Biosecurity Plan for the Australian Production Nursery Industry

A shared responsibility between government and industry

Version 4.0 July 2023

Plant Health AUSTRALIA

Greenlife Industry Australia

Hort Innovation
Strategic levy investment

NURSERY FUND

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Revision history

VERSION NUMBER	DATE	DETAILS
4.0	2023	Full revision of the *Biosecurity Plan for the Australian Production Nursery Industry* (update from version 3.0)

Acknowledgements

The *Biosecurity Plan for the Australian Production Nursery Industry* project was coordinated by Plant Health Australia and developed through a partnership approach with government and industry.

The following organisations and agencies were involved in the development and finalisation of the plan:

Endorsement

The *Biosecurity Plan for the Australian Production Nursery Industry (Version 4.0)* was formally endorsed by the production nursery industry (through Greenlife Industry Australia) in .....2023, and all state and territory governments (through the Plant Health Committee) in .....2023. The Australian Government endorses the document without prejudice for the purposes of industry's planning needs and meeting the Department's obligations under Clause 13 of the Emergency Plant Pest Response Deed (EPPRD). In providing this endorsement the Department notes page 39 of the Plan which states: "This Document considers all potential pathways by which a pest might enter Australia, including natural and assisted spread (including smuggling). This is a broader view of potential risk than the Biosecurity Import Risk Assessment (BIRA) conducted by the Department of Agriculture, Water and Environment which focus only on specific regulated import pathways."

Reporting suspect pests

Any unusual plant pest should be reported immediately to the relevant state/territory agriculture department through the Exotic Plant Pest Hotline (1800 084 881). Early reporting enhances the chance of effective control and eradication.

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LIST OF ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
ACPPO	Australian Chief Plant Protection Officer
AgVic	Agriculture Victoria
APVMA	Australian Pesticides and Veterinary Medicines Authority
AS/NZS	Australian Standard/New Zealand Standard
BICON	Australian Biosecurity Import Conditions database
BIG	Biosecurity Implementation Group
BIRA	Biosecurity Import Risk Analysis
BISOP	Biosecurity Incident Standard Operating Procedure
BMP	Best Management Practise
BOLT	Biosecurity On-Line Training
BP	Biosecurity Plan
BRP	Biosecurity Reference Panel
CABI	Centre for Agriculture and Bioscience International
CCEPP	Consultative Committee on Emergency Plant Pests
CPHM	Chief Plant Health Manager
DAF Qld	Department of Agriculture and Fisheries, Queensland
DAFF	Department of Agriculture, Fisheries and Forestry
DAWE	Department of Agriculture, Water and Energy (now DAFF)
DAWR	Department of Agriculture and Water Resources (now DAFF)
DEECA	Department of Energy, Environment and Climate Action, Victoria
DITT NT	Department of Industry, Tourism and Trade, Northern Territory
DPI NSW	Department of Primary Industries, New South Wales
DPIRD	Department of Primary Industries and Regional Development, WA
EPP	Emergency Plant Pest
EPPO	European and Mediterranean Plant Protection Organization
EPPRD	Emergency Plant Pest Response Deed
FAO	Food and Agriculture Organization of the United Nations
GIA	Greenlife Industry Australia
HACCP	Hazard Analysis Critical Control Point
HPP	High Priority Pest
ICA	Interstate Certification Assurance
IGAB	Intergovernmental Agreement on Biosecurity
IPM	Integrated Pest Management
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
LCC	Local Control Centres
MICOR	Manual of Importing Country Requirements
NAQS	Northern Australian Quarantine Strategy
NDP	National Diagnostic Protocol
NIASA	Nursery Industry Accreditation Scheme Australia

NMG	National Management Group
NPBDN	National Plant Biosecurity Diagnostic Network
NPBS	National Plant Biosecurity Strategy
NSW	New South Wales
NRE Tas	Department of Natural Resources and Environment, Tasmania
NT	Northern Territory
ORC	Owner Reimbursement Costs
PaDIL	Pest and Disease Image Library
PEQ	Post Entry Quarantine
PHA	Plant Health Australia
PHC	Plant Health Committee
PIC	Property Identification Code
PIRSA	Primary Industries and Regions South Australia
QA	Quality Assurance
R&D	Research and Development
RDC	Research and Development Corporation
RD&E	Research, Development and Extension
SA	South Australia
SARDI	South Australian Research and Development Institute
SCC	State Coordination Centre
SDQMA	Subcommittee for Domestic Quarantine and Market Access
SMART	Subcommittee on Market Access, Risk and Trade
SNPHS	Subcommittee on National Plant Health Surveillance
SPHD	Subcommittee on Plant Health Diagnostics
SPS	Sanitary and Phytosanitary
T2M	Transition to Management
TBA	To be announced
TEG	Technical Expert Group
TST	Threat Summary Table
WA	Western Australia
WTO	World Trade Organization

DEFINITIONS

The definition of a plant pest used in this document includes insects, mites, snails, nematodes, or pathogens (diseases) that have the potential to adversely affect food, fibre, ornamental crops, bees and stored products, as well as environmental flora and fauna. Exotic pests are those not currently present in Australia. Endemic pests are those established within Australia.

Emergency Plant Pest (EPP) – for a pest to be classified as an emergency plant pest (EPP), it must either be listed in Schedule 13 of the EPPRD, or be determined by the Categorisation Group or National Management Group (NMG) to be of potential national significance and meet at least one of the criteria below:

- A known exotic pest,
- a variant form of an established plant pest,
- a previously unknown pest,
- a confined or contained pest.

High Priority Pest (HPP) – an exotic plant pest identified as one of the greatest pest threats to one or more plant production industries. For more information on risk ratings please refer to page 38.

EXECUTIVE SUMMARY

To ensure its future viability and sustainability, it is important that the Australian production nursery industry, represented by Greenlife Industry Australia (GIA) minimises the risks posed by exotic pests and responds effectively to plant pest threats. This plan is a framework to coordinate biosecurity activities and investment for Australia's production nursery industry. It provides a mechanism for industry, government, and stakeholders to better prepare for and respond to, incursions of pests that could have significant impacts on the production nursery industry. It identifies and prioritises exotic plant pests (not currently present in Australia) and established pests of biosecurity concern and a focus on future biosecurity challenges.

The *Biosecurity Plan for the Australian Production Nursery Industry* was developed in consultation with the production nurseries Technical Expert Group (TEG) and Biosecurity Implementation Group (BIG), which consisted of plant health and biosecurity experts and industry representatives. These groups were coordinated by Plant Health Australia (PHA) and included representatives from GIA, relevant state, and territory agriculture agencies and PHA.

The development of Threat Summary Tables (TST), constituting a list of more than 250 exotic plant pests and the potential biosecurity threat that they present to the Australian production nursery industry was key to the industry biosecurity planning process. Each pest on the list was given an overall risk rating based on four criteria; entry potential, establishment potential, spread potential, and economic impact. In this biosecurity plan, the exotic pests and diseases with a high overall risk are summarised in Table 1.

The biosecurity plan also details current mitigation and surveillance activities being undertaken and identifies contingency plans, fact sheets and diagnostic protocols that have been developed for pests relevant to the industry. This enables identification of gaps and prioritises specific actions, as listed in the Biosecurity Implementation Plan. The development of this plan will increase industry's biosecurity preparedness and response capability by outlining specific areas of action which could be undertaken through the work of industry and government.

This biosecurity plan is principally designed for decision makers. It provides the industry and government with a mechanism to identify exotic plant pests as well as to address the strengths and weaknesses of the industry's current biosecurity position. It is envisaged that regular reviews of biosecurity plan will be undertaken to assess progress against agreed activities.

The biosecurity plan is a document outlining the commitment to the partnership between the production nursery industry and government to improve biosecurity for the industry, and Australia.

BIOSECURITY PLANNING AND PLAN DEVELOPMENT

What is biosecurity and why is it important?

Plant biosecurity is a set of measures which protect the economy, environment, and community from the negative impacts of plant pests. A fully functional and effective biosecurity system is a vital part of the future profitability, productivity and sustainability of Australia's plant production industries and is necessary to preserve the Australian environment and way of life.

Plant pests are insects, mites, snails, nematodes, or pathogens (diseases) that have the potential to adversely affect food, fibre, ornamental crops, bees and stored products, as well as environmental flora and fauna. For agricultural systems, if exotic pests enter Australia they can reduce crop yields, affect trade, and market access, significantly increase costs to production and in the worst-case scenario, bring about the complete failure of a production system. Historical examples present us with an important reminder of the serious impact that exotic plant pests can have on agricultural production.

Australia's geographic isolation and lack of shared land borders have, in the past, provided a degree of natural protection from exotic plant pest threats. Australia's national quarantine system also helps to prevent the introduction of harmful exotic threats to plant industries. However, there will always be some risk of an exotic pest entering Australia, whether through natural dispersal (such as wind) or assisted dispersal as a result of increases in international tourism, imports and exports, mail and changes to transport procedures (e.g., refrigeration and containerisation of produce).

The plant biosecurity system in Australia

Australia has a unique and internationally recognised biosecurity system to protect our plant production industries and the natural environment against new pests. The system is underpinned by a cooperative partnership between plant industries and all levels of government.

The framework for managing the cooperative partnership for delivering an effective plant biosecurity system is built on a range of strategies, policies, and legislation, such as the Intergovernmental Agreement on Biosecurity (IGAB) and the National Plant Biosecurity Strategy (NPBS). These not only provide details about the current structure but provide a vision of how the future plant biosecurity system should operate.

Australia's biosecurity system has been subject to several reviews in recent times, with the recommendations recognising that a future-focused approach is vital for maintaining a strong and resilient biosecurity system that will protect Australia from new challenges. As a result, there is a continuous improvement from industry and governments to Australia's plant biosecurity system, with the key themes including:

- Targeting what matters most, including risk-based decision making and managing biosecurity risks across the biosecurity continuum (pre-border, border, and post-border),
- good regulation, including reducing regulatory burden and having effective legislation in place,
- better processes, including service delivery modernisation with electronic, streamlined systems,
- sharing the responsibility, including maintaining productive relationships with all levels of government, primary industries, and the wider Australian public,
- maintaining a capable workforce.

Through these themes, a focus on the biosecurity continuum better supports consistent service delivery offshore, at the border, and onshore, and provides an effective biosecurity risk management underpinned by sound evidence and technical justification.

The benefits of the modern biosecurity system are realised by industry, government, and the community, with positive flow on effects to the economy more generally. This occurs through streamlined business processes, productivity improvements and reduced regulatory burden in a seamless and lower cost business environment, by emphasising risk-based decision making and robust partnerships.

Greenlife Industry Australia Biosecurity Statement

All EPPRD Parties are required under Clause 13 of the EPPRD to produce a Biosecurity Statement, the purpose of which is to provide acknowledgement of, and commitment to, risk mitigation measures and preparedness activities related to plant biosecurity. The Biosecurity Statement will inform all Parties of activities being undertaken by the Industry Party to meet this commitment. Parties are required to report to PHA each year any material changes to the content of, or the Party's commitment to, the Party's Biosecurity statement. Biosecurity Statements are included in Schedule 15 of the EPPRD, which can be found on the PHA website at planthealthaustralia.com.au/emergency-plant-pest-response-deed/.

Plant Health Australia

Plant Health Australia (PHA) is the national coordinator of the government-industry partnership for plant biosecurity in Australia.

PHA is a not-for-profit, subscription-funded public company based in Canberra. PHA's main activities are funded from annual subscriptions paid by members. The Australian Government, state, and territory governments and 38 plant industry organisations are all members of PHA and each meet one third of the total annual membership subscription. This tripartisan funding model ensures the independence of the company.

The company was formed to address priority plant health issues, and to work with all its members to develop an internationally outstanding plant health management system that enhances Australia's plant health status and the sustainability and profitability of plant industries. Through PHA, current and future needs of the plant biosecurity system can be mutually agreed, issues identified, and solutions to problems found. PHA's independence and impartiality allow the company to put the interests of the plant biosecurity system first and support a longer-term perspective.

For more information about PHA visit planthealthaustralia.com.au.

Biosecurity Planning

Biosecurity planning provides a mechanism for the production nursery industry, government, and other relevant stakeholders to actively determine pests of highest priority, analyse the risks they pose and put in place practices and procedures that would rapidly detect an incursion, minimise the impact if a pest incursion occurs and/or reduce the chance of pests becoming established. Effective industry biosecurity planning relies on all stakeholders, including government agencies, industry, and the public (Figure 1).

Ensuring the industry has the capacity to minimise the risks posed by pests, and to respond effectively to any pest threats is a vital step for the future sustainability and viability of the industry. Through this pre-emptive planning process, the industry will be better placed to maintain domestic and international trade and reduce the social and economic costs of pest incursions on both growers and the wider community. The information gathered during these processes provides additional assurance that the industry is free from specific pests and has systems in place to control and manage biosecurity risks, which assists the negotiation of access to new overseas markets.

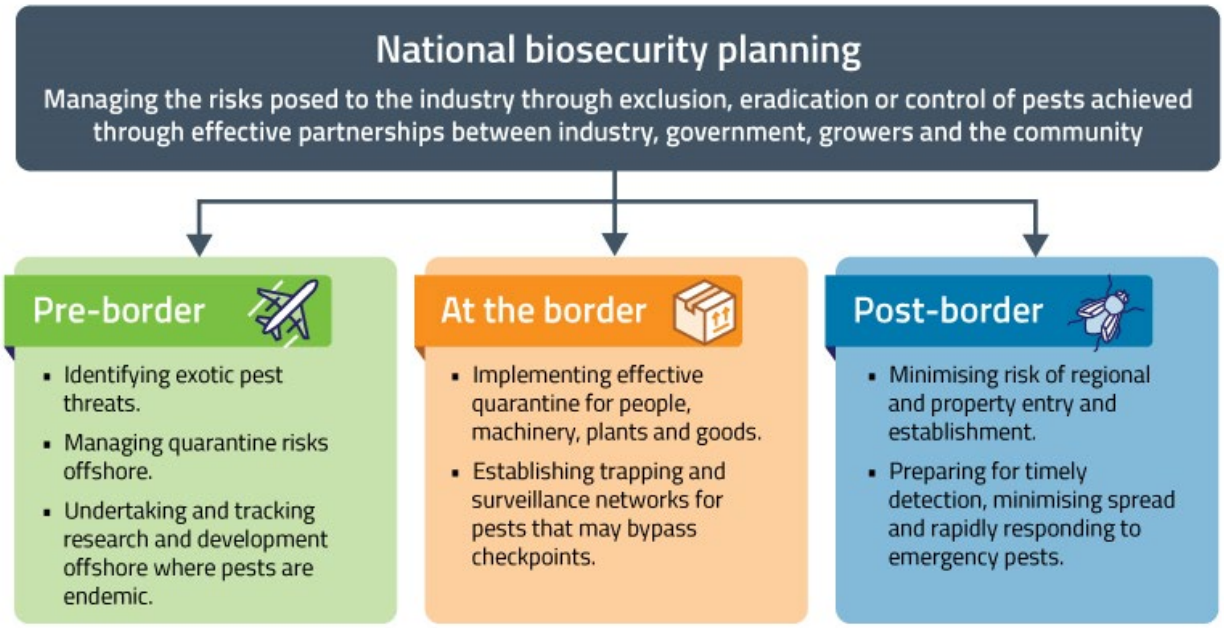

Figure 1. Industry biosecurity: a shared responsibility.

PRODUCTION NURSERY INDUSTRY PROFILE

Greenlife Industry Australia (GIA)

Greenlife Industry Australia (GIA) is the national peak industry for businesses and organisations that provide products and services for greenlife production, produce, supply and retail greenlife and promote the benefits and share greenlife with the community. They are a signatory to the EPPRD and are the key industry contact point if a suspect emergency plant pest affecting the production nursery industry is detected.

At the centre of the greenlife industry are production nurseries. GIA also promotes the benefits of greenlife by engaging with business partners, stakeholders and the wider community, provides leadership and resources to support initiatives which meet the goals of the industry and prioritises advocacy for members on issues of collective importance which include growing demand for the product, reducing costs to business and protecting investments (e.g., biosecurity).

GIA owns and administers the Australian Plant Production Standard (APPS) and the operating guidelines for the three programs within it (Nursery Industry Accreditation Scheme Australia [NIASA], EcoHort and BioSecure HACCP). These standards and guidelines are delivered in partnership with state and territory Nursery & Garden Industry (NGI's) bodies. The industry continues to build the online electronic plant pest identification resource Pest ID Tool[1] which combines information and images on established and key exotic plant pests that impact on production or trade.[2]

The Australian greenlife industry

The greenlife industry in Australia is a multi-billion-dollar industry that plays a vital part in the human (community and personal), environmental and economic well-being of the wider Australian community. The production nursery industry employs over 23,000 staff in approximately 1,650 small to medium sized enterprises across Australia.[3]

Production nurseries are located adjacent to the Australian coastline and in major inland centres (Figure 2). Production occurs in all state and territories of Australia. However, most of the production is located along the eastern seaboard with New South Wales (30%), Queensland (30%) and Victoria (28%) (Figure 3). Production occurs throughout the year with peaks during key planting periods to supply horticultural industries and retail markets.

[1] (Pest ID Tool, 2023).
[2] (DAFF, 2022).
[3] (Hort Innovation, 2021).

Figure 2. Major areas for nursery production (*Hort Innovation, 2023*).

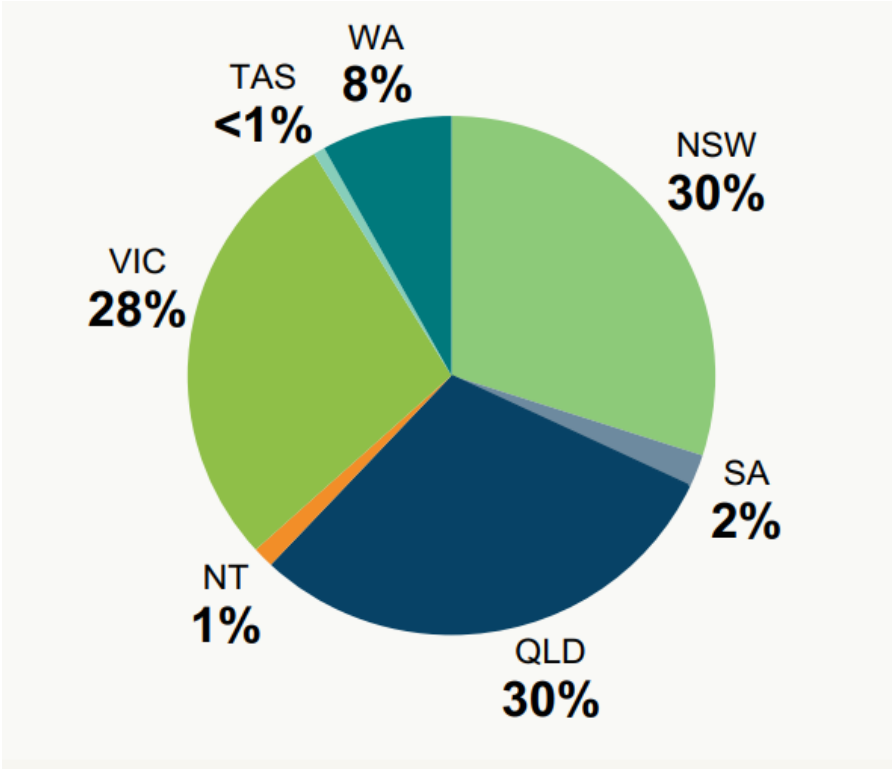

Figure 3. Nursery production by state in 2021/22 (*Hort Innovation, 2023*).

Supply Chain

The production nursery Industry supply chain is a significant component of the Australian horticultural industry encompassing plants grown for horticulture including, fruit and vegetables, landscaping, and ornamental retail supply chains as well as forestry.

For the fiscal year of 2021/22 the value of production was $2.56 billion domestically. A value of $8.6 million of produce was exported in the fiscal year of 2021/22 which equates to less than 1% of production value. The primary destinations for fresh nursery stock were Saudi Arabia, the United Kingdom and Morocco which represent 15%, 13% and 12% of the volume share, respectively. The remaining domestic nursery produce was allocated to the wholesale market, which was supplemented by fresh imports valued at $47.8 million for the 2021/22 fiscal year, making Australia a net importer of nursery products.[4]

The countries with the greatest volume of imported nursery stock into Australia were the Netherlands (37%), Taiwan (22%) and China (20%). The majority (~60%) of the import volume enters Victoria. The imported materials enter through the Post Entry Quarantine (PEQ) facility in Mickleham, Victoria to meet any post-entry requirements.

Distribution networks

Many production nurseries produce seedlings, budwood and small trees for numerous horticultural production industries across Australia. These include vegetables, bananas, citrus, pome fruit, strawberries, summerfruit, tropical fruit, viticulture, and plantation forests. Additionally, the distribution channels for greenlife are varied and include:

- weekend markets,
- independent garden centres,
- major retail chains and hardware stores,
- construction and service sectors within the broader horticultural industry (include landscaping, revegetation, plant hire, public amenities, and domestic garden services).

The numerous links between nurseries and other sectors reflects the very significant role and position of the nursery industry within the plant production and distribution system. These linkages have significant biosecurity implications. Specifically, many plant pests that affect crops will also affect the production nurseries that produce seedling or propagation materials for that commodity. Similarly, if a pest has a broad host range, it could affect multiple species produced by nurseries which may lead to quarantine restrictions on those products during an incursion.

[4] (Hort Innovation, 2023).

DOCUMENT OVERVIEW

Biosecurity for the Australian production nursery industry focuses on five key areas outlined below and identifies the components to be implemented over the life of the biosecurity plan (2023-2028).

Exotic High Priority Pests and established pests of biosecurity significance

A key outcome of this biosecurity plan is the identification of the exotic High Priority Pests (HPPs) and established pests of biosecurity significance for the production nursery industry. No weeds of biosecurity significance were identified for the production nursery industry through consultation with government and industry. This section includes:

- The HPPs which are considered to present the most significant potential pest threat to the production nursery industry, as identified through a pest risk identification and prioritisation process,
- established pests of biosecurity significance identified in consultation with the production nursery industry.

The identification of HPPs and important established pests will allow industry and government to better prioritise and implement preparedness activities. For example, the development and implementation of:

- Effective grower and community awareness campaigns,
- targeted biosecurity education and training programs for growers,
- development of surveillance programs and diagnostic protocols,
- pest-specific mitigation activities can enhance biosecurity preparedness.

Implementing biosecurity for the Australian production nursery industry 2023-2028

This section includes the biosecurity implementation plan and a gap analysis of the current level of preparedness for HPPs of the industry. The Biosecurity Implementation Group (BIG), comprised of both industry and government representatives, developed the implementation plan that sets out shared biosecurity goals and objectives over the next five years. It is intended that the Biosecurity Implementation Plan (Table 3) is revisited by the Biosecurity Reference Panel (BRP) regularly to monitor its implementation and when necessary, adapt to changing circumstances.

Threat identification and pest risk assessments

Guidelines are provided for the identification and ranking of biosecurity threats through a process of qualitative risk assessment. The primary goal is to coordinate identification of exotic pest threats that could impact productivity, or marketability. This plan strengthens risk assessment work already being done both interstate and overseas. All exotic production nursery biosecurity pest threats considered in the biosecurity plan are detailed in TST (APPENDIX 1: THREAT SUMMARY TABLES). From the prioritisation process undertaken in the TST, pests with the highest ratings were identified as a HPP.

Risk mitigation and preparedness

This section provides a summary of activities to mitigate the impact of pest threats on the Australian production nursery industry, along with a set of guidelines for managing risk at all operational levels. Many pre-emptive practices can be adopted by plant industries and government agencies to reduce risks. The major themes covered include:

- Barrier quarantine,
- Surveillance,
- Training,
- Awareness,
- Farm biosecurity,
- Reporting of suspect pests.

A summary of pest-specific information and preparedness documents, such as fact sheets, contingency plans and diagnostic protocols are also described to outline activities industry has undertaken to prepare for an exotic pest incursion (Table 4). Information for industry on how to align preparedness activities with RD&E, such as researching Integrated Pest Management (IPM) strategies, resistance breeding, and chemical control is also provided.

Response management

This section provides a summary of the processes in place to respond to emergency plant pest (EPP)[5] incursions that would affect the Australian production nursery industry. Areas covered in this section include the Emergency Plant Pest Response Deed (EPPRD), PLANTPLAN (outlines the generic approach to response management under the EPPRD), categorisation of pests under the EPPRD and industry specific response procedures and industry communication.

PESTS OF BIOSECURITY SIGNIFICANCE OVERVIEW

One of the primary goals of the biosecurity plan is to identify the high priority exotic and established pests of biosecurity significance to the industry. This section provides information on the High Priority Pest (HPP) list and the established pests of biosecurity significance for the industry. These pest lists were developed in consultation with industry and government stakeholders and provide information to aid prioritisation of resources for biosecurity risk management.

The exotic pests identified as HPPs are included in Table 1. Further details on each pest along with the basis for the likelihood ratings are provided in the TST (APPENDIX 1: THREAT SUMMARY TABLES). Assessments may change due to increased understanding of pest biology, changes to pest/host interactions, or production methods. The HPP list will be reviewed on a regular basis through the BRP. An explanation of the method used for calculating the overall risk can be found on the PHA website.[6]

[5] Refer to the PHA website for details planthealthaustralia.com.au/biosecurity/emergency-plant-pests/
[6] Available from planthealthaustralia.com.au/biosecurity/risk-mitigation

Production nursery industry High Priority Pests

Table 1. High Priority Pests.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
Invertebrates										
Acari (mites and ticks)										
Oligonychus spp. (exotic[9])	Spider mites	Wide range of hosts.[10]	Leaves.	Potential for wind-borne ballooning. Infested plant material, soil, and machinery. Most likely pathway is plants for planting (particularly nursery stock).	The genus *Oligonychus* has a wide global distribution. Some *Oligonychus* species are exotic to Australia.[11]	HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM[12]
Diptera (flies)										
Liriomyza bryoniae	Tomato leaf miner	Wide range of hosts.[13]	Leaves.	Adults capable of flight. Could potentially enter via hitchhiking, contaminated soil and/or infested plant materials (potentially borne internally).	Asia, Europe, Middle East.[14]	HIGH	HIGH	HIGH	MEDIUM	MEDIUM[15]
Liriomyza sativae	Vegetable leaf miner	Primary hosts are within Solanaceae, Fabaceae and	Leaves.	Adults capable of flight. Could potentially enter via hitchhiking, contaminated soil and/or infested plant materials (potentially borne	Widespread in Asia, the Americas and some areas in the Africa, the Middle East	HIGH	HIGH	HIGH	MEDIUM	MEDIUM[18]

[7] (CABI, 2023).
[8] Establishment potential.
[9] Including *O. ilicis, O. peruvianus, O. pratensis, O. thelytokus, O. yothersi*.
[10] Azalea, camellia, holly, boxwood, eucalyptus, oak, walnut, camphor laurel, rice, quince, cotoneaster, loquat, strawberry, pear, coffee, rhododendron, carrot, cotton, cassava, avocado, grape, citrus, papaya, mango, cucurbits, *Allium* spp.
[11] *O. ilicis*: The northern hemisphere including Italy, Japan, Korea, Netherlands, United States of America, Brazil, Paraguay. *O. peruvianus*: Mexico, Guatemala, Trinidad and Tobago, Brazil, Colombia, Ecuador, Peru, Venezuela. *O. pratensis*: Antigua and Barbuda, Barbados, Bermuda, Costa Rica, Dominican Republic, Guadeloupe, Haiti, Martinique, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, French Guiana, Guyana, Suriname. *O. thelytokus*: Comoros, Madagascar, New Caledonia, Reunion, Seychelles. *O. yothersi*: Asia, Central America, the Caribbean, South America.
[12] HPP for coffee and berries (strawberries).
[13] Amaranthaceae, Apiaceae, Asteraceae, Brassicaceae, Caryophyllaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Liliaceae, Papaveraceae, Poaceae, Scrophulariaceae, Solanaceae, Verbenaceae.
[14] Egypt, Morocco, China, India, Indonesia, Iraq, Israel, Japan, Nepal, South Korea, Taiwan, Turkey, Turkmenistan, Vietnam, Albania, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovenia, Spain, Sweden, Ukraine, United Kingdom.
[15] HPP for potatoes and vegetables.
[18] HPP for potatoes.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
		Asteraceae.[16]		internally).	and Oceania.[17] *Liriomyza sativae* is contained within the Queensland - Far Northern Biosecurity Zones 1 & 2 in Australia.					
Gastropoda (slugs and snails)										
Arion vulgaris	Spanish slug	A. vulgaris utilises a wide variety of host plants and food sources.[19]	Whole plant. Above ground, external feeding.	Introduction to new areas is possible through the movement of plant materials (including garden and horticultural waste) or hitchhiking. *Arion vulgaris* often colonises anthropogenically disturbed environments.	Europe.[20]	MEDIUM	HIGH	HIGH	HIGH	HIGH
Lissachatina fulica (syn. *Achatina fulica*)	Giant African snail	Highly polyphagous, feeding on over 500 species.	Whole plant.	Infested plant materials, contaminated soil, tools and machinery. Hitchhiking, pet trade, commercial purposes (i.e., food, medicine), and unregulated pathways.	Widely distributed in the Americas, the Caribbean, Asia, Africa, Europe, Oceania.[21]	HIGH	HIGH	HIGH	HIGH	HIGH[22]
Veronicella cubensis	Cuban slug	Wide host range.[23]	Leaves, stems,	Infested plant material and/or soils	The Americas, the Caribbean,	MEDIUM	HIGH	HIGH	HIGH	HIGH

[16] Other host families include Amaranthaceae, Apiaceae, Brassicaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Lamiaceae, Liliaceae, Malvaceae, Poaceae, Polemoniaceae.

