

Guidelines on pest risk analysis
Lignes directrices pour l'analyse du risque phytosanitaire**PM 5/9 (1) Preparation of pest lists in the framework of commodity PRAs****Specific scope**

This Standard describes the process recommended for preparing pest lists in the framework of pathway-initiated pest risk analyses (PRAs) where a specific commodity and origin(s) have been identified. It also provides suggestions for criteria for the establishment of

priorities between pests for the preparation of individual PRAs.

Specific approval and amendment

First approved in 2017-09.

1. Introduction

Pathway-initiated pest risk analyses (PRAs) may be performed in particular when international trade is initiated in a commodity not previously imported into a country, or in a commodity from a new area or new country of origin, or when requirements for a commodity already being imported are reviewed. When preparing a pathway-initiated PRA, the first step of the process is to prepare a list of pests that may be carried by the commodity from the specific origin. When a large number of pests are identified for a commodity, priorities should be set for the preparation of PRAs. ISPM 11 (FAO, 2013) states that 'it is preferable to prioritize the listing, based on expert judgement on pest distribution and types of pests'. The potential impact should also be taken into account.

This document proposes a process to harmonize the preparation of pest lists, including the suggestion of criteria for the establishment of priorities between pests for the preparation of individual PRAs. Information collected during this process will be useful when preparing the categorization stage of the individual PRAs for priority pests. A more detailed document presenting the EPPO Secretariat's approach for commodity studies was developed in 2015/2016 (EPPO, 2016), and can also provide useful guidance when preparing pest lists in the framework of commodity PRAs.

2. Initiation

Before starting to compile the pest list, the following elements should be described.

2.1 Area at risk

This is the area for which the pest list is made. It can be a part of a country, a whole country or a region (e.g. the European Union or the Eurasian Economic Union). Whether particular territories (e.g. overseas territories, islands) are part of the area covered should be specified.

2.2 Origin of the commodity

The country of origin should be defined or, if relevant, a list of countries of origin from an area (e.g. countries from West Africa) that can – if useful – be considered together.

2.3 Commodity studied

A precise description of the commodity should be made including:

- Plant species covered when the commodity includes several species (e.g. the commodity is a genus such as *Rosa*).
- The taxonomy of each species (preferred scientific name and common synonyms, common names in English and in the languages relevant to the origins).
- Different parts of the plant comprising the commodity. As some pests may be found on some plant parts only it is important that these different plant parts are clearly identified from the start. Examples include:

Fruits may be with or without green parts such as the calyx or stems, but also leaf material. For example, citrus fruits may be traded with or without leaves and stems attached, apples and pears include both fruits and

stems; tomato fruits may be traded as fruits only, or fruits with the calyx, or fruits on the vine.

Cut flowers may be with or without parts such as leaves or buds. For example, *Rosa* spp. may be traded with buds in addition to leaves and stems.

Regarding wood commodities, wood chips may be made from wood or both wood and bark, possibly originating from the above-ground part of the tree or also from root systems; logs may be with or without bark, squared or not. Plants intended for planting may be with or without growing medium attached, in the dormant stage, with or without fruit.

- Elements of processing and use of commodities: method and degree of processing before export, intended use (see ISPM 32 *Categorization of commodities according to their pest risk*, FAO, 2009).
- Any other elements that could help the selection of pests, such as the method of travel (air, sea), foreseeable consignment frequencies, volumes, seasons.

3. Process for preparing the commodity pest list

The pest list is assembled and analysed to establish priorities for the preparation of individual pest-specific PRAs. A stepwise approach is proposed to reach this objective. A flow diagram is presented in Fig. 1.

3.1 Information gathering

Table A1 in Appendix 1 presents the information to be collected throughout the process. The information can be collected as an Excel spreadsheet or in another compatible data format (an example is provided in Appendix 2). For some information (EPPO Codes, taxonomic information and host plants), an extraction tool is now available in the EPPO Global Database (<https://data.eppo.int/>).

