NAPPO
North American Plant Protection Organization
Organización Norteamericana de Protección a las Plantas

NAPPO Regional Standards for Phytosanitary Measures (RSPM)

RSPM 35
Guidelines for the Movement of Propagative Plant Material of Stone Fruit, Pome Fruit, and Grapevine into a NAPPO Member Country

The Secretariat of the North American Plant Protection Organization
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Review

NAPPO Regional Standards for Phytosanitary Measures (RSPMs) are subject to periodic review and amendment. This standard was last reviewed in 2021. A review of a NAPPO standard may be initiated at any time upon request of a NAPPO member country. The next review of RSPM 35 is scheduled for 2026.

Approval

This Standard was approved by the North American Plant Protection Organization (NAPPO) Executive Committee on [INSERT DATE] and is effective from this date.

Virtual approval of NAPPO Products

Given the current travel restrictions brought about by the COVID-19 pandemic, the NAPPO Management Team unanimously endorsed a temporary process for virtual approval of its products.

Beginning in January 2021 and until further notice, this statement will be included with each approved NAPPO product in lieu of the Executive Committee original signature page.

Regional standard for phytosanitary measures 35 – ***Guidelines for the Movement of Propagative Plant Material of Stone Fruit, Pome Fruit, and Grapevine into a NAPPO Member Country*** – was approved by the North American Plant Protection Organization (NAPPO) Executive Committee – see approval dates below each signature - and is effective from the latest date below.

Approved by:

Greg Wolff
Executive Committee Member
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Date XXXX, 2021

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Implementation

No implementation plans required.

Amendment Record

Amendments to this Standard will be dated and filed with the NAPPO Secretariat.

Distribution

This standard is distributed by the NAPPO Secretariat to the Industry Advisory Group (IAG), the International Plant Protection Convention (IPPC) Secretariat, and to other Regional Plant Protection Organizations (RPPOs).

INTRODUCTION

Scope

This standard describes guidelines for the importation of propagative plant material of stone fruit, pome fruit and grapevine by NAPPO member countries, and the movement of this material among these countries. Propagative plant material includes grafted plants, cuttings, rootstocks, tissue culture (*in vitro*) and, where applicable, seeds. The pests specifically dealt with in this standard are bacteria, phytoplasmas, viroids, viruses and virus-like agents and, where applicable, arthropods, fungi and nematodes. These pests include those that pose a direct risk to their host, as well as those which act as potential vectors of a secondary pest. This standard does not address abiotic disorders, varietal trueness-to-type, quality grades and standards, or soil or fruit associated with the material.

References

Good plant protection practice – EPPO PP 2/1(2), 2003.
Good plant protection practice – Grapevine EPPO PP 2/23(1), 2002.
Good plant protection practice – Pome fruits EPPO PP 2/18(1),1999.
Good plant protection practice – Stone fruits EPPO PP 2/33(1), 2004.
Jelkmann, W. 2004. *International Working Group on Fruit Tree Viruses: Detection of virus and virus-like diseases of fruit trees.* Acta Horticulturae 657:575-596.
Thompson, D.A. 1998. The Role of NAPPO in Fruit Crop Virus-Testing and Certification. Acta Horticulturae 472:100.
ISPM 2. 2016. *Framework for pest risk analysis.* Rome, IPPC, FAO.
ISPM 4. 2017. *Requirements for the establishment of pest free areas*. Rome, IPPC, FAO.
ISPM 5. 2021. *Glossary of phytosanitary terms.* Rome, IPPC, FAO.
ISPM 6. 2018. *Surveillance.* Rome, IPPC, FAO.
ISPM 7. 2016. *Phytosanitary certification system.* Rome, IPPC, FAO.
ISPM 8. 2021. *Determination of pest status in an area.* Rome, IPPC, FAO.
ISPM 10. 2016. *Requirements for the establishment of pest free places of production and pest free production sites.* Rome, IPPC, FAO.
ISPM 11. 2017. *Pest risk analysis for quarantine pests.* Rome, IPPC, FAO.
ISPM 12. 2017. *Phytosanitary certificates.* Rome, IPPC, FAO.
ISPM 14. 2017. *The use of integrated measures in a systems approach for pest risk management.* Rome, IPPC, FAO**.**
ISPM 29. 2017. *Recognition of pest free areas and areas of low pest prevalence.* Rome, IPPC, FAO.
ISPM 36. 2012. *Integrated measures for plants for planting*. Rome, IPPC, FAO.
RSPM 3. 2017. *Requirements for importation of potatoes into a NAPPO member country* on hold. Raleigh, NC, USA.
RSPM 5. 2021. *NAPPO glossary of phytosanitary terms.* Raleigh, NC, USA. NAPPO.
RSPM 9. 2021. *Authorization of laboratories for phytosanitary testing.* Raleigh, NC, USA. NAPPO.
RSPM 19. 2012. *Guidelines for bilateral workplans.* Raleigh, NC, USA. NAPPO.
RSPM 24. 2013 *Integrated pest risk management measures for the importation of plants for planting into NAPPO member countries.* Raleigh, NC, USA. NAPPO.

Definitions

Definitions of phytosanitary terms used in this standard can be found in NAPPO RSPM 5 (NAPPO *glossary of phytosanitary terms)* and in ISPM 5 (*Glossary of phytosanitary terms).*

Stone fruits: Species belonging to the genus *Prunus*, including all its varieties, cultivars, and hybrids.

Pome fruits: Species belonging to the genera of *Malus*, *Pyrus*, *Cydonia*, and *Chaenomeles*, including all their varieties, cultivars, and hybrids.

Grapevines: Species of the genus *Vitis*, including all varieties, cultivars, and hybrids, propagated from seed(s), cutting(s), graft(s), scion(s), budwood, rootstock(s) or other plant parts.

SPFTG: propagative plant material of stone and pome fruit trees and grapevines.

Outline of Requirements

This standard outlines a systems approach for mitigating the risk of pest introductions associated with the international movement of SPFTG, without undue restriction of trade. A systems approach is achieved through a combination of phytosanitary measures to prevent the entry, establishment and spread of associated pests including arthropods, bacteria, fungi, nematodes, phytoplasmas, viroids, viruses, and virus-like agents. Section 1 (General Requirements) of this standard address the pest risk assessment and phytosanitary measures for pest risk management. Section 2 (Specific Requirements) identifies and describes the components of a SPFTG certification program primarily designed to control phytoplasmas, viruses, viroids, and virus-like agents spread by infected propagative material. Certification programs may also be applicable to other types of pests.

Background

This standard deals specifically with bacteria, phytoplasmas, viroids, viruses, and virus-like agents and, where applicable, arthropods, fungi and nematodes of SPFTG. Economic impacts of these pests on crops covered by this standard include delayed maturity; increased agricultural inputs; reduced growth, yield, and fruit quality; graft incompatibility; plant mortality; as well as potential impacts on trade. The pests addressed in this standard may also affect other crops or natural ecosystems, with varying economic impacts. In addition to direct effects on the plants, certain nematodes and arthropods are vectors of SPFTG diseases. SPFTG including cuttings, rootstock, and tissue cultures pose a high risk for introducing pests. Traditional phytosanitary measures used to reduce risk of pest introductions include prohibition, quarantine restrictions, entry point inspections, appropriate treatment and therapies, and post-entry quarantines. Competitiveness in the world-wide markets for these commodities requires development and exchange of new varieties and germplasm. The increased volume of trade in SPFTG now occurring between and within countries has increased the risk of pest introduction and establishment.

Systems approaches for pest risk management combine a wide range of independent measures to meet an appropriate level of phytosanitary protection. Systems approaches should be developed in accordance with ISPM 14 (*The use of integrated measures in a systems approach*

for pest risk management), RSPM 24 (*Integrated pest risk management measures for the importation of plants for planting into NAPPO member countries)* and ISPM 36 *(Integrated measures for plants for planting).*

Systems approaches can provide an alternative to procedures such as disinfestation treatments or more restrictive measures like prohibition. Effectiveness of systems approaches is achieved by the combined effect of different conditions and procedures used in a coordinated way to meet the phytosanitary requirements of the importing country. Systems approaches provide the opportunity to consider both pre-harvest and post-harvest procedures that may contribute to the effective management of pest risk.

A systems approach requires two or more measures that are independent of each other and may include any number of measures that are dependent on each other. An advantage of the systems approach is the ability to address variability and uncertainty by modifying the number and strength of measures to meet the appropriate level of phytosanitary protection and confidence.

Certification programs used to control virus diseases are good examples of a systems approach at work. Various independent components such as virus-testing, field inspection, isolation distances, and vector control all work together to minimize the entry, establishment, and spread of pests.

The objectives of this Standard are to:

- prevent the entry, establishment and spread of quarantine pests into NAPPO member countries;
- mitigate the impact of regulated non-quarantine pests within NAPPO member countries;
- facilitate equitable and orderly trade into and within the NAPPO region;
- promote the use of systems approaches and good plant protection practices as the basis for the development of a certification program for international exchange of SPFTG.

1. GENERAL REQUIREMENTS

1.1 Stone and Pome Fruit and Grapevine Pests

A comprehensive list of pests associated with SPFTG along with their phytosanitary status in each NAPPO member country can be found in Annex 1 and 2. While not all of these pests are regulated by NAPPO member countries, they may be considered to be pests of concern to SPFTG production. These pest lists are useful references for the targeting testing, therapy, and transfer of clean germplasm among NAPPO countries.

1.2 Pest Risk Analysis

All Pest Risk Analyses (PRAs) for SPFTG pests should be performed in accordance with ISPM 2 (*Framework for pest risk analysis),* ISPM 5 (*Glossary of phytosanitary terms)*, ISPM 8 (*Determination of pest status in an area)* and ISPM 11 (*Pest risk analysis for quarantine pests)*. Application of phytosanitary measures should be based on the results of a PRA. The pests in Annexes 1 and 2 may be classified as regulated pests, depending on their presence or absence in a country and the official control measures applied.

1.3 Phytosanitary Measures for Pest Risk Management

Phytosanitary measures for pest risk management should be used to prevent the entry, establishment, and spread of regulated pests.

The importation and movement of SPFTG is subject to the application of integrated phytosanitary measures for pest risk management in a systems approach in accordance with ISPM 14 (*The use of integrated measures in a systems approach for pest risk management)*.

Following a PRA, phytosanitary measures to mitigate risks associated with importing propagative plant material into a NAPPO member country are identified. The phytosanitary measures described below may be combined to obtain an appropriate level of phytosanitary protection. For the purposes of this standard “small quantities” of plant material are considered to be 100 plants or less, but the definition of “small quantities” will ultimately be left to the discretion of the National Plant Protection Organizations (NPPOs).

Other phytosanitary measures and procedures such as inspection, fumigation, chemical sprays, hot water dips, biological control, cold treatment, and others, may also be applied to plant material, growing media, or packaging for any of the options. Section 3.0 “Post-entry Quarantine of Stone and Pome Fruit Trees and Grapevines” identifies the criteria appropriate for the post-entry quarantine of these plants.

The suggested phytosanitary measures for various categories of SPFTG are outlined below:

1.3.1 Research Purposes and Subsequent Destruction

This option could be applied to SPFTG that do not necessarily come from an official certification program or that may be infested with pests. Plants are maintained under official quarantine conditions to prevent the establishment and spread of regulated pests. Plant material may be inspected, tested, or treated for pests of concern before importation or after entry, at the discretion of the NPPO. Plant material, growing media, or packaging must be disposed of as instructed by the NPPO. This option is only suitable for small quantities of plant material.

1.3.2 Quarantine, Testing and Treatment at NPPO-authorized Facilities and Subsequent Distribution

This option could be applied to SPFTG that do not come from an official certification program or that may be infested with pests. Plants are imported for quarantine, testing and treatment in a post-entry quarantine station approved by the importing NPPO. Detected regulated pests should be eliminated from the plants before their release from quarantine conditions. This option is only suitable for small quantities of plant material.

1.3.3 Quarantine at Importers’ Premises and Subsequent Distribution

This option could be applied to SPFTG that do not come from an official certification program recognized by the importing NPPO. Plants are planted under quarantine conditions on the importer’s premises. The NPPO should test and/or visually examine or treat, as appropriate, for regulated pests before release from the quarantine conditions. This option may apply to the importation of plants from a certification program under evaluation.

1.3.4 Plants originating from an Official Certification Program

SPFTG may be imported into a NAPPO member country if produced under an official certification program that has been evaluated using this standard and authorized by the importing NPPO. The importing NPPO should perform audit inspections either in the country of origin or on imported plants, including testing samples for the presence of pests. The importing NPPO may require post-entry quarantine conditions.

1.3.5 Plants originating from a Pest-free Area, Pest Free Place of Production, or Pest Free Production Site

This option is usually not appropriate for pests such as viruses, viroids, and phytoplasmas, where inspection is inadequate and comprehensive sampling and monitoring are impractical for determining pest-free status. SPFTG may be certified free from specific pests for entry into NAPPO member countries based on absence of these pests in the exporting site or area as outlined in ISPM 4 (*Requirements for the establishment of pest free areas)*, ISPM 10 (*Requirements for establishment of pest-free places of production and pest-free production sites),* and ISPM 29 (*Recognition of pest-free areas and areas of low pest prevalence)*. The importing NPPO should perform audit inspections and may take samples to test for the presence of pests. The importing NPPO may require post-entry quarantine conditions.

1.3.6 Prohibition

If no satisfactory phytosanitary measure to reduce risk to an acceptable level can be found, the final option may be to prohibit importation of SPFTG.

1.4 Documentation Requirements

A phytosanitary certificate or an equivalent official document should be issued by the exporting country according to the requirements of the NPPO of the importing country. A permit to import must be obtained by the importer, if required by the importing NPPO.

2. SPECIFIC REQUIREMENTS

2.1 Stone and Pome Fruit and Grapevine Certification Programs

This standard deals specifically with the essential elements of a certification program to mitigate the risk of SPFTG pests listed in the annexes.

The certification program should be carried out by or under the authority of the NPPO. Additional entities may be authorized by the NPPO to perform specific certification actions on its behalf, with clearly specified accountability and oversight by the NPPO. The certification program should clearly define phytosanitary requirements such as terminology, testing, eligibility, the nomenclature of certification levels, agricultural management, isolation and sanitation requirements, inspection and re-testing, documentation and reporting, identification and labeling, quality controls and monitoring, non-compliance and remedial measures, and criteria for post entry quarantine.

2.1.1 Program Administration

The certification program should be administered by a NPPO or an entity authorized by a NPPO to perform specific certification actions on its behalf (herein referred to as an “authorized entity”).

The program should clearly and comprehensively specify the roles and responsibilities of the NPPO, the program participants, any authorized entities (e.g., laboratories involved in testing), and any organizations involved in certification activities.

The NPPO and any authorized entities should ensure that all administration, inspection, certification, and laboratory diagnostic personnel meet appropriate training, experience, educational and proficiency requirements. Authorized entities should be prepared to supply, upon request, this information to their NPPO.

Authorized entities must notify and obtain approval from their NPPO prior to making changes to the certification program or deviating from program requirements, and before plants produced under such modifications are exported.

The exporting country’s NPPO must inform the importing country’s NPPO of changes to the certification program or diagnostics before plants produced under the modified program are exported.

2.1.2 Terminology

The certification program should define all terminology specific to the certification program using sufficient detail to ensure clear understanding of the certification requirements. The terminology used by the NAPPO countries for similar purposes should be harmonized to the greatest extent possible.

2.1.3 Diagnostics

Diagnostics include but are not limited to:

- sample processing for the recovery or isolation and identification of pathogens such as insects, nematodes and other pests;
- pest identification utilizing morphological characters such as for insects, mites, and other arthropods, and nematodes;
- disease determinations utilizing indicator plants;
- serological tests such as Enzyme Linked Immuno-Sorbent Assays (ELISA); and
- assays based on nucleic acid amplification by various Polymerase Chain Reaction (PCR) methodologies.

Determinations based on High Throughput Sequencing (HTS) methodologies may also be considered but should follow the recommendations outlined in CPM-14; 2019 Recommendation R-08 (Preparing to use high-throughput sequencing (HTS) technologies as a diagnostic tool for phytosanitary purposes).

Two or more of the aforementioned types should be considered for a more accurate diagnostic.

Diagnostics will be done by the NPPO or authorized entity. If private laboratories are used, they should be accredited by the NPPO in accordance with RSPM 9 (*Authorization of laboratories for phytosanitary testing)*.

Upon request, the exporting NPPO must provide the importing NPPO with the diagnostic results, methodology and a list of pests regulated in the certification program in the exporting country.

The NPPO of the exporting country must notify the NPPO of the importing country of proposed changes to diagnostics being used by the NPPO or authorized entity in the exporting country. Such changes must be communicated and approved by the importing NPPO before plants produced under the modified program are exported.

2.1.4 Eligibility

Potential program participants should file an application with the NPPO or authorized entity. Eligibility is conferred by the NPPO or authorized entity if the conditions of the certification program have been met.

The certification program should specify eligibility for plant material used in the program. Eligibility requirements also must be met when plants are purchased for export. Plant brokers must ensure the traceability of export consignments to approved places of production.