[17] Cameroon, Egypt, Kenya, Nigeria, Sudan, Zimbabwe, Bangladesh, China, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Malaysia, Oman, Pakistan, Sri Lanka, Thailand, Turkey, Uzbekistan, Vietnam, Yemen, Antigua and Barbuda, Bahamas, Barbados, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Guatemala, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, American Samoa, Cook Islands, Federated States of Micronesia, French Polynesia, Guam, New Caledonia, Northern Mariana Islands, Papua New Guinea, Samoa, Vanuatu, Argentina, Brazil, Chile, Colombia, Ecuador, French Guiana, Peru, Venezuela.

[19] Hosts are found within Apiaceae, Asteraceae, Brassicaceae, Caryophyllaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Geraniaceae, Hydrophyllaceae, Iridaceae, Lamiaceae, Liliaceae, Malvaceae, Onagraceae, Paeoniaceae, Papaveraceae, Plantaginaceae, Poaceae, Polygonaceae, Portulacaceae, Ranunculaceae, Rosaceae, Scrophulariaceae, Solanaceae, Tropaeolaceae, Urticaceae, Violaceae.

[20] Andorra, Austria, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Liechtenstein, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

[21] Central African Republic, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Mauritius, Nigeria, Réunion, Seychelles, Tanzania, Togo, Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Israel, Japan, Malaysia, Maldives, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, Spain, Anguilla, Antigua and Barbuda, Barbados, Cuba, Dominica, Dominican Republic, Guadeloupe, Martinique, Netherlands Antilles, Saint Lucia, Trinidad and Tobago, United States of America, American Samoa, Christmas Island, Federated States of Micronesia, French Polynesia, Guam, Marshall Islands, New Caledonia, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Vanuatu, Wallis and Futuna, Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Venezuela.

[22] HPP for melons, tomatoes, vegetables.

[23] Hosts include *Annona muricata* (soursop), *Artocarpus altilis* (breadfruit), *Averrhoa bilimbi* (bilimbi), *Averrhoa carambola* (carambola), *Brassica* spp. (cabbages, cauliflowers), *Brugmansia* spp., *Capsicum* spp., *Carica papaya* (pawpaw), *Cecropia peltata* (trumpet tree), *Cecropia schreberiana* (pumpwood), *Citrus* spp., *Coffea* (coffee), *Colocasia esculenta* (taro), *Colocasia* spp., *Crotalaria retusa* (rattleweed), *Cucumis* spp.,

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
			flowers.	as well as hitchhiking.	Oceania.[24]					
Xerolenta obvia	Heath snail	Feeds on a wide range of plant species (254 genera) e.g., grasses, ornamentals, trees (including fruit), shrubs and weeds.[25]	Above ground plant parts.	Infested plant materials, contaminated soil, tools and machinery, hitchhiking, pet trade, commercial purposes (i.e., food, medicine), and unregulated entry pathways.	Hungary, Bulgaria, Czechia, Italy, Poland, Slovakia, Ukraine, Canada, United States of America.[26]	HIGH[27]	HIGH	HIGH	HIGH	HIGH
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)										
Aphis fabae	Black bean aphid	Very broad host range with over 200 hosts.[28]	Leaves.	Infested plant material. Adults capable of flight and can be spread long distances on strong wind currents.	Wide global distribution (excluding Australia and New Zealand).[29]	HIGH	HIGH	HIGH	MEDIUM[30]	MEDIUM[31]

Cucurbita spp., *Cyanthillium cinereum* (little ironweed), *Cyanthillium* spp., *Dioscorea* spp., *Eulophia alta*, *Eupatorium odoratum*, *Euphorbia cyathophora*, *Hibiscus* (rosemallows), *Ipomoea batatas* (sweetpotato), *Lactuca* spp., *Lantana camara* (lantana), *Mangifera indica* (mango), *Manihot esculenta* (cassava), *Mentha spicata* (Spearmint), *Miconia* spp., *Mikania micrantha* (bitter vine), *Mimosa pellita* (catclaw mimosa), *Mimosa pudica* (sensitive plant), *Morinda citrifolia* (Indian mulberry), *Musa* (banana), *Neomarica caerulea* (walking iris), *Nephrolepis biserrata, Nephrolepis multiflora, Ocimum basilicum* (basil), *Paspalum* spp., *Passiflora* spp., *Peperomia mariannensis, Philodendron* spp., *Piper aduncum* (spiked pepper*), Pipturus albidus, Pteridium* spp., *Sida rhombifolia, Solanum melongena* (aubergine), *Spermacoce laevis, Tacca leontopetaloides* (East Indian arrowroot), *Thunbergia* spp., *Trimezia* spp., *Urena lobata* (caesar weed), *Vernonia cinerea, Vernonia* spp., *Vinca* (periwinkle).

[24] Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Haiti, Jamaica, Puerto Rico, Saint Kitts and Nevis, U.S. Virgin Islands, United States of America, American Samoa, Micronesia, Guam, Northern Mariana Islands. Undetected in pacific basin countries for many years due to being misidentified as *Sarasinula plebeia* (present in Australia).

[25] (Montana Department of Agriculture, n.d.).

[26] (Forsyth et al., 2015).

[27] It has been intercepted in shipments of vehicles from Europe at the Australian border.

[28] Including beans, peas, beets, crucifers, cucurbits, chilli bell pepper, tomato, potato, maize, fennel, cotton and ornamentals (including dahlia and tulip).

[29] Algeria, Burundi, Cameroon, Congo (DRC), Côte d'Ivoire, Egypt, Ethiopia, Kenya, Libya, Malawi, Mauritius, Morocco, Niger, Nigeria, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zimbabwe, Afghanistan, China, Georgia, Hong Kong, India, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Nepal, Pakistan, Philippines, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Yemen, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Bermuda, Bonaire, Saint Eustatius and Saba, Canada, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Chile, Peru, Uruguay.

[30] Transmits a range of pathogenic viruses.

[31] HPP for potatoes and vegetables.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
Aphis gossypii (exotic strains)	Cotton aphid	Very broad host range.[32]	Leaves, inflorescence, stems.	Infested plant material. Adults capable of flight and can be spread long distances on strong wind currents.	Wide global distribution.[33]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[34]
Bemisia tabaci (exotic biotypes and strains)	Silverleaf whitefly	Extremely wide host range of more than 500 species of plants from 63 plant families.	Leaves, stems.	*B. tabaci* are not efficient fliers but can be transported quite long distances by the wind. All stages of the pest can be carried on planting material and cut flowers.	Global distribution.[35] Endemic species of *Bemisia tabaci* are present in Australia.	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[36]
Diaphorina citri	Asian citrus psyllid	Fruit, flowers, leaves, stem.	*Citrus* spp. and citrus relatives.[37]	*D. citri* is normally spread only locally by natural dispersal. Citrus and even rutaceous materials (budwood, grafted trees, rootstock, seedlings) from infected areas can carry eggs	Widely distributed in Asia, the Americas, the Caribbean,	HIGH	HIGH	HIGH	MEDIUM[39]	MEDIUM[40]

[32] At least 200 economically important crops including cotton, papaya, citrus, bell pepper, melon, cucumber, pumpkin, carnation, sunflower, jasmine, lettuce, lychee, macadamia, apple, passionfruit, avocado, tomato, potato, maize, Asteraceae, Myrtaceae, Ranunculaceae and roses.

[33] Algeria, Angola, Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Egypt, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Réunion, Rwanda, Saint Helena, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe, Afghanistan, Azerbaijan, Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Laos, Lebanon, Malaysia, Myanmar, Nepal, North Korea, Oman, Pakistan, Palestine, Philippines, Qatar, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Vietnam, Yemen, Albania, Austria, Belarus, Belgium, Bulgaria, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Italy, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Anguilla, Bahamas, Barbados, Bermuda, British Virgin Islands, Canada, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, American Samoa, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Papua New Guinea, Pitcairn, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna, Argentina, Bolivia, Brazil, Chile, Colombia, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

[34] HPP for potatoes.

[35] Largely global distribution. Algeria, Angola, Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mauritius, Mayotte, Morocco, Mozambique, Nigeria, Réunion, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zimbabwe, Afghanistan, Azerbaijan, Bahrain, Bangladesh, Brunei, Cambodia, China, Georgia, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Vietnam, Yemen, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Finland, France, Germany, Greece, Hungary, Italy, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, United Kingdom, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago, United States of America, American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Argentina, Bolivia, Brazil, Colombia, French Guiana, Guyana, Paraguay, Peru, Uruguay, Venezuela.

[36] HPP for melons, tomatoes, vegetables.

[37] Including *Atalantia, Citropsis, Limonia, Murraya, Bergera* and *Clausena*.

[39] A vector of *Candidatus* Liberibacter asiaticus (huanglongbing).

[40] HPP for citrus.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
				and/or nymphs over longer distances.	Middle East, Africa, Oceania.[38]					
Dysmicoccus neobrevipes	Grey pineapple mealybug	Broad host range.[41]	Leaves, stems, inflorescence, fruit.	First instar nymphs ('crawlers') can be wind dispersed. Long distance spread could be aided by infested plant materials and/or hitchhiking.	The Americas, Africa, Europe, Asia, Oceania.[42]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[43]
Halyomorpha halys	Brown marmorated stink bug (BMSB)	Very wide host range, preferring hosts with fruiting structures.[44]	Whole plant, leaves, fruit.	Adults capable of flight. Infested plant materials and hitchhiking. Regularly found in shipping containers.	Asia, Middle East, Europe, the Americas.[45]	HIGH	MEDIUM	MEDIUM	HIGH	MEDIUM[46]
*Homalodisca vitripennis (*with *Xylella fastidiosa)*	Glassy winged sharpshooter	Very broad host range of over 200 species.[47]	Leaves, stems.	Wingless nymphs spread by jumping or walking to new hosts. Adults capable of flight over long distances. Most long-distance movement is as viable egg masses in nursery stock.	United States of America, Mexico, French Polynesia, Easter Island, Cook Islands, Chile.	MEDIUM	HIGH	HIGH	HIGH	HIGH[48]
Lepidoptera (butterflies and moths)										
Lymantria dispar	Spongy moth[49]	Spongy moths have an	Leaves, flowers.	Potential pathways include clothing,	Europe, Asia, Middle East, the	HIGH[52]	MEDIUM	HIGH	HIGH	HIGH[53]

[38] Kenya, Mauritius, Réunion, Tanzania, Afghanistan, Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Iran, Israel, Japan, Laos, Macau, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Taiwan, Thailand, United Arab Emirates, Vietnam, Yemen, Belgium, France, Netherlands, Slovenia, Antigua and Barbuda, Bahamas, Barbados, Belize, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Honduras, Jamaica, Martinique, Mexico, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, U.S. Virgin Islands, United States of America, American Samoa, Guam, Northern Mariana Islands, Papua New Guinea, Timor-Leste, Argentina, Brazil, Colombia, Paraguay, Uruguay, Venezuela.

[41] including pineapple, apple, citrus, banana, cotton, tomato, vegetables, maize, sugarcane, avocado, mango, ginger, grasses, and clover.

[42] Uganda, China, India, Japan, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Italy, Lithuania, Antigua and Barbuda, Bahamas, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, American Samoa, Cook Islands, Fiji, Guam, Kiribati, Marshall Islands, Northern Mariana Islands, Samoa, Brazil, Colombia, Ecuador, Peru, Suriname.

[43] HPP for bananas and pineapples.

[44] Some hosts include apple, Asian pear, European pear, citrus, raspberry, blackberry, strawberry, pea, blueberry, peach, grapevine, cherry, bean, soybean, maize, cotton, sweetcorn, Phalaenopsis orchids, rose, hazelnut, pecan, walnut, maple, oak, fig, olive and vegetable crops (including solanaceous crops), okra, snapdragon, common burdock, horseradish, birch, nettle tree, dogwood, sunflower, hops, holly, crepe myrtle, apricot, plum (Bergmann et al., 2016; Penca & Hodges, 2019).

[45] China, Georgia, Japan, Kazakhstan, North Korea, South Korea, Taiwan, Turkey, Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Liechtenstein, Malta, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Canada, United States of America, Guam, Chile.

[46] HPP for apple and pear, berries (*Rubus* and strawberries), cherries, tree nuts, summerfruit, truffles, vegetables, viticulture.

[47] Some hosts include citrus, crape myrtle, *Prunus* spp., blackberry, bottlebrush, bougainvillea, camellia, acacia, daylily, dianthus, chrysanthemum, macadamia, pistachio, and grapevine. Host lists continue to grow, primarily within ornamental plants.

[48] HPP for apple and pear.

[49] (Previously known as Asian gypsy moth).

[52] 458 interceptions internationally. The most frequently intercepted Erebidae. The *Lymantria dispar* complex has a propensity to be transported on human-made objects, typically as egg masses.

[53] HPP for apple and pear, berries (R*ubus*), lychees, plantation forest, summerfruit, tree nuts.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
(All races, subspecies or strains)		extremely wide host range.[50]		footwear, wood packaging, containers, cars, and plants.	Americas.[51]					
Pathogens										
Bacteria										
Candidatus Liberibacter asiaticus	Huanglongbing	*Citrus* spp. Australian native citrus, *Atalantia* spp., *Murraya* spp. *Clausena* spp., *Vepris* spp., rutaceous plants (eg. ornamentals).	Leaves, stems, flowers, fruit, roots, whole plant.	Short and long-distance dispersal is primarily impingent on infected plant material and insect vectors that are harbouring the phytoplasma.	Asia, Middle East, the Americas, the Caribbean, Africa.[54]	HIGH	HIGH	HIGH	MEDIUM	MEDIUM[55]
Erwinia amylovora	Fire blight	Apples, pears, *Rubus* spp. quince, *Pyacantha* spp., cotoneaster, hawthorns, and other ornamental plants.	Leaves, stems, fruit, flowers.	Transmitted by infected plant material, wind, rain, insects, or birds.	Middle East, Europe, United States of America, Oceania.[56]	HIGH	HIGH	HIGH	HIGH	HIGH[57]
Pseudomonas syringae pv. *syringae* (exotic	Bacterial canker	Broad host range.[58]	Attacks plants at all stages of	Local dispersal is likely via wind, rain, aerosols and insects or contaminated	Widely distributed worldwide.[60]	HIGH	HIGH	HIGH	HIGH	HIGH

[50] Oak species (*Quercus* spp.) are considered to be the preferred hosts, but heavy defoliation is also observed on *Carpinus*, *Castanea*, *Fagus*, *Malus*, *Populus*, *Prunus*, *Pyrus* and *Salix*. Other host genera include *Acacia, Acer, Alnus, Betula, Callistemon, Carya, Corylus, Corymbia, Diospyrus, Eucalyptus, Eugenia, Fraxinus, Glycine, Hamamelis, Larix, Leptospermum, Liquidambar, Litchi, Lithocarpus, Nothofagus, Ostrya, Picea, Pinus, Pistacea, Platanus, Pseudotsuga, Quercus, Robinia, Taxodium, Tilia, Ulmus, Vaccinium, Zea*.

[51] Algeria, Morocco, Tunisia, Afghanistan, Armenia, Azerbaijan, China, India, Iran, Iraq, Israel, Japan, Kazakhstan, Kyrgyzstan, Lebanon, Mongolia, North Korea, South Korea, Syria, Taiwan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America.

[54] Ethiopia, Kenya, Mauritius, Réunion, Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Iran, Japan, Laos, Malaysia, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Sri Lanka, Taiwan, Thailand, Vietnam, Yemen, Barbados, Belize, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Guatemala, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, Papua New Guinea, Timor-Leste, Argentina, Brazil, Colombia, Paraguay, Venezuela.

[55] HPP for citrus.

[56] Algeria, Egypt, Morocco, Tunisia, Armenia, Georgia, Iran, Israel, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, South Korea, Syria, Turkey, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Bermuda, Canada, Guatemala, Mexico, United States of America, New Zealand.

[57] HPP for apple and pear.

[58] Hosts include onion, leek, bell pepper, chrysanthemum, citrus, cucumber, pumpkin, garden dahlia, hibiscus, walnut, lettuce, magnolia, mango, lucerne, rice, passionfruit, avocado, bean, poplar, stonefruit, azalea, roses, tomato, willows, clover, blueberries, grapevine, and maize.

[60] Algeria, Egypt, Ethiopia, Kenya, Lesotho, Libya, Malawi, Morocco, Nigeria, South Africa, Tanzania, Tunisia, Uganda, Zimbabwe, Afghanistan, Azerbaijan, Bangladesh, China, Georgia, India, Iran, Israel, Japan, Kazakhstan, Kyrgyzstan, Lebanon, North Korea, Pakistan, South Korea, Sri Lanka, Thailand, Turkey, Uzbekistan, Vietnam, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden,

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
races)			growth (leaves, inflorescence, stems, pods, seeds, flowers, and fruit).	equipment. In international trade, infected plant materials including pollen, seed (several taxa) and budwood can carry the bacteria.[59]						
Xylella fastidiosa	Pierce's disease	Wide host range of at least 343 plant species.[61]	Whole plant.	Infected plant material, insect vectors.[62]	Middle East, Asia, Europe, the Americas.[63]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[64]
Fungi										
*Austropuccinia psidii sensu lato (*syn. *Puccinia psidii) (*exotic variants*)*	Myrtle rust; Guava rust; Eucalyptus rust	Myrtaceae.	Whole plant can be affected.[65]	*A. psidii* can be dispersed over long distances by wind and animal vectors; infected or contaminated plant materials; contaminated plant waste, timber, wood packaging contaminated equipment and tools.	The Americas, New Caledonia, the Caribbean, South Africa, Indonesia, Japan, China, Singapore, New Zealand. One strain of *A. psidii* is present in Australia (Myrtle rust).[66]	MEDIUM	HIGH	HIGH	HIGH	HIGH
Phytophthora kernoviae	Phytophthora blight	Broad host range (at least 17 plant genera, representing 12 families).[67]	Leaf blight, dieback, and bleeding cankers.	Local spread via wind and rain-splash. Potential long-distance dispersal on wood products (even without bark) and nursery stock (incl. potting mix and latent infections).[68]	Ireland, United Kingdom, New Zealand, Chile.	HIGH	HIGH	MEDIUM	HIGH	HIGH

Switzerland, Ukraine, United Kingdom, Barbados, Canada, El Salvador, Guatemala, Honduras, Mexico, Panama, Puerto Rico, United States of America, New Zealand, Argentina, Brazil, Chile, Uruguay, Venezuela.

[59] (Upper et al., 2003).

[61] Host families include Altingiaceae, Apocynaceae, Araliaceae, Asteraceae, Betulaceae, Brassicaceae, Caryophyllaceae, Celastraceae, Cornaceae, Ericaceae, Fabaceae, Fagaceae, Ginkgoaceae, Juglandaceae, Lamiaceae, Lythraceae, Magnoliaceae, Malvaceae, Moraceae, Oleaceae, Persea, Plantaginaceae, Poaceae, Rutaceae, Sapindaceae, Ulmaceae, Urticaceae, Vitaceae (European Food Safety Authority, 2020).

[62] Vectored and transmitted by known xylem feeding hemipteran insects in the Cicadellidae, Cicadidae, Aphrophoridae, and Cercopidae. The glassy-winged sharpshooter, *Homalodisca vitripennis* is a key vector (Cornara et al., 2019).

[63] Iran, Israel, Taiwan, France, Germany, Italy, Portugal, Spain, Switzerland, Canada, Costa Rica, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Paraguay, Venezuela.

[64] HPP for berries (blueberries and R*ubus*), cherries, citrus, coffee, olives, summerfruit, tree nuts, viticulture.

[65] Including leaves, young branches, epicormic shoots, coppice, and stem blight. Severe infection and crown loss; dieback and mortality has been reported for certain myrtaceous species. (Fernandez Winzer et al., 2017; Pegg et al., 2017).

[66] (Makinson et al., 2020).

[67]Hosts include rhododendron, *Drimys winteri, Fagus sylvatica, Gevuina avellana, Hedera helix, Ilex aquifolium, Liriodendron tulipifera, Magnolia* spp., *Michelia doltsopa, Pieris formosa, Quercus ilex, Quercus robur* and *Vaccinium myrtillus*.

[68] Chlamydospores have not been reported for this species.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[7]	Entry potential	Est.[8] potential	Spread potential	Economic impact	Overall risk
Phytophthora ramorum	Sudden oak death	Broad host range across 70 genera from 33 families.[69]	Stems, branches, leaves.[70]	Wind-blown rain or rain splash are likely mechanisms for local spread.[71] Potential long-distance pathways: plants for planting, cut branches or contaminated soil and/or water.	Asia, Europe, North America.[72]	MEDIUM	HIGH	HIGH	HIGH	HIGH[73]
Viruses and viroids[74]										
Closteroviridae										
Lettuce infectious yellows virus (*Crinivirus*)	Lettuce infectious yellows virus (LIYV)	Lettuce, cucurbits, and other crops.[75]	Leaf chlorosis and necrosis. Plants may be stunted, exhibit poor fruit set and/or fruit development.	The main pathways of LIVY dispersal are through infected plants for planting and the vector (*Bemisia tabaci*).	Mexico, United States of America.	LOW	HIGH	HIGH	HIGH	MEDIUM
Potyviridae										
Plum pox virus (*Potyvirus*)	Plum pox virus (PPV); Sharka	The main woody hosts are the fruit-producing and ornamental species of *Prunus*.	Vein clearing in leaves, chlorotic spots, deformation of leaves and fruit.	Primarily distributed through latent budwood used for grafting and planting materials. Aphids can transmit the virus.[76]	Europe, Asia, Middle East, Canada, Argentina, Chile, Brazil.[77]	MEDIUM	HIGH	HIGH	HIGH	HIGH[78]

[69] Some hosts include oak trees, *Arbutus*, *Lithocarpus* spp., fir, maple plants in Ericaceae family, *Eucalyptus gunnii*, beech, bay laurel, magnolia and yew.
[70] Infectious airborne sporangia were not produced in significant numbers on the bole lesions responsible for oak and tanoak mortality but were extremely abundant on foliar lesions of other hosts (Davidson et al., 2002; Garbelotto & Hayden, 2012).
[71] *P. ramorum* has been recovered from plants, rain, soil, litter and stream water from forests with suitable host taxa.
[72] Vietnam, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Canada, United States of America.
[73] HPP for berries (blueberries), cut flowers, plantation forest, tree nuts, truffles, tea tree.
[74] (ICTV, 2023).
[75] *Beta vulgaris* var. *saccharifera* (sugarbeet), *Chenopodium album* (fat hen), *Citrullus lanatus* (watermelon), *Cucumis melo* (melon), *Cucurbita maxima* (giant pumpkin), *Cucurbita moschata* (pumpkin), *Cucurbita pepo* (marrow), *Daucus carota* (carrot), *Helianthus annuus* (sunflower), *Lactuca sativa* (lettuce), *Lactuca serriola* (prickly lettuce), *Portulaca oleracea* (purslane), *Sonchus oleraceus* (common sowthistle), *Taraxacum* (dandelion).
[76] Aphid vectors include *Aphis craccivora, A. fabae, A. gossypii, A. hederae, A. spiraecola, Brachycaudus cardui, B. helichrysi, B. persicae, Hyalopterus pruni, Metopolophium dirhodum, Myzus persicae, M. varians, Phorodon humuli, Rhopalosiphum padi*.
[77] Egypt, Tunisia, China, India, Iran, Israel, Japan, Jordan, Kazakhstan, Pakistan, South Korea, Syria, Turkey, Uzbekistan, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, United Kingdom, Canada, Argentina, Chile.
[78] HPP for cherries, summerfruit.

Established pests of biosecurity significance

This section identifies established pests of biosecurity significance for the Australian production nursery industry. By identifying pests which growers already manage, mechanisms can be put in place to better align industry and government resources and provide a stronger base for biosecurity risk management for the industry.

Identification of established pests of biosecurity significance will also assist in the implementation of effective grower and community awareness campaigns, targeted biosecurity education and training programs for growers, surveillance coordinators, diagnosticians, and development of pest-specific mitigation activities.

In order to be considered as an established pest of biosecurity significance, the pests included in Table 2 should be economically important to the production nursery industry and at least one of the following:

- Restricted to regions within Australia,
- notifiable by law,
- have market access implications,
- able to be prevented from entering a farm through good biosecurity practices.

These pests were considered to prioritise investment but did not undergo a formal pest risk assessment.

Table 2. Established pests of biosecurity significance.