Information should be collected in sequence in order to avoid recording superfluous data.

A stepwise approach using various sources of information is recommended.

3.2 Step 1: Listing pests for the plant species/commodity

The aim of Step 1 is to collect a list of pests of the plant species forming the commodity. Vectors of pests are also included.

→Output: 'Step 1 list': pest list for the plant species.

The list should contain all pests considered for the plant species and include information that can be collected quickly (i.e. not all information is collected at Step 1; see below). In some cases, the pest status of an organism is not clear and this organism is kept in the list until this is clarified.

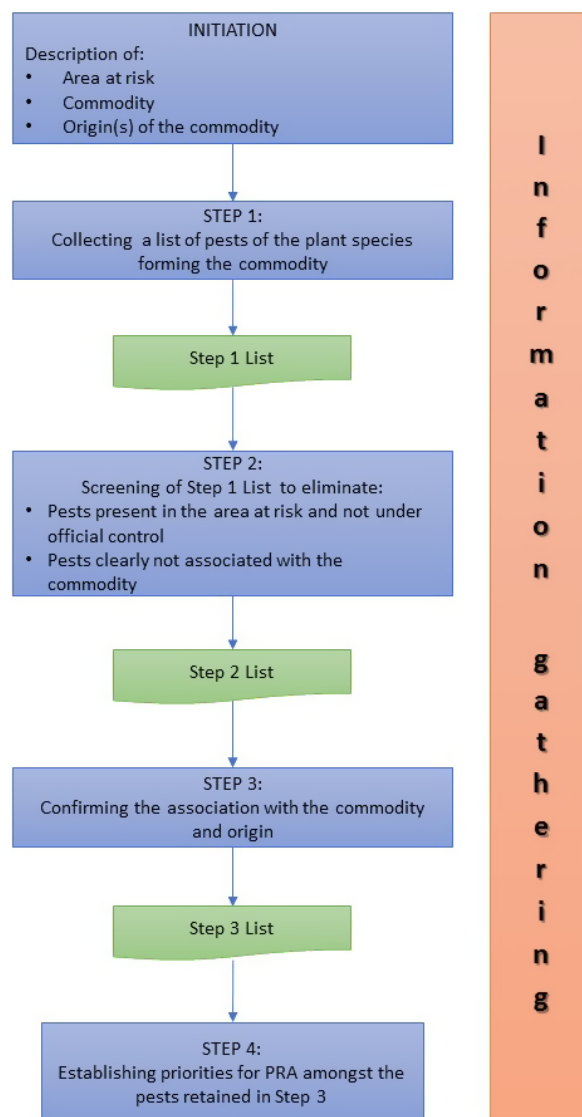


Fig. 1 Flow diagram for the preparation of pest lists in the framework of commodity PRAs.

At this stage, no attempt is made to restrict the list to the commodity or the origin(s) concerned as it may be used again for preparing pest lists for another commodity of the same plant or for a different origin.

The list of pests should be prepared based on datasets such as the EPPO Global Database, the CABI Crop Protection Compendium (CPC) and any other sources that are readily available for the commodity, such as existing commodity PRAs, extracting pests for which the plant species considered are listed as hosts, and organisms with species names that may indicate the host (e.g. *vaccinii* for *Vaccinium*). Interception data should also be considered to establish this list. Furthermore, pests listed in existing legislation for the commodity are included.

The list should be completed progressively with additional pests extracted from various other sources. Table A3 in Appendix 1 provides a non-exhaustive list of the types of publications that are useful at this stage. Consulting these other sources is resource intensive and it is recommended that basic information is searched first, such as information on the presence of the pests in the area at risk and regulatory status, or the association with the plant species and commodity, to make sure that no time is spent unnecessarily on pests that could easily be shown not to meet these basic criteria.