2.1.5 Certification Levels

Certification levels represent successive generations of propagation from the original tested material and may have additional phytosanitary measures applied depending on the generation. Certification levels are a categorical measure of the health status of certified plants. The certification program should clearly define certification levels. Eligibility criteria should be established at each level, including nomenclature, propagation and pest management measures, and the number of generations removed from the original tested material. It is strongly recommended that the certification levels be identified as Generation 1, 2, 3, 4, etc.

2.1.6 Agricultural Management

The certification program should define agricultural management requirements for hosts of pests or pest vectors within the field and buffer zones.

All stone and pome fruit trees and grapevines in the certification program should be kept in good horticultural condition by following good agricultural practices for their region. Good agricultural practices are explained at the FAO website at http://www.fao.org/3/a-i6677e.pdf.

Where they exist, it is recommended to employ best management practices for pest control, for example:

- principles of good plant protection practice – EPPO PP 2/1(2), 2003;
- good plant protection practice – Grapevine EPPO PP 2/23(1), 2002;
- good plant protection practice – Pome fruits EPPO PP 2/18(1), 1999; and
- good plant protection practice – Stone fruits EPPO PP 2/33(1), 2004.

2.1.7 Phytosanitary Management

The isolation requirements of the certification program will vary according to the certification level of the propagative plant material and should be based on the epidemiology and biology of the pests and their vectors present in the certification area. The certification program should specify the minimum distance from non-certified hosts, and acceptable cover crops and weed control measures required to reduce alternate pest hosts to acceptable levels.

The certification program should specify pest management measures including vector suppression and the control of pollen-borne viruses required to adequately protect plants produced under the program from exposure to pests.

The certification program should specify phytosanitary measures by which the risks associated with the movement of soil or water, other growing media or plant products potentially infested with vectors or pests are mitigated to acceptable levels.

The certification program should specify crop rotation and fallow requirements between pest host crops, and chemical control requirements for a site being used to produce plants under the certification program.

2.1.8 Inspection and Diagnostics

The certification program should specify the inspection and diagnostics requirements throughout all levels of the certification program.

Plants in the certification program should be inspected during the growing season at times appropriate for detecting disease symptoms and determining the presence of insects or other pest vectors using appropriate methods for each pest.

The certification program should specify:

- the process to be undertaken upon suspicion of pest infestation;
- the process to be undertaken upon confirmation of pest infestation;
- notification and inspection requirements when selling or purchasing certified material;
- sampling procedures and diagnostics for pests at each certification level;
- the diagnostic methodology(ies) to be used; and
- inspection requirements including reviews of maps of places of production and production sites, variety labelling practices, new places of production and production sites, and any deviations between inventory, sales, and purchases.

2.1.9 Documentation and Identification

The NPPO or authorized entity must document all inspection, certification, and diagnostic activities to ensure the eligibility of the program participants, their places of production and production sites, and the plants for planting produced under this certification program. These documents must be available, upon request, to the exporting and importing country NPPOs for audit, traceback, trace forward and other regulatory purposes.

The certification program should include a system approved by the NPPO or authorized entity to document and identify plants during growth, post-harvest, and at sale to ensure traceability. The system should at least record the certification level, the year of propagation, the participant,

geographic location of the field of production, location of certified trees within the field of production, the variety and rootstock, and the purchaser's identity.

Purchases and sales of plants produced under the certification program, previous cropping history for production sites, and production site maps should be retained by the participants for a period specified by the NPPO or authorized entity.

2.1.10 Quality Assurance and Program Review

The exporting country NPPO or authorized entity should ensure the validity and reliability of their certification program through periodic audit and reviews of the program. Records and any other supporting documentation must be maintained for any such audits or reviews. In addition, the place of production should adhere to the program quality management requirements of the NPPO. Fundamental changes to program delivery or phytosanitary measures must be communicated in advance and approved by the importing NPPO.

The importing NPPO should review and/or audit the exporting NPPO certification program to ensure it continues to meet the certification standards and their import requirements. This may be done on a periodic basis, or in response to certification program or pest status changes, or evidence of non-compliance. It should include testing of imported plant material, site visits and/or review of the exporting certification program. Detection of pests or vectors controlled under the certification program or deficiencies of documentation, etc. may indicate that the integrity of the exporting NPPO certification system is compromised.

2.1.11 Non-compliance and Corrective Measures

The certification program should specify the consequences of non-compliance. In addition, the corrective measures should be specified to enable a suspended or de-certified participant, production area or variety to become eligible for re-certification or reinstatement.

3. Post-entry Quarantine

The importing NPPO may require post-entry quarantine conditions for imported SPFTG. The post-entry quarantine may occur at a NPPO-approved private or public facility and should follow the guidelines outlined in ISPM 34 ;2016 (*Design and operation of post-entry quarantine stations for plants)*. The post-entry requirements should be based on the level of risk determined by the biology of the pests of concern, including their host range, their means of natural spread, and the likelihood of transmission by local vectors.

Post-entry quarantine criteria should specify:

- the roles and responsibilities of the NPPO of the importing country, authorized entities, and the importer;
- agricultural management requirements to promote plant growth and the detection of pests;
- isolation and suppression measures to control pest vectors and prevent the movement of pests within and outside the post-entry quarantine area;
- measures within the post-entry quarantine area to reduce alternate hosts of pests and pest vectors, such as weed control and buffer zones;
- soil and plant treatment, vector surveillance and suppression, facility design and other criteria to be met before a facility, production site, or production area becomes suitable

for post-entry quarantine;

- the requirements for movement and sanitation of agricultural equipment and personnel into and from the post-entry quarantine area;
- containment, security, and access restrictions to the imported plants;
- handling and disposal of pruning waste and all other articles capable of transmitting or harboring pests;
- inspection, sampling, and diagnostics to determine the presence of pests in the imported plants;
- conditions under which the imported plants would be moved, removed, or released from post-entry quarantine; and
- sanitation and subsequent use restrictions of a post-entry quarantine area.

4. Evaluation and Approval of a Certification Program

Prior to allowing importation of SPFTG, the importing NPPO should evaluate the certification program of the exporting NPPO including a documentation review, a site visit, and/or testing of plants by the importing NPPO to ensure they meet the standard of the certification program.

Following approval of the certification program additional temporary restrictions such as pre-clearance testing and post-entry quarantine may be used.

5. Bilateral Workplans

Exporting and importing country NPPOs may decide that a bilateral workplan is necessary to elaborate on these guidelines. Guidelines for the development of bilateral workplans are provided in RSPM 19 (*Guidelines for Bilateral Workplans)*. Modifications to these guidelines should be technically justified.

Annex 1: Fruit Tree Pests

Note: Synonyms for virus names in Tables 1 and 2 can be found in Appendix 2 of RSPM 25 archived on the NAPPO website.

LEGEND FOR SYMBOLS USED IN TABLES

Presence or absence unless otherwise noted conform to the categories listed in ISPM 8; 2021 (*Determination of pest status in an area)*. For ease of reference alphanumeric designations have been added here.

Ab1: Absent: pest not recorded
Ab2: Absent: the entire country is pest free
Ab3: Absent: pest records invalid
Ab4: Absent: pest no longer present
Ab5: Absent: pest eradicated

P1: Present: widely distributed
P2: Present: not widely distributed and not under official control
P3: Present: not widely distributed and under official control
P4: Present: at low prevalence
P5: Present: except in specified pest free areas
P6: Present: transient
P7: Present: not associated with host crop (NAPPO category)

Table 1: Virus pests of stone fruit

Table 2: Virus pests of pome fruit

Table 3: Fungal pathogens (incl. Chromista) of stone and pome fruit trees

Table 4. Bacterial and phytoplasmal pathogens of stone and pome fruit trees

Table 5: Arthropod pests of stone and pome fruit trees

Table 6: Nematode pests of stone and pome fruit trees

1 **Table 1: Virus pests of stone fruit**

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PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE/ABSENCE		
						CAN	USA	MEX
Amasya cherry disease associated virus	ACDaV	Chrysoviridae	*Chrysovirus*	*P. avium*	Covelli *et al*., 2004	Ab1	Ab1	Ab1
American plum line pattern virus	APLPV	Bromoviridae	*Ilarvirus*	*P. avium, P. domestica, P. persica, P. salicina*	Hadidi *et al*., 2011	P2	P2	Ab1
Apple chlorotic leaf spot virus	ACLSV	Betaflexiviridae	*Trichovirus*	*Prunus* spp.	Hadidi *et al*., 2011	P2	P2	Ab1
Apple mosaic virus	ApMV	Bromoviridae	*Ilarvirus*	*Prunus* spp.	Hadidi *et al*., 2011	P7	P2	Ab3
Apricot latent ringspot virus	ALRSV	Secoviridae	*Nepovirus*	*P. armeniaca, P. avium, P. domestica, P. persica*	Gentit *et al*., 2001	Ab1	Ab1	Ab1
Apricot latent virus	ApLV	Betaflexiviridae	*Foveavirus*	*P. armeniaca, P. avium, P. domestica, P. persica*	Grimová & Rysanek, 2012	Ab1	Ab1	Ab1
Apricot pseudo-chlorotic leaf spot virus	APCLSV	Betaflexiviridae	*Trichovirus*	*P. armeniaca, P. avium, P. domestica, P. persica*	Hadidi *et al*., 2011	Ab1	Ab1	Ab1
Apple scar skin viroid	ASSVd	Pospiviroidae	*Apscaviroid*	*P. armeniaca, P. avium, P. persica*	Kaponi *et al*., 2013	P7	P7	Ab1
Apricot vein clearing associated virus	AVCaV	Betaflexiviridae	*Prunevirus*	*P. armeniaca*	Elbeaino *et al*., 2014	Ab1	Ab1	Ab1
Arabis mosaic virus	ArMV	Secoviridae	*Nepovirus*	*P. avium, P. persica*	Hadidi *et al*., 2011	P7	P2	Ab3
Asian *Prunus* virus 1	APV1	Betaflexiviridae	*Foveavirus*	*Prunus* spp.	Marini *et al*., 2009	P2	Ab1	Ab1
Asian *Prunus* virus 2	APV2	Betaflexiviridae	*Foveavirus*	*Prunus* spp.	Marais *et al*., 2016	P2	Ab1	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE/ABSENCE		
						CAN	USA	MEX
Asian *Prunus* virus 3	APV3	Unassigned	*Foveavirus*	*Prunus* spp.	Marais *et al*., 2016	P2	Ab1	Ab1
Carnation Italian ringspot virus	CIRV	Tombusviridae	*Tombusvirus*	*P. avium*	Hadidi *et al*., 2011	Ab1	Ab3	Ab1
Caucasus prunus virus	CPrV	Betaflexiviridae	*Prunevirus*	*Prunus* spp.	Marais *et al*., 2015b	Ab1	Ab1	Ab1
Cherry associated luteovirus	ChALV	Luteoviridae	*Luteovirus*	*P. avium*	Lenz *et al.*, 2017	Ab1	Ab1	Ab1
Cherry green ring mottle virus	CGRMV	Betaflexiviridae	*Robiogovirus*	*Prunus* spp.	Hadidi *et al*., 2011	P1	P2	Ab1
Cherry leaf roll virus	CLRV	Secoviridae	*Nepovirus*	*P. avium*	Hadidi *et al.*, 2011	P3	P2	Ab1
Cherry mottle leaf virus	CMLV	Betaflexiviridae	*Trichovirus*	*P. armeniaca, P. avium, P. persica*	Hadidi *et al*., 2011	P2	P2	Ab1
Cherry necrotic rusty mottle virus	CNRMV	Betaflexiviridae	*Robigovirus*	*P. armeniaca, P. avium, P. domestica, P. persica*	Villamor *et al*., 2015	P1	P2	Ab1
Cherry rasp leaf virus	CRLV	Secoviridae	*Cheravirus*	*Prunus* spp.	Hadidi *et al*., 2011	P2	P2	Ab1
Cherry robigovirus 5	CRV-5	Betaflexiviridae	*Robigovirus*	*P. avium*	Wu *et al.*, 2019	Ab1	Ab1	Ab1
Cherry rusty mottle associated virus	CRMV	Betaflexiviridae	*Robigovirus*	*P. avium*	Hadidi *et al.*, 2011	P1	Ab1	Ab1
Cherry twisted leaf associated virus	CTLaV	Betaflexiviridae	*Robigovirus*	*P. avium*	Hadidi *et al*., 2011	P2	P2	Ab1
Cherry virus A	CVA	Betaflexiviridae	*Capillovirus*	*P. armeniaca, P. avium, P. domestica, P. persica*	Hadidi *et al*., 2011	P1	P2	Ab1
Cherry virus F	CVF	Secoviridae	*Fabavirus*	*P. avium*	Koloniuk *et al*., 2018	P2	Ab1	Ab1
Cherry virus Trakiya	CVT	in the Picornavirales (proposed)		*P. avium*	Milusheva *et al*., 2019	Ab1	Ab1	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE/ABSENCE		
						CAN	USA	MEX
Cherry virus Turkey	CVTR	Betaflexiviridae	*Robigovirus*	*P. avium*	Çağlayan *et al*., 2019	Ab1	Ab1	Ab1
Cherry yellow spot-associated virus	CYSaV	Unassigned in Order Tymovirales	*Gratylivirus*	*P. davidiana*	Hou *et al*., 2019	Ab1	Ab1	Ab1
Cucumber green mottle mosaic virus	CGMMV	Virgaviridae	*Tobamovirus*	*P. armeniaca*	Cech *et al*., 1981	P7	P2	Ab1
Cucumber mosaic virus	CMV	Bromoviridae	*Cucumovirus*	*P. armeniaca*	Hadidi *et al*., 2011	P7	P2	P2
Hop stunt viroid	HSVd	Popsiviroidae	*Hostuviroid*	*P. armeniaca, P. avium, P. domestica, P. dulcis, P. persica, P. salicina*	Hadidi *et al.*, 2011	P2	P2	P2
Little cherry virus 1	LChV-1	Closteroviridae	*Velarivirus*	*P. avium*	Hadidi *et al.,* 2011	P1 (P3 in BC)	P2	Ab1
Little cherry virus 2	LChV-2	Closteroviridae	*Ampelovirus*	*P. avium*	Hadidi *et al.*, 2011	P1 (P3 in BC)	P2	Ab1
Mume virus A	MuVA	Betaflexiviridae	*Capillovirus*	*Prunus* spp.	Marais *et al.,* 2018	Ab1	Ab1	Ab1
Nectarine stem pitting associated virus	NSPaV	Luteoviridae	*Luteovirus*	*P. persica var. nectarina*	Bag *et al.*, 2015	Ab1	P2	Ab1
Nectarine virus M	NeVM	Tymoviridae	*Marafavirus*	*P. persica, P. persica var. nectarina*	Villamor *et al*., 2016	Ab1	P2	Ab1
Peach associated luteovirus	PaLV	Luteoviridae	*Luteovirus*	*P. persica*	Wu *et al*., 2017	Ab1	Ab1	Ab1
Peach chlorotic mottle virus	PcCMV	Betaflexiviridae	*Foveavirus*	*P. persica*	James *et al*., 2007	P2	Ab1	Ab1
Peach latent mosaic viroid	PLMVd	Avsunviroidae	*Pelamoviroid*	*P. armeniaca, P. domestica, P. dulcis, P. persica, P. persica var.*	Hadidi *et al*., 2011	P1	P2	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE/ABSENCE		
						CAN	USA	MEX
				nectarina				
Peach leaf pitting-associated virus	PLPaV	Secoviridae	*Fabavirus*	*P. persica*	He *et al.*, 2017	Ab1	Ab1	Ab1
Peach mosaic virus	PcMV	Betaflexiviridae	*Trichovirus*	*P. armeniaca, P. domestica, P. dulcis, P. persica, P. persica var. nectarine, P. salicina*	James *et al.*, 2006	Ab1	P2	Ab1
Peach rosette mosaic virus	PRMV	Secoviridae	*Nepovirus*	*P. domestica, P. persica, P. salicina*	Hadidi *et al.*, 2011	P2	P2	Ab1
Peach virus D	PeVD	Tymoviridae	*Marafivirus*	*P. persica*	Igori *et al*., 2017	Ab1	Ab1	Ab1
Petunia asteroid mosaic virus	PeAMV	Tombusviridae	*Tombusvirus*	*P. avium*	Hadidi *et al*., 2011	P2	Ab1	Ab1
Plum bark necrosis stem pitting-associated virus	PBNSPaV	Closteroviridae	*Ampelovirus*	*P. armeniaca, P. avium, P. domestica, P. dulcis, P. persica*	Hadidi *et al*., 2011	Ab1	P2	Ab1
Plum pox virus	PPV	Potyviridae	*Potyvirus*	*Prunus* spp.	Hadidi *et al*., 2011	P3 (Ab5 for NS)	Ab5	Ab3
Prune dwarf virus	PDV	Bromoviridae	*Ilarvirus*	*Prunus* spp.	Hadidi *et al*., 2011	P1	P2	Ab1
Prunus geminivirus A	PrGVA	Geminiviridae	*Grablovirus*	*P. armeniaca, P. domestica, P. salicina*	Al-Rwahnih *et al*., 2018	Ab1	P2	Ab1
Prunus necrotic ringspot virus	PNRSV	Bromoviridae	*Ilarvirus*	*Prunus* spp.	Hadidi *et al*., 2011	P1	P2	P2
Prunus virus F	PrVF	Secoviridae	*Fabavirus*	*P. avium*	Villamor *et al*., 2017	P2	P2	Ab1
Prunus virus T	PrVT	Betaflexiviridae	*Tepovirus*	*Prunus* spp.	Marais *et al*.,	Ab1	Ab1	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE/ABSENCE		
						CAN	USA	MEX
					2015a			
Raspberry ringspot virus	RRSV	Secoviridae	*Nepovirus*	*P. domestica*	Hadidi *et al*., 2011	Ab1	Ab1	Ab1
Sowbane mosaic virus	SoMV	Solemoviridae	*Sobemovirus*	*P. domestica*	Németh, 1986	P7	P2	Ab1
Stocky prune virus	StPV	Secoviridae	*Cheravirus*	*P. domestica, P. persica*	Candresse *et al*., 2006	Ab1	Ab1	Ab1
Strawberry latent ringspot virus	SLRSV	Secoviridae	*unassigned*	*P. avium, P. persica, P. salicina*	Tang *et al*., 2013	P2	P2	Ab3
Tobacco mosaic virus	TMV	Virgaviridae	*Tobamovirus*	*P. avium, P. cerasus, P. domestica*	Németh, 1986	P7	P2	P2
Tobacco necrosis virus A	TNVA	Tombusviridae	*Alphanecrovirus*	*P. armeniaca, P. cerasus, P. domestica*	Németh, 1986	P7	P2	Ab1
Tobacco necrosis virus D	TNVD	Tombusviridae	*Bentanecrovirus*	*P. armeniaca, P. cerasus, P. domestica*	Németh, 1986	P7	P7	Ab1
Tobacco ringspot virus	TRSV	Secoviridae	*Nepovirus*	*P. avium, P. incisa, P. persica, P. serrula, P. serrulata*	Hadidi *et al.*, 2011	P2	P2	P2
Tomato black ring virus	TBRV	Secoviridae	*Nepovirus*	*Prunus* spp.	Hadidi *et al*., 2011	P7	Ab1	Ab1
Tomato bushy stunt virus	TBSV	Tombusviridae	*Tombusvirus*	*P. avium, P. domestica, P. salicina*	Ogawa, 1995	P2	P2	Ab3
Tomato ringspot virus	ToRSV	Secoviridae	*Nepovirus*	*P. avium, P. dulcis, P. persica*	Ogawa, 1995	P1	P2	Ab3