Scientific name	Common name	Host(s)	Affected plant part	Distribution in Australia	State movement controls and/or markets impact by pests	Factsheets
Invertebrates						
Diptera (flies)						
Liriomyza huidobrensis	Serpentine leaf miner	Wide host range over 40 species.	Leaves, internal feeding.	NSW, Qld. First detected in NSW and Qld in 2020.	Surveillance activities were implemented on affected sites in NSW and Qld. Contact relevant state/territory department for the most recent movement controls.	PHA[79], NSW DPI[80]
Liriomyza trifolii	American serpentine leaf miner	Feed on more than 400 plant species, affects a wide host range of common horticultural crops and ornamental plant species.	Leaves, internal plant tissues.	Kununurra (WA), Torres Strait & Far North Qld, NT. First detected in Kununurra, WA in 2021.	Qld – 2 biosecurity zones covering Torres Strait and the northern Cape York Peninsula, plant material can't leave these zones without a permit. Contact relevant state/territory department for the most recent movement controls.	PHA[81], DAF Qld[82], DPIRD[83]
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)						
Aleurodicus disperses	Spiralling whitefly	Very broad host range recorded from 27 families including horticultural crops and range of ornamentals and shade trees.	Leaves, fruit.	Qld, NT. First detected in Qld in 1997.	Major impact for the production nursery industry is on trade with restrictions on movement of containerised plants. Spiralling whitefly is a declared prohibited pest for WA.	DPIR[84], DPIRD/AusVeg[85], DAF Qld[86]
Bactericera cockerelli	Tomato/potato psyllid (TPP)	Range of hosts including tomato, potato, bell pepper, chilli, goji berry, tamarillo, eggplant, and sweet potato.	TPP can affect plant growth, reduce crop yield, and spread a serious plant disease known as 'zebra chip' in potato, caused by *Candidatus* Liberibacter solanacearum (CLso).	Perth metropolitan area and surrounding areas (WA). Detected in Perth, WA in 2017, a quarantine area has been established	Contact relevant state/territory department for the most recent movement controls, WA, Vic, NSW, Qld, and SA have all imposed state-based restrictions for movement of plant material.	DPIRD[88], PIRSA[89], PHA[90], NRE Tas[91]

[79] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Serpentine-leaf-miner-FS.pdf
[80] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/1272913/Primefact-Serpentine-Leafminer-2nd-Edition.pdf
[81] https://www.planthealthaustralia.com.au/wp-content/uploads/2018/07/American-serpentine-leaf-miner-FS-Potatoes.pdf
[82] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/american-leafminer
[83] https://www.agric.wa.gov.au/plant-biosecurity/biosecurity-alert-american-serpentine-leafminer
[84] https://dpir.nt.gov.au/__data/assets/pdf_file/0011/228089/ent1-biology-pest-management-spiraling-whitefly.pdf
[85] https://ausveg.com.au/app/data/technical-insights/docs/TL38.pdf
[86] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/spiralling-whitefly
[88] https://www.agric.wa.gov.au/sites/gateway/files/DPIRD%20TPP%20factsheet%20%28WA%29_HR%20%28no%20bleed%29.pdf
[89] https://pir.sa.gov.au/__data/assets/pdf_file/0004/293962/Fact_Sheet_-_Tomato_potato_psyllid.-_June_2020.pdf
[90] https://www.planthealthaustralia.com.au/wp-content/uploads/2018/07/Tomato-potato-psyllid-FS-Potatoes.pdf
[91] https://nre.tas.gov.au/biosecurity-tasmania/plant-biosecurity/pests-and-diseases/tomato-potato-psyllid

Scientific name	Common name	Host(s)	Affected plant part	Distribution in Australia	State movement controls and/or markets impact by pests	Factsheets
				within the state.[87]		
Daktulosphaira vitifoliae	Grapevine phylloxera	*Vitis* spp.	Roots, leaves.	Parts of NSW and Vic.[92] First detected in Vic in 1877.	Prohibited declared pest for WA, Phylloxera Management and Exclusion Zones are established in states and regions within states.	NSW DPI[93], Vine Health Australia[94], PHA[95], DEECA[96]
Hymenoptera (sawflies, wasps, bees and ants)						
Anoplolepis gracilipes	Yellow crazy ant	Wide host range including coffee, cacao, coconut, citrus and cinnamon plantations readily invaded.	Leaves, fruit, whole plant.	NT, Qld, NSW. First detected in 1980 in Arnhem Land (NT).	Most transported inside sea cargo and regularly detected and eradicated by DAFF Biosecurity in port areas. Major impact for the production nursery industry is on trade with restrictions on movement of containerised plants.	DAF Qld[97], Invasives[98], NSW DPI[99]
Solenopsis invicta	Red imported fire ant (RIFA)	Broad host range.[100]	Seeds, fruit, seedlings.	Qld. First detected in Qld in 2001.	Movement of host material from Qld to other states is prohibited unless certified. Major impact for the production nursery industry is on trade with restrictions on movement of containerised.	PIRSA[101], DAF Qld[102], DPIRD[103], PHA[104], DEECA[105], NSW DPI[106], Invasives[107]
Lepidoptera (butterflies and moths)						
Spodoptera	Fall armyworm	Larvae is known to destroy more than 350 plant species, including	Fruit, growing points (external feeding),	NSW, NT, Qld, Tas, Vic,	Contact relevant state/territory department for the most	DAF Qld[108], NSW DPI[109], DEECA[110],

[87] https://www.agric.wa.gov.au/tpp/tpp-quarantine-area
[92] See phylloxera information and zones. https://vinehealth.com.au/pests/pests-and-diseases/phylloxera/
[93] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/584316/grape-phylloxera.pdf
[94] https://vinehealth.com.au/wp-content/uploads/VHA-Fact-Sheet-Grape-Phylloxera.pdf
[95] https://www.planthealthaustralia.com.au/wp-content/uploads/2020/08/Grape-phylloxera-FS.pdf
[96] https://agriculture.vic.gov.au/biosecurity/pest-insects-and-mites/priority-pest-insects-and-mites/grapevine-phylloxera
[97] https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/76637/yellow-crazy-ant.pdf
[98] https://invasives.org.au/wp-content/uploads/2022/05/Yellow-crazy-ants-fact-sheet-May-2022-Invasive-Species-Council.pdf
[99] https://www.dpi.nsw.gov.au/biosecurity/insect-pests/yellow-crazy-ant
[100] Including okra, sunflower, citrus, pecan, watermelon, strawberry, soyabean, cabbage, pines, nightshade, sorghum, eggplant, corn, turfgrass, cotton and passionfruit.
[101] https://pir.sa.gov.au/__data/assets/pdf_file/0019/321166/Fact_Sheet_-_Red_Imported_Fire_Ant_-_May_2020.pdf
[102] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/animals/invasive/restricted/fire-ant
[103] https://www.agric.wa.gov.au/sites/gateway/files/Fact%20sheet%20-%20Red%20imported%20fire%20ant.pdf
[104] https://www.planthealthaustralia.com.au/wp-content/uploads/2019/06/Fire-ants-FS-Tea-tree.pdf
[105] https://agriculture.vic.gov.au/biosecurity/pest-insects-and-mites/priority-pest-insects-and-mites/fire-ants
[106] https://www.dpi.nsw.gov.au/biosecurity/insect-pests/fire-ants
[107] https://invasives.org.au/wp-content/uploads/2015/01/Fact-Sheet-Red-Fire-Ants.pdf
[108] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/insects/field-crop/fall-armyworm
[109] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0016/1205332/New-Pest-Alert-Fall-armyworm.pdf
[110] https://agriculture.vic.gov.au/biosecurity/pest-insects-and-mites/priority-pest-insects-and-mites/armyworms

Scientific name	Common name	Host(s)	Affected plant part	Distribution in Australia	State movement controls and/or markets impact by pests	Factsheets
frugiperda		maize, cotton, rice, sorghum, sugarcane, wheat, vegetables, fruit, ornamental crops.	inflorescence, leaves, stems.	WA. First detected on two Torres Strait islands, then Qld and NT.	recent movement controls.	DPIRD[111], DPIR[112]
Thysanoptera (thrips)						
Thrips palmi	Melon thrips	Broad host range; onion, bell pepper, eggplant, chrysanthemum, citrus, cucurbits, leguminous plants, sunflower, cotton, lettuce, orchids, mango, avocado and *Solanum* spp.	Leaves, growing points, fruit.	NT, Qld, WA, NSW. First detected in NT in 1989.	Fumigation requirements apply for movement in SA and WA. Inspection required for movement in NSW. Major impact for production nursery industry is on trade with restrictions on movement of melon thrips host plants and plant material.	PHA[113], DPIR[114], PIRSA[115]
Pathogens						
Fungi						
Austropuccinia psidii (syn. *Uredo rangelii*)	Myrtle rust	Over 350 species from 58 different genera within the Myrtaceae family.	Leaves.	Qld, NSW, WA, Vic, Tas, NT. First detected in NSW in 2010.	SA – restricted plant material into the state without certification under the Plant Quarantine Standard. Major impact for the production nursery industry is on trade with restrictions on movement of myrtle rust host plants (Myrtaceae) and plant material.	PIRSA[116], NRE Tas[117], Invasives[118], DPIRD[119], NSW DPI[120]
Nematode						
Globodera rostochiensis	Potato cyst nematode (PCN)	*Solanum* spp. including tomato, potato and eggplant.	Leaves, roots, whole plant.	Vic. First discovered in WA in 1986, WA has since been declared free of PCN	Vic has established PCN management zones, including 4 potato protection districts. Five Control Areas have also been declared to prevent the spread of PCN from the areas of Boneo, Thorpdale, Gembrook, Koo Wee Rup and Wandin. All	PIRSA[121], DEECA[122], DPIRD/AusVeg[123],

[111] https://www.agric.wa.gov.au/sites/gateway/files/Fall%20armyworm%20factsheet%20DPIRD.pdf
[112] https://industry.nt.gov.au/__data/assets/pdf_file/0017/810314/ENT-16-fall-armyworm-factsheet.pdf
[113] https://planthealthaustralia.com.au/wp-content/uploads/2013/01/Melon-thrips-FS.pdf#:~:text=Fact%20sheet%20Melon%20thrips%20What%20are%20Melon%20thrips%3F,also%20known%20to%20be%20a%20potential%20virus%20vector.
[114] https://industry.nt.gov.au/__data/assets/pdf_file/0020/233606/753.pdf
[115] https://pir.sa.gov.au/__data/assets/pdf_file/0019/297010/Fact_Sheet_-_Melon_thrips_-_May_2020.pdf
[116] https://pir.sa.gov.au/__data/assets/pdf_file/0005/259709/fact-sheet-myrtle-rust-july-2021.pdf
[117] https://nre.tas.gov.au/Documents/myrtle.pdf
[118] https://invasives.org.au/wp-content/uploads/2014/02/fs_myrtle_rust.pdf
[119] https://www.agric.wa.gov.au/sites/gateway/files/DPIRD%20Myrtle%20Rust%20Fact%20Sheet.pdf
[120] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/573707/primefact-myrtle-rust.pdf
[121] https://pir.sa.gov.au/__data/assets/pdf_file/0004/296185/Fact_Sheet_-_Potato_Cyst_Nematodes_-_June_2017.pdf
[122] https://agriculture.vic.gov.au/biosecurity/pest-insects-and-mites/priority-pest-insects-and-mites/potato-cyst-nematode
[123] https://ausveg.com.au/app/data/technical-insights/docs/TL31.pdf

Scientific name	Common name	Host(s)	Affected plant part	Distribution in Australia	State movement controls and/or markets impact by pests	Factsheets
				since 2010. It was then discovered in 1991 in Vic.	of NSW is a potato biosecurity zone, there are two seed potato protected areas. Major impact for the production nursery industry is on trade with restrictions on the movement of nursery stock.	NSW DPI[124]
Viruses and viroids[125]						
Closteroviridae						
Beet pseudoyellows virus (*Crinivirus*)	Beet pseudoyellows virus (BPYV)	Lettuce, beetroot, endive, cucumber, common weeds, strawberry, giant pumpkin.	Chlorosis between veins in older cucumber leaves, with symptoms spreading to younger leaves; severely affected plants stunted.	Tas, SA. First discovered in 1981 in Tas.[126]	Impact seen within greenhouses via the greenhouse whitefly. May have varying degrees of severity depending on production method.	DAF Qld[127], Hort Innovation[128]
Geminiviridae						
Tomato yellow leaf curl virus *(Begomovirus*)	Tomato yellow leaf curl virus (TYLCV)	Tomato, bell pepper, *Lisianthus,* petunia, common bean, *Physalis philadelphica*, morning glory, cowpea, black nightshade.	Affects the whole plant.[129]	Qld, Vic, NT. First discovered in Qld in 2006.	Within Qld - plants and fruit may be moved without restriction, movement from Vic to NSW and Tas is possible with a Plant Health Certificate. To interstate markets - movement of fruit is not restricted except tomato fruit attached to its truss. This is not permitted entry to WA.	NSW DPI[130], PIRSA[131], DEECA[132]

[124] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/potatocystnem
[125] (ICTV, 2023).
[126] (Duffus & Johnstone, 1981).
[127] https://www.daf.qld.gov.au/__data/assets/pdf_file/0005/58802/Viruses-in-vegies.pdf
[128] https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/vg16086-virus-diseases-of-cucurbits-final.pdf
[129] Plants are stunted or dwarfed. New growth only produced after infection is reduced in size. Leaflets are rolled upwards and inwards, Leaves are often bent downwards, stiff, thicker than normal, have a leathery texture, show interveinal chlorosis, and are wrinkled. Flowers appear normal. Fruit, if produced at all, are small, dry, and unsaleable.
[130] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/77113/Tomato-yellow-leaf-curl-virus-in-Australia-Primefact-220.pdf
[131] https://www.pir.sa.gov.au/__data/assets/pdf_file/0006/299472/Tomato_Yellow_Leaf_Curl_Virus_Fact_Sheet_-_June_2019.pdf
[132] https://agriculture.vic.gov.au/biosecurity/plant-diseases/vegetable-diseases/tomato-yellow-leaf-curl-virus

IMPLEMENTING BIOSECURITY FOR THE AUSTRALIAN PRODUCTION NURSERY INDUSTRY 2023-2028

Following the pest prioritisation and analysis of preparedness, an implementation plan that sets out shared biosecurity goals and objectives has been developed. This section contains a Biosecurity Implementation Plan, which was developed to act as a guide for biosecurity activities for GIA, governments, and other stakeholders for 2023-2028. It is intended that the plan is monitored and reviewed regularly by the Biosecurity Reference Panel (BRP).

Biosecurity Implementation Plan

The Biosecurity Implementation Plan documents the industry's priorities with regards to biosecurity. The Implementation Plan outlines the strategies and activities that may be implemented over the life of the plan through the efforts of the industry, GIA, Hort Innovation, PHA, government and other stakeholders.

The five key priority areas of the Biosecurity Implementation Plan align with the five key priority areas of the National Biosecurity Strategy 2022-2032.[133] The Implementation Plan highlights both activities that are currently underway and those activities that may be addressed in the future, in accordance with industry priorities and resource availability. A number of these priorities are currently being addressed by the industry.

This Plan has been developed in recognition that biosecurity is a shared responsibility between industry, government, and other stakeholders. For this reason, the Biosecurity Implementation Plan has been produced to help coordinate actions and resources in the biosecurity system, with the intention of creating an effective and productive biosecurity partnership.

Implementing the specific actions listed in the Biosecurity Implementation Plan will not only strengthen the production nursery industry's biosecurity system, but also the broader national plant biosecurity system. Future versions of this plan will contain information on the progress in implementing the plan.

[133] https://www.biosecurity.gov.au/sites/default/files/2022-08/National%20Biosecurity%20Strategy%28final%29.pdf

Table 3. Production nursery Biosecurity Implementation Plan.

Biosecurity plan strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Production nursery strategic investment plan	Priority rank[134]	Implementation[135]
1. Preparedness and Response	1.1 Develop/maintain Biosecurity Incident Standard Operating Procedures (BISOP) which is designed to guide industry and government in the event of an exotic pest/pathogen incursion.	Production nursery BISOP which identifies and document corporate knowledge, organisational procedures, and roles/responsibilities for responding to a biosecurity incident/incursion.	The BISOP will provide industry and govt with operational guidance when responding to a biosecurity incursion/response.	Greenlife Industry Australia (GIA), Plant Health Australia (PHA).	Production nursery BISOP has yet to be developed.	2024 - 2025	Outcome 2 Strategy 2	Medium	Short term
	1.2 Continue to encourage the certification and formal accreditation of production nurseries, greenlife markets and growing media manufacturers.	Adoption of BioSecure HACCP and other relevant certification.	Improved management of biosecurity and trade within the production nursery industry.	GIA, state, and territory governments.	GIA actively promotes BioSecure HACCP and other biosecurity related industry certification.	Ongoing	Outcome 2 Strategy 3	High	Long term
	1.3 Participate in future simulation exercises that test the preparedness and response of the biosecurity system to exotic pest and/or pathogen incursions.	Simulation exercises.	Participating industries and governments are better prepared to respond to a pest incursion.	GIA, state, and territory governments. Commonwealth, Hort Innovation, PHA.	GIA participated in Exercise Fastidious which focused on the pathogen *Xylella fastidiosa*.	2024 - 2028	Outcome 2 Strategy 2	Medium	Medium term
	1.4 Review the availability of crop protection products available to manage exotic pests and pathogens and identify gaps in control options.	A list of important pests and control options are available with gaps identified.	Industry will have a list of identified gaps in control options for important pests and pathogens.	GIA, Hort Innovation, Australian Pesticides and Veterinary Medicines Authority (APVMA, collaborating industries.	GIA manages the industry pesticide minor use permit program linking to the industry Strategic Agrichemical Review Process (SARP).	Ongoing	Outcome 2 Strategies 9,10,11	Low	Long term

[134] Low; Medium; High.
[135] Short term < 2 years; Medium term 2 – 5 years; Long term >5 years.

Biosecurity plan strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Production nursery strategic investment plan	Priority rank[134]	Implementation[135]
	1.5 Prioritise identified gaps in pest control options and develop options to address gaps.	A plan to address crop protection gaps.	A prioritised list of pests and control options with strategies developed to gain access.	GIA, Hort Innovation, APVMA, collaborating industries, crop protection companies.	GIA manages the industry pesticide minor use permit program linking to industry SARP.	Ongoing	Outcome 2 Strategies 9,10,11	Low	Long term
	1.6 Encourage the implementation of surveillance for pests and pathogens for both presence and absence of key pests.	Surveillance data.	Surveillance data to demonstrated pest freedom and assist with trade.	GIA, PHA, Commonwealth, state and territory governments.		Ongoing	Outcome 2 Strategy 2	Low	Medium
	1.7 Maintain Industry support for continued improvement of diagnostics for key pests.	New or improved diagnostic protocols and methods.	Increased accuracy and rapid diagnosis of pests/pathogens will provide greater opportunity for eradication and/or management.	GIA, Hort Innovation, collaborating industries, SPHD, state and territory governments.	Hort Innovation are funding a range of projects to maintain and build the industry's ability to manage pests and diseases, including specific projects on pests /pathogens and biosecurity pathways.	Ongoing	Outcome 2 Strategy 2	Medium	Long
	1.8 Maintain oversight of relevant biosecurity legislation and regulations in all states/territories.	Regular legislation and regulation update.	Any specific state/ territory or discordant requirements identified. Increase industry awareness of legislation and regulations impacting their businesses.		GIA manages the national market access program BioSecure HACCP under regulatory instruments. Growers are aware of legislative responsibilities and industry regulations.	Ongoing	Outcome 2 Strategy 3	Medium	Long
	1.9 Ensure the Owner Reimbursement Costs (ORC) Framework and cost calculations are current and appropriate for key production nursery categories.	Current ORC framework and cost structure.	ORC framework and costs structures remain relevant to key industry sectors.	GIA, PHA.	Framework currently in place.	Ongoing	Outcome 2 Strategy 2	Medium	Medium

Biosecurity plan strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Production nursery strategic investment plan	Priority rank[134]	Implementation[135]
2. Capacity & Capability	2.1 Ensure GIA Board Directors and staff receive appropriate biosecurity training (e.g., EPPRD, BOLT).	Training industry members and GIA staff.	Knowledge and understanding of biosecurity systems and processes will provide GIA with greater capacity to contribute to biosecurity for the benefit of their industry.	GIA, PHA, Plant Industries Biosecurity Committee (PIBC).	GIA directs key staff to undertake BOLT courses.	Ongoing	Outcome 3 Strategy 3	Medium	Long term
	2.2 Development and implement a biosecurity training framework for the production nursery industry.	Biosecurity training framework.	Production nursery framework with training modules will assist develop a skilled biosecurity focussed workforce.	GIA, Hort Innovation, PHA, state and territory governments.	GIA provides a range of eLearning courses, workshops, and mini technical skills courses for industry.	Ongoing	Outcome 3 Strategy 3	Medium	Long term
3. Communication and Engagement	3.1 GIA maintains an industry database which holds current contact information for production nursery managers and key industry stakeholders.	Current and maintained database.	Critical information on biosecurity can be delivered rapidly to the industry.	GIA.	GIA maintains a member database.	Ongoing	Outcome 3 Strategy 1	High	Long term
	3.2 GIA delivers an effective industry communications program with multiple delivery methods which has the capacity to deliver biosecurity relevant information.	Communications program.	The production nursery industry is well informed on the range of issues impacting on industry and business.	GIA, Hort Innovation.	GIA delivers communication across e-platforms, hard copy, training and via an extension network.	Ongoing	Outcome 3 Strategy 1	High	Long term
	3.3 Promote, disseminate, and demonstrate benefits of biosecurity to industry.	Biosecurity Training Package, BOLT courses, Biosecure HACCP.	Increased preparedness and response capacity and capability.	GIA, Hort Innovation, PHA, state and territory governments.		Ongoing	Outcome 3 Strategy 3	Medium	Long term
	3.4 Prepare articles on biosecurity and key pests (exotic and established) for publication in industry journals and website.	Biosecurity and pest related articles.	Industry stakeholders are informed on pests, current management practices and research activities.	GIA, state, and territory governments, PHA.	GIA currently undertakes the national communication across biosecurity risks, etc.	Ongoing	Outcome 3 Strategy 1	High	Long term

Biosecurity plan strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Production nursery strategic investment plan	Priority rank[134]	Implementation[135]
	3.5 Maintain an understanding of relevant legislation/regulations in all states/territories with regards to biosecurity relevant to the production nursery industry and ensure industry awareness.	Report on legislative and regulatory issues which may potentially impact on the industry.	Industry awareness of legislation and regulations which may impact on industry members.	GIA, Commonwealth, state, and territory governments, PHA.	GIA manages the national market access program BioSecure HACCP under regulatory instruments. GIA through project officers provide input into all facets of the Australian plant biosecurity system.	Ongoing	Outcome 2 Strategy 2	Medium	Long term
	3.6 Ensure industry (in particular new entrants) are aware of the Emergency Plant Pest Response Deed (EPPRD), the ORC Framework and the implications for the industry and business.	Biosecurity EPPRD and ORC awareness program.	Industry retains and builds knowledge of the response and management of exotic pests and pathogens.	GIA, PHA.	GIA manages the national biosecurity and sustainable plant production program including on-site extension and communication.	Ongoing	Outcome 3 Strategy 2	High	Medium term
	3.7 Develop a biosecurity information kit for new industry participants which includes information on the EPPRD and ORC Framework.	Biosecurity information kit.	New industry participants gain and awareness of biosecurity and documents that support the deed.	GIA, PHA.	Biosecurity information is available to all industry participants.	2024-2025	Outcome 3 Strategy 2	Medium	Medium term
	3.8 Develop and implement training of people and encourage uptake of production and pest/pathogen knowledge.	Biosecurity training program.	Skilled people who can contribute to the growth of the Australian industry.	GIA Commonwealth, state, and territory governments, PHA.	GIA provides a range of eLearning courses, workshops, and mini technical skills courses for industry.	2024 - 2028	Outcome 3 Strategy 3	High	Long term
4. Innovation, Research, Development and Extension	4.1 Review and prioritise production nursery plant protection, biosecurity RD&E annually and identify opportunities for collaboration and cross-sectoral investment.	Plant protection and biosecurity program.	A production nursery Innovation and RD&E program that addresses key issues challenging the industry.	GIA, Hort Innovation.	GIA, through the National Biosecurity and Sustainable Plant Production Program and the National Governance Committee provide relevant RD&E advice to partners.	Ongoing	Outcome 2 Strategy 2	High	Long term
5. Collaboration and partnerships	5.1 Build strong networks among both researchers and	Strong connected research and	Greater input into future decisions making that may	GIA, state, and territory	GIA has well established links across state and	Ongoing	Outcome 2 Strategy 4	High	Long term

Biosecurity plan strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Production nursery strategic investment plan	Priority rank[134]	Implementation[135]
	regulators in Commonwealth and state and territory governments.	biosecurity network.	impact on the industry.	governments, PHA, Hort Innovation, PBRI.	commonwealth agencies, Hort Innovation, industries, and research institutions.				
	5.2 Maintain collaborative arrangements with universities and other research and education providers so opportunities for production nursery research and development activities can be addressed.	New products, technologies, and methods.	The production nursery industry maintains access to innovative solutions and products.	GIA.	GIA maintains collaborative arrangements with RD&E providers across states and territories.	Ongoing	Outcome 2 Strategy 5	High	Long term
	5.3 Support addressing gaps in biosecurity preparedness by collaborating with other industries, governments, and other stakeholders.	Collaborative and shared biosecurity.	Improved biosecurity preparedness by industry and government.	GIA, other industries, state, and territory governments.	GIA engages in a range of activities and partnerships (stakeholders) to identify and communicate gaps in biosecurity preparedness.	Ongoing	Outcome 2 Strategy 2	Medium	Long term
	5.4 Continue to support the activities of the Primary Industries Biosecurity Committee (PIBC).	Improved management of biosecurity.	Improved industry input into the government and industry approach to managing biosecurity.	GIA, PIBC, PHA, industries, state, and territory govts.	GIA supports the PIBC.	Ongoing	Outcome 2 Strategy 2	High	Long term

Production nursery industry - biosecurity preparedness

The following table has been populated with the High Priority Pests (HPPs) of the production nursery industry. The aim of this table is to document the current preparedness documents and activities which are available and are currently being undertaken. This will allow industry, governments, and RD&E agencies to better prepare for these HPP and align future activities as listed in the Biosecurity Implementation Plan.

Table 4. Documents and activities currently available for High Priority Pests of the production nursery industry.[136]

Scientific name	Common name	National Diagnostic Protocol[137]	Surveillance programs	Factsheets[137]	Contingency plan	EPPRD category	National Priority Plant Pest[138]	Potential collaborators[139]
Invertebrates								
Acari (mites)								
Oligonychus spp. (exotic[140])	Spider mites	Not developed	Not covered by a pest specific surveillance program.	Hort Innovation/GIA/DAF Qld[141]	GIA/DAF Qld (2019)[142]	Not categorised	No	Strawberries
Diptera (flies)								
Liriomyza bryoniae	Tomato leaf miner	Draft NDP[143] - Protocol as Lucid key	Qld/Tas (multi pest surveillance – visual inspection).	PHA[144]	Hort Innovation/AusVeg/ DAF Qld (2009)[145]	Not categorised	NPPP 20	Melons; Vegetables; Processing tomatoes
Liriomyza sativae	Vegetable leaf miner	Draft NDP[146] - Protocol as Lucid	Qld/Tas (multi pest surveillance – visual inspection) NT (NAQS target list), multi pest	PHA[147], Hort	Hort Innovation /AusVeg/PHA/DAFF	Category 3	NPPP 20	Grains; Vegetables; Onions; Potato; Processing tomatoes

[136] Information presented has been taken from the National Plant Biosecurity Status Report 2020, National Plant Health Surveillance Program and the Northern Australian Quarantine Strategy and confirmed through the Plant Health Committee.
[137] Copies of these documents are available from planthealthaustralia.com.au/pidd
[138] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/national-priority-plant-pests-2019
[139] Industries listed in this column identify these pests within their biosecurity plans as a High Priority Pest.
[140] Including *O. ilicis, O. peruvianus, O. pratensis, O. thelytokus, O. yothersi*
[141] https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/ny15002-southern-red-mite-factsheet.pdf
[142] https://www.planthealthaustralia.com.au/wp-content/uploads/2019/12/Southern-red-mite-CP.pdf
[143] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/American-serpentine-leafminer-DP-2005-draft.pdf
[144] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Exotic-leaf-miners-FS-Vegetable.pdf
[145] https://ausveg.com.au/app/data/technical-insights/docs/VG06113.pdf#:~:text=The%20purpose%20of%20this%20pest-generic%20incursion%20management%20plan,for%20an%20incursion%20of%20these%20leafminers%20into%20Australia
[146] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/American-serpentine-leafminer-DP-2005-draft.pdf
[147] https://www.planthealthaustralia.com.au/wp-content/uploads/2015/12/Vegetable-leaf-miner-FS-Tomatoes.pdf

Scientific name	Common name	National Diagnostic Protocol[137]	Surveillance programs	Factsheets[137]	Contingency plan	EPPRD category	National Priority Plant Pest[138]	Potential collaborators[139]
		key	surveillance – visual inspection).	Innovation[148]	/UniMelb/Cesar (2020)[149]			
Gastropoda (slugs and snails)								
Arion vulgaris	Spanish slug	Not developed	Not covered by a pest specific surveillance program.	No	No	Not categorised	No	-
Lissachatina fulica	Giant African snail	Not developed	NT (NAQS target list, National Plant Health Surveillance Program (NPHSP), multi pest surveillance – visual inspection).	DAF Qld[150], PIRSA[151], NSW DPI[152]	GIA/DAF Qld (2015)[153]	Not categorised	NPPP 12	Banana; Tomato; Vegetable; Sweetpotato
Veronicella cubensis	Cuban slug	Not developed	Not covered by a pest specific surveillance program.	No	No	Not categorised	No	Sweetpotato
Xerolenta obvia	Heath snail	Not developed	Not covered by a pest specific surveillance program.	PIRSA[154]	No	Not categorised	No	-
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)								
Aphis fabae	Black bean aphid	Not developed	Not covered by a pest specific surveillance program.	PHA[155]	GIA/DAF Qld (2019)[156], PHA/ GRDC/PBCRC (2015)[157]	Not categorised	No	Potatoes; Vegetables
Aphis gossypii (exotic strains)	Cotton aphid	Not developed	Not covered by a pest specific surveillance program.	PHA[158], Cesar[159], Bayer[160]	No	Not categorised	No	Cotton; Potatoes

[148] https://ausveg.com.au/app/uploads/2020/07/1303CR2_Preparedness-guide_FINAL_150620.pdf
[149] https://www.planthealthaustralia.com.au/wp-content/uploads/2021/08/Liriomyza-sativae-CP-2020-v1.02.pdf
[150] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/giant-african-snail
[151] https://pir.sa.gov.au/__data/assets/pdf_file/0007/369790/Factsheet-Giant-African-Snail-August-2020.pdf
[152] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/giant-african-snail
[153] https://nurseryproductionfms.com.au/download/pest-contingency-plan-giant-african-snail/
[154] https://pir.sa.gov.au/__data/assets/pdf_file/0010/369793/Factsheet-Heath-Snail-August-2020.pdf
[155] https://www.planthealthaustralia.com.au/wp-content/uploads/2018/07/Black-bean-aphid-FS.pdf
[156] https://www.planthealthaustralia.com.au/wp-content/uploads/2019/12/Black-bean-aphid-CP.pdf
[157] https://www.planthealthaustralia.com.au/wp-content/uploads/2016/03/Sap-sucking-insect-pests-of-grain-CP.pdf
[158] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Cotton-aphid-FS.pdf
[159] https://www.plantbiosecuritydiagnostics.net.au/app/uploads/2022/07/Cottonaphid_FactSheet.pdf
[160] https://www.crop.bayer.com.au/pests/pests/cotton-aphid

Scientific name	Common name	National Diagnostic Protocol[137]	Surveillance programs	Factsheets[137]	Contingency plan	EPPRD category	National Priority Plant Pest[138]	Potential collaborators[139]
Bemisia tabaci (exotic biotypes and strains)	Silverleaf whitefly	Not developed - Protocol as Lucid key	Qld (Silverleaf whitefly resistance monitoring), Tas (Silverleaf whitefly surveillance).	NSW DPI[161][162], DAF Qld[163], Cotton Info[164]	PHA/GIA (2010)[165]	Not categorised	No	Cotton; Melons; Vegetables; Tomato
Diaphorina citri	Asian citrus psyllid	Draft NDP	NSW/NT/Qld/SA/Vic/WA (multi pest surveillance – visual inspection), Vic/WA (NPHSP), Vic (Urban Plant Health Network), WA (Carnarvon Area Wide Freedom surveillance program), NT (NAQS target list).	PHA[166], PIRSA[167], DAF Qld[168], NSW DPI[169]	GIA/DAF Qld (2013)[170]	Category 3	NPPP 6	Citrus
Dysmicoccus neobrevipes	Grey pineapple mealybug	Not developed	Not covered by a pest specific surveillance program.	PHA[171], ACIAR[172]	No	Not categorised	No	Banana; Pineapple
Halyomorpha halys	Brown marmorated stink bug (BMSB)	Not developed	NSW/Vic (multi pest surveillance – visual inspection/trapping), Tas/Vic/WA/NSW/SA (NPHSP), Vic (Urban Plant Health Network), WA (Brown marmorated stink bug, Carnarvon Area Wide Freedom surveillance program).	PHA[173], PIRSA[174], DPIRD[175], DAF Qld[176], DAFF[177], DEECA[178], NSW DPI[179]	GIA/DAF Qld (2016)[180], PHA (2017)[181]	Category 2	NPPP 9	Apples and pear; Berries; Cherries; Cotton; Dried Grapes; Hazelnuts; Pears; Strawberries; Summerfruit; Table Grapes; Truffles; Walnuts; Vegetables