Attention should be paid to:

- The need to list pests using preferred names (to avoid multiple inclusions of the same pest in the list under both its preferred name and synonyms).
- Carefully recording sources of information (including name, URL, accessed date) and, especially for pests that are likely to be retained at further steps, ensuring that this information can be retrieved if necessary.
- It is not necessary to complete all fields of the table provided in Appendix 2 as long as the information collected allows a conclusion to be reached in Step 2.
- The level of detail necessary for pests that do not meet basic criteria should be decided (e.g. one reference with yes/no may be considered sufficient for presence in the area at risk, provided the source is reliable).

The amount of detail recorded on the list should be limited to what is necessary to justify retaining the pest to Step 3. However, more details may be recorded at this stage for those pests for which it is already clear from the data available that they will be retained at least to Step 3, to avoid re-reading the same publications.

3.3 Step 2: Screening of Step 1 list

The aim of Step 2 is to screen the Step 1 list, focusing on elements that would exclude the pest from further consideration (e.g. present in the area at risk and not regulated, or clearly not associated with the commodity).

→Output: ‘Step 2 list’: list of pests potentially associated with the commodity that are either not present in the area at risk or are present and under official control.

For lists prepared for a group of importing countries it should be clarified whether presence in one of the importing countries is sufficient to exclude the pest from the Step 2 list. As soon as a pest can be eliminated from the list, no further information needs to be searched for. Organisms that are not pests may have been identified in Step 1; however, these should be screened out, and only ‘pests’ should remain at the end of this step. ISPM 2 section 1.2 (FAO, 2007) provides guidance for assessing whether an organism should be considered as a pest. More in-depth data is only collected in Steps 3 and 4.

Groups of organisms (e.g. orders, families) that are always unlikely to be associated with the commodity considered (even when they are pests of the plant species)

should be excluded from further consideration. This may include broad taxonomic groups such as plants, but also some families. For example, Scolytidae is not associated with fruit. For transparency, this should be recorded.

3.4 Step 3: Confirming the association with the commodity and origin

The aim of Step 3 is to prepare a more targeted list of pests for the commodity and origin(s) concerned.

→Output: ‘Step 3 list’: list of pests for the commodity and origin(s) concerned.

This step first requires confirmation that the pest may be carried by the commodity, which means verification that the pest can be associated with the plant parts and species that constitute the commodity. Prior to conducting Step 3, one may consider whether other elements will exclude the pest from further consideration at Step 2. For example, if the Step 2 list is very long, one may wish only to focus on pests that are associated with certain elements of the commodity (e.g. fruit versus fruit with peduncles; debarked wood versus wood with bark).

A number of additional pests may be identified only in Step 3. If pests are added at this stage, they should first be evaluated against the exclusion criteria of Step 2 before searching for further information. It is recommended to add these to the Step 1 and Step 2 lists, if these lists are used in the future.

Host range

In Step 1, the information generally relies on one or a small number of sources, which are sometimes contradictory. If information in Step 1 is not sufficient to confirm the host status of the plant, complementary information may be needed to verify that the plant species concerned is a host. If there is good evidence that the plant species is not a host, and there are no other reasons to keep the pest (such as interception records), the pest is not considered further. In some cases, a more complete list of hosts may be needed, especially if this has not been obtained at Step 1 and is needed at Step 4 to evaluate the ‘level of polyphagy’. It is also useful to document other possible pathways, as care should be taken to avoid the case where a pest is regulated on one commodity and not on another likely to present at least a similar risk.

Parts of plants attacked according to the biology of the pest

Where needed, an additional search for information is made concerning the parts of plants that are likely to carry the pest. This is to confirm that the pest may be transported with the commodity (depending on the plant parts with which it can be associated). This information is used for

the prioritization process in Step 4. Where the commodity is determined as not being a possible pathway, the assessment of the pest stops, the pest is excluded from further consideration and no other information is sought.

In many cases, the assessment that the pest may be carried on a commodity is preliminary, and the extent to which a pest is likely to be associated with a commodity normally requires detailed analysis in a PRA. At this stage, a pest should not be excluded too quickly. For example, if an insect is mainly found on leaves, but may in some cases be found on fruit or wander onto fruit, it is reasonable to consider that the pest can be associated with the fruit. In-depth analysis will then be done in a PRA.