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1 **Table 2. Virus pests of pome fruits**

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PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE / ABSENCE		
						CAN	USA	MEX
Apple associated luteovirus	AaLV	Luteoviridae	*Luteovirus*	*Malus* spp.	Shen *et al.,* 2018	P2	P2	Ab1
Apple chlorotic leaf spot virus	ACLSV	Betaflexiviridae	*Trichovirus*	*Malus* spp., *Pyrus* spp, *Cydonia* spp.	Hadidi *et al.,* 2011	P1	P2	Ab1
Apple dimple fruit viroid	ADFVd	Pospiviroidae	*Apscaviroid*	*Malus* spp.	Hadidi *et al.*, 2011	Ab1	Ab1	Ab1
Apple fruit crinkle viroid	AFCVd	Pospiviroidae	*Apscaviroid*	*Malus* spp.	Hadidi *et al*., 2011	Ab1	Ab1	Ab1
Apple geminivirus	AGV	Geminiviridae	*Geminivirus*	*Malus* spp.	Hadidi *et al.*, 2017	Ab1	Ab1	Ab1
Apple green crinkle associated virus	AGCaV	Betaflexiviridae	*Foveavirus*	*Malus* spp., *Cydonia* spp.	Morelli *et al.,* 2017	P2	P2	Ab1
Apple hammerhead viroid-like RNA	AHVd	Avsunviroidae	*Pelamoviroid*	*Malus* spp.	Hadidi *et al.,* 2017	P2	P2	Ab1
Apple latent spherical virus	ALSV	Secoviridae	*Cheravirus*	*Malus* spp.	Hadidi *et al.,* 2011	Ab1	Ab1	Ab1
Apple mosaic virus	ApMV	Bromoviridae	*Ilarvirus*	*Malus* spp., *Pyrus* spp.	Liang *et al.,* 2015	P1	P2	Ab3
Apple necrotic mosaic virus	ApNMV	Bromoviridae	*Ilarvirus*	*Malus* spp.	Noda *et a*l., 2017	Ab1	Ab1	Ab1
Apple rootstock virus A	ApRVA	Rhabdoviridae	*Nucleorhabdo -virus*	*Malus* spp.	Morelli *et al*., 2017	Ab1	Ab1	Ab1
Apple rubbery wood virus 1	ARWV-1	Phenuiviridae	*Rubodvirus?*	*Malus* spp., *Pyrus* spp.	Rott *et al.,* 2018	P1	P2	Ab1
Apple rubbery wood virus 2	ARWV-2	Phenuiviridae	*Rubodvirus?*	*Malus* spp., *Pyrus* spp.	Messmer *et al*., 2017	P1	P2	Ab1
Apple scar skin viroid	ASSVd	Pospiviroidae	*Apscaviroid*	*Malus* spp., *Pyrus* spp.	Hadidi *et al.,* 2017	P2	P2	Ab1
Apple stem grooving virus	ASGV	Betaflexiviridae	*Capillovirus*	*Malus* spp., *Pyrus* spp.	Hadidi *et al.,* 2011	P1	P2	Ab1
Apple stem pitting	ASPV	Betaflexiviridae	*Foveavirus*	*Malus* spp.,	Hadidi *et al.,*	P1	P2	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	MAIN HOST(S)	REFERENCES	PRESENCE / ABSENCE		
						CAN	USA	MEX
virus				*Pyrus* spp.	2017			
Apricot latent virus	ApLV	Betaflexiviridae	*Foveavirus*	*Malus* spp.	Hadidi *et al.,* 2011	Ab1	Ab1	Ab1
Cherry leaf roll virus	CLRV	Secoviridae	*Nepovirus*	*Malus* spp.	Woo *et al.,* 2012	P7	P2	Ab1
Cherry rasp leaf virus	CRLV	Secoviridae	*Cheravirus*	*Malus* spp.	Noda *et al.,* 2017	P2	P2	Ab1
Citrus concave gum-associated virus	CCGaV	Bunyaviridae?	*Bunya-like virus*	*Malus* spp.	Wright *et al.,* 2018	Ab1	P2	Ab1
Citrus virus A	CiVA	Bunyaviridae?	*Bunya-like virus*	*Pyrus* spp.	Baek *et al.,* 2019	Ab1	Ab1	Ab1
Hop stunt viroid	HSVd	Pospiviroidae	*Hostuviroid*	*Pyrus* spp.	Hadidi *et al*., 2017	P7	P2	P2
Malus domestica virus A	MdoVA	Closteroviridae	*Velarivirus*	*Malus* spp.	Rott *et al*., 2018	Ab1	Ab1	Ab1
Peach latent mosaic viroid	PLMVd	Avsunviroidae	*Pelamoviroid*	*Pyrus* spp.	Hadidi *et al*., 2017	P7	P2	Ab1
Pear blister canker viroid	PBCVd	Pospiviroidae	*Apscaviroid*	*Pyrus* spp.	Rott *et al.,* 2018	P2	P2	Ab1
Pyrus pyrifolia cryptic virus	PpCV	Partitiviridae	*Deltapartitivirus*	*P. pyrifolia*	Osaki *et al.,* 2017	Ab1	Ab1	Ab1
Prunus necrotic ringspot virus	PNRSV	Bromoviridae	*Ilarvirus*	*Malus* spp.	Hadidi *et al*., 2017	P7	P2	Ab1
Raspberry bushy dwarf virus	RBDV	Unassigned, proposed Bromoviridae	*Idaeovirus*	*Cydonia* spp.	Hadidi *et al*., 2011	P7	P2	Ab1
Tobacco ringspot virus	TRSV	Secoviridae	*Nepovirus*	*Malus* spp.	Hadidi *et al.,* 2011	P2	P2	P2
Tomato ringspot virus	ToRSV	Secoviridae	*Nepovirus*	*Malus* spp.	Hadidi *et al.,* 2011	P2	P2	Ab3

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Table 3: Regulated fungal pathogens (incl. Chromista) of stone and pome fruit trees

Regulated pests in each NAPPO country (indicated in yellow) are listed.

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Alternaria gaisen Nagano ex Hara Synonym: *Alternaria kikuchiana* Tanaka	*Pyrus*	Japanese pear black spot	Jones & Aldwinckle, 1990	Ab1	Ab3	Ab1
Alternaria mali Roberts	*Malus*	Alternaria blotch	Jones & Aldwinckle, 1990	P2	P2	Ab3
Alternaria yali-inficiens R G. Roberts	*Pyrus*	Chocolate spot	Roberts, 2005	Ab1	Ab1	Ab1
Apiognomonia erythrostoma (Fuckel) Höhn (Pers.) V. Hohnel. Anamorph: *Phomopsis stipata* (Lib.) Sutton	*Prunus*	Red spot, leaf scorch, gnomoniosis	Ogawa *et al*., 1995	Ab1	Ab3	Ab1
Athelia rolfsii (Curzi) C.C. Tu & Kimbr. Synonym: Sclerotium rolfsii Sacc	*Prunus* spp.*; Malus* spp.	Sclerotium Stem Rot, Southern blight	Ogawa *et al.,* 1995; Ohlendorf, 1999*;* Sutton *et al.,* 2014	P7	P2	P2
Berkeleyomyces basicola (Berk. & Broome) W.J. Nel, Z.W. de Beer, T.A. Duong & M.J. Wingf. Synonyms: Thielaviopsis basicola (Berk. & Broome) Ferraris, Chalara elegans	*Prunus avium*	Black root rot	Sewell & Wilson*,* 1975*; Sønderhousen,* 1970	P1	P2	Ab3
Blumeriella jaapii (Rehm) Arx	*Prunus* spp.	Leaf spot, Shot hole	Joshua *&* Mmbaga*,* 2015; Ogawa *et al.,* 1995; USDA*,* 2020	P1	P2	Ab1
Botryosphaeria dothidea (Moug.:Fr.) Ces. & De Not. (Moug. ex Fr.) Ces. & De Not. Anamorph: *Fusicoccum aesculi* Corda	*Prunus* spp.*; Malus* spp.	Fungal gummosis (Prunus), white rot (Malus)	Jones & Aldwinckle, 1990; Ogawa *et al.*, 1995	P2	P2	Ab3
Botryosphaeria kuwatsukai (Hara) G.Y. Sun & E. Tanaka Synonyms: Guignardia piricola (nose) W.Yanam, Macrophoma kuwatsukai Hara, Botryosphaeria berengeriana f. sp. pyricola (Nose) Kogan. & Sakuma, Guignardia pyricola (Nose) W. Yamam	*Prunus americana; Pyrus pyrifolia); Malus domestica;*	Apple ring rot, Plum wilt	Deng *et al.,* 2004; Sutton *et al.,* 2014; Xu *et al.,* 2015	Ab1	Ab1	Ab1

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Botryosphaeria obtusa (Schwein.) Shoemaker (=Diplodia seriata De Not) Anamorph: *Sphaeropsis malorum* Berk.	*Prunus* spp.*; Malus* spp.	Fungal gummosis (*Prunus*), black rot (*Malus*)	Jones & Aldwinckle, 1990; Ogawa *et al.*, 1995	P1	P2	P2
Botryosphaeria ribis Gross. & Duggar Anamorph: *Fusicoccum ribis* Slippers	*Malus* spp.; *Pyrus* spp.	Fruit rot, gummosis	Pusey, 1993	P7	P1	Ab3
Botryosphaeria stevensii Shoemaker Synonym: *Physalospora malorum* Shear, N. Stevens, & M.S. Wilcox Anamorph: *Diplodia mutila* (Fr. :Fr.) Mont.	*Malus* spp.; *Pyrus* spp.	Black rot	Jones & Aldwinckle, 1990	P1	P2	Ab1
Botrytis cinerea Pers. : Fr. Synonym: Botryotinia fuckeliana (de Bary) Whetzel	*Chaenomeles* spp.*; Prunus* spp.*; Pyrus* spp. and *Malus spp.*	Gray mold, dry eye rot blossom end rot green fruit rot	Norina *&* Rumpunen*,* 2003; Ferrada *et al.,* 2016; Strand*,* 1999*;* Sutton *et al.,* 2014	P2	P2	P2
Cadophora malorum (Kidd & Beaumont) W. Gams Synonym: Phialophora malorum (Kidd & Beaumont) McColloch	*Malus* spp.; *Pyrus* spp.	Side rot	McColloch*,* 1944*;* Sugar & Spotts*,* 1992; Sutton *et al.,* 2014	P2	P2	Ab3
Ceratobasidium ochroleucum (F. Noack) Ginns & M.N. Lefebvre Synonym: Corticium stevensii Burt	*Malus* spp. *Pyrus* spp.	Thread blight	Jones & Sutton*,* 2019*;* Sutton *et al.,* 2014	Ab1	P2	Ab3
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. Synonym: Glomerella cingulata (Stoneman) Spauld. & H. Schrenk	*Cydonia oblonga, Malus* spp.*, Pyrus* spp.	Anthracnose, Fruit rot, Bitter rot, Black spot	Sutton *et al.,* 2014	P1	P2	P2
Cylindrocarpon didymum (Harting) Wollenweb.	*Malus* spp.	Twig blight	Dugan & Grove, 1994	P7	P2	Ab3
Cytospora ceratosperma (Tode) G.C. Adams & Rossman Synonyms: Valsa ceratosperma (Tode) Maire, Cytospora sacculus (Schwein.)	*Cydonia oblonga, Malus* spp.*, Pyrus* spp.	Valsa canker	Sutton *et al.,* 2014	P7	P2	Ab1

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Gvritischvili						
Cytospora cincta Sacc. *Synonyms: Leucostoma cinctum (Fr. : Fr.) Höhn., Leucostoma cincta (Fr. : Fr.) Höhn.; Valsa cincta (Fr. : Fr.) Fr.*	*Prunus avium ; Prunus* spp.*; Malus* spp.*;*	Dieback, Perennial canker	Barakat & Johnson, 1997; Ogawa *et al*., 1995; Brown-Rytlewski & McManus, 2000; Proffer & Jones, 1989; Sutton *et al*., 2014	P2	P2	Ab1
Cytospora leucostoma (Pers.) Sacc. *Synonyms: Leucostoma persoonii (Nitschke) Höhn., Valsa leucostoma (Pers.: Fr.) Fr.*	*Cydonia; Prunus domestica; Prunus* spp.	Dieback, canker	Biggs & Grove, 2005; Strand, 1999; Ogawa *et al*., 1995	P1	P2	Ab1
Diaporthe tanakae Ts. Kobay. & Sakuma Kobayashi & Sakuma Anamorph: *Phomopsis tanakae* Kobayashi & Sakuma	*Malus* spp., *Pyrus* spp.	Canker	Jones & Aldwinckle, 1990	Ab1	Ab1	Ab1
Ellisembia asterinum (Cooke) Shoemaker & Hambl. Synonym: Helminthosporium papulosum A. Berg	*Malus* spp., *Pyrus* spp.	Black pox of apple, Blister canker of pear	Sutton *et al*., 2014	Ab1	P2	Ab1
Erythricium salmonicolor (Berk. & Broome) Burdsall	*Malus* spp., *Pyrus* spp.	Pink disease	Prasad, 2013; Momol *et al.,* 2017	Ab1	P2	Ab3
Gloeodes pomigena (Schwein.) Colby (=*Phyllachora pomigena* (Schwein.) Sacc.)	*Malus, Pyrus, Prunus*	Sooty blotch, flyspeck	Jones & Aldwinckle, 1990; Estafne, 2015; USDA, 2020; Wilcox, 1994; Ogawa *et al*., 1995	P2	P2	Ab1
Guignardia piricola (Nose) W. Yanam Synonym: *Physalospora piriciola* Nose Anamorph: *Fusicoccum sp*.	*Malus* spp., *Pyrus* spp.	Apple ring rot disease	Jones & Aldwinckle, 1990	Ab1	Ab1	Ab1
Gymnosporangium asiaticum Miyabe ex G. Yamada	*Pyrus* spp.	Japanese pear rust	Jones & Aldwinckle, 1990	Ab1	P2	Ab1