[161] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0019/312805/Silverleaf-whitefly-in-vegetables.pdf
[162] https://www.melonsaustralia.org.au/wp-content/uploads/2019/12/Silverleaf-whitefly.pdf
[163] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/insects/field-crop/silverleaf-whitefly
[164] https://cottoninfo.com.au/sites/default/files/documents/SLW%20Booklet%20-%20Dec%202020.pdf
[165] https://nurseryproductionfms.com.au/download/pest-contingency-plan-white-fly-transmitted-viruses/
[166] https://www.planthealthaustralia.com.au/wp-content/uploads/2020/01/Citrus-psyllids-FS.pdf
[167] https://www.pir.sa.gov.au/__data/assets/pdf_file/0011/296174/Fact_Sheet_-_Asian_and_African_Citrus_Psyllids_-_July_2019.pdf
[168] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/asian-citrus-psyllid
[169] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/asian-citrus-psyllid
[170] https://nurseryproductionfms.com.au/download/pest-contingency-plan-hlb/
[171] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Grey-pineapple-mealy-bug-FS.pdf
[172] https://apps.lucidcentral.org/ppp/pdf/full/pineapple_mealybug_282.pdf
[173] https://www.planthealthaustralia.com.au/wp-content/uploads/2020/02/Brown-marmorated-stink-bug-FS-2.pdf
[174] https://pir.sa.gov.au/__data/assets/pdf_file/0003/296175/Brown_Marmorated_Stink_Bug_Fact_Sheet_-_June_2019.pdf
[175] https://www.agric.wa.gov.au/sites/gateway/files/Brown%20marmorated%20stink%20bug%20factsheet_0.pdf
[176] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/brown-marmorated-stink-bug
[177] https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/biosecurity/import/cargo/pests/brown-marmorated-factsheet.pdf
[178] https://agriculture.vic.gov.au/biosecurity/pest-insects-and-mites/priority-pest-insects-and-mites/brown-marmorated-stink-bug
[179] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/brown-marmorated
[180] https://nurseryproductionfms.com.au/download/pest-contingency-plan-brown-marmorated-stink-bug/
[181] https://www.planthealthaustralia.com.au/wp-content/uploads/2018/09/Brown-marmorated-stink-bug-CP.pdf

Scientific name	Common name	National Diagnostic Protocol[137]	Surveillance programs	Factsheets[137]	Contingency plan	EPPRD category	National Priority Plant Pest[138]	Potential collaborators[139]
Homalodisca vitripennis (with *Xylella fastidiosa)*	Glassy winged sharpshooter	NDP 23[182]	NSW/SA/Tas/WA/NT/Qld (NPHSP), Vic (Urban Plant Health Network), NSW/Qld/NT/WA/SA/Tas/Vic (Xylella Survey – Visual inspection/trapping).	PHA[183], PIRSA[184], ACIAR[185], DPIRD[186], DAF Qld[187], NSW DPI[188]	GIA/DAF Qld (2017)[189]	Not categorised	NPPP 1	Berries; Blueberries; Cherries; Citrus; Summerfruit; Table Grapes
Lepidoptera (butterflies and moths)								
Lymantria dispar (All subspecies or strains)	Spongy moth[190]	NDP 42[191]	ACT/NSW/Qld/SA/Tas/Vic/WA (spongy moth survey - trapping), Vic (NPHSP), WA/SA (Port of Entry – Asian spongy moth trapping).	PHA[192], DPIRD[193], PIRSA[194], DAF Qld[195], DAFF[196], NSW DPI[197]	GIA/PHA (2009)[198]	Not categorised	NPPP 8	Apples and Pear; Berries; Plantation Forest; Chestnuts; Hazelnuts; Pecans; Pistachios; Summerfruit; Walnuts
Pathogens								
Bacteria								
Candidatus Liberibacter asiaticus	Huanglongbing	NDP 25[199]	NSW/NT/Qld/SA (Multi pest surveillance – Visual inspection/sampling), NSW/NT/SA/Tas	PHA[200], PIRSA[201], DAF Qld[202], DAFF[203],	GIA/DAF Qld (2013)[205]	Category 2	NPPP 6	Citrus

[182] https://www.plantbiosecuritydiagnostics.net.au/app/uploads/2018/11/NDP-23-Glassy-winged-sharpshooter-Homalodisca-vitripennis-V1.2.pdf
[183] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Glassy-winged-sharpshooter-FS-Nursery-and-Garden.pdf
[184] https://www.pir.sa.gov.au/__data/assets/pdf_file/0007/296179/Fact_Sheet_-_Glassy_Winged_Sharpshooter_-_December_2019.pdf
[185] https://apps.lucidcentral.org/ppp_v9/pdf/web_full/citrus_glassywinged_sharpshooter_269.pdf
[186] https://www.agric.wa.gov.au/sites/gateway/files/Glassy-winged%20sharpshooter%20factsheet.pdf
[187] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/glassy-winged-sharpshooter
[188] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/glassywing-sharpshooter
[189] https://www.planthealthaustralia.com.au/wp-content/uploads/2017/11/Glassy-winged-sharp-shooter-CP-NG-2017.pdf
[190] (Previously known as Asian gypsy moth).
[191] https://www.plantbiosecuritydiagnostics.net.au/app/uploads/2020/10/NDP-42-Gypsy-moths-Lymantria-dispar-V1.pdf
[192] https://www.planthealthaustralia.com.au/wp-content/uploads/2022/06/Asian-spongy-moth-FS-Apple-and-Pear.pdf
[193] https://www.agric.wa.gov.au/sites/gateway/files/Spongy%20moth%20factsheet.pdf
[194] https://www.pir.sa.gov.au/__data/assets/pdf_file/0006/296178/Gypsy_Moths_Fact_Sheet_-_July_2019.pdf
[195] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/exotic-spongy-moth
[196] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/spongy-moths
[197] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/asian-gypsy-moth
[198] https://www.planthealthaustralia.com.au/wp-content/uploads/2013/03/Gypsy-moth-CP-2009.pdf
[199] https://www.plantbiosecuritydiagnostics.net.au/app/uploads/2018/11/NDP-25-Huanglongbing-Candidatus-Liberibacter-asiaticus-V1.1.pdf
[200] https://www.planthealthaustralia.com.au/wp-content/uploads/2015/01/Huanglongbing-FS.pdf
[201] https://www.pir.sa.gov.au/__data/assets/pdf_file/0008/296180/Fact_Sheet_-_Huanglongbing_HLB_-_November_2019.pdf
[202] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/huanglongbing
[203] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/huanglongbing
[205] https://nurseryproductionfms.com.au/download/pest-contingency-plan-hlb/

Scientific name	Common name	National Diagnostic Protocol[137]	Surveillance programs	Factsheets[137]	Contingency plan	EPPRD category	National Priority Plant Pest[138]	Potential collaborators[139]
			(NPHSP), NT (NAQS target list).	NSW DPI[204]				
Erwinia amylovora	Fire blight	Draft NDP	NSW/Tas/WA (multi pest surveillance – Visual inspection), NSW/Tas/WA (NPHSP).	PHA[206], Hort Innovation[207], PIRSA[208], DPIRD[209], DAFF[210], DEECA[211], NSW DPI[212]	GIA/DAF Qld (2014)[213]	Category 2	NPPP 18	Apple and Pears
Pseudomonas syringae pv. *syringae* (exotic races)	Bacterial canker	Not developed	Vic (Area freedom surveillance for market access).	NSW DPI[214], DAF Qld[215]	No	Not categorised	No	Avocados
Xylella fastidiosa	Pierce's disease	NDP 6[216]	NSW/NT/Qld (Xylella Survey – Visual inspection/sampling), NSW/NT/Qld/SA/Tas/Vic (NPHSP).	PHA[217], DAFF[218], NSW DPI[219], PIRSA[220]	GIA/DAF Qld (2016)[221]	Category 2	NPPP 1	Almond; Blueberry; Cherry; Citrus; Coffee; Macadamia; Olive; Pecan; Summerfruit (& canned fruit); Viticulture
Fungi								
Austropuccinia psidii sensu lato (syn. *Puccinia*	Myrtle rust; Guava rust;	Draft NDP	NT (multi pest surveillance – Visual	PHA[222], DPIRD[223], NRE Tas[224], DAF	GIA/PHA (2009)[226]	Category 1	NPPP 11	Cut Flower; Plantation Forest;

[204] https://www.dpi.nsw.gov.au/agriculture/horticulture/citrus/content/insects-diseases-disorders-and-biosecurity/disease-overseas-factsheets/Huanglongbing
[206] https://www.planthealthaustralia.com.au/wp-content/uploads/2020/01/Fire-blight-FS.pdf
[207] https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/ny11001-fire-blight-biosecurity-threat.pdf
[208] https://www.pir.sa.gov.au/__data/assets/pdf_file/0007/299464/Fact_Sheet_-_Fire_blight_-_July_2019.pdf
[209] https://www.agric.wa.gov.au/sites/gateway/files/Fire%20blight.pdf
[210] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/fire-blight#daff-page-main
[211] https://agriculture.vic.gov.au/biosecurity/plant-diseases/fruit-and-nut-diseases/pome-fruits/fire-blight
[212] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/fire-blight
[213] https://www.planthealthaustralia.com.au/wp-content/uploads/2014/11/Fire-blight-CP-2014.pdf
[214] https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0015/41514/Bacterial_canker_of_stone_fruit_-_Primefact_77.pdf
[215] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/diseases/horticultural/bacterial-blight
[216] https://www.plantbiosecuritydiagnostics.net.au/app/uploads/2018/11/NDP-6-Pierces-disease-Xylella-fastidiosa-V1.2.pdf
[217] https://www.planthealthaustralia.com.au/wp-content/uploads/2019/05/Pierces-disease-FS-cherries.pdf
[218] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/xylella
[219] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/pierces-disease
[220] https://www.pir.sa.gov.au/__data/assets/pdf_file/0011/296183/Fact_Sheet_-_Xylella_fastidiosa_-_June_2020.pdf
[221] https://www.planthealthaustralia.com.au/wp-content/uploads/2017/11/Xylella-fastidiosa-CP-NG-2017.pdf
[222] https://www.planthealthaustralia.com.au/wp-content/uploads/2022/10/22-031-Sudden-Oak-Death-FS_Final.pdf
[223] https://www.agric.wa.gov.au/sites/gateway/files/DPIRD%20Myrtle%20Rust%20Fact%20Sheet.pdf
[224] https://nre.tas.gov.au/Documents/myrtle.pdf
[226] https://nurseryproductionfms.com.au/download/pest-contingency-plan-guava-rust/

Scientific name	Common name	National Diagnostic Protocol[137]	Surveillance programs	Factsheets[137]	Contingency plan	EPPRD category	National Priority Plant Pest[138]	Potential collaborators[139]
psidii) (exotic variants)	Eucalyptus rust		inspection/sampling).	Qld[225]				Tea Tree
Phytophthora kernoviae	Phytophthora blight	Not developed	Qld (Grow Help Australia diagnostic service project (*Phytophthora* spp.)).	No	No	Not categorised	NPPP 14	
Phytophthora ramorum	Sudden oak death	NDP 5[227]	Qld (Grow Help Australia diagnostic service project (*Phytophthora* spp.)).	NSW DPI[228], DAFF[229]	GIA/PHA (2019)[230]	Category 1	NPPP 14	Avocados; Blueberries; Plantation Forestry; Chestnuts; Hazelnuts; Macadamia; Tea Tree; Truffles
Viruses and viroids[231]								
Potyviridae								
Aphid transmitted viruses. e.g. Tobacco etch virus (*Potyvirus*), Plum pox virus (*Potyvirus*)	Tobacco etch virus (TEV), Plum pox virus (PPV)	Not developed	Qld, SA, WA (Generic and specific surveillance in grains).	In draft format	GIA, PHA	Category 2 (PPV)	No	
Closteroviridae								
Whitefly transmitted viruses. e.g. Lettuce infectious yellows virus (*Crinivirus)*	Lettuce infectious yellows virus (LIYV)	Not developed	Tas (Silverleaf whitefly surveillance – Nursery stock).	In draft format	GIA, PHA	Not categorised	No	-

[225] https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/plants/priority-pest-disease/myrtle-rust
[227] https://www.plantbiosecuritydiagnostics.net.au/app/uploads/2018/11/NDP-5-Sudden-Oak-Death-Phytophthora-ramorum-V2.pdf
[228] https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/sudden-oak-death
[229] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/plant/sudden-oak-death
[230] https://www.planthealthaustralia.com.au/wp-content/uploads/2019/09/Sudden-oak-death-and-other-diseases-caused-by-Phytophthora-ramorum-CP.pdf
[231] (ICTV, 2023).

Biosecurity Plan development and review

With the assistance of Greenlife Industry Australia (GIA), a Technical Expert Group (TEG) and a Biosecurity Implementation Group (BIG) were formed to work on the review of the *Biosecurity Plan for the Australian Production Nursery Industry*. These groups were coordinated by Plant Health Australia (PHA) and included representatives from GIA, relevant state, and territory agriculture agencies and PHA.

Key roles of the Technical Expert Group for biosecurity plan review included:

- Identifying and documenting key threats to the Australian production nursery industry,
- confirming an agreed High Priority Pest (HPP) list.

Key roles of the Biosecurity Implementation Group for the biosecurity plan included:

- Documenting pest-specific fact sheets, contingency plans, diagnostic protocols, and surveillance programs for HPPs,
- documenting the roles and responsibilities of stakeholder groups,
- developing a biosecurity implementation table for future biosecurity related work to be conducted over the life of this biosecurity plan.

Table 5. Members of the Technical Expert Group (TEG) and/or the Biosecurity Implementation Group (BIG)

Name	Organisation	Area of expertise	Member of TEG	Member of BIG
John McDonald	GIA	Production, Biosecurity	Yes	Yes
Andrew Manners	DAF Qld	Entomology	Yes	Yes
Christine Horlock	DAF Qld	Biosecurity, Pathology	No	Yes
Greg Chandler	Hort Innovation	RD&E	No	Yes
Shannon Mulholland	NSW DPI	Pathology	Yes	Yes
Leonie Martin	NSW DPI	Biosecurity	No	Yes
Fiona Constable	AgVic/DEECA	Pathology	Yes	No
David Lovelock	AgVic/DEECA	Pathology	No	Yes
Marc Poole	DPIRD	Entomology	Yes	Yes
Kylie Ireland	DPIRD	Pathology	No	Yes
Vincent Lanoiselet	DPIRD	Pathology	Yes	No
Mary Finlay-Doney	DITT NT	Entomology	Yes	No
Brian Thistleton	DITT NT	Entomology	No	Yes
Andrew Vossen	PHA	Biosecurity	Yes	Yes
Victoria Ludowici	PHA	Biosecurity	Yes	No
Rebecca Powderly	PHA	Biosecurity	No	Yes
Trevor Dunmall	PHA	Biosecurity	No	Yes

Review processes

With the support of the relevant industry bodies and PHA, this plan should be reviewed on a 5-yearly basis. The review process will ensure:

- Threat Summary Tables are updated to reflect current knowledge,
- pest risk assessments are current,
- changes to biosecurity processes and legislation are documented,
- contact details and references to available resources are accurate.

In addition to the formal review process above, the document should be reviewed/revisited annually by the production nursery BRP comprised of industry, government and PHA representatives and scientific experts to ensure currency and relevance; and to monitor progress with implementation. As an example, the industry biosecurity priorities identified within the plan could feed directly into industry RD&E priority setting activities on an annual basis.

Opportunities to make out-of-session changes to the biosecurity plan, including the addition/subtraction of high priority pests or changes to legislation are currently being investigated. Such changes would need to include consultation and agreement of all stakeholders. This flexibility will increase the plan's currency and relevance.

THREAT IDENTIFICATION AND PEST RISK ASSESSMENTS

Introduction

This section identifies high risk exotic pest threats to the Australian production nursery industry, and presents a framework for assessing the potential economic, social, and environmental impacts associated with each threat. This part of the biosecurity plan uses a nationally consistent and coordinated approach to threat identification and risk assessment to provide a strong base for future risk management in the Australian production nursery industry.

By identifying key threats, a pre-emptive approach may be taken to risk management. Under this approach, mechanisms can be put into place to increase our response effectiveness if pest incursions occur. One such mechanism is the Emergency Plant Pest Response Deed (EPPRD) that has been negotiated between PHA's government and industry members. The EPPRD ensures reliable and agreed funding arrangements are in place in advance of Exotic Plant Pest (EPP) incursions, and assists in the response to EPP incursions, particularly those identified as key threats.

Identification of exotic High Priority Pests (HPPs) will also assist in the implementation of effective grower and community awareness campaigns, targeted biosecurity education and training programs for growers and diagnosticians, and development of pest-specific incursion response plans.

Established pests of biosecurity significance have also been considered in this plan. It is well understood that good biosecurity practice is beneficial for the ongoing management of established pests, as well as for surveillance and early detection of exotic pests. Established pests and weeds cause ongoing hardships for growers and have been listed with the support of industry and government in recognition that they need a strategic, consistent, scientific, and risk-based approach to better manage these pests for the industry.

Exotic pests of the Australian production nursery industry

Threat identification

Information on exotic pest threats to the Australian production nursery industry described in this document came from a combination of:

- Past records,
- existing industry protection plans,
- industry practice and experience,
- relevant published literature,
- local industry and overseas research,
- specialist and expert judgment.

At this time, only invertebrate pests (insects, mites and molluscs), nematodes and pathogens (disease causing organisms) have been identified for risk assessment, as these pests are covered under national agreed arrangements, under the EPPRD. If exotic weeds were to be included in the EPPRD then this would be revisited through future reviews of the plan.

Pest risk assessments

The assessment process used in this biosecurity plan was developed in accordance with the International Standards for Phytosanitary Measures (ISPM) No. 2[232] and 11 [Food and Agriculture Organization of the United Nations.[233] A summary of the pest risk analysis protocol followed in this biosecurity plan is shown in Table 6.

While there are similarities in the ranking system used in this document and the Biosecurity Import Risk Analysis (BIRA)[234] process followed by the Department of Agriculture, Fisheries and Forestry (DAFF), there are differences in the underlying methodology and scope of consideration that may result in different outcomes between the two assessment systems. This includes different guidance to assignment of qualitative probabilities.

Modifications of the DAWR[235] (Department of Agriculture and Water Resources, 2016) protocol have been made to suit the analysis required in the biosecurity plan development process, including, but not limited to:

- Entry potential: The determination of entry potential in this biosecurity plan takes into account multiple possible pathways for the legal importation of plant material as well as illegal pathways, contamination and the possibility of introduction through natural means such as wind. Therefore, the scope is wider than that used in the BIRA process, which only considers legal importation of plants or plant commodities.
- Potential economic impact of pest establishment in this document only takes into account the impacts on the Australian production nursery industry. The BIRA process has a wider scope, including the impacts on all of Australia's plant industries, trade, the environment, social amenity, and public health.
- Risk potential and impacts: The categories used in this biosecurity plan for describing the entry, establishment, spread, and potential economic impact (Table 7) differs in comparison to that used in the BIRA process.

Table 6. Summary of pest risk assessment process used in biosecurity plans.

Step 1	Clearly identify the pest	• Generally, pest defined to species level. • Alternatively, a group (e.g. family, genus level) can be used. • Sub-species level (e.g. race, pathovar, etc.) may be required.
Step 2	Assess entry establishment and spread likelihoods	• Assessment based on current system and factors. • Negligible, low, medium, high or unknown ratings.
Step 3	Assess the likely consequences	• Primarily based on likely economic impact to industry based on current factors. • Negligible, low, medium, high, extreme, or unknown ratings.
Step 4	Derive overall risks	• Entry, establishment and spread likelihoods are combined to generate an overall likelihood score. • Likelihood score combined with the likely economic impact to generate an overall risk score.
Step 5	Review the risks	• Risk ratings should be reviewed with the biosecurity plan.

The objective of risk assessment is to clearly identify and classify biosecurity risks and to provide data to assist in the evaluation and mitigation of these risks. Risk assessment involves consideration of the sources of risk, their consequences, and the likelihood that those consequences may occur. Factors that affect the

[232] (FAO, 2007).
[233] (FAO, 2004).
[234] https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/bira-guidelines-2016.pdf
[235] Now DAFF.

consequences and likelihood may be identified and addressed via risk mitigation strategies.

Risk assessment may be undertaken to various degrees of refinement, depending on the risk information and data available. Assessment may be qualitative, semi-quantitative, quantitative, or a combination of these. The complexity and cost of assessment increases with the production of more quantitative data. It is often more practical to first obtain a general indication of the level of risk through qualitative risk assessment, and if necessary, undertake more specific quantitative assessment later [Australian Standard/New Zealand Standard (AS/NZS) ISO 31000, 2018].

Ranking pest threats

Key questions required for ranking the importance of pests include the following:

- What are the probabilities of entry into Australia, establishment and spread, for each pest?
- What are the likely impacts of the pest on cost of production, overall productivity, and market access?
- How difficult is each pest to identify and control and/or eradicate?

The Threat Summary Tables (TST) (APPENDIX 1: THREAT SUMMARY TABLES) present a list of potential plant pest threats to the Australian production nursery industry and provide summarised information on entry, establishment and spread potential, the economic consequences of establishment and eradication potential (where available). The most serious threats from the TST were identified through a process of qualitative risk assessment and are detailed in the HPP list.

> This document considers all potential pathways by which a pest might enter Australia, including natural and assisted spread (including smuggling). This is a broader view of potential risk than the BIRA conducted by the Department of Agriculture, Fisheries and Forestry which focuses only on specific regulated import pathways.

When a pest that threatens multiple industries is assessed, the entry, establishment and spread potentials take into account all known factors across all host industries. This accurately reflects the ability of a pest to enter, establish and spread across Australia and ultimately results in different industries, and their biosecurity plans, sharing similar pest ratings. However, the economic impact of a pest is considered at an industry specific level (i.e. only for the Australian production nursery industry), and therefore this rating may differ between biosecurity plans.

Description of terms used in pest risk tables

The descriptions below relate to terms in Table 1 and elsewhere in the document.

Table 7. Description of terms used in pest risk tables.

Entry potential

Negligible	The probability of entry is extremely low given the combination of all known factors including the geographic distribution of the pest, quarantine practices applied, probability of pest survival in transit and pathways for pest entry and distribution to a suitable host.
Low	The probability of entry is low, but clearly possible given the expected combination of factors described above.
Medium	Pest entry is likely given the combination of factors described above.
High	Pest entry is very likely and potentially frequent given the combination of factors described above.
Unknown	The pest entry potential is unknown or very little of value is known.

Establishment potential

Negligible	The pest has limited potential to survive and become established within Australia given the combination of all known factors.
Low	The pest has the potential to survive and become established in approximately one-third or less of the range of hosts. The pest could have a low probability of contact with susceptible hosts.
Medium	The pest has the potential to survive and become established in between approximately one-third and two-thirds of the range of hosts.
High	The pest has potential to survive and become established throughout most or all of the range of hosts. Distribution is not limited by environmental conditions that prevail in Australia. Based upon its current world distribution, and known conditions of survival, it is likely to survive in Australia wherever major hosts are grown.
Unknown	The establishment potential of the pest is unknown or very little of value is known.

Spread potential

Negligible	The pest has very limited potential for spread in Australia given the combination of dispersal mechanisms, availability of hosts, vector presence, industry practices and geographic and climatic barriers.
Low	The pest has the potential for natural or assisted spread to susceptible hosts within Australia yet is hindered by a number of the above factors
Medium	The pest has an increased likelihood of spread due to the above factors
High	The natural spread of the pest to most production areas is largely unhindered and assisted spread within Australia is also difficult to manage
Unknown	The spread potential is unknown or very little of value is known.

Economic impact

Negligible	There are very minor, often undetectable, impacts on production with insignificant changes to host longevity, crop quality, production costs or storage ability. There are no restrictions to market access.
Very low	There are minor, yet measurable, impacts on production including either host longevity, crop quality, production costs or storage ability. There are no restrictions to market access.
Low	There are measurable impacts to production including either host mortality, reduction in yield, production costs, crop quality, storage losses, and/or minimal impacts on market access.
Medium	There are significant impacts on production with either host mortality, reduction in yield, production costs, crop quality, storage losses, and/or moderate impacts on market access.
High	There are severe impacts on production including host mortality and significant impacts on either crop quality or storage losses, and/or severe impacts on market access.
Extreme	There is extreme impact on standing crop at all stages of maturity, with high host mortality or unmanageable impacts to crop production and quality, and /or extreme, long term, impacts on market access.
Unknown	The economic potential of the pest is unknown or very little of value is known.

RISK MITIGATION AND PREPAREDNESS

Introduction

There are a number of strategies that can be adopted to help protect and minimise the risks of Emergency Plant Pests (EPPs) under International Plant Protection Convention (IPPC) standards[236] and Commonwealth and state/territory legislation.

Many pre-emptive practices can be adopted to reduce the risk of exotic pest movement for the industry. Such risk mitigation and preparedness practises are the responsibility of governments, industry, and the community.

A number of key risk mitigation areas are outlined in this guide, along with summaries of the roles and responsibilities of the Australian Government, state/territory governments, and industry members (Figure 4). This section is to be used as a guide outlining possible activities that may be adopted by industry and growers to mitigate the risk and prepare for an incursion response. Each grower will need to evaluate the efficacy of each activity for their situation.

Figure 4. Examples of biosecurity risk mitigation activities.

[236] https://www.ippc.int/en/core-activities/standards-setting/ispms/

Barrier quarantine

Barrier quarantine refers to the biosecurity measures implemented at all levels of the industry including national, state, regional and production nursery levels.

National level – importation restrictions

The Department of Agriculture, Fisheries and Forestry (DAFF) is the Australian Government department responsible for maintaining and improving international trade and market access opportunities for agriculture, fisheries, forestry, and food industries. DAFF achieves this through:

- Establishment of scientifically based quarantine policies,
- provision of effective technical advice and export certification services,
- negotiations with key trading partners,
- participation in multilateral forums and international sanitary and phytosanitary (SPS) standard-setting organisations,
- collaboration with portfolio industries and exporters.

DAFF is responsible for developing biosecurity (i.e. SPS) risk management policy and reviewing existing quarantine measures for the importation of live animals and plants, and animal and plant products. DAFF undertakes import risk analyses to determine which products may enter Australia, and under what quarantine conditions. DAFF also consults with industry and the community, conducting research and developing policy and procedures to protect Australia's animal and plant health status and natural environment. In addition, DAFF assists Australia's export market program by negotiating other countries' import requirements for Australian animals and plants. Further information can be found at agriculture.gov.au.

The administrative authority for national quarantine is vested in DAFF under the Australian Government *Biosecurity Act 2015*. Quarantine policies are developed through the Biosecurity Import Risk Analysis (BIRA) process. This process is outlined in the BIRA Guidelines 2016 (Department of Agriculture and Water Resources, 2016). DAFF maintains barrier quarantine services at all Australian international sea and airports, and in the Torres Strait region. The management of quarantine policy, as it relates to the introduction into Australia of fruit, seed, or other plant material, is the responsibility of DAFF.

The Australian Biosecurity Import Conditions Database (BICON) contains the current Australian import conditions for more than 20,000 foreign plants, animal, mineral, and human products and is the first point of access to information about Australian import requirements for a range of commodities. It can be used to determine if a commodity intended for import to Australia requires a quarantine import permit and/or treatment or if there are any other quarantine prerequisites. BICON can be accessed at agriculture.gov.au/import/bicon. For export conditions see the Manual of Importing Country Requirements (MICoR) database at https://micor.agriculture.gov.au/Pages/default.aspx.

The Australian Government is responsible for the inspection of machinery and equipment being imported into Australia. Any machinery or equipment being imported into Australia must meet quarantine requirements. If there is any uncertainty, contact DAFF on 1800 900 090, or visit the website at awe.gov.au/biosecurity-trade/import/online-services/bicon.

The World Trade Organization (WTO) SPS Agreement facilitates international trade while providing a framework to protect the human, animal, and plant health of WTO members. SPS measures put in place must minimise negative effects on trade while meeting an importing country's appropriate level of protection. For plant products, these measures are delivered through the IPPC standard setting organisations and collaboration with portfolio industries and exporters. For more information on the IPPC visit ippc.int.

SURVEILLANCE

Surveillance enhances prospects for early detection, minimising costs of eradication and are necessary to meet the treaty obligations of the WTO SPS Agreement[237] with respect to the area freedom status of Australia's states, territories, and regions.