Presence of the pest in the country (or group of countries) of origin of the commodity

When a pest is not recorded as present in the country (or group of countries) of origin, it can be excluded from the Step 2 list. However, the pest should not be excluded when, for example, it is recorded as present in neighbouring countries. It is recommended to contact the NPPOs of the country(ies) of origin to obtain a list of pests associated with the commodity in accordance with IPPC Article VIII 1 (c).¹

3.5 Step 4: Prioritizing pests for PRA

The aim of Step 4 is to establish priorities for PRA amongst the pests retained in Step 3.

→Output: ‘Step 4 list’: commodity pest list prioritized for individual PRAs.

At Step 4, criteria are used to consistently identify pests that require further consideration in terms of having the potential to be a quarantine pest. For each pest, more detailed information is sought (See Section 3.5.1) in order to sort them against a number of criteria (See Section 3.5.2).

3.5.1 More detailed information gathered

Data gathering in Step 4 aims only to find information related to prioritization. It does not aim to make an extensive bibliographic study for each pest (further study may still be necessary at a later stage for the pests selected for PRA). However, it is important that ratings in Step 4 are based on sufficient reliable information (i.e. relying on several publications to confirm the information as necessary) to make sure the pests are correctly rated. Interesting additional information can

¹Extract Article VIII 1 (c). The contracting parties shall cooperate with one another to the fullest practicable extent in achieving the aims of this Convention, and shall in particular: cooperate, to the extent practicable, in providing technical and biological information necessary for pest risk analysis.

nevertheless be recorded where available (especially for pests that will be selected for performing a PRA).

3.5.2 Criteria used to prioritize pests

The criteria used to prioritize the pests should be decided upon. In choosing criteria, it should be kept in mind that a sufficient number of criteria is necessary to discriminate between the possibly large number of pests at Step 3. At the same time, the system should be kept simple. Criteria are proposed below.

- Presence of hosts in the area at risk
- Likelihood of association of the pest with the pathway
- Recorded economic, environmental and social impacts
- Pest has spread/is an emerging pest
- Pest intercepted on the commodity or a similar commodity (e.g. intercepted on pears where the commodity evaluated is apples)
- Ability of the pest to serve as a vector
- Polyphagous or not
- Climatic similarity with the area at risk

Note that if the pest is already regulated on the commodity and for the origin(s) concerned it is not considered as a priority for PRA.

The criteria described above are used to establish priorities. For each criterion, a set of possible answers should be defined². It may also be necessary to establish sub-ratings if there is a need to better discriminate between pests (for examples of sub-ratings see EPPO (2016)); however, it should be kept in mind that these pests need to be rated with limited amounts of information (i.e. ratings should be general, and detailed evaluations that may be undertaken in PRAs should not be made).

Details on some of the criteria

- Recorded economic, environmental and social impacts

This should be based on the information given in the literature consulted and will often be qualitative. This criterion is difficult to apply consistently, and decisions should be taken prior to starting the rating about the different factors used (e.g. if only one record of a high level of damage in any country qualifies as giving an overall high rating for impact). This should always take account of direct impact, and it should be decided how indirect impacts should be taken into account (e.g. impact on export markets). For EPPO studies, this criterion was based mostly on direct impact.

- Intercepted

This criterion is intended to identify pests that are already known to have moved with the trade in the selected commodity or others. The information can be retrieved from the EPPO Reporting Service, national or regional

²The Panel on Phytosanitary Measures in 2016 considered that more experience was needed in order to propose specific ratings in this Standard. The Standard will be revised in due course.

databases or other sources. Records of interceptions in publications, PRAs, etc. should also be taken into account. Only limited data on interceptions is available publicly worldwide, and the absence of interception records does not mean that a pest has not moved with the commodity.