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Anamorph: *Roestelia koreaënsis* Henn.						
Gymnosporangium clavipes Cooke & Peck (Cooke & Peck) Cooke & Peck en Peck	*Malus* spp., *Pyrus* spp.	Quince rust	Jones & Aldwinckle, 1990	P1	P2	P2
Gymnosporangium globosum (Farl.) Farl.	*Malus* spp., *Pyrus* spp.	American hawthorn rust	Jones & Aldwinckle, 1990	P1	P1	P2
Gymnosporangium juniperi-virginianae Schwein.	*Malus* spp.	Cedar-apple rust	Jones & Aldwinckle, 1990	P2	P2	Ab1
Gymnosporangium kernianum Bethel	*Pyrus* spp.	Kern's pear rust	Jones & Aldwinckle, 1990	Ab1	P2	Ab3
Gymnosporangium libocedri (Henn.) F. Kern	*Pyrus* spp.	Pacific coast pear rust	Jones & Aldwinckle, 1990	Ab1	P2	Ab1
Gymnosporangium nelsonii Arthur.	*Pyrus* spp.	Rocky mountain pear rust	Jones & Aldwinckle, 1990	P2	P2	Ab3
Gymnosporangium sabinae (Dicks.) G. Winter *Synonym: Gymnosporangium fuscum R. Hedw. in DC*	*Pyrus calleryana* *Pyrus* spp.	European pear rust, Pear trellis Rust	Hansen *et al.,* 2016; Sutton *et al*., 2014; Lim *et al.,* 1978	P2	P2	Ab1
Gymnosporangium yamadae Miyabe ex G. Yamada	*Malus* spp.	Japanese apple rust	Jones & Aldwinckle, 1990	Ab1	P2	Ab1
Helminthosporium papulosum Anth. Berg (=Helminthosporium asterinum Cooke)	*Malus* spp., *Pyrus* spp.	Black pox of apple, blister canker of pear	Jones & Aldwinckle, 1990	Ab1	P2	Ab1
Leucostoma persoonii Hohn. (Nitschke) Höhn. (=Valsa persoonii Nitschke) Anamorph: *Cytospora rubescens* Fr.	*Prunus* spp.	Dieback, canker	Ogawa *et al*., 1995	P1	P1	Ab1
Macrophoma kawatsakai Hara	*Prunus* spp.	Plum wilt	Qong *et al*., 2005	Ab1	Ab1	Ab1
Monilinia fructigena Honey in Whetzel (Aderh. & Ruhland) Honey	*Prunus* spp., *Malus* spp., *Pyrus* spp.	Brown rot	Jones & Aldwinckle 1990; Ogawa *et al*., 1995	Ab1	Ab3	Ab1

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Monilinia kusanoi (Henn. ex Takah.) (Takah.) W. Yamamoto Anamorph: *Monilia kusanoi* P. Henn.	*Prunus* spp.	Leaf blight, green fruit rot	Ogawa *et al*., 1995	Ab1	Ab1	Ab1
Monilinia laxa (Aderhhold & Ruhland) Honey Synonym: *Sclerotinia laxa* Aderh. & Ruhland	*Prunus* spp., *Malus* spp.	Brown rot	Jones & Aldwinckle 1990; Ogawa *et al*., 1995	P2	P2	Ab1
Monilinia mali (Takah.) Whetzel Synonym: *Sclerotinia mali* Takah.	*Malus* spp.	Blossom blight, leaf blight	Jones & Aldwinckle, 1990	Ab1	Ab1	Ab1
Monilia polystroma G. van Leeuwen *et al*. Synonym: *Monilinia polystroma* (G.C.M. Leeuwen) Kohn	*Malus* spp., *Prunus* spp.	Brown rot	van Leeuwen *et al.*, 2002	Ab1	Ab1	Ab1
Neofabraea malicorticis (Cordley) H. Jacks. Synonyms: Cryptosporiopsis curvispora (Peck) Gremmen, Pezicula malicorticis (Cordley) Nannf.	*Malus* spp.	Anthracnose canker and Perennial canker	Brun & Bush, 2016; Sutton *et al*., 2014	P2	P2	Ab3
Phaeoacremonium parasiticum (Ajello, Georg & C.J.K. Wang) W. Gams, Crous & M.J. Wingf. Synonym: Phialophora parasitica Ajello, Georg & Wang	*Cydonia oblonga); Prunus avium ; Prunus armeniaca; Prunus salicina; Malus* spp.*; Pyrus* spp.	Dieback	Mohammadi & Sharifi, 2016; Ogawa *et al*., 1995; Rumbos, 1986 Damm *et al*., 2008; Sami *et al*., 2014; Groenewald *et al*., 2001; OSU, 2020	Ab1	P2	Ab1
Phacidiopycnis piri (Fuckel) Weindlm J. Weindlymayr (=*Discula pyri* (Fuckel) Höhn.) Teleomorph: *Potebniamyces pyri* (Berk. & Broome) Dennis	*Pyrus* spp., *Malus* spp.	Canker, stem end rot	Xiao & Boal, 2005	P2	P2	Ab1

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Anamorph: *Potebniamyces discolor* (Mouton & Sacc.) Smerlis						
Phialophora parasitica Ajello, L.K. Georg. & Wang Teleomorph: *Togninia parasitica* L. Mostert	*Prunus* spp.	Dieback	Ogawa *et al*., 1995	Ab1	P2	Ab1
Phyllosticta arbutifolia Ellis & G. Martin Synonym: Phyllosticta solitaria Ellis & Everh. .	*Malus* spp.	Blotch	Jones & Aldwinckle, 1990; Sutton *et al*., 2014	P2	P2	Ab1
Phymatotrichopsis omnivora (Duggar) Hennebert	*Malus* spp., *Prunus* spp., *Pyrus* spp., *Cydonia* spp.	Texas root rot	Jones & Aldwinckle 1990; Ogawa *et al*., 1995; Sutton *et al*., 2014	Ab1	P2	Ab3
Phytophthora cambivora (Petri) Buisman	*Malus* spp., *Prunus* spp.	Ink disease	Jones & Aldwinckle, 1990; Ogawa *et al*., 1995	P2	P2	Ab1
Phytophthora cryptogea Pethybr. & Lafferty	*Prunus* spp., *Malus* spp.	Collar rot	Jones & Aldwinckle, 1990; Ogawa *et al.*, 1995	P5	P2	P2
Phytophthora drechsleri Tucker	*Malus* spp.	Fruit rot	Jones & Aldwinckle, 1990	P7	P2	P2
Phytophthora megasperma Dreschsler	*Malus* spp., *Prunus* spp.	Collar rot, crown rot	Jones & Aldwinckle, 1990; Ogawa *et al.*, 1995	P7	P2	Ab1
Phytophthora syringae (Kleb.) Kleb.	*Malus* spp., *Prunus* spp.	Fruit rot	Jones & Aldwinckle, 1990; Ogawa *et al.*, 1995	P2	P2	Ab1
Phytopythium vexans (de Bary) Abad, de Cock, Bala, Robideau, Lodhi & Lévesque Synonym:	*Prunus persica*	Damping-off, root rot	Biesbrock & Hendrix Jr., 1970; Hendrix *et al*., 1966	P7	P2	Ab1

PEST	HOST	DISEASE	REFERENCE	PRESENCE/ABSENCE		
				CAN	USA	MEX
Pythium vexans de Bary						
Podosphaera pannosa (Wallr. : Fr.) de Bary Synonym: Sphaerotheca pannosa (Wallr.: Fr.) Lév	*Prunus* spp.*; Pyrus* spp.	Powdery mildew	Ogawa *et al.,* 1995; Pscheidt & Ocamb, 2020; Strand, 1999	P1	P2	P2
Pythium irregulare Buisman	*Malus* spp.	Replant disease	Braun, 1991	P1	P1	P2
Rosellinia necatrix Berl. ex Prill. Anamorph: *Dematophora necatrix* R. Hartig	*Prunus* spp.*, Malus* spp.	Root rot	Jones & Aldwinckle 1990; Ogawa *et al*., 1995	Ab1	P2	P2
Tranzschelia discolor (Fuckel) Tranzschel & M.A. Litv. Synonym: (=*Tranzschelia pruni-spinosae* var. discolor (Pers. :Pers.) Dietel var. discolor (Fuckel) Dunegan)	*Prunus* spp.	Rust	Ogawa *et al*., 1995	P2	P2	Ab3
Venturia carpophila E.E. Fisher Synonyms: Fusicladium amygdali Ducomet, Cladosporium carpophilum Thüm.	*Prunus* spp.	Peach scab	Haviland *et a*l., 2019; Ogawa *et al*., 1995	P1	P2	Ab1
Venturia nashicola S. Tanaka & S. Yamamoto Anamorph: *Fusicladium nashicola* K. Schub. & U. Braun	*Pyrus* spp.	Pear scab	Jones & Aldwinckle, 1990	Ab1	Ab1	Ab1
Verticillium albo-atrum Reinke & Berthier Berthold	*Prunus* spp.	Verticllium wilt	Ogawa *et al*., 1995	P1	P2	P2
Verticillium dahliae Kleb.	*Prunus* spp.	Verticillium wilt	Ogawa *et al.,*1995	P1	P2	P2

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Table 4. Bacterial and phytoplasmal pathogens of stone and pome fruit trees

PEST	HOST(S)	DISEASE	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
Bacteria						
Agrobacterium tumefaciens (updated scientific name: *Rhizobium radiobacter*, synonym *Agrobacterium radiobacter*)	*Prunus* spp., *Malus* spp.	Crown gall, hairy root	CABI 2021; WPBUS, 2020; Pulawska, J., 2016	P1	P2	P2
Erwinia amylovora (Burrill) Winslow *et al*.	*Malus* spp., *Pyrus* spp.	Fire blight	Sutton *et al*., 2014,	P1	P2	P2
Erwinia pyrifoliae Kim *et al*.	*Pyrus pyrifolia*	Asian pear blight	Sutton *et al.*, 2014; WPBUS, 2020	Ab1	Ab1	Ab1
Pseudomonas amygdali Psallidas & Panagopoulos	*Prunus* spp.	Almond bacteriosis	Sutton *et al*., 2014	Ab1	Ab1	Ab1
Pseudomonas syringae pv. morsprunorum (Wormald) Young *et al*.	*Prunus* spp.	Bacterial canker of stone fruits; dieback	Sutton et al., 2014; Latorre & Jones, 1979; Hulin *et al.,* 2018; Ahmed *et al*., 2018	P1	P2	Ab1
Pseudomonas syringae pv. papulans (Rose) Dhanvantari	*Malus* spp.	Blister spot	Kerkoud *et al*., 2000	P2	P2	Ab1
Pseudomonas syringae pv. persicae (Prunier *et al*.) Young *et al*.	*Prunus* spp.	Bacterial shoot dieback; canker; leaf spot; fruit lesions	Hulin *et al*., 2018, Sutton *et al*., 2014; Zhao *et al*., 2015	Ab1	Ab1	Ab1
Pseudomonas syringae pv. syringae van Hall	*Prunus* spp., *Malus* spp., *Pyrus* spp.	Bacterial canker & fruit spot; blossom blast of pear; blister bark of apple	Ogawa *et al*., 1995; Sutton *et al*., 2014; Hulin *et al*, 2018; Gasic *et al.,* 2018; Little *et al.,* 1998 ; Xu *et al.*, 2008	P1	P2	Ab3
Xanthomonas arboricola pv. pruni (Smith) Vauterin *et al*.	*Prunus* spp.	Leaf and fruit spot and stem canker or bacterial canker of stone fruit	Garita-Cambronero, *et al*., 2018	P2	P2	Ab1
Xanthomonas prunicola sp. nov. The type strain is CFBP 8353 (=CECT 9404=IVIA 3287.1)	*Prunus* (nectarine)	Necrotic lesions on leaves	López, *et al*., 2018	Ab1	Ab1	Ab1

PEST	HOST(S)	DISEASE	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
Xylella fastidiosa Wells *et al*.	*Prunus* spp.	Phony peach disease; plum leaf scald; almond scorch; Pierce's disease	Sutton *et al*., 2014; Janse & Obradovic, 2010; WPBUS, 2020; Alves *et al.*, 2004; Chen *et al.,* 2008	P7	P2	P3
Phytoplasma						
Candidatus Phytoplasma pruni	*Prunus* spp. including - Almond, cherry, French prune, Japanese plum, peach	X-disease, Cherry buckskin, Cherry Western X disease, Prunus X disease	Davis *et al*., 2013; Davis *et a*l., 2019	P5	P2	P2
Candidatus Phytoplasma pruni	*Malus domestica*	X-disease, Cherry buckskin, Cherry Western X disease, Prunus X disease	Davis *et al.,* 2013	P2	P2	P2
Candidatus Phytoplama prunorum	*Prunus* spp. including - Almond, apricot, cherry, European plum, Japanese plum, peach	European stone fruit yellows, apricot chlorotic leafroll, plum leptonecrosis, plum decline, peach yellows, peach decline, European peach yellows	Krizanac *et al*.,2010	P5	Ab1	Ab1
Candidatus Phytoplasma asteris	Sweet & sour cherry, *Malus domestica*	Aster yellows, apple sessile leaf, sweet/sour cherry decline	Jomantiene & Davis, 2005; Caglayan *et al*., 2013; Zunnoon-Khan *et al.*, 2010b; Lee *et al.,* 2004a; Davis, 2020	Ab1	P2	P2
Candidatus Phytoplasma mali	Sweet & sour cherry, *Malus domestica*	Apple Proliferation, Sweet/sour cherry decline	Bulgariet *et al.,* 2012	Ab1	Ab1	A1
Candidatus Phytoplasma phoenicium	Almond, possibly other *Prunus* spp.	Almond's witches broom, almond brooming	Zirak *et al.,* 2019; Salehi *et al*., 2006	Ab1	Ab1	Ab1

PEST	HOST(S)	DISEASE	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
Candidatus Phytoplasma pyri	*Prunus* spp. including - Peach, Pear, *Cydonia oblonga*	Pear decline, Peach decline	Sabate *et al*.,2014, EPPO, 2017; Hunter *et al.*, 2010	P2	P2	Ab1
Candidatus phytoplasma ulmi	*Prunus avium*	Cherry leaf yellows	Lee *et al.,* 2004b	P7	Ab1	Ab1

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Table 5: Arthropod pests of stone and pome fruit trees

Context: The pests named in this table are considered vectors which promote the introduction (entry and establishment) and spread of the stone and pome fruit diseases listed in this standard.

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
Acari						
Trombidiformes: Eriophyidae						
Aculus fockeui (Nalepa and Trouessart)	*P. armeniaca, P. avium, P. domestica, P. persica*	Isac *et al*. 1998; Alford 2014; Abou-Awad *et al*. 2010	Leaves	P2	P2	Ab1
Eriophyes inaequalis Wilson & Oldfield	*P. avium*	Lindquist *et al.* 1996; Caprile *et al*. 2016; Beers *et al*. 1993	Leaves	P2	P2	Ab1
Eriophyes insidiosus Keifer & Wilson	*P. persica, P.* var. *nectarina, Prunus* spp.	Lindquist et al. 1996; Gispert *et al*. 1998	Leaves	Ab1	P2	Ab1
Insects						
Coleoptera: Nitidulidae						
Carpophilus freemani Dodson	Indiscriminate pest of *Prunus* spp.	Moller & DeVay 1968; Connell *et al*. 2005; Ewing & Cline 2005; UF/IFAS 2018	Damaged trees, flower, fruit	Ab1	P2	Ab3
Diptera: Drosophilidae						
Chymomyza procnemoides Wheeler	*P. dulcis*	Moller & DeVay 1968); Connell *et al*. 2005	Damaged trees	P2	P2	Ab1
Hemiptera: Aphididae						
Aphis craccivora Koch	*P. persica*	Labonne *et al*. 1994; Alford 2014; Blackman & Eastop 2000	Leaves, stems, inflorescence	P2	P2	P2
Aphis fabae (Scopoli)	*P. armeniaca, P. avium, P. domestica, P. persica, Prunus* spp.	Gildow *et al*. 2004; Wallis *et al*. 2005; Blackman & Eastop	Leaves, stems, inflorescence	P1	P2	P2

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
		2000				
Aphis gossypii Glover	*P. domestica, P. dulcis*	Labonne *et al*. 1994; Gildow *et al.* 2004; Wallis *et al*. 2005; Blackman & Eastop 2000; Hill 1987	Leaves, stems, inflorescence	P1	P2	P2
Aphis hederae Kaltenbach	*P. dulcis*	Labonne *et al*. 1994; Halima 2012; Blackman & Eastop 2000	Leaves, stems, inflorescence	P1	P2	P2
Aphis spiraecola Patch	*Prunus* spp.*, P. domestica, P. dulcis, P. domestica, P. persica*	Labonne *et al*. 1994); Gildow *et al*. 2004; CABI 2019; Blackman & Eastop 2000; Wallis *et al*. 2005; Blackman n.d.	Leaves, stems, inflorescence	P2	P2	P2
Brachycaudus cardui (L.)	*Prunus* spp*., P. domestica*	Alford 2014; *Isac et al*. 1998; Kunze & Krczal 1971; Blackman & Eastop 2000	Leaves, stems, inflorescence	P1	P2	Ab1
Brachycaudus helichrysi (Kaltenbach)	*Prunus* spp., *P. domestica, P. dulcis, P. persica*	Zsuzsa *et al*. 1997; Kunze & Krczal 1971; Hadidi *et al*. 2011; Isac *et al*. 1998; Blackman & Eastop 2000	Leaves, stems, inflorescence	P1	P2	P2
Brachycaudus persicae (Passerini)	*Prunus* spp.*, P. domestica, P. dulcis, P. persica*	Gildow *et al*. 2004; Wallis *et al*. 2005; Leclant 1973; Blackman & Eastop 2000	Leaves, stems, inflorescence	P2	P2	P2
Hyalopterus pruni (Geoffroy)	*Prunus* spp.*, P. domestica*, *P. armeniaca*, *P. persica*, *P. persica* var. *nectarina*	Zsuzsa *et al*. 1997; Kunze & Krczal 1971; Hadidi *et al*. 2011; Isac *et al*. 1998;	Leaves, stems, inflorescence	P1	P2	P2

