomist, photographs, molecular identification, voucher specimens); and
* ***[52]***in the absence of infestation, a clear presentation of fruit fly rearing results (e.g. no eggs or larvae, no pupation, no viable fruit fly adults reared from the plant species or cultivar under suitable conditions).

***[53]***In addition to these general evaluation criteria, further information is required for each host status category as described in sections 3.2 to 3.4 of this annex.

***[54]***3.2 Natural host

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

***[56]***National plant protection organizations should consider whether, in addition to the items listed in section 3.1 of this annex, the information available also provides details of the viability of emergent adults in terms of their size, flight ability, longevity and fecundity.

***[57]***3.3 Conditional host

***[58]***The information used to determine conditional host status should contain evidence of both infestation and development to viable adults from trials under semi-natural field conditions as set out in section 2 of this standard, with published methodological details and results.

***[59]***National plant protection organizations should consider whether, in addition to the items listed in section 3.1 of this annex, the information available also provides details of the viability of emergent adults in terms of their size, flight ability, longevity and fecundity.

***[60]***3.4 Non-host

***[61]***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 trials or trials conducted under semi-natural conditions as set out in section 2 of this standard, with published methodological details and results. If this information is not available, data from laboratory experiments may be used.

***[62]***If the information on non-host status is derived from field surveillance by fruit sampling, NPPOs should consider whether, in addition to the items listed in section 3.1 of this annex, the information available also provides 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).

***[63]***If the information on non-host status is derived from field trials or from trials conducted under semi-natural conditions, there are no further criteria for evaluation of the information other than the general evaluation criteria listed in section 3.1 of this annex.

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

* ***[65]***details of the fruit fly 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, unless wild types are added during the maintenance of the colony), substrate used for egg collection (preferably fruit substrate));
* ***[66]***a description of the fruit fly rearing method used for maintenance of the colony (e.g. artificial diet used for larvae; conditions of the rearing room, such as temperature, humidity, light);
* ***[67]***details of the quality of the fruit fly colony used in the experiment (e.g. developmental rates and survival, mating period, oviposition period, fecundity);
* ***[68]***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);
* ***[69]***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;
* ***[70]***details of the natural infestation rate of the plant species or cultivar used in the experiment (fruit fly species identified and 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
* ***[71]***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).

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

***[73]***The available information related to the host status of plant species or cultivars to fruit flies has varying levels of quality (i.e. completeness, reliability and relevance) and this will, in turn, influence the level of uncertainty associated with the host status determination. As a general rule, the reliability of a host record diminishes with the age of the publication. Further guidance on the quality of information can be found in ISPM 6 (*Surveillance*), ISPM 8 (*Determination of pest status in an area*) and IPPC Secretariat (2021).

***[74]***The quality of the information should be assessed based on the design of the method used to determine the type of host (e.g. sample size, number of replicates), the presentation of results and the expertise of the contributors.

***[75]***The completeness of the information should be assessed against the criteria listed in the section on General requirements in this standard and the evaluation criteria listed in section 3 of this annex. National plant protection organizations should consider the key elements for the determination of host status to be the identification of the plant species or cultivar and the fruit fly species by a specialist taxonomist, the deposition of voucher specimens of plant and fruit fly species, and the details provided of the fruit origin and condition.

***[76]***The quality of the information sources will dictate the level of uncertainty associated with the resulting host status determination: the greater the quality of information, 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.

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

* ***[78]***A new interception record lacks relevant information or contains unconfirmed information (e.g. life stage not mentioned, the fruit fly association with the fruit is unclear, quality of fruit not mentioned).
* ***[79]***A new plant species or cultivar is introduced into an area where a fruit fly species is present, or a fruit fly establishes in a new area and encounters new plant species.
* ***[80]***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 or cultivar should be considered for its potential as a natural or conditional host until it can be confirmed otherwise).
* ***[81]***here is a taxonomic change in a plant or fruit fly species. If there is a taxonomic change that splits a fruit fly species into two or more species, the host range of each valid species could potentially be different. Similarly, if two or more fruit fly species that were thought to be different are now synonymized, the singular new species is likely to have a broader host range. Therefore, particular attention should be paid to taxonomic changes when evaluating host records.

***[82]***The result of an analysis of host status should be accompanied by a determination of the level and nature of the associated uncertainty. If the level of uncertainty is too high, and the NPPO cannot determine host status, appropriate field surveillance by fruit sampling or field trials should be used to determine host status (see step C in the section on General requirements in this standard).

***[83]***5. Application of the host status of a fruit to a fruit fly in pest risk analysis

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

* ***[85]***The host status of a fruit to a fruit fly species (including the level and nature of the associated uncertainty) should be considered:
* ***[86]***in the initiation stage;
* ***[87]***in the evaluation of the probability of introduction and spread and in the assessment of impacts;
* ***[88]***in the evaluation and selection of pest risk management options to mitigate the pest risk (e.g. inspection, phytosanitary treatment); and
* ***[89]***in risk communication (e.g. consultation and sharing of information).
* ***[90]***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.
* ***[91]***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.
* ***[92]***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 described in detail so that phytosanitary measures can be selected that are appropriate for the level of pest risk posed.

***[93]***6. References

***[94]*IPPC Secretariat**. 2021. *Pest status guide – Understanding the principal requirements for pest status determination*. Rome, IPPC Secretariat, FAO. xv + 77 pp. [www.fao.org/documents/card/en/c/cb6103en](https://www.fao.org/documents/card/en/c/cb6103en)

***[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.