- Polyphagous or not

This criterion may be useful where the Step 3 list contains a mixture of polyphagous pests and more oligophagous pests, if this is an element that will be taken into account in the final selection. The levels of polyphagy to be considered should be defined (e.g. one species, a genus, family of the species considered, several families). This may not be discriminatory, as shown in the EPPO commodity studies conducted so far.

- Climatic similarity

The assessment of climatic similarity can be adapted from the rating guidance for climatic suitability developed in the framework of the PRATIQUE project (for details see DT 1074, EPPO, 2016).

References

- CABI CPC. *Internet Database. Crop Protection Compendium*. CAB International. <http://www.cabi.org/cpc> [accessed on 01 June 2017]
- EPPO (2015) EPPO DT No. 1074, EPPO Secretariat's approach for commodity studies. EPPO Paris www.eppo.int/QUARANTINE/DT1074_Secretariat_approach_for_commodity_studies.pdf [accessed on 01 June 2017]
- EPPO (2017) Global Database. Internet database. <https://gd.eppo.int/> [accessed on 01 June 2017]
- FAO (2007) *ISPM 2. Framework for Pest Risk Analysis*. IPPC, FAO, Rome (IT).
- FAO (2009) *ISPM 32 Categorization of Commodities According to Their Pest Risk*. IPPC, FAO, Rome (IT).
- FAO (2013) *ISPM 11 Pest Risk Analysis for Quarantine Pests*. IPPC, FAO, Rome (IT).

Appendix 1 – Category of information to be collected throughout the process and codes

Table A1. Information to be collected

Field name	Content
Species	Scientific name, i.e. species or genus as identified during the search. If the name in the publication is now a synonym, the preferred name should be indicated here and the synonym in the relevant column (to avoid duplications). Uncertainties on synonymy can sometimes not be resolved easily and can be recorded under 'other information' (so as not to spend time on organisms that will not be considered in further steps)
Synonyms	This does not record systematically all known synonyms, but <i>only</i> names under which a pest was mentioned in the reference concerned (to facilitate retrieval of information), or a synonym that is especially important for the further use of the information
Type of pest	As a code. See Table A2
Taxonomy	See Table A2. Taxonomic levels proposed are not consistent across all groups of pests, in order to be more informative. For pests in the EPPO Global Database this data can be extracted automatically (but necessitates some combination/formatting; instructions are provided in the EPPO data services)
Source	EPPO Global Database, CABI CPC, or author (date or ND (when there is no date)). It may be useful that references are saved in parallel (and Internet pages as PDF) for the purpose of future access when links change or disappear from the Internet. However, this also depends on the intended use of the lists
Citation or weblink	URL (e.g. web pages, articles posted on the web, databases etc.) or original publication if the source was cited in another publication. Possibly date of access for URL
Pest distribution	Global distribution may be used in the individual pest risk assessment
Present in the area at risk	The answers are: Not present Present and under official control (details are given in the next field) Present and not under official control
Location of life stages on plant part	This should especially address the plant parts that are relevant for the commodity studied. Indicate here information on the presence of different life stages on the different parts of the plant and elements of the commodity (e.g. eggs on leaves, larvae feed on leaves, peduncles and on the fruit itself, pupae in the soil, adults fly and feed on nectar)
Commodity is a pathway	This is based on information recorded in the previous field. A pest should not be excluded too quickly as the assessment is based on one or a small number of sources. Assessing whether a pest may be transported on the commodity is not always straightforward and may require detailed consideration of the biology of the pest when conflicting information is found (it is a detailed process within PRA). It may therefore not be possible at this stage to provide a definitive answer. Uncertainties should be recorded For each commodity, adjust the assessment to the different parts of plants composing the commodity. Details can be added if the pest can be found on part of the commodity only (e.g. leaves, not fruit; bark, not wood). Indicate if the pest may be associated with the commodity as contaminant or incidentally (e.g. flying adults on a plant part they do not feed on) A certain 'No' here excludes a pest from further consideration

(continued)