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
		Blackman & Eastop 2000); Hill 1987				
Myzus cerasi	*P. avium*, *P. persica*	Zsuzsa *et al.* 1997; Blackman & Eastop 2000	Leaves, stems, inflorescence	P1	P2	P2
Myzus persicae (Sulzer)	*Prunus* spp.*, P. armeniaca*, *P. domestica*, *P. dulcis*, *P. persica, P.* var. *nectarina*	Labonne *et al*. 1994; Gildow *et al*. 2004; Wallis *et al*. 2005; Isac *et al*. 1998; Kunze & Krczal 1971; Leclant 1973; Blackman & Eastop 2000; Alford 2014; Hill 1987	Leaves, stems, inflorescence	P1	P2	P1
Myzus varians (Davidson)	*Prunus persica*	Manachini *et al*. 2004; Németh 1994	Leaves, stems, inflorescence	Ab1	P2	P2
Phorodon humuli (Schrank)	*P. domestica, Prunus* spp.	Zsuzsa *et al*. 1997); Alford 2014; *Isac et al*. 1998; Kunze & Krczal 1971; Blackman & Eastop 2000; Hill 1987	Leaves, stems, inflorescence	P1	P2	Ab1
Rhopalosiphum padi (Linnaeus)	*Prunus* spp.	Labonne *et al*. 1994; Zsuzsa *et al.* 1997; Blackman & Eastop 2000	Leaves, stems, inflorescence	P1	P2	P2
Toxoptera citricida	*P. domestica*	Gildow *et al*. 2004; Blackman & Eastop 2000	Leaves, stems, inflorescence	Ab1	P2	P2
Hemiptera: Cercopidae						
Philaenus spumarius L.	*P. dulcis*, *P. persica*	CABI 2019; Cornara *et al*. 2017; Ivanauskas *et al*., 2014; Redak *et al*., 2004; Cornara *et al*., 2017	Stems, twigs	P1	P2	Ab1
Hemiptera: Cicadellidae						

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
Colladonus clitellarius (Say)	*P. persica, P. avium, Prunus* spp.	George & Davidson 1959;Gilmer 1966; Taboada *et al*., 1975	Leaves, stems, twigs	P2	P2	Ab1
Colladonus geminatus (Van Duzee)	*P. persica, P. avium*	Nielson 1968; Wolfe *et al*., 1950	Stems and twigs	P2	P2	Ab1
Colladonus montanus (Van Duzee)	*P. persica* in the lab	Caprile *et al*. 2016; Nielson 1968; Diekmann & Putter 1996; *Kirkpatrick et al*., 1990	Leaves, stems, and twigs	P2	P2	Ab1
Cuerna costalis (F.)	*P. persica*	Nielson 1968; Overall & Rebek 2017; Redak *et al*, 2004; Janse & Obradovic 2010; Janse 2005; Purcell 2008; Turner & Pollard 1959a; Turner & Pollard 1959b; Turner & Pollard 1955	Stems	P2	P2	Ab1
Fieberiella florii (Stal)	*P. avium, P. persica, P.* var. *nectarina*, *Malus domestica*	Alford 2014; Caprile et al. 2016; Douglas 1999; Jensen 1957; Nielson 1968; Gilmer 1966; *Kirkpatrick et al*., 1990; Anthon & Wolfe 1951; Krczal *et al*., 1989	Stems	P2	P2	Ab1
Graphocephala confluens Uhler)= *Keonella confluens* (Uhler) – typo: *Keonolla confluens*, now *Neokolla confluens*	*Prunus* spp.	Nielson 1968; Anthon & Wolfe 1951; (https://bugguide.net/node/view/86658)	Leaves, stems, twigs	P2 (As *Neokolla confluens* (Uhler)	P1	Ab1

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
Graphocephala versuta (Say)	*P. persica, P. domestica, Prunus* spp.	Janse 2005; Nielson 1968; Purcell 2008; Turner *and* Pollard 1959a; Turner & Pollard 1955	Stems	Ab1	P2	Ab1
Gyponana lamina Delong = *Gyponana expanda* DeLong ()	*Prunus* spp.	Hamilton, 1982; Gilmer 1966; Nielson 1968	Stems and twigs	P2 (as *G. expanda*)	P2	Ab1
Homalodisca vitripennis (Germar) syn: *H. coagulata*	*P. avium*, *P. domestica*, *P. dulcis*, *P. persica*, *P. salicina*, *Prunus* spp.	CABI 2019Overall & Rebek 2017; Nielson 1968 Redak *et al*., 2004); Janse & Obradovic 2010; Triapitsyn & Phillips 2000; Janse 2005; Purcell 2008; Turner & Pollard 1959a	Leaves, stems, twigs	Ab1	P2	P3
Macropsis trimaculata (Fitch)	*P. persica, P armeniaca, P. domestica, Prunus* spp.	Nielson 1968; Layne and Bassi 2008	Leaves, stems, twigs	P2	P2	Ab1
Norvellina seminuda (Say)	*P. persica*	Nielson 1968; Gilmer 1966	Leaves, stems, twigs	P2	P2	Ab1
Oncometopia orbona (F.)	*P. persica, Prunus* spp.	Overall and Rebek 2017; Janse & Obradovic 2010; Nielson 1968; Janse 2005)	Stems	P2	P2	Ab1
Oncometopia nigricans (Walker)	*P. persica*	Nielson 1968; Redak *et al*., 2004; Purcell 2008; Layne & Bassi 2008)	Stems	Ab1	P2	Ab3
Osbornellus borealis DeLong & Mohr.	*P. persica*	Nielson 1968; Jensen 1957	Stems and twigs	P2	P2	Ab1
Paraphlepsius irroratus (Say)	*P. persica*	Layne & Bassi 2008;	Leaves, stems,	P1	P2	Ab3

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
		Nielson 1968; Rosenberger & Jones 1978); Gilmer 1966	twigs			
Scaphytopius acutus (Say) syn.: *Scaphytopius acutus delongi* Young	*P. persica, P. avium, Prunus* spp.	Nielson 1968; Taboada *et al*. 1975; Rosenberger & Jones 1978; Gilmer 1966; Anthon & Wolfe 1951	Leaves, stems, twigs	P1	P2	Ab1
Hemiptera: Cixiidae						
Hyalesthes obsoletus Signoret	*P. domestica, P. avium, Prunus* spp.	Alford 2014; Bressan *et al*., 2007; Sforza *et al*., 1998)	Leaves, stems, twigs, roots	Ab1	Ab1	
Hemiptera: Pseudococcidae						
Phenacoccus aceris (Signoret)	*P. armeniaca, P. avium, P. domestica, P. dulcis, P. persica, Prunus* spp.	García Morales *et al*. 2016; Raine *et al*. 1986	Leaves	P2	P2	Ab1
Pseudococcus maritimus (Ehrhorn)	*P. armeniaca, P. persica*	García Morales *et al*., 2016; Hill 1987; Long *et al*., 2017; Mekuria *et al*., 2013)	Leaves and trunk	P2	P2	Ab1
Hemiptera: Psyllidae						
Cacopsylla melanoneura (Förster)	*Malus* spp.	Jarausch & Jarausch, 2010		Ab1	Ab1	Ab1
Cacopsylla picta (Förster) syn. *C. costalis* (Flor))	*Malus* spp.	Hadidi *et al*., 2011; Jarausch & Jarausch, 2010		Ab1	Ab1	Ab1
Cacopsylla pruni (Scopoli)	*P. dulcis, P. armeniaca, P. domestica, Prunus* spp.	Gallinger & Gross 2018; Layne & Bassi 2008; Hadidi *et al*., 2011	Leaves, stems, twigs, fruit	Ab1	Ab1	Ab1
Cacopsylla pyri (Linnaeus)	*Pyrus* spp.	Hadidi *et al*., 2011; Jarausch & Jarausch, 2010		Ab1	Ab1	Ab1
Cacopsylla pyricola (Förster)	*P. persica*, *Pyrus* spp.	Alford 2014; Jarausch	Flowers, buds,	P2	P2	Ab1

VECTOR NAME	HOST	REFERENCES	PLANT PART ASSOCIATION	PRESENCE / ABSENCE		
				CAN	USA	MEX
		& Jarausch, 2010; Layne & Bassi 2008); Hadidi *et al*., 2011; Blomquist & Kirkpatrick 2002	shoots, fruits, leaves			
Lepidoptera: Pyralidae						
Amyelois transitella (Walker)	*P. domestica, P. armeniaca, P. persica, P. dulcis*	Ampt *et al*. 2015; Palumbo *et al*. 2014; Wenneker *et al*., 2015	Primarily feeds inside fruits and nuts, however, (Wenneker et al.) (2015) lists “plants for planting” as a pathway.	Ab1	P2	P2
Euzophera semifuneralis (Walker)	*P. avium, P. domestica*	Connell *et al.,* 2005; Long *et al*., 2017 Robinson *et al*., 2002; Van Steenwyk *et al*., 1986	Leaves, damaged trunks and branches	P1	P2	Ab1
Thysanoptera: Thripidae						
Frankliniella occidentalis (Pergande)	*P. avium*, *P. domestica, P. persica*, *P.* var. *nectarina*	CABI 2019; Caprile *et al*., 2016; Hill 1987; Hadidi *et al.,* 2011; Long *et al*., 2017; Milne & Walter 2003; Saccaggi & Pieterse 2013	Fruits, inflorescence, leaves, flowers	P2	P2	P2
Thrips tabaci Lindeman	*P. persica*	Greber *et al*., 1991; Hill 1987; Milne & Walter 2003; Pinent *et al*., 2008	Stems, leaves, flowers	P1	P2	P2

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1 **Table 6: Nematode pests of stone and pome fruit trees**

2

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
Criconema mutabile	Ectoparasite	*Prunus persica*	Hugo & Storey, 2017	Ab1	P2	P2
Criconemoides annulatus	Ectoparasite	*Prunus* spp., *Malus* spp.	Raski, D.J. 1952; Siddiqui *et al.,* 1973	Ab1	P2	Ab1
Criconemoides curvatum	Ectoparasite	*Prunus persica*, *Prunus avium*	Bridge & Starr, 2007.	P2	P7	Ab3
Criconemoides ornatus	Ectoparasite	*Prunus persica*	Ratanaworabhan & Smart 1970	Ab1	Ab3	Ab1
Helicotylenchus dihystera	Migratory ecto and semi endoparasite	*Prunus* spp.	Dong *et al.,* 2007; McKenry & Roberts, 1985; Ravichandra, N.G. 2008; Siddiqui *et al.,* 1973; Subbotin *et al*., 2015.	P7	P2	P2
Helicotylenchus erythrinae	Migratory ecto and semi endoparasite	*Malus domestica*	Siddiqui *et al*., 1973	P7	P2	P2
Helicotylenchus digonicus	Migratory ecto and semi endoparasite	*Prunus* spp.	Siddiqui *et al*., 1973	Ab1	Ab1	P2
Helicotylenchus paragiris	Migratory ecto and semi endoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Helicotylenchus platyurus	Migratory ecto and semi endoparasite	*Prunus* spp.	Hafez *et al*., 2010	P2	Ab1	
Helicotylenchus pseudorobustus	Migratory ecto and semi endoparasite	*Prunus* spp.	Dong *et al*., 2007; Ravichandra, N.G. 2008; Siddiqui *et al.,* 1973; Subbotin *et al*., 2015	P2	P2	Ab1
Hemicriconemoides sheri	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Hemicriconemoides striatula	Ectoparasite	*Prunus* spp.	Dong *et al.,* 2007	Ab1	Ab4	Ab1
Heterodera urticae	Sedentary endoparasite	*Prunus* spp.	Hafez *et al*., 2010	Ab1	Ab1	Ab1
Longidorus attenuatus	Root tip ectoparasite	*Pyrus communis*	Arias & Andres, 1989; CPC 2006 edition; Griffiths & Robertson,1984; Raski,	Ab1	Ab1	Ab1

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
			D.J.,1988			
Longidorus breviannulatus	Root tip ectoparasite	*Prunus* spp.	Simard *et al*., 2009. Van Driell *et al*., 1990	P2	P2	Ab1
Longidorus brevicaudatus	Root tip ectoparasite	*Malus domestica*	Lone *et al*., 2018	Ab1	P2	Ab1
Longidorus coespiticola	Root tip ectoparasite	*Prunus* spp.	Arias & Andres, 1989; Ravichandra, N.G. 2008	Ab1	Ab1	Ab1
Longidorus diadecturus	Root tip ectoparasite	*Prunus persica*	Eveleigh & Allen, 1982	P2	P2	Ab1
Longidorus euonymus	Root tip ectoparasite	*Malus domestica*	Barsi, L. 1994a; Choleva-Abadzhieva, B.1975; Lone *et al*., 2018	Ab1	Ab1	Ab1
Longidorus macrosoma	Root tip ectoparasite	*Prunus* spp., *Pyrus* spp.	Andres *et al*., 1991; Arias & Andres, 1989; Raski, D.J., 1988	Ab1	Ab1	Ab1
Longidorus mirus	Root tip ectoparasite	*Malus domestica*	Lone *et al*., 2018	Ab1	Ab1	Ab1
Meloidogyne arenaria	Sedentary endoparasite	*Prunus* spp., *Malus domestica*	Cid del Prado *et al*., 2001; Hugo & Storey, 2017; Powers *et al*., 2005; Raski, D.J., 1988; CPC 2006 edition	P7	P2	P2
Meloidogyne floridensis	Sedentary endoparasite	*Prunus* spp.	Chitambar, 2018; Shirley, 2011	Ab1	P2	Ab1
Meloidogyne incognita	Sedentary endoparasite	*Prunus* spp., *Malus domestica*	Martínez, 1980; Ogawa *et al*., 1995; Powers *et al*., 2005; Raski, D.J.,1988	P2	P2	P2
Meloidogyne hapla	Sedentary endoparasite	*Prunus* spp., *Malus domestica*	Ogawa *et al.,* 1995; Powers *et al.,* 2005; Raski, D.J.,1988; CPC 2006 edition	P2	P2	P2
Meloidogyne javanica	Sedentary endoparasite	*Prunus* spp., *Malus domestica*	Cid del Prado *et al.,* 2001; Ogawa *et al.,* 1995; Powers *et al.*, 2005; Raski, D.J.,1988	P7	P2	P2
Meloidogyne mali	Sedentary endoparasite	*Prunus avium*, *Malus* spp.	Bridge & Starr, 2007; Itoh *et al.*, 1969	Ab1	P2	Ab1
Merlinius brevidens	Root tip ectoparasite	*Prunus* spp.	Dong *et al*., 2007; McKenry &	P7	P2	Ab1

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
			Roberts, 1985			
Mesocriconema curvatum	Ectoparasite	*Malus domestica*	Hafez *et al*., 1992	Ab1	P2	Ab1
Mesocriconema ornatum	Ectoparasite	*Malus domestica*	Hafez *et al*., 1992	Ab1	P2	Ab1
Mesocriconema xenoplax (Criconemella xenoplax)	Ectoparasite	*Malus domestica*, *Prunus* spp.	Dong *et al*., 2007; Ferris *et al.,* 2004; Ogawa *et al*., 1995; Raski, D.J. 1952; Siddiqui *et al.*, 1973	P2	P2	P2
Nanidorus minor (Paratrichodorus minor)	Root tip ectoparasite	*Malus domestica*, *Prunus* spp., *Pyrus communis*	Dong *et al*., 2007; Hafez *et al.,* 1992; Hafez *et al*., 2010; Hugo & Storey, 2017; Kumari & Subbotin, 2012	P7	P2	Ab1
Paratrichodorus lobatus	Root tip ectoparasite	*Pyrus communis*	Hugo & Storey, 2017.	Ab1	Ab1	Ab1
Paratrichodorus pachydermus	Ectoparasite	*Prunus* spp.,*Malus domestica*	Kumari, S. 2010; Ravichandra, N.G. 2008.	P7	P2	Ab1
Paratrichodorus porosus	Root tip ectoparasite	*Malus domestica*, *Prunus* spp., *Pyrus communis*	Hugo & Storey, 2017; Siddiqui *et al*., 1973	Ab1	P2	Ab1
Pratylenchus baldacci	Migratory endo and ectoparasite	*Prunus* spp.	Dong *et a*l., 2007	Ab1	P2	Ab1
Pratylenchus brachyurus	Migratory endo and ectoparasite	*Prunus* spp., *Malus domestica*	Cepeda & Hernández. 1991; Dong *et al*., 2007; McKenry & Roberts, 1985; Oliveira *et al*., 1999; Siddiqui *et al*., 1973.	Ab3	P2	P2
Pratylenchus bukowinensis	Migratory endo and ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Pratylenchus coffeae	Migratory endo and ectoparasite	*Malus domestica*	Hafez *et al*., 1992; Hafez *et al.,* 2010; Silva & Inomoto, 2002	Ab1	P2	P2
Pratylenchus crenatus	Migratory endo and	*Prunus* spp.,	Brown *et al*., 1980; Hafez *et*	P2	P2	Ab1