The SPS Agreement gives WTO members the right to impose SPS measures to protect human, animal and plant health provided such measures do not serve as technical barriers to trade. In other words, for countries (such as Australia) that have signed the SPS Agreement, imports of food, including fresh fruit and production nursery, can only be restricted on proper, science-based quarantine grounds. Where quarantine conditions are imposed, these will be the least trade restrictive measures available that meet Australia's appropriate level of quarantine protection. The SPS Agreement also stipulates that claims of area freedom must be supported by appropriate information, including evidence from surveillance, and monitoring activities. This is termed "evidence of absence" data and is used to provide support that we have actively looked-for pests and not found them.

ISPM 6[238] provides international guidelines for structured pest surveys. Structured pest survey planning, and implementation depends on the risk involved, the resources available, and the requirements of trading partners (particularly when Australia wishes to access overseas markets). The intensity and timing of surveys also depend on the spread characteristics of the pest and the costs of eradication.

Early detection of an exotic pest incursion can significantly increase the likelihood of a successful eradication campaign and reduce the associated costs. Effective surveillance plays a critical role in working toward this goal. Surveillance can be either targeted toward specific pests, or general in nature. General non-targeted surveillance is based on recognising normal versus suspect plant material. Targeted surveillance is important for establishing whether particular pests are present in each state or region, and if so, where these occur.

Industry personnel can provide very effective early detection of new or unusual symptoms through their normal management practices (i.e. 'passive surveillance'), provided individuals are aware of what to look for and of reporting procedures. Consultants and crop scouts can provide valuable information as they are regularly in the field, and hence can observe any unusual pest activity or symptoms on plants.

National surveillance programs

The Department of Agriculture, Fisheries and Forestry (DAFF) maintains barrier quarantine services at all international ports and in the Torres Strait region. DAFF also surveys the northern coast of Australia, offshore islands and neighbouring countries for exotic pests that may have reached the country through other channels (e.g., illegal vessel landings in remote areas, bird migrations, wind currents) as part of the Northern Australia Quarantine Strategy (NAQS).[239] NAQS surveillance programs relevant to the production nursery industry are listed in Table 8.

State surveillance programs

State level surveillance depends on the participation of all stakeholder groups, particularly state/territory agriculture departments, industry representative groups, agri-business and growers.

The state/territory agriculture department can provide:

- Planning and auditing of surveillance systems,
- coordination of surveillance activities between industry and interstate groups,
- diagnostic services,
- field diagnosticians for special field surveillance,
- surveillance on non-commercial sites,
- liaison services with industry members,

[237] https://www.wto.org/english/tratop_e/sps_e/spsund_e.htm
[238] (FAO, 2018).
[239] https://www.agriculture.gov.au/biosecurity-trade/policy/australia/naqs

- communication, training, and extension strategies with industry,
- biosecurity training,
- reporting services to all interested parties (DAFF, national bodies, trading partners and industry).

Various pest surveillance programs are managed by the DAFF and the state/territory agriculture departments. Many state/territory agriculture departments run general surveillance programs whereby suspect samples can be forwarded and diagnosed for the presence of exotic pests free of charge. Official surveillance programs that target pests of the production nursery industry (exotic or those under official control in a region or state/territory) are shown in Table 8.

Table 8. Official surveillance programs that target pest of the production nursery industry (as of 2021).[240]

Surveillance program name	Target host(s)	Target pest(s)	Type of Surveillance
Australian Government			
External Territories Surveillance Program	Various environmental, production and ornamental plants.	High priority exotic pests.	General and specific
International Plant Health Surveillance Program	Tropical horticultural, environmental, and agricultural species.	High priority exotic pests.	General and specific
National Bee Pest Surveillance Program	Bee swarms at first points of entry.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Braula coeca,* acute bee paralysis virus, deformed wing virus, slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris* and new exotic swarms of *A. mellifera.*	General (noting other stakeholders conduct the targeted surveillance required under this program)
National Border Surveillance Program	Plant families of high economic importance and known or potential key hosts of specific exotic pests, focusing on regulatory import pathway risks.	Specific high priority exotic pests and any pest belonging to key taxonomic groups.	General and specific
National Plant Health Surveillance Program (delivered through states and territories)	Various, based on the species surveyed.	High priority exotic pests including exotic gypsy moth and fruit fly species.	General and specific
Northern Australia Quarantine Strategy – exotic fruit fly trapping	Various.	Exotic fruit flies including *Bactrocera dorsalis, B. latifrons, B. trivialis, B. umbrosa, Zeugodacus atrisetosa, Z. cucurbitae, Z. decipiens.*	Specific
Northern Australia Quarantine Strategy – pest and disease surveys	Tropical horticultural, environmental, and agricultural species.	123 high priority exotic pests, diseases, and weeds.	General and specific
Within New South Wales			
Area wide management – vegetable diseases	Multiple hosts including Cucurbitaceae and Brassicaceae.	Various endemic and exotic high priority pests including Cucumber green mottle mosaic virus.	Specific
Asian market access for citrus and cherries	Cherries and citrus.	Queensland fruit fly (*Bactrocera tryoni*), lesser Queensland fruit fly (*Bactrocera neohumeralis*), various cue lure attracted exotic fruit flies.	Specific
CGMMV Pest Free Place of Production	Cucurbits.	Cucumber green mottle mosaic virus.	Specific
Citrus budwood mother tree inspections	Multiple citrus hosts.	Various graft transmissible diseases and other high priority pests.	Specific
Exotic fruit flies – Riverina	Various horticultural	Mediterranean fruit fly (*Ceratitis capitata*), other tri lure responsive	Specific

[240] https://www.planthealthaustralia.com.au/wp-content/uploads/2021/08/2020-National-Plant-Biosecurity-Status-Report.pdf

Surveillance program name	Target host(s)	Target pest(s)	Type of Surveillance
	crops (citrus, stone fruit).	exotic fruit flies.	
Exotic longhorn beetle trapping	Various hosts around ports.	Asian longhorn beetle (*Anoplophora glabripennis*), Japanese pine sawyer beetle (*Monochamus alternatus*), brown mulberry longhorn beetle (*Apriona germari*).	Specific
Forestry Corporation of NSW Forest Health Surveillance	General forests.	Various exotic and endemic high priority pests.	Specific
Forest High-Risk Surveillance Program	Multiple.	Various exotic and endemic high priority pests of *Pinus* spp.	Specific
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Braula coeca,* acute bee paralysis virus, deformed wing virus, slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris* and new exotic swarms of *A. mellifera.*	Specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Multiple including *Bactrocera albistrigata, B. carambolae, B. caryae, B. correcta, B. curvipennis, B. dorsalis, B. facialis, B. kandiensis, B. kirki, B. melanotus, B. occipitalis, B. passiflorae, B. psidii, B. trilineola, B. trivialis, B. umbrosa, B. xanthodes, B. zonata, Ceratitis capitata, Zeugodacus cucurbitae, Z. tau,* spongy moth (*Lymantria* spp.), glassy winged sharpshooter *(Homalodisca vitripennis), Xylella fastidiosa,* fire blight *(Erwinia amylovora),* brown marmorated stink bug *(Halyomorpha halys),* exotic mites *(including Brevipalpus* spp., *Aceria granati*), Asian citrus psyllid *(Diaphorina citri)*, African citrus psyllid *(Trioza erytreae)*, huanglongbing (*Candidatus* Liberibacter asiaticus), citrus canker *(Xanthomonas axonopodis* subsp. *citri)*, and invasive ants *(Solenopsis* spp., *Wasmannia auropunctata*, *Anoplolepis gracilipes*).	Specific
National tomato potato psyllid and zebra chip surveillance	Solanaceous hosts.	Tomato potato psyllid (*Bactericera cockerelli*).	Specific
Onion diseases – Riverina	Onions, garlic.	White rot (*Sclerotium cepivorum*), onion smut (*Urocystis cepulae*), onion rust (*Puccinia allii*).	Specific
Serpentine leafminer	Multiple horticultural and ornamental hosts.	Serpentine leafminer (*Liriomyza huidobrensis*).	Specific
Within the Northern Territory			
Area Freedom Surveillance Program	Horticultural crops.	Queensland fruit fly (*Bactrocera tryoni*).	Specific
Major Industry Monitoring and Surveillance	Mango.	Mango malformation (*Fusarium mangiferae*), mango pulp weevil (*Sternochetus frigidus*), mango seed weevil (*Sternochetus mangiferae*), mango gall midges (*Procontarinia* spp.) and red banded mango caterpillar (*Deanolis sublimbalis*).	General and targeted
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Braula coeca, Aethina tumida,* acute bee paralysis virus, deformed wing virus and slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris,* and new exotic swarms of *A. mellifera.*	Specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Multiple including citrus canker (*Xanthomonas axonopodis* pv. *citri*), huanglongbing (*Candidatus* Liberibacter spp.), Asiatic citrus psyllid (*Diaphorina citri*), giant African snail (*Lissachatina fulica*), glassy winged sharpshooter (*Homalodisca vitripennis*), Pierce's disease (*Xylella fastidiosa*), banana black sigatoka (*Mycosphaerella fijiensis*), red imported fire ant (*Solenopsis invicta*), electric ant (*Wasmannia auropunctata*), yellow crazy ant (*Anoplolepis gracilipes*), *Bactericera cockerelli, Candidatus* Liberibacter solanacearum, potato leafminer, pea leafminer, serpentine leafminer (*Liriomyza huidobrensis*), American leafminer (*Liriomyza trifolii*), vegetable leafminer (*Liriomyza sativae*), exotic fruit flies (*Bactrocera* spp. and *Ceratitis* spp.).	Specific
Plant Pest Diagnostic	Horticultural crops.	All pests and pathogens that can affect horticultural crops (mango,	General

Surveillance program name	Target host(s)	Target pest(s)	Type of Surveillance
Service – horticulture		chilli, watermelon, Cucurbitaceae).	
Regional Fruit Fly Monitoring and Surveillance	Horticultural crops.	Exotic fruit flies (*Bactrocera* spp. and *Ceratitis* spp.).	Specific
Within Queensland			
Area freedom surveys	Multiple.	Multiple pests.	Specific
Area wide management of vegetable diseases	Multiple vegetable hosts.	Multiple viruses and bacterial pests.	Specific and general
Banana pest surveillance	Banana.	A range of banana pests.	General
Exotic Fruit Fly in the Torres Strait Program	Multiple.	Exotic fruit fly including *Bactrocera* and *Zeugodacus* spp.	Specific
Forest High-Risk Surveillance Program	Multiple.	Various exotic and endemic high priority pests of *Pinus* spp.	Specific
General forest pest surveillance	Multiple.	General forest pests.	General
Grow Help Australia diagnostic service project	Fruit, vegetables, and ornamental hosts.	All pests and pathogens that can affect horticultural crops, national parks, gardens, hobby growers and home gardeners. Commonly encountered pathogens include *Phytophthora* spp., *Fusarium* spp., *Colletotrichum* spp., *Alternaria* spp., *Rhizoctonia* spp., *Pythium* spp., *Ralstonia* spp., *Erwinia* spp. and viruses.	General
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Braula coeca, Aethina tumida,* acute bee paralysis virus, deformed wing virus and slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris,* and new exotic swarms of *A. mellifera.*	Specific
National Plant Health Surveillance Program	Multiple.	Multiple, including exotic fruit flies, exotic gypsy moths, Pierce's disease (*Xylella fastidiosa*) and glassy winged sharpshooter (*Homalodisca vitripennis*).	Specific
Panama TR4 Program	Banana.	Panama disease (*Fusarium oxysporum* f. sp. *cubense*).	Specific
National tomato potato psyllid and zebra chip surveillance	Solanaceae.	Tomato potato psyllid (*Bactericera cockerelli*) and *Candidatus* Liberibacter solanacearum.	Specific
Fall Armyworm Response Project monitoring	Multiple.	Fall armyworm (*Spodoptera frugiperda*).	General and specific
Serpentine leafminer monitoring	Multiple.	Serpentine leafminer (*Liriomyza huidobrensis*).	General and specific
Bee pests and pest bees diagnostic service	European honey bees.	Multiple pests.	General and specific
Within South Australia			
Area freedom surveys	Multiple.	Multiple pests.	General and specific
Bee surveillance – endemic disease	European honey bees.	American foulbrood (*Paenibacillus* spp.).	General and specific
Giant pine scale industry surveillance program	Pinaceae.	Giant pine scale (*Marchalina hellenica*).	General and specific
Grape phylloxera	*Vitus vinifera.*	Grapevine phylloxera (*Daktulosphaira vitifoliae*).	General and specific
Mediterranean fruit fly	Horticultural crops.	Mediterranean fruit fly (*Ceratitis capitata*).	General and specific
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Braula coeca, acute* bee paralysis virus, deformed wing virus and slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris* and new exotic swarms of *A. mellifera.*	General and specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Multiple, including exotic invasive ants (tramp ants), Asian and African citrus psyllids (*Diaphorina citri*, *Candidatus* Liberibacter africanus), huanglongbing (*Candidatus* Liberibacter asiaticus), citrus canker (*Xanthomonas axonopodis* pv. *citri*), glassy winged sharpshooters (*Homalodisca vitripennis* and *H. coagulata*), brown mamorated stink bug (*Halyomorpha halys*), xylella (*Xylella fastidiosa*).	General and specific

Surveillance program name	Target host(s)	Target pest(s)	Type of Surveillance
Ports of Entry Trapping Program	*Eucalyptus* spp., ornamental trees.	Exotic gypsy moths (*Lymantria* spp.).	General and specific
Ports of Entry Trapping Program	Various fruit fly hosts.	Multiple – *Bactrocera albistrigata, B. carambolae, B. caryae, B. correcta, B. curvipennis, B. dorsalis, B. facialis, B. kandiensis, B. kirki, B. melanotus, B. occipitalis, B. passiflorae, B. psidii, B. trilineola, B, trivialis, B. tryoni, B. umbrosa, B. xanthodes, B. zonata, Ceratitis capitata, C. rosa, Zeugodacus cucurbitae, Z. tau.*	General and specific
Mediterranean fruit fly	Horticultural crops.	Mediterranean fruit fly (*Ceratitis capitata*).	General and specific
Queensland fruit fly	Horticultural crops.	Queensland fruit fly (*Bactrocera tryoni*).	General and specific
Tomato potato psyllid program	Solanaceae.	Tomato potato psyllid (*Bactericera cockerelli*).	General and specific
Tomato yellow curl leaf virus	Solanaceae.	Tomato yellow curl leaf virus.	General and specific
Trogoderma glabrum program	Multiple.	*Trogoderma glabrum.*	General and specific
Within Tasmania			
Bee surveillance – endemic disease and pests	European honey bees.	American foulbrood (*Paenibacillus* spp.), European foulbrood (*Melissococcus pluton*), chalkbrood (*Ascophera apis),* sacbrood (*Nosema apis, N. ceranae),* sacbrood virus (*Morator aetatulas*), greater wax moth *(Galleria mellonella)*, lesser wax moth (*G. achroia grisella)*, European wasps (*Vespula germanica*), *Braula coeca,* bumble bee *(Bombus terestris).*	General and specific
Blueberry rust surveillance	Commercial blueberry crops and wholesale nurseries.	Blueberry rust (*Thekopsora minima*).	Specific
Codling moth trapping surveillance	Apples, cherries.	Codling moth (*Cydia pomonella*).	Specific
Fruit fly trapping surveillance	Host fruit trees, fruit, and vegetables.	*Bactrocera dorsalis, B. tryoni, Ceratitis capitata* and exotic fruit flies.	Specific
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Aethina tumida*, acute bee paralysis virus, deformed wing virus and slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris* and new exotic swarms of *A. mellifera.*	Specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Brown marmorated stink bug (*Halyomorpha halys*), citrus canker (*Xanthomonas citri* subsp. *citri*), gypsy moths (including *Lymantria albescens, L. atameles, L. concolor, L. dispar asiatica, L. dispar, L. dispar japonica, L. dissoluta, L. fumida, L. marginata, L. minomonis, L. monacha, L. postalba, L. pulverea, L. sinica, L. umbrosa, L. xylina*), huanglongbing (*Candidatus* Liberibacter asiaticus), *Bactericera cockerelli, Diaphorina citri, Trioza erytreae, B. trigonica, Trioza apicallis*, Pierce's disease (*Xylella fastidiosa*), glassy winged sharpshooter (*Homalodisca vitripennis*), *Bactrocera, Zeugodacus* and *Ceratitis* spp. (exotic fruit fly species).	Specific
Silverleaf whitefly surveillance	Nursery stock.	Silver leaf whitefly (*Bemisia tabaci*).	Specific
Tomato potato psyllid	Commercial potato and tomato crops, community gardens, urban pathways.	Tomato potato psyllid (*Bactericera cockerelli*).	Specific
Within Victoria			
Alert contacts	All hosts, general surveillance.	All plant pests.	General
Area freedom surveillance for market access	Blueberries, port area, processed tomatoes, and potatoes.	Blueberry rust (*Thekopsora minima*), red imported fire ant (*Soelenopsis invicta*), tomato yellow leaf curl virus, tomato potato psyllid (*Bactericera cockerelli*), grapevine phylloxera, bacterial canker, cucumber green mottle mosaic virus, green snail, pyriform scale.	Specific
Exotic fruit flies – Sunraysia	Various horticultural	Mediterranean fruit fly (*Ceratitis capitata*).	Specific

Surveillance program name	Target host(s)	Target pest(s)	Type of Surveillance
	crops (citrus, stone fruit).		
Forest Health Surveillance Program	Multiple.	Various exotic and endemic high priority pests of *Pinus* spp. Japanese sawyer beetle (*Monocamus alternatus*), wood wasp (*Urocerus fantoma*), black spruce longhorn beetle (*Tetropium castaneum*), brown spruce longhorn beetle (*Tetropium fuscum*), pine wilt nematode (*Bursaphelenchus* spp.) and dutch elm disease.	Specific
Forest Health and Biosecurity Surveillance system	Multiple.	Various exotic and endemic high priority pests.	Specific
MyPestGuide e-surveillance	All hosts, general surveillance.	All plant pests.	General and specific
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor, V. jacobsoni, Tropilaelaps clareae, T. mercedesae, Acarapis woodi, Oplostoma fuligineus, Braula coeca,* acute bee paralysis virus, deformed wing virus, slow paralysis virus, *Apis cerana, A. dorsata, A. florea, Bombus terrestris* and new exotic swarms of *A. mellifera.*	Specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Multiple including citrus canker (*Xanthomonas axonopodis* pv. *citri*), exotic fruit flies (*Bactrocera* spp., *Ceratitis captitata*), Pierce's disease (*Xylella fastidiosa*), glassy winged sharpshooter (*Homalodisca vitripennis*), plum pox virus, Asian gypsy moth (*Lymantria dispar* and other *Lymantria* spp.), brown marmorated stink bug (*Halyomorpha halys*), Asian citrus psyllid (*Diaphorina citri*), African citrus psyllid (*Trioza erytreae*) and spotted wing drosophila (*drosophila suzukii*).	Specific
National tomato potato psyllid and zebra chip surveillance	Solanaceous hosts.	Tomato potato psyllid (*Bactericera cockerelli*).	Specific
Passive MedFly Program	Fruit trees in backyards.	Mediteranean fruit fly (*Ceratitis capitata*).	General
Urban Plant Health Network	Multiple plant hosts in peri-urban landscape, including community gardens.	Various, including brown marmorated stink bug (*Halyomorpha halys*), Asian citrus psyllid (*Diaphorina citri*), African citrus psyllid (*Trioza erytreae*), Asian honeybee, red imported fire ant (*Solenopsis invicta*), spotted wing drosphila (drosophila suzukii) and glassy winged sharpshooter (*Homalodisca vitripennis*).	General
Victorian funded containment program	Pasture and fruit trees.	Green snail (*Cantareus apertus*).	Specific
Within Western Australia			
Ant Blitz	Urban areas.	Browsing ant (*Lepisiota frauenfeldi*), Red Imported Fire Ant (*Solenopsis invicta*), Small black sugar ant (*Lepisiota capensis*).	General
Biosecurity Blitz	General surveillance, all hosts.	All plant pests.	General
Brown marmorated stink bug	General surveillance, all hosts, urban areas.	Brown marmorated stink bug (*Halyomorpha halys*).	Specific
Candidatus Liberibacter solanacearum	Tomato, potato, bell pepper, chilli, and eggplant crops.	Tomato potato pysllid (*Bactericera cockerelli*).	General
Codling moth surveillance	Pome fruit.	Codling moth (*Cydia pomonella*).	Specific
European wasp surveillance	Urban areas and horticultural crops.	European wasp (*Vespula germanica*).	General and specific
Medfly Area Freedom (Ord River Irrigation Area)	Many horticultural hosts.	Mediterranean fruit fly (*Ceratitis capitata*).	Specific
MyPestGuide e-surveillance	All hosts, general surveillance.	All plant pests.	General and specific
National Bee Pest Surveillance Program	Ports and surrounding environment.	*Varroa destructor*, *V. jacobsoni*, *Tropilaelaps clareae*, *T. mercedesae*, *Acarapis woodi*, *Oplostoma fuligineus*, *Braula coeca*, acute bee paralysis virus, deformed wing virus, slow paralysis virus, *Apis cerana*, *A. dorsata*, *A. florea*, *Bombus terrestris* and new exotic	Specific

Surveillance program name	Target host(s)	Target pest(s)	Type of Surveillance
		swarms of *A. mellifera*.	
National Plant Health Surveillance Program – multi pest surveillance	Pome and citrus crops.	Multiple including Asian citrus psyllid (*Diaphorina citri*), citrus canker (*Xanthomonas axonopodis* pv. *citri*), citrus longicorn beetle (*Anoplophora chinensis*), glassy winged sharpshooter (*Homalodisca vitripennis*), xylella (*Xylella fastidiosa*), brown marmorated stink bug (*Halyomorpha halys*).	Specific
Port of Entry – Asian gypsy moth trapping	More than 600 forest, orchard, ornamental and native species.	Asian gypsy moth (*Lymantria dispar*).	Specific
Port of Entry – fruit fly trapping	Horticultural hosts.	Various *Bactrocera* and *Ceratitis* spp.	Specific
Queensland fruit fly surveillance	Many horticultural hosts.	Queensland fruit fly (*Bactrocera tryoni*).	Specific
Tramp ant surveillance	Environmental, urban areas, ports of entry, other high-risk sites.	Browsing ant (*Lepisiota frauenfeldi*), red imported fire ant (*Solenopsis invicta*), small black sugar ant (*Lepisiota capensis*).	General

Nursery level pest monitoring

Nursery level monitoring involves the participation and interaction of owners, managers, agribusiness, and industry representative groups. Examples of the surveillance activities that can be carried out by each of these groups are outlined in Figure 5.

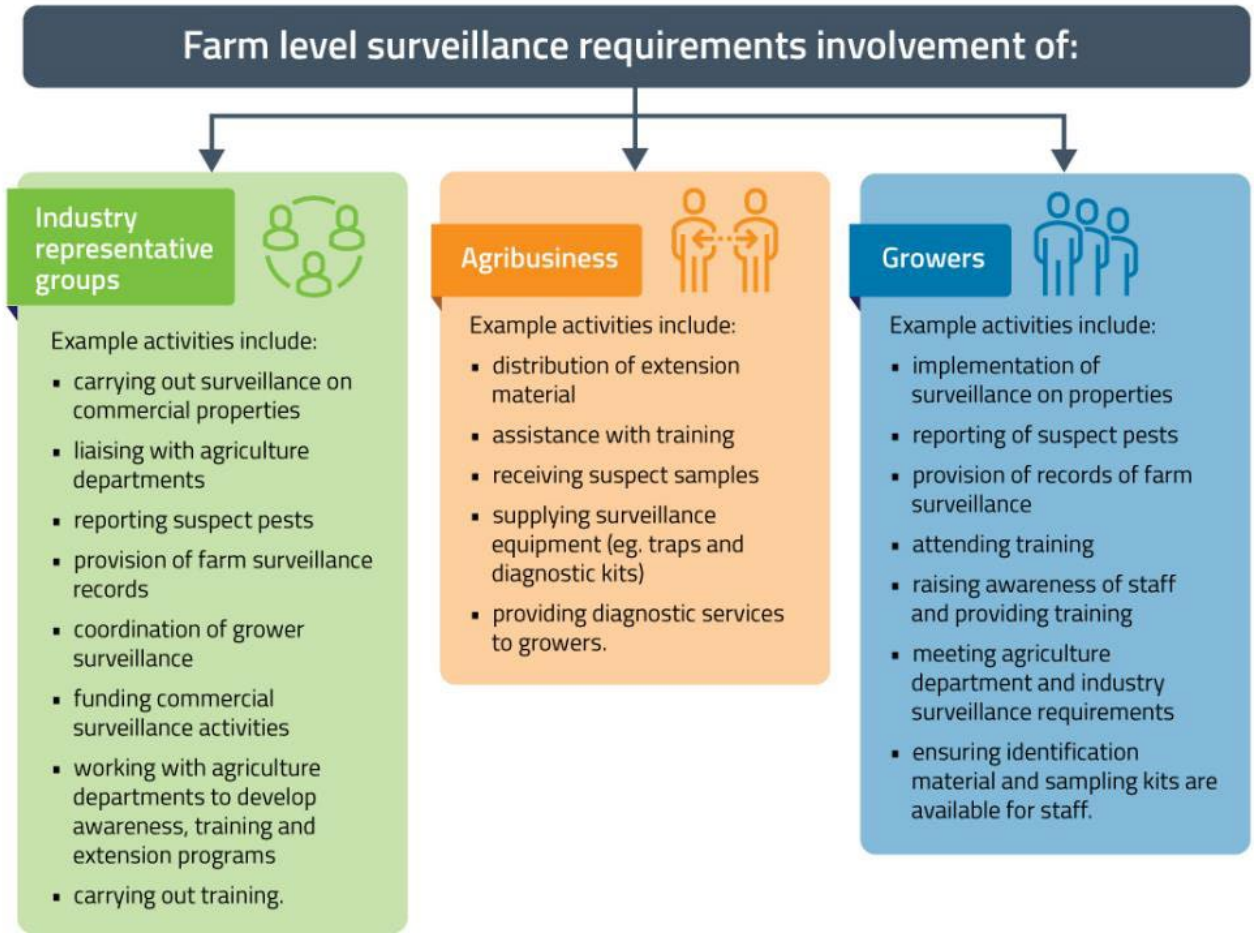

Figure 5. Examples of nursery level surveillance activities.

TRAINING AND AWARENESS

A key component of biosecurity preparedness is ensuring personnel engaged are suitable and effectively trained for their designated roles in a response. Biosecurity preparedness training is the responsibility of all governments and industries, involved in the biosecurity system.

Training

National Emergency Plant Pest Training Program

PHA supports members in training personnel through the delivery of the National Emergency Plant Pest (EPP) Training Program. This program is focussed on ensuring personnel from the governments and peak industry bodies who will be involved in responses to EPPs have the skills and knowledge to effectively fulfil the roles and responsibilities of their parties, as signatories to the EPPRD. This covers a range of areas, from representatives on the national decision-making committees (i.e. the Consultative Committee on Emergency Plant Pests and the National Management Group) through to industry liaison personnel in the State Coordination Centres (SCC) or Local Control Centres (LCC).

In addition to face-to-face training delivered to members and the provision of simulation exercises, PHA also offers biosecurity training through the Biosecurity OnLine Training (BOLT) platform which houses a variety of eLearning courses relevant to plant biosecurity. Access to BOLT is free and open to any stakeholder interested in biosecurity and is available through planthealthaustralia.com.au/bolt.

For more information on the National EPP Training program, refer to planthealthaustralia.com.au/training.

Biosecurity Incident Standard Operating Procedures

The industry Biosecurity Incident Standard Operating Procedure (BISOP) is focussed on documenting the critical processes, functions, contact and authorisations information regarding how a specific organisation fulfils its roles and responsibilities during biosecurity incidents managed under the Emergency Plant Pest Response Deed (EPPRD). The completion of an organisation(s) BISOP involves:

- A detailed look at key decision points in a response put into the context of basic incursion scenarios and documentation of how the industry body will determine their view on those decision points (e.g., technical feasibility, approval to fund a Response Plan, input into communications),
- documentation of the peak industry body record keeping processes and other internal processes to meet responsibilities under the EPPRD.

GIA is currently working with PHA in the development of their organisation's BISOP.

Awareness

Early reporting enhances the chance of effective control and eradication. Awareness activities raise the profile of biosecurity and exotic pest threats to the Australian production nursery industry, which increases the chance of early detection and reporting of suspect pests. Responsibility for awareness material lies with industry and government, with assistance from PHA as appropriate. Any unusual plant pest should be reported immediately to the relevant state/territory agriculture department through the Exotic Plant Pest Hotline (1800 084 881).

High priority plant pest threat-related documents

Pests listed in Table 1 have been identified as high priority threats to the production nursery industry by members of the TEG. They have been assessed as having high entry, establishment and spread potentials and/or a high economic impact. This list should provide the basis for the development of awareness material for the industry.

Further information on High Priority Pests

The websites listed below in Table 9 contain information on pests across most plant industries, including the production nursery industry.

Table 9. Sources of information on High Priority Pests for the production nursery industry.