Table A1. (continued)

Field name	Content
Other pathways	Preliminary assessment of other pathways with which the pest could be associated. This is also based on the field 'Parts of plant on which the pest is present'. The usefulness of this may depend on the expected output. It is generally not needed at Step 1 and can be added where needed at later stages (except if readily available, and the pest is likely to be retained) Some details on pathways may be available for pests in the EPPO Global Database or CABI CPC
Hosts	All listed pests should have an association with one or several of the plant species covered by the commodity; however, it is also important to gather host lists as this information will be needed for those pests that are selected for PRA (although these do not need to be complete until Step 4) Some organisms are listed because they are mentioned in a database recording all plant species on which any life stage was found (hosts or not), or because they were intercepted on the commodity, or from data obtained through data mining. The host status for the plants species considered is sometimes difficult to determine. In some cases, it is possible to exclude the pest. Alternatively, the pest can be retained to the next step, if more extensive searches are required Where the plant species considered is not included as a host in CABI CPC or the EPPO Global Database, a general search can be made to determine if other sources associate the pest with the plant species. For pests in the EPPO Global Database some data can be extracted automatically (but needs some combination/formatting) Interceptions records are a special case. The intercepted organisms may have been hitchhikers on the commodity, and may not be a pest at all or not a pest of that plant. A decision needs to be made on which pests to keep Latin names are recommended for the purpose of future searches in spreadsheets. If there is any ambiguity as to the species concerned, a phrasing such as ' <i>Malus</i> (as apple)' may be used This is labour-intensive, so the level of detail necessary should be decided (i.e. full lists as found, hosts that are important for the area at risk, only recording that the plant species considered are hosts) This should also take account of the stage at which assessors prefer to assemble data. In any case, detailed searches should focus on pests that are likely to be retained to the next step A certain answer that the plant is not a host always excludes a pest from further consideration (interception data is a special case which supports keeping the pest on the list)
Other information	This relates in particular to information allowing the assessment of the possible association with the pathway. Other elements of biology may be recorded as well as records of interception. Such information should be noted when available in the publications reviewed, but not systematically searched for The assessor may look out for any essential information that may also be needed at subsequent steps
Regulation in the area at risk	This records whether the pest is already regulated in the area at risk. In the case of EPPO, if the pest is already recommended for regulation, or under consideration or on the EPPO Alert List The type of list should be indicated (e.g. A1, A2, Alert List) For pests in the EPPO Global Database, the categorization status for EPPO, the European Union and any given country can be extracted automatically The level of detail needed should be decided in advance. For example, in addition to the list number, the name under which the pest is regulated (if different), and whether it is regulated for the commodity or another pathway
Type of damage	If it is available in a publication used to retrieve other data, information on damage (type, importance, potential for economic consequences in the area at risk) is useful for further steps. It is not necessary to perform specific searches at Step 1 to find this information
EPPO Code	This is useful to group organisms and identify possible synonymy between listed pests EPPO codes are given in the EPPO Global Database for a large number of pests (including many for which no detailed data is available), and can be extracted automatically based on preferred names or synonyms

This table indicates the fields that should be included in the lists. Some simple or shortened answers may be given when necessary (to avoid assembling unnecessary information for pests that will not be retained at further stages – especially for hosts and distribution). Fields highlighted in grey are exclusion criteria.