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
	ectoparasite	*Malus domestica*	*al.*, 1992; Hafez *et al*., 2010; Siddiqui *et al.,* 1973			
Pratylenchus flakkensis	Migratory endo and ectoparasite	*Malus domestica*, *Pyrus communis*	Hugo & Storey, 2017	P7	Ab3	P2
Paratylenchus hamatus	Migratory endo and ectoparasite	*Prunus persica*, *Prunus* spp.	Dong *et al*., 2007; Raski, D.J. 1952; Ravichandra, N.G. 2008; Siddiqui *et al*., 1973; Van den Berg *et al*., 2014	P2	P2	Ab1
Pratylenchus hexincisus	Migratory endo and ectoparasite	*Prunus* spp.	Carta *et al*., 2001; Dong *et al*., 2007	P7	P7	Ab1
Pratylenchus lepidus	Migratory endo and ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Pratylenchus neglectus	Migratory endo and ectoparasite	*Malus domestica*, *Pyrus communis*, *Prunus* spp.	Carta *et al*., 2001; Hafez *et al*., 2010; Siddiqui *et al*., 1973; Subbotin *et al*., 2008	P2	P2	Ab1
Paratylenchus neoamblycephanus	Migratory endo and ectoparasite	*Prunus* spp.	Dong *et al*., 2007; McKenry & Roberts, 1985; Ravichandra, N.G. 2008	Ab1	P2	Ab1
Pratylenchus penetrans	Migratory endo and ectoparasite	*Prunus* spp., *Malus domestica*, *Pyrus communis*	Carta *et al*., 2001; Ogawa et al., 1995); Potter et al., 1984; Subbotin *et al*., 2008; Villalobos *et al*., 1980	P1	P2	Ab1
Pratylenchus pratensis	Migratory endo and ectoparasite	*Malus domestica*	Handoo & Morgan, 1989. Hugo & Storey, 2017	P7	P2	P2
Paratylenchus projectus	Migratory endo and ectoparasite	*Prunus* spp.	Townshend, 1967	P2	P2	Ab1
Pratylenchus scribneri	Migratory endo and ectoparasite	*Malus domestica*	Handoo & Morgan, 1989; Hugo & Storey, 2017	Ab1	P2	Ab3
Pratylenchus straeleni	Migratory endo and ectoparasite	*Prunus* spp.	Van den Berg *et al*., 2014	Ab1	Ab1	Ab1

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
Pratylenchus thornei	Migratory endo and ectoparasite	*Prunus* spp.	Handoo & Morgan, 1989; Subbotin *et al*., 2008	P7	P2	P2
Pratylenchus vulnus	Migratory endo and ectoparasite	*Prunus* spp., *Malus domestica*, *Pyrus communis*	Chitambar & Raski, 1984; Handoo &Morgan, 1989; Hugo & Storey, 2017; Ogawa *et al*., 1995	Ab4	P2	Ab1
Pratylenchus zeae	Migratory endo and ectoparasite	*Malus domestica*	Hugo & Storey, 2017	P7	P2	P2
Quinisulcius acutus	Ectoparasite	*Prunus* spp., *Malus domestica*	Siddiqui *et al*., 1973	P7	P2	Ab1
Rotylenchulus robustus	Semiendoparasite	*Malus domestica*	Cantalapiedra-Navarrete *et al.,* 2013; Dong *et al*., 2007; Siddiqui *et al*., 1973	P7	P2	Ab1
Scutellonema brachyurus (S. brachyurum)	Semiendoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Scutellonema clathricaudatum	Semiendoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Scutellonema conicephalum	Semiendoparasite	*Prunus* spp.	Dong *et al.*, 2007	Ab1	P2	Ab1
Tylenchorhynchus agri	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Tylenchorhynchus aspericutis	Ectoparasite	*Prunus* spp.	Dong *et al.*, 2007	Ab1	P2	P2
Tylenchorhynchus annulatus	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007; Handoo *et al.*, 2014	Ab1	P2	Ab1
Tylenchorhynchus capitatus	Ectoparasite	*Malus domestica*, *Prunus* spp.	Allen, 1955; Siddiqui *et al.*, 1973	P7	P3	Ab3
Tylenchorhynchus claytoni	Ectoparasite	*Malus domestica*, *Prunus* spp.	Siddiqui *et al.,* 1973	P2	P1	Ab3
Tylenchorhynchus clarus	Ectoparasite	*Prunus* spp.	Handoo *et al*., 2014; McKenry & Roberts, 1985; Siddiqui *et*	Ab1	P2	Ab3

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
			al., 1973			
Tylenchorhynchus cylindricus	Ectoparasite	*Malus domestica*, *Prunus* spp.	Siddiqui *et al*., 1973	Ab1	P2	Ab3
Tylenchorhynchus dubius	Ectoparasite	*Prunus* spp.	Siddiqui *et al.,* 1973	P2	Ab1	Ab1
Tylenchorhynchus ebriensis	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Tylenchorhynchus elegans	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P7	Ab1
Tylenchorhynchus mashhood	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	P2
Tylenchorhynchus maximus	Ectoparasite	*Malus domestica*, *Prunus* spp.	Chitwood, 1953	P2	Ab1	Ab1
Tylenchorhynchus microconus	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	Ab1	P2	Ab1
Tylenchorhynchus nudus	Ectoparasite	*Prunus* spp.	Dong *et al*., 2007	P2	Ab1	Ab1
Xiphinema americanum	Root tip ectoparasite	*Prunus* spp., *Pyrus communis*, *Malus domestica*	Allen *et al*., 1984; Ebsary *et al*., 1984; Lone *et al*., 2018; Ogawa *et al*., 1995; Ramírez & Jiménez, 1987; Vrain & Rouselle, 1980; Weimin *et al*., 2004; Barsi, 1994b; Martinez, 1980	P2	P1	Ab3
Xiphinema diffusum	Root tip ectoparasite	*Prunus* spp., *Pyrus communis*	Hugo & Storey, 2017	Ab1	P2	Ab1
Xiphinema basiri	Root tip ectoparasite	*Malus domestica*	Lone *et al*., 2018	Ab1	P2	Ab3
Xiphinema brevicolle	Root tip ectoparasite	*Prunus* spp., *Malus domestica*	Olivera *et al*., 2004, Bridge & Starr, 2007	Ab1	P2	Ab1
Xiphinema bricolense (X. bricolensis)	Root tip ectoparasite	*Prunus* spp.	Ebsary, *et al*. 1989	P2	P2	Ab1

PEST	MODE of PARASITISM	HOST	REFERENCES	PRESENCE / ABSENCE		
				CAN	USA	MEX
Xiphinema californicum	Root tip ectoparasite	*Prunus* spp., *Malus domestica*	Georgi, L. L. 1988, Bridge & Starr, 2007	Ab1	P2	Ab1
Xiphinema elongatum	Root tip ectoparasite	*Pyrus communis*, *Malus domestica*	Hugo & Storey, 2017, Lone *et al*., 2018	Ab1	P2	Ab1
Xiphinema parvistillus	Root tip ectoparasite	*Pyrus communis*	Hugo & Storey, 2017.	Ab1	Ab1	Ab1
Xiphinema mluci	Root tip ectoparasite	*Pyrus communis*	Hugo & Storey, 2017	Ab1	Ab1	Ab1
Xiphinema diversicaudatum	Root tip ectoparasite	*Pyrus communis*, *Malus domestica*	Hugo & Storey, 2017, Lone *et al*., 2018; Weimin *et al*., 2004	P7	P2	Ab1
Xiphinema index	Root tip ectoparasite	*Malus domestica*	Lone *et al*., 2018; Weimin *et al.*, 2004; Téliz and Goheen, 1968	Ab1	P2	Ab1
Xiphinema insigne	Root tip ectoparasite	*Malus domestica*, *Prunus* spp.	Lambert *et al*., 1997, Lone *et al.*, 2018; Luc & Southey, 1980	Ab1	P2	Ab1
Xiphinema mirus	Root tip ectoparasite	*Malus domestica*	Lone *et al*., 2018	Ab1	Ab1	Ab1
Xiphinema occiduum	Root tip ectoparasite	*Malus domestica*	Ebsary *et al*., 1984	P2	Ab1	Ab1
Xiphinema rivesi	Root tip ectoparasite	*Prunus avium*, *Malus domestica*	Akinbade *et al*., 2014; Ebsary *et al*., 1984; Georgi, 1988	P2	P2	Ab1
Xiphinema vuittenezi	Root tip ectoparasite	*Prunus* spp., *Malus domestica*	Bridge & Starr, 2007; Weimin *et al*., 2004	Ab1	P2	Ab1

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Annex 2: Grapevine Pests

LEGEND FOR SYMBOLS USED IN TABLES

Presence or absence unless otherwise noted conform to the categories listed in ISPM 8; 2021 (*Determination of pest status in an area)*. For ease of reference alphanumeric designations have been added here.

Ab1: Absent: pest not recorded
Ab2: Absent: the entire country is pest free
Ab3: Absent: pest records invalid
Ab4: Absent: pest no longer present
Ab5: Absent: pest eradicated

P1: Present: widely distributed
P2: Present: not widely distributed and not under official control
P3: Present: not widely distributed and under official control
P4: Present: at low prevalence
P5: Present: except in specified pest free areas
P6: Present: transient
P7: Present: not associated with host crop (NAPPO category)

Table 1: Virus and virus-like pests of grapevine

Table 2: Fungal pathogens (incl. Chromista) of grapevine

Table 3. Bacterial and phytoplasmal pathogens of grapevine

Table 4: Arthropod pests of grapevine

Table 5: Nematode pests of grapevine

Table 1: Virus and virus-like pests of grapevine

Viroid infections are ubiquitous throughout all grapevine growing regions of the world. All known viroids in grapevines are not known to cause any agronomic significant effects. Therefore, the viroids that are known to occur in the NAPPO region will not be included in this standard.

PEST	ABBREVIATION	FAMILY	GENUS	REFERENCES	PRESENCE/ABSENCE		
					CAN	USA	MEX
Alfalfa mosaic virus	AMV	*Bromoviridae*	*Alfamovirus*	Meng *et al*., 2017	P7	P2	P2
Arabis mosaic virus	ArMV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017; MacKenzie *et al*., 1996	P2	P2	Ab1
Artichoke Italian latent virus	AILV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017; Jankulova *et al*., 2020	Ab1	Ab1	Ab1
Bean common mosaic virus	BCMV-PSt; peanut strain	*Potyviridae*	*Potyvirus*	Meng *et al*., 2017	Ab1	P2	Ab3
Blackberry virus S	BVS	*Tymoviridae*	*Marafivirus*	Meng *et al*., 2017	Ab1	P2	Ab1
Blueberry leaf mottle virus	BBLMV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017	P7	P2	Ab1
Broad bean wilt virus	BBWV	*Secoviridae*	*Fabavirus*	Castrovilli *et al*., 1985; Pearson, 1988; Basso *et al*., 2017	P7	P2	Ab1
Carnation mottle virus	CarMV	*Tombusviridae*	*Alphacarmovirus*	Basso *et al*., 2017; Wilcox, 2015	P7	P2	P2
Cherry leaf roll virus	CLRV	*Secoviridae*	*Nepovirus*	Basso *et al*., 2017	P7	P2	Ab1
Cucumber mosaic virus	CMV	*Bromoviridae*	*Cucumovirus*	Basso *et al*., 2017; Bovey, 1985	P7	P2	P2
Grapevine Algerian latent virus	GALV	*Tombusviridae*	*Tombusvirus*	Basso *et al*., 2017; Meng et al., 2017	Ab1	Ab1	Ab1
Grapevine Anatolian ringspot virus	GARSV	*Secoviridae*	*Nepovirus*	Basso *et al*., 2017; Meng *et al*., 2017; Hajizadeh *et al*., 2012	Ab1	Ab1	Ab1
Grapevine angular mosaic virus	GAMoV	*Bromoviridae*	*Ilarvirus*	Basso *et al*., 2017; Meng *et al.,* 2017; Girgis, *et al.,* 2009	Ab1	Ab1	Ab1
Grapevine asteroid mosaic-associated virus	GAMaV	*Tymoviridae*	*Marafivirus*	Martelli, 2014; Xiao &Meng, 2016	P2	P2	Ab1
Grapevine berry inner necrosis virus	GINV	*Betaflexiviridae*	*Trichovirus*	Martelli, 2014; Meng *et al*., 2017; Giampetruzzi *et al*.,	Ab1	Ab1	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	REFERENCES	PRESENCE/ABSENCE		
					CAN	USA	MEX
				2012			
Grapevine Bulgarian latent virus	GBLV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017; Uyemoto *et al.,* 1977	Ab1	Ab1	Ab1
Grapevine chrome mosaic virus	GCMV	*Secoviridae*	*Nepovirus*	Meng *et al.,* 2017	Ab1	Ab1	Ab1
Grapevine deformation virus	GDefV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017; Hajizadeh *et al*., 2012	Ab1	Ab1	Ab1
Grapevine enamovirus 1	GEV-1	*Luteoviridae*	*Enamovirus*	Silva *et al*., 2017	Ab1	Ab1	Ab1
Grapevine endophyte endornavirus	GEEV	*Endornaviridae*	*Aphaendornavirus*	Espach *et al.* , 2012	Ab1	Ab1	Ab1
Grapevine fabavirus		*Secoviridae*	Fabavirus	Al Rwahnih *et al.,* 2016b	Ab1	Ab1	Ab1
Grapevine fanleaf virus	GFLV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017; Wilcox, 2015; CISEH, 2018a; MacKenzie *et al.,* 1996	P2	P2	Ab1
Grapevine fleck virus	GFkV	*Tymoviridae*	*Maculavirus*	Meng *et al*., 2017; CISEH, 2018b; Kanuya, *et al*., 2012; Naidu & Mekuria, 2010; Mikus & Goodman, 1999; Poojari *et al.,* 2016	P2	P2	Ab1
Grapevine geminivirus A	GGVA	*Geminiviridae*	Unassigned	Al Rwahnih et al., 2016a	Ab1	P2	Ab1
Grapevine leafroll-associated virus 1	GLRaV-1	*Closteroviridae*	*Ampelovirus*	Meng *et al*., 2017; Fuchs *et al.*, 2009; MacKenzie *et al.,* 1996; Martin *et al.,* 2005; Borges *et al.,* 2020; Sharma *et al*., 2011	P2	P2	Ab1
Grapevine leafroll-associated virus 2	GLRaV-2	*Closteroviridae*	*Closterovirus*	Meng *et al*., 2017; Fuchs *et al.*, 2009; Martin *et al*., 2005; Borges *et al*., 2020; Sharma *et al.,* 2011	P2	P2	Ab1
Grapevine leafroll-	GLRaV-3	*Closteroviridae*	*Ampelovirus*	Meng *et al*., 2017; Fuchs *et*	P2	P2	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	REFERENCES	PRESENCE/ABSENCE		
					CAN	USA	MEX
associated virus 3				*al.*, 2009; Hoffman *et al*., 2020; MacKenzie *et al*., 1996; Martin *et al.,* 2005; Borges *et al.,* 2020; Mikus & Goodman, 1999; Sharma *et al*., 2011			
Grapevine leafroll-associated virus 4	GLRaV-4	*Closteroviridae*	*Ampelovirus*	Wilcox, 2015; CISEH, 2018c; Sharma *et al*., 2011	P2	P2	Ab1
Grapevine leafroll-associated virus 7	GLRaV-7	*Closteroviridae*	*Velarivirus*	Al Rwahnih *et al*., 2012a; Wilcox, 2015; Morales & Monis, 2007	Ab1	P2	Ab1
Grapevine leafroll-associated virus 13	GLRaV-13	*Closteroviridae*	*Ampelovirus*	Ito and Nakaune, 2016	Ab1	Ab1	Ab1
Grapevine line pattern virus	GLPV	*Bromoviridae*	*Ilarvirus*	Wilcox, 2015	Ab1	Ab1	Ab1
Grapevine Pinot Gris virus	GPGV	*Betaflexiviridae*	*Trichovirus*	Giampetruzzi *et al.*, 2012; Al Rwahnih, 2016c	P2	P2	Ab1
Grapevine red blotch virus	GRBV	*Geminiviridae*	*Grablovirus*	Al Rwahnih *et al.,* 2013; Wilcox, 2015	P2	P2	P2
Grapevine red globe virus	GRGV	*Tymoviridae*	*Maculavirus*	Wilcox, 2015	Ab1	Ab3	Ab1
Grapevine roditis leaf discoloration-associated virus	GRLDaV	*Caulimoviridae*	*Badnavirus*	Maliogka *et al*., 2015	Ab1	Ab1	Ab1
Grapevine rupestris vein feathering virus	GRVFV	*Tymoviridae*	*Marafivirus*	Giampetruzzi *et al*., 2012; Chingandu *et al.,* 2020; Xiao & Meng, 2016	P2	P2	Ab1
Grapevine rupestris stem pitting-associated virus	RSPaV	*Betaflexiviridae*	*Foveavirus*	Meng *et al*., 2017; Al Rwahnih *et al*., 2009; CISEH, 2018d; Martin *et al.,* 2005	P2	P2	Ab1
Grapevine Tunisian ringspot virus	GTRV	*Secoviridae*	*Nepovirus*	Basso *et al.*, 2017; Quertani *et al*., 1992	Ab1	Ab1	Ab1
Grapevine vein-clearing virus	GVCV	*Caulimoviridae*	*Badnavirus*	Jones *et al.*, 2015; Zhang *et al.*, 2011	Ab1	P2	Ab1
Grapevine virus A	GVA	*Betaflexiviridae*	*Vitivirus*	Jones *et al.*, 2015; CISEH,	P2	P2	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	REFERENCES	PRESENCE/ABSENCE		
					CAN	USA	MEX
				2018e			
Grapevine virus B	GVB	*Betaflexiviridae*	*Vitivirus*	Basso *et al.*, 2017; CISEH, 2018f	P2	P2	Ab1
Grapevine virus D	GVD	*Betaflexiviridae*	*Vitivirus*	Basso *et al.*, 2017; Abou-Ghanem *et al*., 1997; CISEH, 2018g	Ab1	Ab3	Ab1
Grapevine virus E	GVE	*Betaflexiviridae*	*Vitivirus*	Basso *et al*., 2017; Alabi *et al.*, 2013	Ab1	P2	Ab1
Grapevine virus F	GVF	*Betaflexiviridae*	*Vitivirus*	Al Rwahnih *et al*., 2012b	Ab1	P2	Ab1
Grapevine virus G	GVG	*Betaflexiviridae*	*Vitivirus*	Blouin *et al*., 2018b; Diaz-Lara *et al*., 2019	Ab1	Ab1	Ab1
Grapevine virus H	GVH	*Betaflexiviridae*	*Vitivirus*	Candresse *et al*., 2018; Diaz-Lara *et al*., 2019	Ab1	Ab1	Ab1
Grapevine virus I	GVI	*Betaflexiviridae*	*Vitivirus*	Blouin *et al.*, 2018a; Diaz-Lara *et al*., 2019	Ab1	Ab1	Ab1
Grapevine virus J	GVJ	*Betaflexiviridae*	*Vitivirus*	Diaz-Lara *et al*., 2018	Ab1	Ab1	Ab1
Grapevine virus L	GVL	*Betaflexiviridae*	*Vitivirus*	Debat *et al*., 2019	Ab1	P2	Ab1
Grapevine virus M	GVM	*Betaflexiviridae*	*Vitivirus*	Alabi *et al*., 2019	Ab1	P2	Ab1
Grapevine virus T	GVT	*Betaflexiviridae*	*Foveavirus*	Glasa *et al*., 2018	Ab1	Ab1	Ab1
Grapevine Syrah virus-1	GSyV-1	*Tymoviridae*	*Marafivirus*	Al Rwahnih *et al*., 2009	P2	P2	Ab1
Peach rosette mosaic virus	PRMV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017	P7	P2	Ab1
Petunia asteroid mosaic virus	PAMV	*Tombusviridae*	*Tombusvirus*	Basso *et al*., 2017	P7	Ab1	Ab1
Potato virus X	PVX	*Alphaflexiviridae*	*Potexvirus*	Wilcox, 2015	P7	P2	Ab1
Raspberry bushy dwarf virus	RBDV	Unclassified	*Ideovirus*	Wilcox, 2015	P7	Ab1	Ab1
Raspberry ringspot virus	RpRSV	*Secoviridae*	*Nepovirus*	Wilcox, 2015; Martelli, 2014	Ab1	Ab1	Ab1
Sowbane mosaic virus	SoMV	*Solemoviridae*	*Sobemovirus*	Wilcox, 2015; Cesati &Van Regenmortel, 1969	P7	P2	Ab1
Strawberry latent ringspot virus	SLRSV	*Secoviridae*	Unassigned	Meng *et al.,* 2017	P7	P2	Ab1
Summer grape	SGLV; GCSV	*Reoviridae*	Unassigned	Meng *et al.,* 2017	Ab1	P2	Ab1