Source	Website
Australian Plant Production Standard (APPS)	https://nurseryproductionfms.com.au/biosecurity/
CABI – Crop Protection Compendium	cabi.org/cpc/
Department of Agriculture, Fisheries and Forestry (DAFF)	agriculture.gov.au
Department of Energy, Environment and Climate Action (DEECA)	https://agriculture.vic.gov.au/biosecurity
Department of Industry, Tourism and Trade, Northern Territory (DITT NT)	https://nt.gov.au/industry/agriculture/food-crops-plants-and-quarantine
Department of Natural Resources and Environment Tasmania (NRE Tas)	https://nre.tas.gov.au/biosecurity-tasmania/plant-biosecurity/pests-and-diseases
Department of Primary Industries and Regions SA (PIRSA)	https://www.pir.sa.gov.au/biosecurity
Department of Primary Industries and Regional Development WA (DPIRD)	https://www.agric.wa.gov.au/biosecurity-quarantine/biosecurity/plant-biosecurity
European and Mediterranean Plant Protection Organization (EPPO)	eppo.int/DATABASES/pqr/pqr.htm
Greenlife Industry Australia (GIA)	https://www.greenlifeindustry.com.au/about/projects-programs/biosecurity-alerts
New South Wales Department of Primary Industries (NSW DPI)	https://www.dpi.nsw.gov.au/biosecurity/plant
Plant Biosecurity Science Foundation	http://www.apbsf.org.au/
Plant Health Australia (PHA)	planthealthaustralia.com.au/
Pest and Disease Image Library (PaDIL)	padil.gov.au/
Queensland Department of Agriculture and Fisheries (DAF Qld)	business.Qld.gov.au/industries/farms-fishing-forestry/agriculture/crop-growing/priority-pest-disease
University of California Statewide Integrated Pest Management (IPM) Program	ipm.ucdavis.edu/EXOTIC/exoticpestsmenu.html

Production Nursery Biosecurity

Introduction

Plant pests can have a major impact on production if not managed effectively. This includes pests already present in Australia and a number of serious pests that Australia does not have.

Biosecurity measures can be used to minimise the spread of such pests before their presence is known or after they are identified, and therefore can greatly increase the likelihood that they could be eradicated. This section of the document outlines nursery biosecurity and hygiene measures to help reduce the impact of pests on the industry.

The biosecurity and hygiene measures outlined here can be considered as options for each nurseries risk management. Many of these measures can be adopted in a way that suits a given nursery so that each can have an appropriate level of biosecurity.

Biosecurity reporting procedures and hygiene strategies to reduce threats covered in this document are:

- Selection and preparation of appropriate planting material,
- chemical control measures,
- control of vectors,
- control of alternative hosts,
- neglected farms and volunteer plants,
- post-harvest handling and produce transport procedures,
- use of warning and information signs,
- managing the movement of vehicles and equipment,
- managing the movement of people,
- visiting overseas nurseries/farms/orchards – what to watch out for when you return,
- including biosecurity in industry best management practice and quality assurance schemes,
- biosecurity checklist.

Development of a biosecurity plan tailored to the needs of an individual operation is a good way to integrate best practice biosecurity with day-to-day operations (farmbiosecurity.com.au/planner/). Further information on biosecurity can be found at farmbiosecurity.com.au or by contacting GIA (contact information available in Table 12).

Reporting suspect emergency plant pests

Rapid reporting of exotic plant pests is critical as early detection gives Australia the best chance to effectively control and eradicate pests. If you find something you believe could be an exotic plant pest, call the Exotic Plant Pest Hotline immediately to report it to your local state or territory government.

The one phone number – **1800 084 881** – will connect to an automated system that allows the caller to choose the state or territory to which the report relates. The caller will then be connected to the relevant authority for that jurisdiction. Most lines are only monitored during business hours. Messages can be left outside of those hours and calls will be returned as soon as an officer is available. A summary of the opening hours for each state and territory is provided in Table 12. Each jurisdiction also has an alternative contact to ensure no report is missed. It does not matter which of these methods is used to report a suspect exotic plant pest. The important thing is to report it.

Calls to the Exotic Plant Pest Hotline will be answered by an experienced person, who will ask some questions to help understand the situation, such as:

- What was seen (describe the pest or send a photo),
- where it was found,
- what it was found on,
- how many pests are present/how infected is the crop,
- how widely distributed it is,
- when it was first noticed.

It is important not to touch or move the suspect material as this may spread the exotic pest or render samples unsuitable for diagnostic purposes. A biosecurity officer may attend the location to inspect and collect a sample. In some cases, the biosecurity officer will explain how to send a sample for testing. In this circumstance they will explain how to do this without risk of spreading the pest and ensuring it arrives at the laboratory in a suitable condition for identification.

Every report will be taken seriously, followed up and treated confidentially.

Recent changes to legislation in some states includes timeframes for reporting and have implications for those who do not report. It is important that individuals know the obligations for their jurisdiction.

Some production nursery pests are notifiable under each state or territory's quarantine legislation. Each state or territory's list of notifiable pests are subject to change over time so contacting your local state/territory agricultural agency will ensure information is up to date. Landowners and consultants have a legal obligation to notify the relevant state/territory agriculture agency of the presence of those pests within a defined timeframe.

PREPAREDNESS

Pest-specific preparedness and response information documents

To help prepare for an incursion response a list of pest-specific preparedness and response information documents is provided (Table 4). Over time, as more resources are produced for individual pests of the production nursery industry they will be included in this document and made available through the PHA website.[241] Resources include the development of pest-specific information and emergency response documents, such as fact sheets, contingency plans, diagnostic protocols and a summary of surveillance programs currently in operation for these High Priority Pests (HPPs). These documents and programs should be developed over time for all medium to high-risk pests listed in the TST (APPENDIX 1: THREAT SUMMARY TABLES).

Fact sheets

Fact sheets or information sheets are a key activity of biosecurity extension and education with growers. Fact sheets provide summary information about the pest, its biology, what it looks like and what symptoms it may cause. They also contain detailed images. Refer to Table 4 for a list of current fact sheets available for production nursery producers.

Contingency Plans

Contingency Plans provide background information on the pest biology and available control measures to assist with preparedness for incursions of a specific pest into Australia. The contingency plan provides guidelines for steps to be undertaken and considered when developing a response plan for the eradication of that pest. Any response plan developed using information in whole or in part from a contingency plan must follow procedures as set out in PLANTPLAN[242] and be endorsed by the National Management Group[243] prior to implementation.

[241] https://www.planthealthaustralia.com.au/resources/pest-information-document-database/
[242] https://www.planthealthaustralia.com.au/biosecurity/incursion-management/plantplan/
[243] https://www.directory.gov.au/portfolios/agriculture-water-and-environment/department-agriculture-water-and-environment/national-management-group

As a part of contingency planning, biological and chemical control options are considered, as are options for breeding for pest resistance. Through the planning process, it may be discovered that there are gaps in knowledge. Such gaps should be identified and consequently be considered as RD&E needs to be met within the Biosecurity Implementation Plan.

For a list of current contingency plans relevant to production nursery HPP's see Table 4.

National Diagnostic Protocols

Diagnostic protocols are documents that contain information about a specific plant pest, or related group of pests, relevant to its diagnosis. National Diagnostic Protocols (NDPs)[244] are diagnostic protocols for the unambiguous taxonomic identification of a pest in a manner consistent with ISPM No. 27 – Diagnostic Protocols for Regulated Pests.[245] NDPs include diagnostic procedures and data on the pest, its hosts, taxonomic information, detection and identification.

Australia has a coherent and effective system for the development of NDPs for plant pests managed by the Subcommittee on Plant Health Diagnostics (SPHD).[246] NDPs are peer reviewed and verified before being endorsed by Plant Health Committee (PHC).[247]

Endorsed NDPs are available on the National Plant Biosecurity Diagnostic Network (NPBDN)[248] website together with additional information regarding their development and endorsement.

Diagnostic information for some pests of production nurseries (Table 4) is available through the PHA website.[249]

Research Development and Extension - Linking Biosecurity Outcomes to Priorities

Through the biosecurity planning process, gaps in knowledge or extension of knowledge have been identified and documented in the Implementation Plan (Table 3) Some of these gaps will require:

- Further research and development (e.g. understanding risk pathways, developing surveillance programs or diagnostic protocols, developing tools to facilitate preparedness and response, developing IPM or resistance breeding strategies),
- communication or extension of that knowledge to various target audiences (i.e. developing awareness raising materials, undertaking training exercises, running workshops, consideration of broader target audiences).

It is important that the RD&E gaps identified through this plan feed directly into the normal annual RD&E priority setting and strategic planning activities that an industry undertakes. This is fundamental if an industry is to progress biosecurity preparedness and response throughout the life of the biosecurity plan.

[244] https://www.plantbiosecuritydiagnostics.net.au/initiatives/national-diagnostic-protocols/
[245] (FAO, 2006).
[246] https://www.plantbiosecuritydiagnostics.net.au/work/subcommittee-on-plant-health-diagnostics/
[247] https://www.agriculture.gov.au/agriculture-land/plant/health/committees/phc
[248] https://www.plantbiosecuritydiagnostics.net.au/
[249] https://www.planthealthaustralia.com.au/resources/pest-information-document-database/

RESPONSE MANAGEMENT

Introduction

No matter how many preparedness activities are undertaken or how much surveillance is done at the border, a small number of plant pests will inevitably make their way into Australia. This section outlines the national agreements and processes in place to effectively respond to such incursions.

Gathering information, developing procedures, and defining roles and responsibilities during an emergency can be extremely difficult. To address this area, PHA coordinated the development of PLANTPLAN, a national set of incursion response guidelines for the plant sector, detailing the procedures required and the roles and responsibilities of all Emergency Plant Pest Response Deed (EPPRD) signatories affected by an Emergency Plant Pest (EPP).

The following section includes key contact details and communication procedures that should be used in the event of an incursion relevant to the Australian production nursery industry. Additionally, a listing of pest-specific emergency response and information documents are provided that may support a response. Over time, as more of these documents are produced for pests of the production nursery industry they will be included in the list and made available through the PHA website.[250]

The Emergency Plant Pest Response Deed

A fundamental component of the Australian plant biosecurity system is the EPPRD[251], which is an agreement between the Australian government, the state/territory governments, 38 plant industries (including Greenlife Industry Australia) and PHA (collectively known as the signatories), that allows the rapid and efficient response to EPPs. The EPPRD is a legally binding document that outlines the basic operating principles and guidelines for EPP eradication responses.

The EPPRD provides:

- A national response management structure that enables all governments and plant industry signatories affected by the EPP to contribute to the decisions made about the response,
- an agreed structure for the sharing of costs to deliver eradication responses to EPPs detected in Australia. Costs are divided between signatories affected by the EPP in an equitable manner based on the relative potential impact of the EPP,
- a mechanism to encourage reporting of EPP detections and the implementation of risk mitigation activities,
- a mechanism to reimburse growers whose crops or property are directly damaged or destroyed as a result of implementing an EPP Response Plan,
- rapid responses to EPPs (excluding weeds),
- a framework for decisions to eradicate are based on appropriate criteria (e.g. eradication must be technically feasible and cost beneficial),
- an industry commitment to biosecurity and risk mitigation and a government commitment to best management practice,
- cost sharing of eligible costs,
- an agreed limit for cost sharing,
- an effective industry/government decision-making process.

For further information on the EPPRD, including copies of the EPPRD, fact sheets or Frequently Asked Questions, visit planthealthaustralia.com.au/epprd and planthealthaustralia.com.au/epprd-qa.

[250] https://www.planthealthaustralia.com.au/biosecurity/emergency-plant-pest-response-deed/
[251] https://www.planthealthaustralia.com.au/wp-content/uploads/2023/02/EPPRD-Full_24-February-2023.pdf

PLANTPLAN

PLANTPLAN outlines the generic approach to response management under the EPPRD and introduces the key roles and positions held by industry and government during a response. The document is supported by a number of operating guidelines, job cards and standard operating procedures that provide further detail on specific topics. PLANTPLAN underpins the EPPRD and is endorsed by all EPPRD signatories.

The current version of PLANTPLAN and supporting documents are available on the PHA website.[252]

Funding a response under the EPPRD

The following section outlines how eradication responses are nationally cost shared between affected industries and governments.

A copy of the EPPRD can be downloaded from the PHA website.[253]

Cost sharing a response

Affected industries and governments invest in the eradication of EPPs and share the costs of an agreed response plan, this is referred to as 'cost sharing'. Not all activities in a response are eligible to be cost shared, with some activities considered as normal commitments for signatories.

The cost shared costs of a response are divided between affected industries and governments in an equitable manner directly related to the benefit obtained from eradicating the EPP. These relative benefits are represented by the category of the pest, with the overall view that 'the higher the benefit, the greater the investment'.

There are four categories for EPPs. The category indicates how the funding will be split between government and industries; with the government funding the share of public benefit and industry funding the share of private benefit. It does not indicate the likelihood of eradication or the overall importance of the pest i.e. an EPP listed as Category 1 is not deemed to be any more or less important than an EPP listed as Category 4.

Table 10. Response funding allocation between Government and Industry for an EPP.

Categorising Of EPP	Government Funding	Industry Funding
Category 1	100%	0%
Category 2	80%	20%
Category 3	50%	50%
Category 4	20%	80%

Pest categorisation

The list of categorised EPPs can be found in Schedule 13 of the EPPRD. In the event that a response plan is endorsed for an uncategorised EPP, cost sharing will commence using the default category (Category 3) and may be revised later.

Any signatory to the EPPRD can request for additional pests to be categorised and added to Schedule 13 of the EPPRD. Contact EPPRD@phau.com.au for more information and guidance on this process.

Once a substantiated request has been received by PHA a group of independent scientific technical experts (known as the categorisation group) will be convened to assess all known information about the EPP to identify the public and private benefits. Full details can be found in Clauses 7 and 9 of the EPPRD.

[252] https://www.planthealthaustralia.com.au/biosecurity/incursion-management/plantplan/
[253] https://www.planthealthaustralia.com.au/biosecurity/emergency-plant-pest-response-deed/

Production nursery EPPs categorised to date

EPPs relevant to the Australian production nursery industry that are categorised and listed within Schedule 13 of the EPPRD are listed in Table 11.

Table 11. Formal categories for high priority pests of the Australian production nursery industry listed in Schedule 13 of the EPPRD (as of February 2023).

Formal Category	Scientific Name	Common Name
1	*Austropuccinia psidii sensu lato (*syn. *Puccinia psidii) (*exotic variants*)*	Myrtle rust
1	*Phytophthora ramorum*	Sudden oak death
2	*Candidatus* Liberibacter asiaticus	Huanglongbing
2	*Erwinia amylovora*	Fire blight
2	*Halyomorpha halys*	Brown marmorated stink bug (BMSB)
2	Plum pox virus (*Potyvirus*)	Plum pox virus (PPV)
2	*Xylella fastidiosa*	Pierce's disease
3	*Diaphorina citri*	Asian citrus psyllid
3	*Liriomyza sativae*	Vegetable leaf miner

How to respond to a suspect EPP

Following the detection of a suspect EPP, the relevant state agency will be notified either directly or through the Exotic Plant Pest Hotline. Within 24 hours of the state agency having a reasonable suspicion that they are dealing with an EPP, the Chief Plant Health Manager (CPHM) of the state or territory will inform the Australian Chief Plant Protection Officer (ACPPO).[254] All signatories affected by the EPP (both government and industry) are then notified immediately, and a Consultative Committee on Emergency Plant Pests (CCEPP)[255] meeting is convened (Figure 6). Only the industry signatories affected by the EPP are engaged in the response process. These are determined based on the known hosts of the EPP. All positive detections of EPPs or suspect EPPs must undergo secondary identification from an independent laboratory. Confirmation of the identification should not delay the reporting of the suspected EPP to the ACPPO or the CCEPP.

The relevant state/territory agriculture department is responsible for the on-ground response to EPPs and will adopt precautionary emergency containment measures if appropriate. Depending on the nature of the EPP, measures could include:

- Restriction of operations in the area
- Disinfection and withdrawal of people, vehicles, and machinery from the area
- Restricted access to the area
- Control or containment measures

[254] https://www.agriculture.gov.au/agriculture-land/plant/health/acppo
[255] https://www.agriculture.gov.au/agriculture-land/plant/health/committees/ccepp

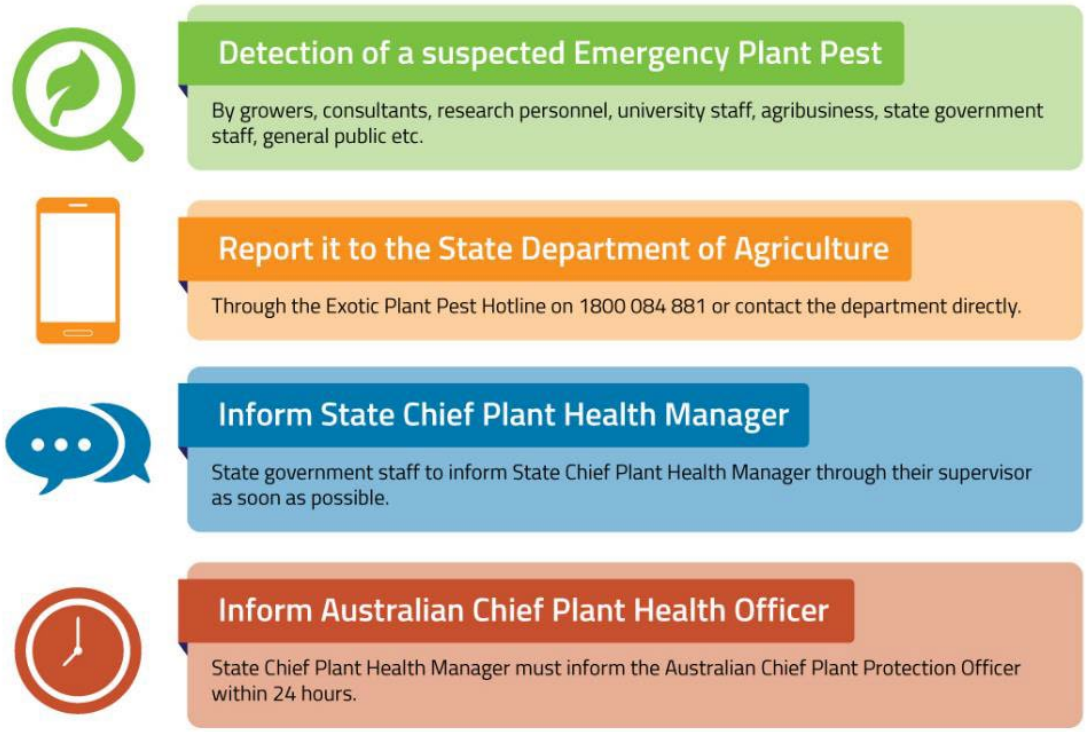

Figure 6. Reporting of suspect EPPs and notification process.

Once a pest is notified to the CCEPP, all EPPRD signatories that are affected by the EPP play a part in the national response. This is primarily through the two national decision-making committees, both of which contain a representative from Greenlife Industry Australia (GIA). The committees are:

- The Consultative Committee on Emergency Plant Pests (CCEPP), which provide technical expertise on the response, and
- The National Management Group (NMG) which acts on recommendations from the CCEPP and make the final decisions about EPP responses and funding.

Each response to an EPP is applied differently due to the nature of the incursion, however, each follows the defined phases of a response as outlined at planthealthaustralia.com.au/biosecurity/incursion-management/phases-of-an-emergency-plant-pest-response/.

Owner reimbursement costs

Owner Reimbursement Costs (ORCs) are included in the shared costs of a response and are available to eligible growers to alleviate the financial impacts of crops or property that are directed to be destroyed under an agreed response plan.

ORCs were developed to encourage early reporting and increase the chance of successful eradication. ORCs are paid to the owner and cover direct costs associated with implementing a response plan, including:

- Value of crops destroyed,
- replacement of lost capital items and,
- fallow periods.

ORCs are only available when there is an approved response plan under the EPPRD, and only to industries that are signatories to the EPPRD, such as the Production Nursery industry.

The value of ORCs is directed by the ORC Evidence Frameworks and is based on an agreed valuation approach developed for each industry.

Further information about ORCs is available from planthealthaustralia.com.au/biosecurity/incursion-management/owner-reimbursement-costs/.

Nursery products levy

Hort Innovation and Plant Health Australia (PHA) are responsible for the management of the nursery products levy. Hort Innovation is a grower owned, not-for-profit Research and Development Corporation (RDC) for Australia's $15.6 billion horticulture industry.

The Australian Government collects statutory levies.[256] Potted plants in Australia that are used by a producer will attract a levy. The 'pot' or 'container' levy is currently set at 5% of the wholesale value of pots or containers. The levy is usually collected by the container manufacturer at the time of sale. The biosecurity and emergency response levies are managed through PHA.

Investments in research, development, and extension (RD&E) or marketing projects are guided by the industry's Strategic Investment Plan (2022-26). Funds acquired from the levy are invested into various RD&E (2.75%) and marketing activities (2%) in consultation with industry-specific Strategic Investment Advisory Panels (SIAP) to increase the profitability and sustainability of the nursery industry. Annual subscription of Greenlife Industry Australia to PHA is supported by a 0.25% allocation from the levy.

The strategic RD&E investments can attract additional financial contributions from the Australian Government by leveraging public money. The Emergency Plant Pest Response (EPPR) levy (established and currently set at 0%) can be flexibly implemented to meet any obligations in terms of funding the eradication of plant 'pests' (as and when required).

In 2021/2022, $1.76 million of Nursery levy and approx. $1.45 million of matched government funding supported a $4.4 million investment into RD&E ($3.17 million) projects and marketing (1.2 million)[257]

[256] https://www.agriculture.gov.au/agriculture-land/farm-food-drought/levies/rates/nursery-products

[257] https://www.horticulture.com.au/globalassets/hort-innovation/levy-fund-financial-and-management-documents/fund-annual-report-pdfs-202122/hort-innovation-far-nursery-2021-22.pdf

Industry specific response procedures

Industry communication

Greenlife Industry Australia (GIA) are the peak industry body for the Australian production nursery industry and a signatory to the EPPRD. GIA will be the key industry contact point if a plant pest affecting the industry is detected and responded to using the arrangements in the EPPRD. GIA will have responsibility for relevant industry communication and media relations (see PLANTPLAN for information on approved communications during an incursion). The contacts nominated for the CCEPP and the NMG by GIA will be contacted regarding any meetings of the CCEPP or NMG. It is important that all Parties to the EPPRD ensure their contacts for these committees are nominated to PHA and updated swiftly when personnel change.

Close cooperation is required between relevant government and industry bodies to ensure the effective development and implementation of a response to an emergency plant pest, and the management of media/communication and trade issues. Readers should refer to PLANTPLAN or undertake the relevant BOLT courses for further information.

Information on state, territory, and regional biosecurity movement restrictions

The ability to control movement of materials that can carry and spread pests of production nurseries is of high importance. Each state/territory has biosecurity legislation in place to control the importation of production nursery material interstate and intrastate, and to manage agreed pests if an incursion occurs. Further regulations have been put in place in response to specific pest threats and these are regularly reviewed and updated by state/territory authorities and the Subcommittee on Market Access, Risk and Trade (SMART).[258]

Moving plant material between states/territories generally requires permits from the appropriate authority, depending on the plant species and which territory/state the material is being transferred to/from. Moving plant material intrastate may also require a permit from the appropriate authority. Information on pre-importation inspection, certification and treatments and/or certification requirements for movement of production nursery plants and related material can be obtained by contacting your local state or territory agriculture department directly (information is included in Table 12) or can be accessed through the Interstate quarantine website[259] which lists relevant contacts in each state/territory as well as Interstate Certification Assurance (ICA) documents relating to each state/territory.

The movement of farm vehicles and equipment between states is also restricted because of the high risk of inadvertently spreading pests. Each state/territory has quarantine legislation in place governing the movement of machinery, equipment, and other potential sources of pest contamination. Further information can be obtained by contacting your local state/territory agriculture department.

[258] Previously referred to as Subcommittee on Domestic Quarantine and Market Access (SQDMA).
[259] https://interstatequarantine.org.au/

Table 12. Contact details and information sources.

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity manuals	Emergency Plant Pest hotline – 1800 084 881
National					1800 084 881
Greenlife Industry Australia (GIA)	greenlifeindustry.com.au/ E. info@greenlifeindustry.com.au	(02) 8861 5100 +61 476 002 219	58/5 Gladstone Road Castle Hill NSW 2154 PO Box 68 Kiama NSW 2533	https://www.greenlifeindustry.com.au/static/uploads/files/reducing-the-pest-risk-web-wfpbqzkdjupg.pdf	
Department of Agriculture, Fisheries and Forestry (DAFF)	agriculture.gov.au	(02) 6272 3933 1800 020 504	GPO Box 858 Canberra, ACT 2601	*Biosecurity Act 2015* *Biosecurity Regulation 2016* https://www.awe.gov.au/biosecurity-trade/policy/legislation	
Plant Health Australia (PHA)	planthealthaustralia.com.au E. biosecurity@phau.com.au	(02) 6215 7700	Level 1, 1 Phipps Cl Deakin, ACT 2600	https://www.planthealthaustralia.com.au/biosecurity/risk-mitigation/biosecurity-planning/	
ACT					1800 084 881
Environment ACT	https://www.environment.act.gov.au/parks-conservation/plants-and-animals/biosecurity E. ACTBiosecurity@act.gov.au	13 22 81	Environment, Planning and Sustainable Development Directorate GPO Box 158 Canberra City ACT 2601 480 Northbourne Avenue Dickson ACT 2602	*Plant Disease Act 2002* *Pest Plants and Animals Act 2005* https://www.environment.act.gov.au/__data/assets/pdf_file/0007/902293/act-biosecurity-strategy-2016-2026.pdf	
New South Wales					1800 084 881
Department of Primary Industries (NSW DPI)	dpi.nsw.gov.au/biosecurity/plant E. biosecurity@dpi.nsw.gov.au E. quarantine@dpi.nsw.gov.au	(02) 6391 3100	Locked Bag 21 Orange, NSW 2800	*Biosecurity Act 2015* *Biosecurity Regulation 2017* *Biosecurity Order (Permitted Activities) 2017* and other supporting legislation such as	Operates 08:30 – 16:30 Monday to Friday. After hours answering machine service with messages followed up the next business day.

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity manuals	Emergency Plant Pest hotline – 1800 084 881
				Control Orders https://www.dpi.nsw.gov.au/biosecurity/managing-biosecurity/legislation	
Queensland					1800 084 881
Biosecurity Queensland, a part of the Department of Agriculture and Fisheries, Queensland (DAF Qld)	https://www.daf.qld.gov.au/ E. info@daf.qld.gov.au	13 25 23	41 George Street Brisbane, Qld 4000	*Biosecurity Act 2014* *Biosecurity Regulation 2016* https://www.daf.qld.gov.au/__data/assets/pdf_file/0004/379138/qld-biosecurity-manual.pdf	Operates 08:00-17:00 Monday to Friday (09:00-17:00 Thursday). Calls outside these hours answered by a third party who will take the message and depending on the urgency of the report, organise a response from a biosecurity officer as soon as possible.
Northern Territory					1800 084 881
Department of Industry, Tourism and Trade (NITT)	https://nt.gov.au/industry/agriculture/food-crops-plants-and-quarantine/plant-diseases-and-pests/pests-and-diseases E. plantbiosecurity@nt.gov.au E. citruscanker@nt.gov.au	(08) 8999 2118 1800 931 722 (Citrus canker)	Berrimah Farm Makagon Road Berrimah, NT 0828	*Plant Health Act 2008* *Plant Health Regulations 2011* https://industry.nt.gov.au/__data/assets/pdf_file/0011/396587/Plant-Quarantine-Manual.pdf	Operates 08:00 – 16:30 Monday to Friday. After hours answering machine service with messages followed up the next business day.
South Australia					1800 084 881
Primary Industries and Regions SA (PIRSA)	pir.sa.gov.au	(08) 8207 7820	25 Grenfell St, Adelaide, SA 5000 GPO Box 1671 Adelaide, SA 5001	*Plant Health Act 2009* *Plant Health Regulations 2022* pir.sa.gov.au/biosecurity/plant_health/importing_commercial_plants_and_plant_products_into_south_australia	Operates all hours
Biosecurity SA-Plant Health	https://pir.sa.gov.au/biosecurity/plant_health E. pirsa.planthealth@sa.gov.au	(08) 8207 7820 1300 666 010 (Fruit fly &	33 Flemington Street Glenside, SA 5065		

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity manuals	Emergency Plant Pest hotline – 1800 084 881
	E. pirsa.planthealthmarketaccess@sa.gov.au	Quarantine) (08) 8207 7814 (Market Access and Interstate Certification Assurance)			
South Australian Research and Development Institute (SARDI)	https://pir.sa.gov.au/research/about_sardi E. pirsa.sardi@sa.gov.au	(08) 8303 9400	Plant Research Centre Waite Campus 2B Hartley Grove Urrbrae SA GPO Box 397 Adelaide SA 5001		
AUSVEG SA – Clean Your Farm Initiative	https://www.ausvegsa.com.au/programs E. jordan.brooke-barnett@ausveg.com.au	+61 404 772 308	South Australian Produce Markets Ltd, Burma Road, Pooraka SA 5095		
Tasmania					1800 084 881
Biosecurity Tasmania, a part of the Department of Natural Resources and the Environment Tasmania (NRE Tas)	https://nre.tas.gov.au/biosecurity-tasmania E. Biosecurity.Tasmania@nre.tas.gov.au	1300 368 550 (Product Integrity) (03) 6165 3777	Department of Natural Resources and Environment Tasmania GPO Box 44, Hobart, Tas 7001 Biosecurity Operations Branch, 13 St Johns Avenue, New Town, Tas, 7008	*Biosecurity Act 2019* *Plant Quarantine Act 1997* *Weed Management Act 1999* https://nre.tas.gov.au/documents/Plant%20Biosecurity%20Manual%20Tasmania.pdf	Operates all hours
Victoria					1800 084 881
Agriculture Victoria (AgVic), a part of the Department of Energy, Environment and Climate Action (DEECA)	https://www.deeca.vic.gov.au/ https://agriculture.vic.gov.au/ E. plant.protection@ecodev.vic.gov.au	13 61 86 (03) 9032 7515 (Crop Health Services)	Various office locations across Victoria, list accessible: https://agriculture.vic.gov.au/about/contact-us AgriBio Specimen Reception Main Loading Dock 5 Ring Road	*Plant Biosecurity Act 2010* *Plant Biosecurity Regulations 2016* agriculture.vic.gov.au/psb	Operates 08:00 – 18:00 Monday to Friday. After hours answering machine service with messages followed up the next business day. Option also to forward to the 24 hr Emergency Animal Disease Watch

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity manuals	Emergency Plant Pest hotline – 1800 084 881
			La Trobe University Bundoora Vic 3083		Hotline.
Western Australia					1800 084 881
Department of Primary Industries and Regional Development (DPIRD)	agric.wa.gov.au/ E. info@agric.wa.gov.au	(08) 9368 3333	DPIRD, 1 Nash Street, Perth, WA 6000 DPIRD, Locked Bag 4, Bentley Delivery Centre, WA 6983 Pest and Disease Information Service (PaDIS) 3 Baron-Hay Court South, Perth WA 6151	*Biosecurity and Agriculture Management Act, 2007* https://www.agric.wa.gov.au/qtine/default.asp	Operates 08:30 – 16:30 Monday to Friday. After hours answering machine service with messages followed up the next business day

New South Wales

Information on pre-importation inspection, certification and treatment requirements may be obtained from dpi.nsw.gov.au/biosecurity.