Table A2. Suggested codes and taxonomic details

Code	For type of pest	Taxonomic details given	Upper taxonomic levels (for reference)
Animals			
I	Insecta (class)	Order: family	Animalia (kingdom), Arthropoda (phylum), Hexapoda (sub-phylum)
E	Entognatha (class)	Order: family	Animalia (kingdom), Arthropoda (phylum), Hexapoda (sub-phylum)
A	Arachnida (class)	Order: family	Animalia (kingdom), Arthropoda (phylum), Chelicerata (sub-phylum)
N	Nematoda (phylum)	Order: family	Animalia (kingdom)
M	Myriapoda (sub-phylum)	Class: order: family	Animalia (kingdom), Arthropoda (phylum)
G	Gastropoda (class)	Order: family	Animalia (kingdom), Mollusca (phylum)
Bird	Aves (class)	Order: family*	Animalia (kingdom), Chordata (phylum), Vertebrata (sub-phylum)
Pathogens			
V	Viruses and viroids (kingdom)	Family: genus	
B	Bacteria (kingdom)	Order: family	Note: this includes Phytoplasma
F	Fungi (kingdom)	Phylum: family	–
C	Chromista (kingdom)	Phylum: class	–
Plants			
P	Plantae (kingdom)	Class: family*	Plantae (kingdom), 14 phyla (according to the EPPO Global Database)

*These may not be relevant for many commodity studies and may be recorded as ‘plants’ and ‘birds’ or not included on the lists.

Table A3. Types of information sources that may be used

To start the list
EPPO Global Database
CABI CPC
To complete the list
Lists from similar studies, e.g. to date EPPO Tomato study (EPPO, 2015), Dropsa studies and Dropsa review list
Interception data, from EPPO countries or other sources
Commodity and pest-specific PRAs (EPPO, EPPO countries, European Food Safety Authority, other countries such as the USA, Australia, New Zealand)
Books and compendiums relating to pests of the crop or to specific regions
Publications on groups of pests, in printed form, databases or internet sites
Sources on pests of the crop in a country or region, e.g. leaflets, cropping advice, lists of pests present in a country, official lists of pests on the IPPC web site (https://www.ippc.int/)
Targeted searches for certain countries, for example important countries not covered in the general publications above
Regulations from countries regarding imports
EPPO Reporting Service articles
Pest lists provided by NPPOs

Appendix 2 – Example of spreadsheet/database format (example from *Dropsa*, *Vaccinium*)

Species	<i>Chrysoteuchia topiaria</i>
Synonyms	
Type (see Appendix 1 Table A2)	I
Taxonomy	Lepidoptera: Crambidae
Source	CABI CPC, Agriculture Canada, 2013; AgriReseau Quebec, 2015; IPM Centers, 1998
Citation or weblink	
Location of life stages on plant parts	Larvae feed on bark and wood of roots and stolons. Overwinter in the litter, pupae and eggs in the litter (Agriculture Canada, 2013). Feeds on roots (AgriReseau Quebec, 2015)
Fruit pathway	?Incidental, adults only
Other pathways	
Hosts	<i>Vaccinium macrocarpon</i> (both Canada references); <i>Poa</i> , <i>Pseudotsuga</i> , <i>Vaccinium</i> (data mining), <i>Vaccinium macrocarpon</i> (CPC)
Other information	Major pest (AgriReseauQuebec, 2015)
Present in neighbouring country(ies) of area of origin.	Canada, USA (CPC) throughout Canada, USA and Europe (Roberts and Mahr, n.d.)
Presence in area at risk	?Need further search, no detailed record found, and no other mention of Europe found
Status for EU/EEC.	
EPPO Lists	
Type of damage and impact	Death of vines, loss of leaves; important, sometimes sporadic pest (IPM Centers, 1998)
EPPO Code	CRAMHO
Conclusion	

References in example spreadsheet: AgriReseauQuebec. 2015. Publication on cranberry, annexe 5: Identification des insectes ravageurs de la canneberge présents au Québec (Source: Insectes ravageurs de la canneberge au Québec. Guide d'identification. CETAQ 2000); AgricultureCanada. 2013. Crop profile for cranberry in Canada. <http://www.agr.gc.ca/pmc-cropprofiles>; IPM Centers. 1998. Crop Profile for Cranberries in Wisconsin. <https://ipmdata.ipmcenters.org/documents/cropprofiles/wicranberries.pdf> [modified URL, has changed since]; Roberts SL, Mahr DL. No date. Cranberry pest control: the cranberry girdler. University of Wisconsin-Extension, Cooperative Extension Programs.