PEST	ABBREVIATION	FAMILY	GENUS	REFERENCES	PRESENCE/ABSENCE		
					CAN	USA	MEX
latent virus = Grapevine Cabernet Sauvignon reovirus							
Tobacco mosaic virus	TMV	*Virgaviridae*	*Tobamovirus*	Wilcox, 2015	P7	P2	Ab1
Tobacco necrosis virus D	TNV-D	*Tombusviridae*	*Betanecrovirus*	Basso *et al.*, 2017	P7	Ab1	Ab1
Tobacco ringspot virus	TRSV	*Secoviridae*	*Nepovirus*	Meng *et al*., 2017; Borges *et al.*, 2020	P7	P2	Ab1
Tomato black ring virus	TBRV	*Secoviridae*	*Nepovirus*	Wilcox, 2015; Meng *et al.,* 2017	P7	Ab1	Ab1
Tomato mosaic virus	ToMV	*Virgaviridae*	*Tobamovirus*	Basso *et al*., 2017	P7	P2	Ab3
Tomato ringspot virus	ToRSV	*Secoviridae*	*Nepovirus*	Wilcox, 2015; Meng *et al.,* 2017; Borges *et al.,* 2020	P2	P2	Ab3
Grapevine Ajinashika virus	GAgV	Unclassified	Unassigned	Wilcox, 2015; Meng *et al.,* 2017	Ab1	Ab1	Ab1
Grapevine labile rod-shaped virus	GLRSV	Unclassified	Unassigned	Basso *et al*., 2017; Faggioli *et al.,* 1992.	Ab1	Ab1	Ab1
Grapevine stunt virus	GSV	Unclassified	Unassigned	Meng *et al*., 2017	Ab1	Ab1	Ab1

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Table 2: Regulated fungal pathogens (incl. Chromista) of grapevine (*Vitis spp*)

Regulated pests in each NAPPO country (indicated in yellow) are indicated in the table.

PEST	DISEASE	REFERENCES	PRESENCE / ABSENCE		
			CAN	USA	MEX
Botryosphaeria dothidea (Moug.: Fr.) Ces. & De Not. Synonym: *Fusicoccum aesculi* Corda	Botryosphaeria dieback	Smith and Stanosz, 2001; WPFUS, 2020; Ammad *et al*., 2014; Wilcox *et al*., 2015	P2	P2	Ab3
Cadophora luteo-olivacea (J.F.H. Beyma) T.C. Harr. & McNew	Grapevine trunk disease	Travadon *et al*., 2015; Gramaje *et al*., 2011; Navarrete *et al*., 2011; Raimondo *et al*., 2019	P2	P2	Ab1
Colletotrichum acutatum J.H. Simmonds Synonym: *Glomerella acutata* Guerber & J.C. Correll	Anthracnose, bitter rot; blackspot	WPFUS, 2020 Haviland *et al*., 2019; Hong *et al.*, 2008; Wilcox *et al.*, 2015	P2	P2	P2
Coniella diplodiella (Speg.) Petr. & Syd. Synonym: *Coniothyrium diplodiella* (Speg.) Sacc., *Pilidiella diplodiella* (Speg.) Crous & Van Niekerk	Dieback, white rot	Blake and Williamson, 2015; Locci & Quaroni, 1972; Wilcox *et al.*, 2015	P2	P2	Ab1
Coniella vitis Chethana, J.Y. Yan, X.H. Li & K.D. Hyde	White rot	Chethana *et al.*, 2017	Ab1	Ab1	Ab1
Cytospora chrysosperma (Pers.: Fr.) Fr. Synonym: *Valsa sordida* Nitschke	Perennial canker	Lawrence *et al*., 2018; WPFUS, 2020; Arzanlou & Narmani, 2015	P7	P2	Ab3
Dactylonectria macrodidyma (Halleen, Schroers & Crous) L. Lombard & Crous Synonym: *Cylindrocarpon macrodidymum* Schroers, Halleen & Crous	Black foot	Petit *et al.*, 2011; Úrbez-Torres *et al.*, 2012; Probst *et al.*, 2019; Wilcox *et al.*, 2015	P2	P2	Ab1
Diplodia corticola A.J.L. Phillips, A. Alves & J. Luque Synonym: *Botryosphaeria corticola* A.J.L.	Canker	Reed et al., 2018; Úrbez-Torres *et al.*, 2010b; Varela *et al.*, 2011	Ab1	P2	Ab3

PEST	DISEASE	REFERENCES	PRESENCE / ABSENCE		
			CAN	USA	MEX
Phillips, A. Alves & J. Luque					
Diaporthe ampelina (Berk & M.A. Curtis) R.R. Gomes, C. Glienke & Crous Synonym: *Phomopsis viticola* (Sacc.) Sacc.	Phomopsis cane and leaf spot	Chen *et al.*, 2014; WPFUS, 2020; Pscheidt & Ocamb, 2020; Wilcox *et al.*, 2015	P3	P2	Ab1
Elsinoe ampelina Shear	Anthracnose	Yun *et al.*, 2007; WPFUS, 2020; Santos *et al*., 2018; Wilcox *et al.*, 2015	P2	P2	Ab3
Eutypa laevata (Nitschke) Sacc.	Eutypa dieback	Rolshausen *et al.*, 2014;	P2	P2	Ab1
Eutypa leptoplaca (Mont.) Rappaz	Eutypa dieback	Trouillas & Gubler, 2004; Trouillas & Gubler, 2010; Pscheidt & Ocamb, 2020;	Ab1	P2	Ab1
Ilyonectria destructans (Zinssm.) Rossman, L. Lombard & Crous Synonyms: *Cylindrocarpon destructans* (Zinssm.) Scholten, *Neonectria radicicola* (Gerlach & L. Nilsson) Mantiri & Samuels	Black foot	Khorasani, 2013; Petit & Gubler, 2005; Pscheidt & Ocamb, 2020; Wilcox *et al.*, 2015	P2	P2	Ab3
Neofusicoccum luteum (Pennycook & Samuels) Crous, Slippers & A.J.L. Phillips Synonym: *Botryosphaeria lutea* A.J.L. Phillips	Canker and dieback	Úrbez-Torres *et al.*, 2006; Chebil *et al.*, 2013; Savocchia *et al.*, 2007	Ab1	P2	Ab3
Neofusicoccum mediterraneum Crous, M.J. Wingf. & A.J.L. Phillips	Cankers and dieback	Úrbez-Torres *et al.*, 2010a; Martin *et al.*, 2011; Varela *et al.*, 2011	Ab1	P2	Ab1
Neonectria obtusispora (Cooke & Harkn.) Rossman, L. Lombard & Crous Synonym: *Cylindrocarpon obtusisporum* (Cooke & Harkn.) Wollenw.	Black foot	Scheck *et al.*, 1998; Petit *et al.*, 2011; Pscheidt & Ocamb, 2020; Scheck *et al*., 1998a; Wilcox *et al.*, 2015	P7	P2	Ab1
Phaeoacremonium parasiticum (Ajello, Georg & C.J.K. Wang) W. Gams, Crous & M.J. Wingf.	Dieback	Groenewald *et al.,* 2001; OSU, 2020; Aroca and Raposo, 2009; Romero-Rivas *et al.*, 2009	Ab1	P2	Ab1

PEST	DISEASE	REFERENCES	PRESENCE / ABSENCE		
			CAN	USA	MEX
Synonym: *Phialophora parasitica* Ajello, Georg & Wang					
Phymatotrichopsis omnivora (Shear) Hennebert Synonym: *Phymatotrichum omnivorum* (Shear) Duggar	Texas root rot	Davis et al., 2017; WPFUS, 2020; Smith, 2019; Wilcox *et al.*, 2015	Ab1	P2	Ab3
Phytophthora cinnamomi Rands	Phytophthora crown and root rot	Nouri *et al.*, 2017; WPFUS, 2020; Latorre *et al.*, 1997; Wilcox *et al.*, 2015	P7	P2	P2
Phytophthora citricola Sawada.	Root rot	Schwingle *et al.*, 2007; WPFUS, 2020; Erwin and Ribeiro, 1996	P7	P2	Ab3
Phytophthora cryptogea Pethybr. & Laff.	Phytophthora crown and root rot	Koike *et al.*, 2019; McKeever & Chastagner, 2016; Latorre *et al.,* 1997; Wilcox *et al.*, 2015	P7	P2	P2
Phytophthora drechsleri Tucker	Phytophthora crown and root rot	Olson & Benson, 2011; Olson *et al.*, 2016; Latorre *et al.*, 1997; Wilcox *et al.*, 2015	P7	P2	P2
Rosellinia necatrix Prill. Synonym: *Dematophora necatrix* Hartig	Dematophora root rot	Windbiel-Rojas *et al.*, 2020; Mansoori & Dorostkar, 2008; Wilcox *et al.*, 2015	Ab1	P2	P2
Seimatosporium botan Sat. Hatak. & Y. Harada	Trunk canker	Díaz *et al.*, 2013; Díaz *et al.*, 2012; Lawrence *et al.*, 2017	Ab1	Ab1	Ab1
Verticillium dahliae Kleb.	Verticillium wilt	Gubler *et al.*, 2004;WPFUS, 2020; Wilcox *et al.*, 2015; Zhang *et al.*, 2009	P2	P2	P2

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1 **Table 3. Bacterial and Phytoplasmal pathogens of grapevine**

2

PEST	HOST(S)	DISEASE	REFERENCES	PRESENCE/ABSENCE		
				CAN	USA	MEX
Bacteria						
Xylophilus ampelinus (formerly *Xanthomonas ampelina*)	*Vitis*	Bacterial Blight	Hand, F. P. 2015	Ab1	P2	Ab1
Agrobacterium vitis, A. tumefaciens	*Vitis,* others	Crown Gall	Burr, T. J. 2015	P2	P2	Ab3
Xylella fastidiosa	*Vitis,* others	Pierce's Disease	Kirkpatrick, B. C. 2015	P7	P2	P3
Pseudomonas syringae pv. syringae	*Vitis,* others	Bacterial Inflorescence Rot	Hall *et al*. 2016	P7	P2	Ab3
Xanthomonas campestris pv. viticola	*Vitis*	Bacterial Canker	Chand & Kishun, 1990; Naue *et al*., 2014	Ab1	Ab1	P2
Phytoplasma						
Candidatus Phytoplasma asteris (16SrI-A,-B,-C)	*Vitis*	Grapevine yellows/aster yellows	Bertaccini, A. 2018	P2	P2	P2
Candidatus Phytoplasma pruni (16SrIII,-J)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	P7	P2	P2
Candidatus Phytoplasma fraxini (16SrVII-A)	*Vitis*	Ash/elm yellows	Bertaccini, A. 2018	P7	P2	Ab1
Candidatus Phytoplasma ulmi (16SrV-A)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	P7	Ab1	Ab1
Candidatus Phytoplasma solani (16SrXII-A)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	Ab5	Ab1	Ab1
Candidatus Phytoplasma brasiliense (16SrXV-A)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	Ab1	Ab1	Ab1
Candidatus Phytoplasma trifolii (16SrVI)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	P7	P2	P2
Candidatus Phytoplasma prunorum (16SrX-B)	*Vitis, Prunus* spp.	Grapevine yellows	Bertaccini, A. 2018	Ab1	Ab1	Ab1
Candidatus Phytoplasma phoenicium (16SrIX,-B)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	Ab1	Ab1	Ab1
Candidatus Phytoplasma aurantifolia (16SrII-B)	*Vitis*	Grapevine yellows	Bertaccini, A. 2018	Ab1	Ab1	P2

PEST	HOST(S)	DISEASE	REFERENCES	PRESENCE/ABSENCE		
				CAN	USA	MEX
AGY [Candidatus Phytoplasma australiense (16SrXII-B)]	*Vitis,* others	Australian grapevine yellows	Bertaccini, A. 2018; Angelini E. *et al.,* 2018	Ab1	Ab1	Ab1
Candidatus Phytoplasma australasia (16SrII-A, -D)	*Vitis*	Australian grapevine yellows	Bertaccini, A. 2018; Angelini E., *et al.,* 2018	Ab1	Ab1	P2
Candidatus Phytoplasma aurantifolia (16SrII-B)	*Vitis*	Australian grapevine yellows	Bertaccini, A. 2018; Angelini E., *et al.,* 2018	Ab1	Ab1	P2
BVGY Phytoplasma (16SrXXXIII-A)	*Vitis*	Buckland Valley grapevine yellows	Bertaccini, A. 2018; Angelini E., *et al.,* 2018	Ab1	Ab1	Ab1
Bois noir [Candidatus Phytoplasma solani (16SrXII-A)]	*Vitis, Convolvulus*	Bois noir (Vergilbungskrankheit)	Angelini E., *et al.,* 2018	Ab5	Ab1	Ab1
Grapevine flavescence dorée (16SrV-C,-D)	*Vitis,* others	Flavescence dorée	Bertaccini, A. 2018; Angelini E., *et al.,* 2018	Ab1	Ab1	Ab1
North American grapevine yellows Phytoplasma (16SrI-A)	*Vitis,* others	North American grapevine yellows	Angelini E., *et al.,* 2018	P7	P2	P2
Western X (16SrIII-I)	*Vitis*	North American grapevine yellows	Angelini E., *et al.,* 2018	P7	Ab1	P2
PGY (16SrV-A, -B, -C, -D)	*Vitis, Alnus*	Palatinate grapevine yellows	Angelini E., *et al.,* 2018	P7	Ab1	Ab1
Candidatus Phytoplasma pruni (16SrIII-I)	*Vitis*	Virginian grapevine yellows	Bertaccini, A. 2018	Ab1	P2	P2
Candidatus Phytoplasma asteris (16SrI-A)	*Vitis*	Virginian grapevine yellows	Bertaccini, A. 2018.	P2	P2	P2

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Table 4: Arthropod pests of grapevines

Context: The pests named in this table are considered vectors which promote the introduction (entry and establishment) and spread of the grapevine diseases listed in this standard.