Northern Territory

Administrative authority for regional quarantine in the Northern Territory (NT) is vested in the Department of Industry, Tourism and Trade (DITT) under the *Plant Health Act 2008* and *Plant Health Regulations 2011*. The Act enables notifiable pests to be gazetted, quarantine areas to be declared and inspectors appointed to carry out wide ranging control and/or eradication measures. Plant import requirements for particular pests, plants or plant related materials are identified in the Regulations. Further information on NT import requirements and treatments can be obtained by contacting NT Quarantine on (08) 8999 2118 or email plantbiosecurity@nt.gov.au.

For more information refer to the DITT website (industry.nt.gov.au/).

Queensland

Information on specific pre-importation inspection, treatments and/or certification requirements for movement of any fruit or plant material into Queensland, as well as maps of pest quarantine areas, may be obtained from the Biosecurity Queensland part of the DAF Qld website business.qld.gov.au/industries/farms-fishing-forestry/agriculture/crop-growing.

Further details can be obtained from the DAF Qld Customer Service Centre on 13 25 23.

South Australia

Information on pre-importation inspection, certification and treatments and/or certification requirements for movement of fruit or plant material in South Australia (SA) may be obtained from Biosecurity SA - Plant Health by phone (08) 8207 7820. Further information can be found at pir.sa.gov.au/biosecurity/plant_health.

Primary Industries and Regions South Australia (PIRSA) have strict regulations and requirements regarding the entry of plant material (fruit, vegetables, flowers, plants, soil and seeds) into the state.

For further information on import conditions consult the Plant Quarantine Standard visit pir.sa.gov.au/biosecurity/plant_health/importing_commercial_plants_and_plant_products_into_south_australia.

Tasmania

Information on specific pre-importation inspection, treatments and/or certification requirements for movement of any fruit or plant material into Tasmania may be obtained from the Department of Natural Resources and Environment Tasmania (NRE Tas) Biosecurity website (https://nre.tas.gov.au/biosecurity-tasmania) or by phoning 1300 368 550.

General and specific import conditions apply to the importation of plant material into Tasmania to prevent the introduction of pests and diseases into the state. Plants and plant products must not be imported into Tasmania unless state import requirements are met and a Notice of Intention to import has been provided to a Biosecurity Tasmania inspector not less than 24 hours prior to the importation.

For further information on import conditions consult the Plant Quarantine Manual

https://nre.tas.gov.au/biosecurity-tasmania/plant-biosecurity/plant-biosecurity-manual.

Victoria

The movement into Victoria of plants and plant products may be subject to a prohibition, or to one or more conditions which may include chemical treatments. These prohibitions and conditions are described on the Department of Energy, Environment and Climate Action (DEECA) https://agriculture.vic.gov.au/biosecurity/moving-plants-and-plant-products/plant-biosecurity-legislation#h2-0.

Some items may need to be presented to a DEECA inspector or an accredited business, for checking of details such as correct certification, labelling or treatment.

Further information on pre-importation inspection, certification and treatments and/or certification requirements for movement of fruit or plant material into or within Victoria may be obtained from Agriculture Victoria (AgVic) on the web at agriculture.vic.gov.au/psb or by phone 13 61 86.

Western Australia

The lead agency for agricultural biosecurity in Western Australia is the Department of Primary Industries and Regional Development (DPIRD). Western Australia is naturally free from a large number of pests and diseases that are present in many other parts of the world. WA's geographical isolation in conjunction with a robust plant biosecurity system including border and intrastate regulations, industry and public awareness campaigns and surveillance programs maintains this status.

There are general and specific legislative requirements which underpin Western Australian plant biosecurity. Amongst other things the legislation regulates movement of potential carriers (such as plant material, honey, machinery, seeds etc.) into and within the state.

General conditions include (but are not limited to the following):

- The requirement for all potential carriers to be presented to an inspector for inspection upon arrival in WA,
- soil is prohibited entry and imported goods, including containers, must be free from soil,
- freedom from pests and diseases of quarantine concern to WA.

In addition to the general requirements, specific requirements are also in place for movement into and within the state.

For further information on requirements contact Quarantine WA on https://www.agric.wa.gov.au/biosecurity-quarantine/quarantine/intrastate-movement or by phone (08) 9334 1800.

Nursery level – exclusion activities

A significant risk of spreading pests onto nurseries arises when propagation material, people, machinery, and equipment move from property to property and from region to region. It is the responsibility of the industry and the owner/manager of each property to ensure these risks are minimised.

It is in the interests of industry to encourage and monitor the management of risk at the nursery level, as this will reduce the probability of an incursion and increase the probability of early detection. This should in turn reduce the likelihood of a costly incident response, thereby reducing costs to industry, government, and the community.

One major way this can be achieved is through management of industry biosecurity at the nursery level using exclusion practices. Further detail on potential strategies is included in the Biosecurity section (page 52). The Australian production nursery industry is already a strong supporter of farm biosecurity but should continue to further extend this message of promoting good farm hygiene in a wide range of ways.

APPENDIX 1: THREAT SUMMARY TABLES

The information provided in the threat summary tables is an overview of exotic plant pest threats to the production nursery industry. More than 250 exotic plant pests were identified. Summarised information on entry, establishment and spread potentials and economic consequences of establishment are provided where available. Pests under official control[260] or eradication may be included in these tables where appropriate. However, production nursery pests that are established but regionalised within Australia are not covered by TST but may be assessed in state/territory biosecurity plans. Assessments may change given more detailed research and will be reviewed with the biosecurity plan.

Full descriptions of the risk rating terms can be found on page 39. An explanation of the method used for calculating the overall risk can be found on the PHA website.[261] Additional information on a number of the pests listed in the TST can be found in pest-specific information document.

Invertebrates

Table 13. Production nursery invertebrate pest threat summary table.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Acari (mites and ticks)										
Aculops fuchsiae	Fuchsia gall mite	Fuchsias only.	Leaves, flowers.	Wind or vectored dispersal. Introduction of infested plant materials.	France, Germany, United Kingdom, United States of America, Brazil.	MEDIUM[264]	HIGH	HIGH	VERY LOW	VERY LOW
Eotetranychus lewisi	Lewis spider mite	*Euphorbias, poinsettias, Ricinus communis* (all Euphorbiaceae), citrus and papaya.	Leaves.	Infested plant material, soil, and machinery. Can be transported by wind currents. Most likely pathway is plants for planting.	Africa, Asia, the Americas.[265]	MEDIUM[266]	HIGH[267]	HIGH	LOW[268]	LOW

[260] Official control defined in ISPM No. 5 as the active enforcement of mandatory phytosanitary regulations and the application of mandatory phytosanitary procedures with the objective of eradication or containment of quarantine pests or for the management of regulated non-quarantine pests.
[261] Available from planthealthaustralia.com.au/biosecurity/risk-mitigation
[262] (CABI, 2023).
[263] Establishment potential.
[264] Entry most likely on infested plants and cuttings.
[265] Libya, South Africa, Japan, Philippines, Taiwan, Portugal, Canada, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, United States of America, Bolivia, Chile, Colombia, Ecuador, Peru.
[266] Entry most likely on infested plants and cuttings.
[267] (EFSA PLH, 2017).
[268] *Tetranychus urticae* (present in Australia) is a good model for control.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Oligonychus spp. (exotic[269])	Spider mites	Wide range of hosts.[270]	Leaves.	Potential for wind-borne ballooning. Infested plant material, soil and machinery. Most likely pathway is plants for planting (particularly nursery stock).	The genus *Oligonychus* has a wide global distribution. Some *Oligonychus* species are exotic to Australia.[271]	HIGH	MEDIUM	HIGH	MEDIUM	MEDIUM[272]
Raoiella indica	Red palm mite	Arecaceae, Zingiberaceae, *Calathea*, *Cycas*, Myrtaceae (*Eucalyptus deglupta*, *Eugenia uniflora*), *Heliconia*, *Musa*, basil, maple, beans, pandanas.	Leaves.	Wind assisted spread is the most likely path for natural dispersal. Introduction of infested plants/plant materials or tourist souvenirs harbouring mites or eggs are potential pathways.	Africa, Asia, Middle East, the Americas, the Caribbean.[273]	MEDIUM	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Tetranychus pacificus	Pacific spider mite	A variety of species.[274]	Leaves.	Infested plant material and hitchhiking. Wind dispersal for localised spread.	Canada, Mexico, United States of America.	LOW	HIGH	HIGH	LOW	VERY LOW
Tetranychus piercei	Pierce's spider mite	Broad host range including *Ageratum* spp., peanut, papaya, African oil palm, sweetpotato, banana, beans.	Leaves, fruit.	Dispersal by crawling and wind mediated spread. Most likely international pathway is plants for planting.	Cambodia, China, Hong Kong, Indonesia, Japan, Malaysia, Philippines, South Korea, Taiwan, Thailand, Papua New Guinea, French Guiana.	HIGH	HIGH	HIGH	LOW	LOW
Tetranychus turkestani	Strawberry spider mite	Roses, sword lily, oleander, bell pepper, gladiolus hybrids, soybean, cotton, almond, peach, maize.	Leaves.	Wind assisted spread is the most likely method of natural dispersal. Introduction of infested plants/plant materials are potential pathways.	South Africa, China, India, Iran, Iraq, Japan, Bulgaria, France, Germany, Hungary, Russia, Spain, Costa Rica, United States of America.	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Coleoptera (beetles and weevils)										
Adoretus spp.	Rose	Wide host range.[276]	Leaves, roots.	These taxa are attracted to lights and	*Adoretus* spp. have ranging	MEDIUM	MEDIUM	MEDIUM	LOW[278]	VERY LOW

[269] Including *O. ilicis, O. peruvianus, O. pratensis, O. thelytokus, O. yothersi*.

[270] Azalea, camellia, holly, boxwood, eucalyptus, oak, walnut, camphor laurel, rice, quince, cotoneaster, loquat, strawberry, pear, coffee, rhododendron, carrot, cotton, cassava, avocado, grape, citrus, papaya, mango, cucurbits, *Allium* spp.

[271] *O. ilicis*: The northern hemisphere including Italy, Japan, Korea, Netherlands, United States of America, Brazil, Paraguay. *O. peruvianus*: Mexico, Guatemala, Trinidad and Tobago, Brazil, Colombia, Ecuador, Peru, Venezuela. *O. pratensis*: Antigua and Barbuda, Barbados, Bermuda, Costa Rica, Dominican Republic, Guadeloupe, Haiti, Martinique, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, French Guiana, Guyana, Suriname. *O. thelytokus*: Comoros, Madagascar, New Caledonia, Reunion, Seychelles. *O. yothersi*: Asia, Central America, the Caribbean, South America.

[272] HPP for coffee and berries (strawberries).

[273] Benin, Egypt, Mauritius, Namibia, Réunion, South Africa, Sudan, Tanzania, Tunisia, India, Iran, Jordan, Oman, Pakistan, Philippines, Saudi Arabia, Sri Lanka, Thailand, United Arab Emirates, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Guatemala, Haiti, Jamaica, Martinique, Mexico, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, U.S. Virgin Islands, United States of America, Brazil, Colombia, Ecuador, Guyana, Venezuela.

[274] Walnut, melon, soybean, common bean, grapevine, Gallini cotton, Bourbon cotton, *Prunus* spp., *Malas* spp., apricot, plum, peach, almond, Japanese plum, *Citrus*, *Rubus* spp.

[276] Host range includes broccoli, cabbage, cucumber, wattles, cashew nut, groundnut, camel's foot, pawpaw, lemon, pummelo, navel orange, grapefruit, coffee, taro, yam, fig, sweet potato, lychee, apple, avocado, beans, plum, guava, European pear, radish, roses, sugarcane, eggplant, sorghum, Singapore almond, cocoa, grape, ginger.

[278] Research conducted on *A. sinicus* tested the effectiveness of pesticides and demonstrated a reduction in damage (Spafford et al., 2016).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
(exotic[275])	beetles			may be attracted to well-lit ports and airports. This would allow for hitchhiking on marine or air cargo. Adults or larvae could be transported in the movement of nursery plants and growing mediums.	geographic distribution.[277]					
Agrilus planipennis	Emerald ash borer	Ash (*Fraxinus* spp.).	Leaves, stems.	Short distance dispersal occurs via flight (often under 1km each year). Long distance dispersal occurs through human-assisted movement of plants, wood packing materials and products.[279]	China, Japan, North and South Korea, Taiwan, Russia, Ukraine, Canada, United States of America.	MEDIUM	LOW	LOW	LOW	NEGLIGIBLE
Anoplophora chinensis	Citrus longicorn beetle	Broad host range of 108 species from 73 genera[280] are potential hosts including citrus, *Acacia* spp., apples, pear, willow, poplar, maple, rose and fig.	Stems, roots, leaves.	Short distance dispersal occurs via flight (up to two kilometres each season). Long distance dispersal occurs through human-assisted movement of eggs, larvae or pupae and adults on plants or within packing materials and wood products.	China, Hong Kong, Indonesia, Japan, Macau, Malaysia, Myanmar, North and South Korea, Philippines, Taiwan, Turkey, Vietnam, Croatia, Italy, Switzerland, United Kingdom.	LOW	MEDIUM	LOW	LOW	NEGLIGIBLE
Anoplophora glabripennis	Asian longicorn beetle.	A wide variety of species.[281]	Stems.	Short distance dispersal occurs via flight (up to two kilometres each season). Long distance dispersal occurs through human-assisted movement of eggs, larvae or pupae and adults on plants or within packing materials and wood products.	China, Lebanon, North and South Korea, Austria, Finland, France, Germany, Italy, Montenegro, Russia, Switzerland, Canada, United States of America.	LOW	MEDIUM	LOW	LOW	NEGLIGIBLE
Conotrachelus nenuphar	Plum curculio	A range of fruit tree hosts.[282]	Fruit.	Short distance dispersal into adjacent woodlands for overwintering. Long distance dispersal could be facilitated	Canada, United States of America.	LOW	MEDIUM	MEDIUM	LOW	VERY LOW

[275] Including *A. compressus, A. ictericus, A. sinicus, A. versutus.*

[277] *A. compressus*: Brunei, Indonesia, Malaysia, Singapore, Thailand, Vietnam. *A. ictericus*: South Africa. *A. sinicus*: China, Hong Kong, India, Indonesia, Macau, Malaysia, Singapore, South Korea, Taiwan, Thailand, Vietnam, United States of America, American Samoa, Micronesia, Guam, Northern Mariana Islands, Palau. *A. versutus*: Madagascar, Mauritius, Réunion, Saint Helena, Seychelles, Bangladesh, British Indian Ocean Territory, India, Indonesia, Malaysia, Pakistan, Sri Lanka, American Samoa, Cook Islands, Fiji, Samoa, Tonga, Vanuatu, Wallis and Futuna.

[279] (Siegert et al., 2010).

[280] (Sjöman et al., 2014).

[281] Hosts include *Acer*, *Aesculus*, *Albizia julibrissin*, *Betula*, *Cercidiphyllum*, *Corylus colurna*, *Elaeagnus angustifolia*, *Fagus sylvatica*, *Fraxinus*, *Koelreuteria paniculata*, *Malus domestica*, *Platanus*, *Populus*, *Pyrus bretschneideri*, *Salix*, *Sorbus aucuparia* and *Ulmus (*van der Gaag & Loomans, 2014).

[282] Japanese plum (*Prunus salicina*), European plum (*Prunus domestica*), peach (*Prunus persica*), sweet cherry (*Prunus avium*), tart cherry (*Prunus cerasus*), apricot (*Prunus armeniaca*), apple (*Malus domestica*) and pear (*Pyrus communis*) (Leskey & Wright, 2007).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
				by human movement of larvae or adults in contaminated fruit, soils (larvae, pupae) and/or adults hitchhiking in packing materials.						
Diabrotica spp. (exotic[283])	Cucumber beetles; Corn rootworms	Various families within vegetables, grains, and fruits.[284]	Whole plant, roots seedlings.	Often slow natural dispersal. Long distance dispersal via undetermined pathways.	*Diabrotica* species have ranging geographic distribution.[285]	LOW	MEDIUM	MEDIUM [286]	MEDIUM	LOW
Diaprepes abbreviatus	Citrus weevil	Widely polyphagous with approximately 270 hosts.[287]	Roots, leaves, whole plant.	Adults are generally poor fliers. Long distance dispersal is through the movement of contaminated soil and plants.	The Americas, the Caribbean.[288]	LOW	HIGH	MEDIUM	MEDIUM	LOW
Leptinotarsa decemlineata	Colorado potato beetle	Solanaceae including tomato, potato, and eggplant.	Leaves, stems, whole plant.	Colorado potato beetles can disperse through wind-borne migration (flying).[289] Adults and larvae can readily be transported on both host or non-host plant materials as well as packaging and transport materials.	Europe, Middle East, the Americas.[290]	LOW	MEDIUM	HIGH	LOW	VERY LOW
Lyctus africanus	Powder post beetle	Attacks sapwood of wide-pored hardwoods provided the sapwood has sufficient starch content.	Trunk.	*Lyctus* spp. are major pests of wooden packing materials in international trade pathways.[291]	Egypt, Sudan, China, India, Israel, Germany, Portugal, United Kingdom, United States of America.	HIGH	MEDIUM	MEDIUM	LOW	VERY LOW

[283] Including *D. balteata, D. speciosa, D. undecimpunctata, D. virgifera.*

[284] Brassicaceae, Chenopodiaceae Convolvulaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Poaceae, Rutaceae, Solanaceae, Vitaceae.

[285] *Diabrotica balteata*: Belize, Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, United States of America, Colombia, Venezuela. *D. speciosa*: Costa Rica, Panama, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, Uruguay, Venezuela. *D. undecimpunctata*: Canada, El Salvador, Guatemala, Mexico, Nicaragua, United States of America, Guam. *D. virgifera*: Albania, Austria, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Switzerland, Ukraine, Canada, Costa Rica, Guatemala, Mexico, Nicaragua, United States of America.

[286] Modelled spread potential shows Australia has a suitable environment for most *Diabrotica* spp. (Marchioro & Krechemer, 2018).

[287] 270 hosts within Agavaceae, Aloaceae, Anacardiaceae, Apiaceae, Aquifoliaceae, Araceae, Araliaceae, Arecaceae, Asclepiadaceae, Bignoniaceae, Bombacaceae, Boraginaceae, Burseraceae, Chrysobalanaceae, Clusiaceae, Combretaceae, Connaraceae, Convolvulaceae, Cupressaceae, Cyperaceae, Dioscoreaceae, Ebenaceae, Euphorbiaceae, Fabaceae, Fagaceae, Iridaceae, Lauraceae, Liliaceae, Lythraceae, Malpighiaceae, Malvaceae, Marantaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Olacaceae, Oleaceae, Passifloraceae, Piperaceae, Poaceae, Polygonaceae, Primulaceae, Rhizophoraceae, Rosaceae, Rubiaceae, Rutaceae, Sapindaceae, Sapotaceae, Solanaceae, Zygophyllaceae (Weissling et al., 2019).

[288] Antigua and Barbuda, Barbados, British Virgin Islands, Costa Rica, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, U.S. Virgin Islands, United States of America, French Guiana.

[289] (Wang et al., 2017).

[290] Armenia, Azerbaijan, China, Georgia, Iran, Iraq, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Albania, Andorra, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Canada, Cuba, Guatemala, Mexico, United States of America.

[291] (Lan-Yu & Geis, 2019).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Monochamus spp. (exotic[292])	Longhorn beetles	*Pinus* spp., spruce, fir, larches, hemlocks, and other softwoods.	Whole plant, fruits, pods, leaves, stems.	11 species intercepted globally. *Monochamus alternatus* intercepted 68 times - one of the most frequently intercepted species. Most likely pathway is wood packaging.	*Diabrotica* species have ranging geographic distribution.[293]	MEDIUM	MEDIUM	MEDIUM	LOW[294]	VERY LOW
Popillia japonica	Japanese beetle	Broad host range (more than 300 spp.) including apple, stone fruit, rose, *Rubus*, grapevine, soybean, poplar, turf, maple, and rhubarb.	Larvae feed on roots. Adults feed on leaves, flowers, and fruit.	Flights are usually only short distances. Long distance dispersal could be facilitated by human movement of larvae or adults in contaminated plant or packing materials as well as soil.	Japan, Italy, Portugal, India, Russia, Switzerland, Canada, United States of America.	MEDIUM	MEDIUM *295*	MEDIUM	LOW	VERY LOW
Rhynchophorus spp. (exotic[296])	Palm weevils	Arecaceae, papaya, citrus, pineapple, mango, banana, plantain, avocado, guava, cocoa.	Apical growth area, stem.	International trade of palms may facilitate long distance movements. Adults can naturally disperse long distances.[297]	*Rhynchophorus ferrugineus* is distributed in Asia, Oceania, Europe, Middle East.[298] *R. palmarum* is distributed in the Americas, the Caribbean.[299]	LOW	HIGH	HIGH	MEDIUM	LOW
Tomicus piniperda	Pine shoot beetle	*Pinus* spp. (including *P. sylvestris* and *P. radiata*), *Abies* spp., *Larix* spp., *Picea* spp., *Pseudotsuga* spp.	Stems and shoots.	Multiple interceptions internationally. One of the most frequently intercepted Curculionidae.[300]	Asia, Middle East, Europe.[301]	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE

[292] Including *M. alternatus, M. galloprovinicialis, M. titillator, M. saltuarius, M. scutellatus*.

[293] *M. alternatus*: China, Japan, Korea, Laos, Taiwan, Vietnam. *M. galloprovincialis*: Algeria, Morocco, Tunisia, China, Kazakhstan, Mongolia, Albania, Armenia, Austria, Azerbaijan, Belarus, Bosnia and Herzegovina, Croatia, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine. *M. titillator*: Canada, United States of America, Cuba. *M. saltuarius*: China, Japan, Korea, Mongolia, Austria, Croatia, Czechia, Germany, Italy, Lithuania, Poland, Romania, Russia, Slovakia, Switzerland, Ukraine. *M. scutellatus*: Canada, Mexico, United States of America.

[294] *Monochamus* spp. are the main vectors of *B. xylophilus* which is a nematode that causes pine wilt disease (Robertson et al., 2008).

[295] (Shanovich et al., 2019).

[296] Including *R. ferrugineus*, *R. palmarum*.

[297] *Rhynchophorus ferrugineus* typically fly <500 m to several kilometres. A small number of insects have recorded >60 km flight in 24 hrs. *R. palmarum* can record an average flight distance of ~41km (Male) and ~53 km (Females; max. 140km) in 24 hrs.

[298] Djibouti, Egypt, Libya, Mauritania, Morocco, Tunisia, Bahrain, Bangladesh, Cambodia, China, Georgia, Hong Kong, India, Iran, Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Myanmar, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Sri Lanka, Syria, Taiwan, Thailand, Turkey, United Arab Emirates, Vietnam, Yemen, Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Malta, Montenegro, Portugal, Russia, Spain, Aruba, Curaçao, Netherlands Antilles.

[299] Barbados, Belize, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Martinique, Mexico, Nicaragua, Panama, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

[300] The pine shoot beetle (*Tomicus piniperda*) is a potential vector of the pitch canker disease (*Fusarium circinatum*) pathogen. The insect could transmit the pathogenic fungus during its maturation or regeneration feeding on the shoots of healthy pine crowns (Bezos et al., 2015).

[301] China, Georgia, Israel, Japan, Korea, Turkey, Algeria, Morocco, Tunisia, Canada, United States of America, Austria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Xylosandrus compactus	Black twig borer	Broad host range across over 225 species.[302]	Stem.	Natural dispersal of at least 200m up to several kilometres, especially if aided by wind. The movement of infected plant materials and waste material is a likely pathway of entry.	Africa, Asia, the Americas, Oceania.[303]	MEDIUM	HIGH	HIGH	LOW	LOW
Diptera (flies)										
Chromatomyia horticola	Pea leafminer	Wide host range from 36 families including: Asteraceae, Brassicaceae, Fabaceae, Alliaceae, Cucurbitaceae.	Leaves.	Could potentially enter on plant material, however this pathway is regulated.	Widely distributed in Asia, Europe, America, Africa.[304]	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW
Delia antiqua	Onion fly	Onion, shallot, Japanese bunching onion (Welsh onion), leek, garlic, chives, and flowering bulbs.	Bulb, foliage, roots, seedling.	Could potentially enter via hitchhiking, contaminated soil and/or plant materials.	Widespread Asia, Europe, the Americas, Middle East.[305]	HIGH	MEDIUM	HIGH	LOW	LOW
Delia florilega	Turnip maggot	Onion, leek, cauliflower, cabbage, cruciferous crops, common bean, tomato, potato, maize, garlic and flowering bulbs.	Bulb, seedling.	Could potentially enter via hitchhiking, contaminated soil and/or plant materials.	Kazakhstan, Norway, Poland, Sweden, Russia, Canada (Quebec), United States of America (New York).	HIGH	MEDIUM	HIGH	LOW	LOW
Eumerus spp. (exotic [306])	Bulb flies	Onion, garlic *Narcissus*, hyacinth, tulip, grapefruit, tomato, carrot, iris, parsnip, potato, *Fritillaria* spp. (lily).	Bulbs.	Moderate dispersal of adults through flight. Could potentially enter via hitchhiking, contaminated soil and/or infested host materials (potentially borne internally).	Japan, Taiwan, Russia, Romania, United Kingdom, United States of America, Canada, New Zealand.	MEDIUM	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE

[302] Range includes soursop, tea, coffee, *Acacia* spp., cinnamon, macadamia, mango, avocado, pine, and mahogany.
[303] Benin, Cameroon, Central African Republic, Comoros, Congo (DRC), Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Mauritania, Mauritius, Nigeria, Réunion, Senegal, Seychelles, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zimbabwe, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, France, Greece, Italy, Monaco, Spain, British Virgin Islands, Cuba, Curaçao, Netherlands Antilles, Puerto Rico, U.S. Virgin Islands, United States of America, American Samoa, Fiji, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Brazil, Ecuador, Peru.
[304] Cabo Verde, Cameroon, Central African Republic, Congo (DRC), Egypt, Eritrea, Ethiopia, Gabon, Gambia, Kenya, Libya, Madagascar, Morocco, Rwanda, Senegal, South Africa, Uganda, Zimbabwe, China, India, Indonesia, Israel, Japan, Jordan, Malaysia, Mongolia, Nepal, North Korea, Pakistan, Philippines, South Korea, Taiwan, Thailand, Turkey, Vietnam, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Denmark, Faroe Islands, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Malta, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.
[305] Egypt, French Southern and Antarctic Lands, Armenia, China, Georgia, India, Iran, Iraq, Israel, Japan, Kazakhstan, Mongolia, North Korea, Philippines, South Korea, Turkey, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, United Kingdom, Antigua and Barbuda, Canada, Costa Rica, Mexico, United States of America, Brazil, Colombia.
[306] *Eumerus strigatus* is established in Australia.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Liriomyza bryoniae	Tomato leaf miner	Wide range of hosts.[307]	Leaves.	Adults capable of flight. Could potentially enter via hitchhiking, contaminated soil and/or infested plant materials (potentially borne internally).	Asia, Europe, Middle East.[308]	HIGH	HIGH	HIGH	MEDIUM	MEDIUM[309]
Liriomyza sativae	Vegetable leaf miner	Primary hosts are within Solanaceae, Fabaceae and Asteraceae.[310]	Leaves.	Adults capable of flight. Could potentially enter via hitchhiking, contaminated soil and/or infested plant materials (potentially borne internally).	Widespread in Asia, the Americas, Africa, Middle East, the Caribbean, Oceania.[311] *Liriomyza sativae* is contained within the Queensland - Far Northern Biosecurity Zones 1 & 2 in Australia.	HIGH	HIGH	HIGH	MEDIUM	MEDIUM[312]
Liriomyza trifolii	American serpentine leaf miner	Wide host range over 400 species of plants.[313]	Leaves.	Adults capable of flight. Could potentially enter via hitchhiking, contaminated soil and/or infested plant materials (potentially borne internally).	Wide distribution. Present on most continents and in many countries (excluding Australia and New Zealand).[314]	HIGH	HIGH	HIGH	MEDIUM	MEDIUM

[307] Amaranthaceae, Apiaceae, Asteraceae, Brassicaceae, Caryophyllaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Liliaceae, Papaveraceae, Poaceae, Scrophulariaceae, Solanaceae, Verbenaceae.