VECTOR NAME	REFERENCES	PRESENCE / ABSENCE		
		CAN	USA	MEX
Acari				
Trombidiformes: Eriophyidae				
Colomerus vitis (Pagenstecher)	PMC 2016, Roy *et al*., 2009	P2	P2	Ab1
Insecta				
Hemiptera: Cicadellidae				
Erythroneura ziczac Walsh ***Vector status unconfirmed***	Maw *et al*., 2000	P1	P2	Ab3
Homalodisca vitripennis (Germar)	Maw *et al*., 2000, Saguez *et al*., 2014	Ab1	P1	P2
Oncopsis alni Schrank	Maw *et al*., 2000, Saguez *et al*., 2014	Ab1	Ab1	Ab1
Scaphoideus titanus Ball	Maw *et al*., 2000, Saguez *et al*., 2014	P2	P1	Ab1
Hemiptera: Cixiidae				
Hyalesthes obsoletus Signoret	Maw *et al*., 2000	Ab1	Ab1	Ab1
Oliarus atkinsonii (Myers)	Maw *et al*., 2000	Ab1	Ab1	Ab1
Hemiptera: Coccidae				
Parthenolecanium corni (Bouché)	Maw *et al*., 2000, Emond & Cerezke 1990	P1	P1	Ab3
Pulvinaria innumerabilis (Rathvon)	Maw *et al*., 2000	P2	P1	Ab1
Pulvinaria vitis (L.)	Maw *et al*., 2000, E. Maw, AAFC, in litt. 2019	P2	Ab1	Ab1
Hemiptera: Membracidae				
Spissistilus festinus (Say)	Maw *et al*., 2000, Caldwell 1949, Beyer *et al*., 2017, Deitz & Wallace 2012	P2	P1	Ab3
Hemiptera: Pseudococcidae				

Heliococcus adenostomae McKenzie	Garcia Morales *et al*., 2016	Ab1	P2	Ab1
Phenacoccus aceris (Signoret)	Maw *et al*., 2000, Garcia Morales *et al*., 2016	P2	Ab1	Ab1
Planococcus citri (Risso)	Garcia Morales *et al*., 2016	Ab1	P1	P2
Planococcus ficus (Signoret)	Garcia Morales *et al*., 2016	Ab1	P2	P3
Pseudococcus calceolariae (Maskell)	Garcia Morales *et al*., 2016	Ab1	P2	Ab3
Pseudococcus comstocki (Kuwana)	Maw *et al*., 2000, Garcia Morales *et al*., 2016	P2	P1	Ab3
Pseudococcus longispinus (Targioni Tozzetti)	Garcia Morales *et al*., 2016, Paiero & Marshall 2003	P2	P1	P2
Pseudococcus maritimus (Ehrhorn)	Maw *et al*., 2000	P2	P2	P2
Pseudococcus viburni (Signoret)	Garcia Morales *et al*., 2016, McKenzie 1967, as *P. obscurus*; Maw *et al*., 2000, as *P. affinis.* In 2003 *P. viburni* was found in the Biodome in Quebec (E. Maw, AAFC, in litt. 2019).	P2	P1	Ab3

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1 **Table 5: Nematode pests of grapevine**

2

PEST	MODE of PARASITISM	REFERENCES	PRESENCE/ABSENCE		
			CAN	USA	MEX
Criconema permistum	Ectoparasite	Siddiqui *et al.,* 1973	Ab1	Ab1	Ab1
Gracilacus idalimus	Migratory endo and ectoparasite	Dong *et al.,* 2007	Ab1	Ab1	Ab1
Gracilacus mirus	Migratory endo and ectoparasite	Raski, D.J. 1962	Ab1	Ab1	Ab1
Helicotylenchus digonicus	Migratory ecto and semiendoparasite	Dong *et al.,* 2007; Siddiqui *et al.,* 1973	P2	Ab1	P2
Helicotylenchus dihystera	Migratory ecto and semi endoparasite	Dong *et al.,* 2007; McKenry & Roberts, 1985; Ravichandra, N.G. 2008; Siddiqui *et al.,* 1973.Subbotin *et al.,* 2015	P7	P1	P2
Helicotylenchus erythrinae	Migratory ecto and semi endoparasite	Siddiqui *et al.,* 1973; CPC 2006	P7	P7	P2
Helicotylenchus pseudorobustus	Migratory ecto and semi endoparasite	Dong *et al.,* 2007; Ravichandra, N.G. 2008; Siddiqui *et al.,* 1973; Subbotin *et al.,* 2015	P7	P2	Ab1
Hemicriconemoides californianus	Ectoparasite	Pinochet & Raski, 1975	Ab1	P2	Ab1
Hoplolaimus pararobustus	Migratory endo and ectoparasite	Cohn, E.1970; Lambert *et al*, 1997; Kleynhans *et al*, 1966.	Ab1	Ab1	Ab1
Hoplolaimus seinhorsti	Migratory endo and ectoparasite	Catalano *et al*., 1992; Brown, *et al.*, 1993.	Ab1	P2	Ab1
Longidorus africanus	Root tip ectoparasite	Andres *et al*., 1991; Raski, D.J., 1988.	Ab1	P2	Ab1
Longidorus apulus	Root tip ectoparasite	Tzortzakakis *et al.,* 2001.	Ab1	Ab1	Ab1
Longidorus attenuatus	Root tip ectoparasite	Arias & Andres, 1989; CPC 2006 edition; Griffiths and Robertson,1984; Raski, D.J.,1988;	Ab1	Ab1	Ab1
Longidorus cretensis	Root tip ectoparasite	Tzortzakakis *et al.,* 2001.	Ab1	Ab1	Ab1
Longidorus coespiticola sp.	Root tip ectoparasite	Arias & Andres, 1989; Ravichandra, N.G.	Ab1	Ab1	Ab1

PEST	MODE of PARASITISM	REFERENCES	PRESENCE/ABSENCE		
			CAN	USA	MEX
(caespiticola?)		2008			
Longidorus diadecturus	Root tip ectoparasite		P2	P2	Ab1
Longidorus elongatus	Root tip ectoparasite	Arias & Andres, 1989; CPC 2006; Griffiths and Robertson,1984; Raski, D.J.,1988	P7	P2	Ab1
Longidorus euonymus	Root tip ectoparasite	Barsi, 1994a; Choleva-Abadzhieva, 1975; Lone *et al.,* 2018	Ab1	Ab1	Ab1
Longidorus fasciatus	Root tip ectoparasite	Brown *et al*.,1993; Brown *et al*., 1997.	Ab1	Ab1	Ab1
Longidorus juvenilis	Root tip ectoparasite	Coiro *et al*., 1992; Kleynhans *et al.*, 1966.	Ab1	Ab1	Ab1
Longidorus macrosoma	Root tip ectoparasite	Andres *et al.*,1991; Arias & Andres, 1989; Raski, D.J., 1988	Ab1	Ab1	Ab1
Longidorus magnus	Root tip ectoparasite	Lamberti *et al*., 1982	Ab1	Ab1	Ab1
Meloidogyne arenaria	Sedentary endoparasite	Cid del Prado *et al.,* 2001. Hugo & Storey, 2017; Powers *et al*., 2005; Raski, D.J., 1988; CPC 2006	P7	P2	P2
Meloidogyne incognita	Sedentary endoparasite	Martínez*,* 1989; Ogawa *et al.,* 1995; Powers *et al*., 2005; Raski, D.J.,1988,	P7	P2	P2
Meloidogyne hapla	Sedentary endoparasite	Ogawa *et al.,* 1995; Powers *et al.*, 2005; Raski, D.J.,1988; CPC 2006	P1	P2	P2
Meloidogyne javanica	Sedentary endoparasite	Cid del Prado *et al.,* 2001; Ogawa *et al.,* 1995; Powers *et al*., 2005; Raski, D.J.,1988	P7	P2	P2
Meloidogyne mali	Sedentary endoparasite	Bridge and Starr, 2007; Itoh *et al*., 1969	Ab1	P2	Ab1
Meloidogyne nataliei	Sedentary endoparasite	Bird *et al*.,1994; Raski, D.J.,1988.	Ab1	P2	Ab1
Merlinius brevidens	Root tip ectoparasite	Dong *et al.,* 2007; McKenry and Roberts, 1985	P7	P2	Ab1
Mesocriconema rusticum	Ectoparasite	Siddiqui *et al.,* 1973	Ab1	P2	Ab1
Mesocriconema xenoplax	Ectoparasite	Dong *et al.,* 2007; Ferris *et al*., 2004; Ogawa *et al.,* 1995; Raski, D.J. 1952	P2	P2	P2
Paralongidorus maximus	Root tip ectoparasite	Mc Elroy *et al*., 1977.	Ab1	Ab1	Ab1
Paratrichodorus minor	Ectoparasite	Ravichandra, N.G. 2008.	P7	P2	P2

PEST	MODE of PARASITISM	REFERENCES	PRESENCE/ABSENCE		
			CAN	USA	MEX
Paratrichodorus pachydermus	Ectoparasite	Kumari, S. 2010; Ravichandra, N.G. 2008.	P7	P2	Ab1
Pratylenchus brachyurus	Migratory endo and ectoparasite	Cepeda & Hernández. 1991; Dong *et al.,*2007; McKenry & Roberts, 1985; Oliveira *et al*., 1999; Siddiqui *et al.,* 1973;	Ab3	P2	P2
Pratylenchus coffeae	Migratory endo and ectoparasite	Hafez *et al.,* 1992; Hafez *et al.,* 2010; Silva & Inomoto, 2002.	Ab1	P2	P2
Pratylenchus crenatus	Migratory endo and ectoparasite	Brown *et al*., 1980; Hafez *et al.,* 1992; Hafez *et al.,* 2010; Siddiqui *et al.,* 1973	P7	P2	Ab1
Paratylenchus hamatus	Migratory endo and ectoparasite	Dong *et al.,* 2007; Raski, D.J. 1952; Ravichandra, 2008; Siddiqui *et al.,* 1973; Van den Berg *et al.,* 2014	P7	P2	Ab1
Pratylenchus hexincisus	Migratory endo and ectoparasite	Carta *et al*., 2001; Dong *et al.,* 2007	P7	P2	Ab1
Pratylenchus neglectus	Migratory endo and ectoparasite	Carta *et al*., 2001; Hafez *et al.,* 1992; Hafez *et al.,* 2010; Siddiqui *et al.,* 1973; Subbotin *et al.,* 2008	P7	P2	Ab1
Paratylenchus neoamblycephanus	Migratory endo and ectoparasite	Dong *et al.,* 2007; McKenry and Roberts, 1985; Ravichandra, 2008	Ab1	P2	Ab1
Pratylenchus penetrans	Migratory endo and ectoparasite	Carta *et al*., 2001; Ogawa *et al.,* 1995); Potter *et* al., 1984; Subbotin *et al.,* 2008; Villalobos *et al.,* 1980	P2	P2	Ab1
Pratylenchus pratensis	Migratory endo and ectoparasite	Handoo & Morgan, 1989. Hugo and Storey, 2017	P7	P7	Ab3
Pratylenchus thornei	Migratory endo and ectoparasite	Handoo & Morgan, 1989; Subbotin *et al.,* 2008	P7	P7	P2
Pratylenchus vulnus	Migratory endo and ectoparasite	Chitambar & Raski, 1984; Handoo & Morgan, 1989; Hugo and Storey, 2017; Ogawa *et al.,* 1995	Ab4	P2	Ab1
Quinisulcius acutus	Ectoparasite	Siddiqui *et al.,* 1973	P7	P2	Ab1
Rotylenchulus gracilidens	Semi endoparasite	Ravichandra, 2008.	Ab1	P2	Ab1
Rotylenchulus reniformis	Semi endoparasite	Ravichandra, 2008.	Ab1	P2	P2
Rotylenchulus robustus	Semi endoparasite	Cantalapiedra-Navarrete *et al.,* 2013; Dong	P7	P2	Ab1

PEST	MODE of PARASITISM	REFERENCES	PRESENCE/ABSENCE		
			CAN	USA	MEX
		et al., 2007; Siddiqui *et al.,* 1973			
Tylenchorhynchus capitatus	Ectoparasite	Allen*,* 1955; Siddiqui *et al.,* 1973	P7	P2	Ab3
Tylenchorhynchus claytoni	Ectoparasite	Siddiqui *et al.,* 1973	P2	P2	Ab3
Tylenchorhynchus clarus	Ectoparasite	Handoo *et al.,* 2014; McKenry & Roberts, 1985; Siddiqui *et al.,* 1973	Ab1	P2	Ab3
Tylenchorhynchus cylindricus	Ectoparasite	Siddiqui *et al.,* 1973	Ab1	P2	Ab3
Tylenchorhynchus elegans	Ectoparasite	Dong *et al.,* 2007	Ab1	P2	Ab1
Tylenchorhynchus mashhood	Ectoparasite	Dong *et al.,* 2007	Ab1	P2	P2
Tylenchulus semipenetrans	Semi endoparasite	Dong *et al.,*2007; Edwards, M. 1988	Ab1	P2	P2
Xiphinema americanum	Root tip ectoparasite	Allen *et al.,* 1984; Ebsary *et al.,* 1984; Lone *et al.,* 2018; Ogawa *et al.,* 1995; Ramírez and Jiménez, 1987; Vrain and Rouselle, 1980; Weimin *et al*., 2004	P2	P2	P2
Xiphinema australiae	Root tip ectoparasite	Luc. M. 1981.	Ab1	Ab1	Ab1
Xiphinema brevicolle	Root tip ectoparasite	Olivera *et al*., 2004, Bridge & Starr, 2007.	Ab1	P2	Ab1
Xiphinema bricolensis	Root tip ectoparasite	Vrain, T. C. 1993.	P2	P2	Ab1
Xiphinema californicum	Root tip ectoparasite	Georgi, L. L. 1988, Bridge and Starr, 2007.	Ab1	P2	Ab1
Xiphinema elongatum	Root tip ectoparasite	Hugo & Storey, 2017; Lone *et al.,* 2018	Ab1	P2	Ab1
Xiphinema diversicaudatum	Root tip ectoparasite	Hugo & Storey, 2017; Lone *et al.,* 2018; Weimin *et al*., 2004;	P7	P2	Ab1
Xiphinema index	Root tip ectoparasite	Lone *et al.,* 2018; Weimin *et al*., 2004; Téliz & Goheen, 1968	Ab1	P2	Ab1
Xiphinema insigne	Root tip ectoparasite	Lambert *et al*., 1997; Lone *et al.,* 2018; Luc & Southey, 1980	Ab1	P2	Ab1
Xiphinema italiae	Root tip ectoparasite	Weimin *et al*., 2004.	Ab1	Ab1	Ab1
Xiphinema mediterraneum	Root tip ectoparasite	Roca *et al*., 1991.	Ab1	P2	Ab1
Xiphinema melitense	Root tip ectoparasite	Roca *et al*., 1991.	Ab1	Ab1	Ab1
Xiphinema monohysterum	Root tip ectoparasite	McLeod & Khair, 1971.	Ab1	Ab1	Ab1

PEST	MODE of PARASITISM	REFERENCES	PRESENCE/ABSENCE		
			CAN	USA	MEX
Xiphinema occiduum	Root tip ectoparasite	Ebsary *et al*.,1984	P2	Ab1	Ab1
Xiphinema pachtaicum	Root tip ectoparasite	Roca *et al*., 1991.	Ab1	Ab1	Ab1
Xiphinema pacificum	Root tip ectoparasite	Vrain, T. C. 1993.	P2	P2	Ab1
Xiphinema rivesi	Root tip ectoparasite	Akinbade *et al.,* 2014; Ebsary *et al.,* 1984; Georgi, L. L. 1988	P2	P2	Ab1
Xiphinema simile	Root tip ectoparasite	Barsi, L. 1994.	Ab1	Ab1	Ab1
Xiphinema taylori	Root tip ectoparasite	Weimin *et al*., 2004.	Ab1	Ab1	Ab1
Xiphinema vuittenezi	Root tip ectoparasite	Bridge and Starr, 2007; Weimin *et al*., 2004	Ab1	P2	Ab1
Zygotylenchus guevarai	Migratory endo and ectoparasite	Siddiqi, 1975.	Ab1	Ab3	Ab1

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