[308] Egypt, Morocco, China, India, Indonesia, Iraq, Israel, Japan, Nepal, South Korea, Taiwan, Turkey, Turkmenistan, Vietnam, Albania, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovenia, Spain, Sweden, Ukraine, United Kingdom.

[309] HPP for potatoes and vegetables.

[310] Other host families include Amaranthaceae, Apiaceae, Brassicaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Lamiaceae, Liliaceae, Malvaceae, Poaceae, Polemoniaceae.

[311] Cameroon, Egypt, Kenya, Nigeria, Sudan, Zimbabwe, Bangladesh, China, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Malaysia, Oman, Pakistan, Sri Lanka, Thailand, Turkey, Uzbekistan, Vietnam, Yemen, Antigua and Barbuda, Bahamas, Barbados, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Guatemala, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, American Samoa, Cook Islands, Federated States of Micronesia, French Polynesia, Guam, New Caledonia, Northern Mariana Islands, Papua New Guinea, Samoa, Vanuatu, Argentina, Brazil, Chile, Colombia, Ecuador, French Guiana, Peru, Venezuela.

[312] HPP for potatoes.

[313] The main host families and species include: Apiaceae (*A. graveolens*), Asteraceae (*Aster* spp., *Chrysanthemum* spp., *Gerbera* spp., *Dahlia* spp., *Ixeris stolonifera, Lactuca sativa, Lactuca* spp., *Zinnia* spp.), Brassicaceae (*Brassica* spp.), Caryophyllaceae (*Gypsophila* spp.), Chenopodiaceae (*Spinacia oleracea, Beta vulgaris*), Cucurbitaceae (*Cucumis* spp., *Cucurbita* spp.), Fabaceae (*Glycine max, Medicago sativa, Phaseolus vulgaris, Pisum sativum*, *Pisum* spp., *Trifolium* spp., *Vicia faba*), Liliaceae (*A. cepa, Allium sativum*) and Solanaceae (*Capsicum annuum, Capsicum frutescens, Petunia* spp., *Solanum lycopersicum, Solanum* spp.).

[314] Benin, Côte d'Ivoire, Egypt, Ethiopia, Guinea, Kenya, Madagascar, Mauritius, Mayotte, Morocco, Nigeria, Réunion, Senegal, South Africa, Sudan, Tanzania, Tunisia, Zambia, Zimbabwe, China, India, Indonesia, Iran, Israel, Japan, Jordan, Lebanon, Oman, Philippines, Saudi Arabia, South Korea, Taiwan, Turkey, United Arab Emirates, Vietnam, Yemen, Austria, Belgium, Bosnia and Herzegovina, Croatia, Cyprus, Finland, France, Greece, Italy, Malta, Montenegro, Netherlands, Portugal, Romania, Russia, Serbia, Spain, Switzerland, Bahamas, Barbados, Bermuda, British Virgin Islands, Canada, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Guatemala, Martinique, Mexico, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Trinidad and Tobago, U.S. Virgin Islands, United States of America, American Samoa, Federated States of Micronesia, Guam, Northern Mariana Islands, Samoa, Tonga, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Peru, Venezuela.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Merodon spp. (exotic[315])	Bulb flies	*Amaryllis*, *Galtonia, Flanthus, Hyacinthus*, *Iris, Leucofum, Narcissus, Scilla, Vallota, Allium*, lilies, and tulips.[316]	Bulbs.	Moderate dispersal of adults through flight (up to 400 m).[317] Could potentially enter via hitchhiking, contaminated soil and/or infested host materials (potentially borne internally).	*Merodon equestris*: Netherlands, Poland, United Kingdom.	MEDIUM	MEDIUM	HIGH	MEDIUM	LOW
Nemorimyza maculosa (syn. *Amauromyza maculosa*)	Chrysanthemum leaf miner; Blotch leafminer	Found most on genera of Asteraceae.[318]	Leaves.	Although adults can fly, natural spread is not considered its main mode for long distance dispersal. Instead, human-assisted transport via plant materials (including cut flowers) is considered a primary pathway for spread. *N. maculosa* may potentially be borne internally.	The Caribbean, the Americas, Europe.[319]	MEDIUM	HIGH	HIGH[320]	VERY LOW	VERY LOW
Psila rosae	Carrot rust fly	Carrot, parsnip, celery, parsley, and other members of Apiaceae.	Roots, crown, petioles.	There is considerable risk of the species being carried as a larva in root crops.	Europe, Middle East, the Americas, Oceania.[321]	HIGH	HIGH	MEDIUM	LOW	LOW
Gastropoda (snails and slugs)										
Arion vulgaris	Spanish slug	A. vulgaris utilises a wide variety of host plants and food sources.[322]	Whole plant. Above ground, external feeding.	Introduction to new areas is possible through the movement of plant materials (including garden and horticultural waste) or hitchhiking. *Arion vulgaris* often colonises anthropogenically disturbed environments.	Europe.[323]	MEDIUM	HIGH	HIGH	HIGH	HIGH

[315] Including *M. equestris*.
[316] (Ricarte et al., 2017).
[317] (Conn, 1976).
[318] *Aster, Bidens, Calendula, Chrysanthemum, Conyza, Dahlia, Emilia, Erigeron, Eupatorium, Gaillardia, Gerbera, Helenium, Helianthus, Lactuca Melanthera, Pericallis* x *hybrida, Porophyllum, Pterocaulon, Solidago, Tagetes, Zinnia*.
[319] Portugal, Spain, United Kingdom, Antigua and Barbuda, Bahamas, Barbados, Bermuda, Canada, Cayman Islands, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Jamaica, Martinique, Mexico, Saint Kitts and Nevis, Trinidad and Tobago, United States of America, Argentina, Bolivia, Brazil, Chile, Colombia, French Guiana, Guyana, Peru, Uruguay, Venezuela.
[320] (EFSA PLH, 2020).
[321] Georgia, Japan, Mongolia, Turkey, Austria, Belarus, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Montenegro, Netherlands, Norway, Poland, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America, New Zealand.
[322] Hosts are found within Apiaceae, Asteraceae, Brassicaceae, Caryophyllaceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Geraniaceae, Hydrophyllaceae, Iridaceae, Lamiaceae, Liliaceae, Malvaceae, Onagraceae, Paeoniaceae, Papaveraceae, Plantaginaceae, Poaceae, Polygonaceae, Portulacaceae, Ranunculaceae, Rosaceae, Scrophulariaceae, Solanaceae, Tropaeolaceae, Urticaceae, Violaceae.
[323] Andorra, Austria, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Liechtenstein, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Caracollina lenticula	Lens snail; Lentil snail	Polyphagous including grains (especially lentils), cabbage and wheat.	Above ground plant parts.	Infested plant materials, contaminated soil, tools and machinery, hitchhiking, pet trade, commercial purposes (i.e. food, medicine), and unregulated entry pathways.	Turkey, Greece, Malta, Atlantic Islands.	HIGH	HIGH	HIGH	MEDIUM	MEDIUM
Discus rotundatus	Rotund disc	Primarily a litter feeder mainly ingesting plant debris, humus, algae, and fungi.	-	As a soil and leaf litter inhabiting snail, *D. rotundatus* can be accidently introduced via the horticultural and nursery trade.	Europe, the Americas, Africa.[324]	HIGH[325]	HIGH	HIGH	MEDIUM[326]	MEDIUM
Lissachatina fulica (syn. *Achatina fulica*)	Giant African snail	Highly polyphagous, feeding on over 500 species.	Whole plant.	Infested plant materials, contaminated soil, tools and machinery. Hitchhiking, pet trade, commercial purposes (i.e., food, medicine), and unregulated pathways.	Widely distributed in the Americas, the Caribbean, Asia, Africa, Europe, Oceania.[327]	HIGH	HIGH	HIGH	HIGH	HIGH[328]
Massylaea spp. (exotic[329])	Chocolate-band snail	Polyphagous including grapevine, *Citrus* spp.	Above ground plant parts.	Infested plant materials. Contaminated soil, tools and machinery. Hitchhiking, pet trade, commercial purposes (i.e. food, medicine), and unregulated entry pathways.	*M. vermiculata* is distributed in Israel, Egypt, Spain, Bulgaria, Greece, Ukraine, Turkey, Northern Africa.	HIGH[330]	HIGH	HIGH	MEDIUM	MEDIUM
Meghimatium pictum	Chinese slug	A wide range of host species. Qualitative damage to grapevine and fox grape production systems.[331]	Leaves, fruit.	Infested plant materials, hitchhiking, natural dispersal.	China, Taiwan, Malaysia, India, Brazil, Argentina.	MEDIUM	MEDIUM	MEDIUM	LOW	VERY LOW

[324] Algeria, South Africa, Tunisia, Turkey, Austria, Belarus, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America, New Zealand, Brazil.
[325] This species was detected in Victoria in 2018 by DAWE (now DAFF) at an Approved Arrangement site. No national response was initiated but the site received treatments.
[326] Recorded as a vector of tobacco mosaic virus (Robinson, n.d; Heinze, 1958).
[327] Central African Republic, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Mauritius, Nigeria, Réunion, Seychelles, Tanzania, Togo, Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Israel, Japan, Malaysia, Maldives, Myanmar, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, Spain, Anguilla, Antigua and Barbuda, Barbados, Cuba, Dominica, Dominican Republic, Guadeloupe, Martinique, Netherlands Antilles, Saint Lucia, Trinidad and Tobago, United States of America, American Samoa, Christmas Island, Federated States of Micronesia, French Polynesia, Guam, Marshall Islands, New Caledonia, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Vanuatu, Wallis and Futuna, Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Venezuela.
[328] HPP for melons, tomatoes, vegetables.
[329] Including *M. vermiculata* (syn. *Eobania vermiculata*)
[330] Introductions have occurred in Germany, Hungary, Netherlands, United States of America, Australia (not established) Japan, South Africa, Saudi Arabia, Jordan, and Iran. Frequently intercepted at Australian border as a hitchhiker, particularly in/on containers (Ronsmans & Van den Neucker, 2016).
[331] (Baronio et al., 2014).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Monacha spp. (exotic[332])	Hygromiid snails	Polyphagous including fodder crops, ornamentals (e.g. *Ruscus* and *Aspidistra*) and horticultural crops.[333]	Above ground plant parts.	Infested plant materials, contaminated soil, tools and machinery, hitchhiking, pet trade, commercial purposes (i.e. food, medicine), and unregulated entry pathways.	*Monacha* spp. distribution includes Turkey, Georgia, Russia, Arabian Peninsula, Iran, Azerbaijan, United States of America, Canada.	HIGH[334]	HIGH	HIGH	MEDIUM[335]	MEDIUM
Pomacea canaliculata	Golden apple snail	Rice, taro, *Azolla* spp., wild rice (*Zizania* spp.).[336]	Leaves, stems.	Infested plant materials, contaminated soil, tools and machinery, hitchhiking, pet/aquarium trade, commercial purposes (i.e. food, medicine), and unregulated entry pathways.	Southern African, Europe, Asia, the Americas, Oceania.[337]	HIGH[338]	HIGH	HIGH	NEGLIGIBLE	NEGLIGIBLE
Veronicella cubensis	Cuban slug	Wide host range.[339]	Leaves, stems, flowers.	Infested plant material and/or soils as well as hitchhiking.	The Americas, Oceania.[340]	MEDIUM	HIGH	HIGH	HIGH	HIGH
Xerolenta obvia	Heath snail	Feeds on a wide range of plant species (254 genera) e.g., grasses, ornamentals, trees (including fruit), shrubs and	Above ground plant parts.	Infested plant materials, contaminated soil, tools, and machinery, hitchhiking, pet trade, commercial purposes (i.e., food, medicine), and unregulated entry	Hungary, Bulgaria, Czechia, Italy, Poland, Slovakia, Ukraine, Canada, United States of America.[342]	HIGH[343]	HIGH	HIGH	HIGH	HIGH

[332] Including *M. cartusiana, M. cantiana* and *M. syriaca*.
[333] *Monacha obstructa* is a serious pest of clover (Mohammed, 2006) and *Citrus* in Egypt (Hashem & El-Halawany, 1996).
[334] *Monacha* spp. have been intercepted in storerooms and containers of ships as well as on baggage, soil (with or without plants), and cargo.
[335] Species in the Hygromiidae family are considered pests of fodder crops and serious pests in Europe. In addition, they can vector of the trematode parasite *Brachylaima*, as described in Egypt (Rashed, 2008). These factors may have implications to trade and market access.
[336] Often associated with aquatic environments.
[337] Réunion, China, Hong Kong, Indonesia, Iraq, Israel, Japan, Laos, Malaysia, Myanmar, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, Vietnam, Spain, Dominican Republic, Mexico, United States of America, Guam, Papua New Guinea, Argentina, Chile, Colombia, Suriname, Uruguay.
[338] Eggs frequently intercepted on containers at border.
[339] Hosts include *Annona muricata* (soursop), *Artocarpus altilis* (breadfruit), *Averrhoa bilimbi* (bilimbi), *Averrhoa carambola* (carambola), *Brassica* spp. (cabbages, cauliflowers), *Brugmansia* spp., *Capsicum* spp., *Carica papaya* (pawpaw), *Cecropia peltata* (trumpet tree), *Cecropia schreberiana* (pumpwood), *Citrus* spp., *Coffea* (coffee), *Colocasia esculenta* (taro), *Colocasia* spp., *Crotalaria retusa* (rattleweed), *Cucumis* spp., *Cucurbita* spp., *Cyanthillium cinereum* (little ironweed), *Cyanthillium* spp., *Dioscorea* spp., *Eulophia alta*, *Eupatorium odoratum*, *Euphorbia cyathophora*, *Hibiscus* (rosemallows), *Ipomoea batatas* (sweetpotato), *Lactuca* spp., *Lantana camara* (lantana), *Mangifera indica* (mango), *Manihot esculenta* (cassava), *Mentha spicata* (Spearmint), *Miconia* spp., *Mikania micrantha* (bitter vine), *Mimosa pellita* (catclaw mimosa), *Mimosa pudica* (sensitive plant), *Morinda citrifolia* (Indian mulberry), *Musa* (banana), *Neomarica caerulea* (walking iris), *Nephrolepis biserrata, Nephrolepis multiflora, Ocimum basilicum* (basil), *Paspalum* spp., *Passiflora* spp., *Peperomia mariannensis, Philodendron* spp., *Piper aduncum* (spiked pepper*), Pipturus albidus, Pteridium* spp., *Sida rhombifolia, Solanum melongena* (aubergine), *Spermacoce laevis, Tacca leontopetaloides* (East Indian arrowroot), *Thunbergia* spp., *Trimezia* spp., *Urena lobata* (caesar weed), *Vernonia cinerea, Vernonia* spp., *Vinca* (periwinkle).
[340] Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Haiti, Jamaica, Puerto Rico, Saint Kitts and Nevis, U.S. Virgin Islands, United States of America, American Samoa, Micronesia, Guam, Northern Mariana Islands. Undetected in pacific basin countries for many years due to being misidentified as *Sarasinula plebeia* (present in Australia).
[342] (Forsyth et al., 2015).
[343] It has been intercepted in shipments of vehicles from Europe at the Australian border.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
		weeds.[341]		pathways.						
Xeropicta spp. (exotic[344])	Hygromiid snails	Wide host range which includes grapevine, citrus and olive.[345]	Above ground plant parts.	*Xeropicta* spp., can move as a hitchhiker via plants and contaminated produce. *X. derbentina* and *X. krynickii* have largely expanded their range as a result of human activities.[346]	Mediterranean region, Middle East.	HIGH	HIGH	HIGH	MEDIUM	MEDIUM
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)										
Acanthocoris scabrator	Squash bug	Varied host range.[347]	Stems, branches, leaves.	Could be transported by international trade in fruit or host plants.	Ethiopia, China, India, Indonesia, Malaysia, Myanmar, Sri Lanka.	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Aleurocanthus woglumi	Citrus blackfly	Wide host range of 169 species.[348]	Leaves and stems.	Winged adults are capable of some down-wind flight. Long-range dispersal is mainly by international trade in planting materials of citrus or other hosts, or possibly by contamination on transported fruits or leaves.	Asia, Middle East, the Americas, the Caribbean, Africa.[349]	HIGH	MEDIUM	HIGH	LOW	LOW
Aleurodicus dugesii	Giant whitefly	Wide host range of potentially 200 species.[350]	Leaves.	Spread through flight and accidental introductions of infested plant materials.	Indonesia, Pakistan, Belize, Costa Rica, El Salvador, Guatemala,	HIGH	MEDIUM	HIGH	LOW	LOW

[341] (Montana Department of Agriculture, n.d.).
[344] Including *X. derbentina, X. krynickii.*
[345] High populations of *X. derbentina* are considered to be problematic in vineyards and orchards, causing bud canker in France. *X. krynickii* is a pest of citrus in Egypt.
[346] (Aubry et al., 2005).
[347] Bell pepper, *Cucurbita maxima* (giant pumpkin), *Mangifera indica* (mango), *Morus* (mulberrytree), *Physalis peruviana* (Cape gooseberry), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Ipomoea carnea.*
[348]Host taxa from Acanthaceae, Actinidiaceae, Anacardiaceae, Annonaceae, Apocynaceae, Araceae, Arecaceae, Asclepiadaceae, Bignoniaceae, Bixaceae, Buxaceae, Caricaceae, Cucurbitaceae, Fabaceae, Flacourtiaceae, Geraniaceae, Juglandaceae, Lauraceae, Loranthaceae, Malvaceae, Meliaceae, Moraceae, Musaceae, Myrtaceae, Nyctaginaceae, Oleaceae, Oxalidaceae, Passifloraceae, Piperaceae, Polygonaceae, Primulaceae, Punicaceae, Rosaceae, Rubiaceae, Rutaceae, Salicaceae, Sapindaceae, Sapotaceae, Solanaceae, Vitaceae, Zingiberaceae.
[349] Eswatini, Kenya, Nigeria, Seychelles, South Africa, Tanzania, Uganda, Zimbabwe, Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Iran, Laos, Malaysia, Maldives, Myanmar, Nepal, North Korea, Oman, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, United Arab Emirates, Vietnam, Yemen, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Haiti, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago, United States of America, Christmas Island, Papua New Guinea, Brazil, Colombia, Ecuador, French Guiana, Guyana, Suriname, Venezuela.
[350] Host taxa include *Acacia longifolia, Acacia saligna, Aralia*, avocado, bamboo, *Bauhinia galpinni, Begonia, Bishofia javanica, Bombax* sp., *Bougainvillea variegata, Brachychiton* spp., *Buxus japonica* (boxwood), *Calliandra , Canna*, castor bean, *Cestrum nocturnum*, citrus, *Clerodendrum* (Fragrant clerodendron), *Coleus, Colacasia* (Elephant ear, taro), *Cyperus papyrus* (papyrus), *Erythrina , Eucalyptus* spp., *Euphorbia pulcherrima* (poinsettia), *Ficus* spp., *Fuchsia*, ginger, gladiolus, *Gossypium hirsutum* (Bourbon cotton), *Hedera helix* (ivy), *Heliconia , Hibiscus* spp., *Hoya* sp., *Howea forsteriana* (paradise palm), lantana, liquidambar (sweet gum), *Mandevilla, Morus alba, Murraya paniculata, Musa* spp. (banana*), Myoporum, Nandina domestica* (heavenly bamboo*), Nasturtium, Orchidaceae* (orchids), *Osteospermum* sp., *Passiflora* (passionflower), *Pelargonium* spp., *Persea americana* (avocado), *Philodendron* spp., *Pittosporum undulatum, Plectranthus, Plumeria* (frangipani), *Ricinus communis* (castor bean), *Pyrostegia venusta* (Goldenshower), *Salix* spp. (willow), *Schefflera* (umbrella tree), *Schinus terebinthifolius, Solandra* spp., *Solanum* (nightshade), *Strelitzia* spp. (bird of paradise), *Syzygium* sp. (Eugenia), *Tupidanthus , Verbesina, Vitex lucens*, water lily, *Xylosma compacta, Xylosma congestum, Zingiber officinale* (ginger) (Redak et al., 2021).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
					Mexico, Nicaragua, United States of America, Venezuela.					
Aleurotrachelus trachoides	Chili whitefly	Sweetpotato, bell pepper, citrus, tomato, avocado, lime, taro, eggplant, lettuce.	Leaves, shoots.	Infested plant materials. Adults are capable of flight (assisted by wind) over short distances.	The Americas, Africa, Oceania.[351]	LOW	MEDIUM	LOW	NEGLIGIBLE	NEGLIGIBLE
Amblypelta cocophaga	Coconut bug	Coconut, mango, papaw, melon, kapok, navel orange, cassava, peach, sugarcane, cocoa and *Eucalyptus deglupta*.	Stems, growing points, and fruit.	Infested plant material. Adults capable of flight.	Singapore, Fiji, Papua New Guinea, Solomon Islands.	HIGH	HIGH	HIGH	MEDIUM	MEDIUM
Aphis fabae	Black bean aphid	Very broad host range with over 200 hosts.[352]	Leaves.	Infested plant material. Adults capable of flight and can be spread long distances on strong wind currents.	Wide global distribution (excluding Australia and New Zealand).[353]	HIGH	HIGH	HIGH	MEDIUM[354]	MEDIUM[355]
Aphis gossypii (exotic strains)	Cotton aphid	Very broad host range.[356]	Leaves, inflorescence, stems.	Infested plant material. Adults capable of flight and can be spread long distances on strong wind currents.	Wide global distribution.[357]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[358]

[351] Comoros, Mayotte, Mozambique, Nigeria, Réunion, Tanzania, India, Antigua and Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, Turks and Caicos Islands, U.S. Virgin Islands, United States of America, Federated States of Micronesia, Fiji, French Polynesia, Guam, Nauru, Tonga, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Venezuela.

[352] Including beans, peas, beets, crucifers, cucurbits, chilli bell pepper, tomato, potato, maize, fennel, cotton and ornamentals (including dahlia and tulip).

[353] Algeria, Burundi, Cameroon, Congo (DRC), Côte d'Ivoire, Egypt, Ethiopia, Kenya, Libya, Malawi, Mauritius, Morocco, Niger, Nigeria, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zimbabwe, Afghanistan, China, Georgia, Hong Kong, India, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Nepal, Pakistan, Philippines, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Yemen, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Bermuda, Bonaire, Saint Eustatius and Saba, Canada, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Chile, Peru, Uruguay.

[354] Transmits a range of pathogenic viruses.

[355] HPP for potatoes and vegetables.

[356] At least 200 economically important crops including cotton, papaya, citrus, bell pepper, melon, cucumber, pumpkin, carnation, sunflower, jasmine, lettuce, lychee, macadamia, apple, passionfruit, avocado, tomato, potato, maize, Asteraceae, Myrtaceae, Ranunculaceae and roses.

[357] Algeria, Angola, Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Egypt, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Réunion, Rwanda, Saint Helena, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe, Afghanistan, Azerbaijan, Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Laos, Lebanon, Malaysia, Myanmar, Nepal, North Korea, Oman, Pakistan, Palestine, Philippines, Qatar, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Vietnam, Yemen, Albania, Austria, Belarus, Belgium, Bulgaria, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Italy, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Anguilla, Bahamas, Barbados, Bermuda, British Virgin Islands, Canada, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, American Samoa, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Papua New Guinea, Pitcairn, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna, Argentina, Bolivia, Brazil, Chile, Colombia, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

[358] HPP for potatoes.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Bemisia tabaci (exotic biotypes and strains)	Silverleaf whitefly	Extremely wide host range of more than 500 species of plants from 63 plant families.	Leaves, stems.	*B. tabaci* are not efficient fliers but can be transported long distances by wind. All stages of the pest can be carried on planting material and cut flowers.	Global distribution.[359] Endemic species of *Bemisia tabaci* are present in Australia.	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[360]
Ceroplastes japonicus	Tortoise wax scale	Polyphagous, attacking more than 100 plant species including maple, tea, citrus, persimmon, ivy, holly, jasmine, sweet bay, and *Prunus* spp.	Leaves, stems.[361]	Wind supported dispersal. Long distance movements are most likely via infested plant materials and hitchhiking.	Armenia, Azerbaijan, China, Georgia, Japan, Nepal, South Korea, Turkey, Croatia, France, Germany, Greece, Hungary, Italy, North Macedonia, Russia, Slovakia, Slovenia.	LOW	HIGH	HIGH	LOW	VERY LOW
Daktulosphaira vitifoliae (exotic strains[362])	Grapevine phylloxera	Grapevine.	Roots, leaves.	Infested plant material and soil. Hitchhiking.	Widely distributed in many viticulture regions around the world.[363]	MEDIUM	HIGH	MEDIUM	MEDIUM	LOW
Dialeurodes citri	Citrus whitefly	Broad host range (~80 plant species) including citrus, pear, myrtle, gardenia, ivy, jasmine,	Fruit, flowers, leaves, stem.	Infested plant materials. The underside of leaves may contain colonies with eggs, nymphs, and adults.	Africa, Asia, Middle East, Europe, the Americas.[364]	LOW	HIGH	HIGH	MEDIUM[365]	LOW

[359] Largely global distribution. Algeria, Angola, Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mauritius, Mayotte, Morocco, Mozambique, Nigeria, Réunion, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zimbabwe, Afghanistan, Azerbaijan, Bahrain, Bangladesh, Brunei, Cambodia, China, Georgia, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Vietnam, Yemen, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Finland, France, Germany, Greece, Hungary, Italy, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, United Kingdom, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago, United States of America, American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Argentina, Bolivia, Brazil, Colombia, French Guiana, Guyana, Paraguay, Peru, Uruguay, Venezuela.

[360] HPP for melons, tomatoes, vegetables.

[361] Attacks fruit and stems by sucking sap and excreting large amounts of honeydew which can cause black fungus to cover the surface of plants. The stress on the plant results in reduced yield and fruit quality. Heavy infestation can lead to death of branches and sometimes entire plants.

[362] Australia (NSW, Vic) is known to have 83 genetic strains of *D. vitifoliae* from several hundred that have been documented worldwide (Powell & Korosi, 2014). Of Australia's 83 endemic strains; 49 are confined to roots only, 23 are confined to leaves only, and 11 strains attack both leaf and root material (Umina et al., 2007).

[363] Algeria, Morocco, South Africa, Tunisia, Zimbabwe, Armenia, Azerbaijan, China, Georgia, India, Indonesia, Israel, Japan, Jordan, Kazakhstan, Lebanon, North Korea, South Korea, Syria, Taiwan, Turkey, Uzbekistan, Europe, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Guernsey, Hungary, Italy, Latvia, Luxembourg, Malta, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, United Kingdom, Bermuda, Canada, Mexico, Panama, United States of America, New Zealand, Argentina, Bolivia, Brazil, Colombia, Peru, Uruguay, Venezuela.

[364] Algeria, Egypt, Morocco, Nigeria, Tunisia, Afghanistan, Azerbaijan, Bangladesh, China, Georgia, Hong Kong, India, Israel, Japan, Lebanon, Macau, Pakistan, South Korea, Sri Lanka, Taiwan, Tajikistan, Thailand, Turkey, Uzbekistan, Vietnam, Croatia, France, Greece, Italy, Malta, Montenegro, Russia, Serbia, Slovenia, Spain, United Kingdom, Bahamas, Barbados, Bermuda, Costa Rica, Cuba, El Salvador, Guatemala, Mexico, Puerto Rico, United States of America, Argentina, Chile, Colombia, Guyana, Peru.

[365] *Dialeurodes citri* can potentially vector and transmit viruses e.g. Citrus yellow vein clearing virus (Zhang et al., 2019).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
		stonefruit, magnolia, privet, blackberry, raspberry, and castor bean.								
Diaphorina citri	Asian citrus psyllid	*Citrus* spp. and citrus relatives; *Atalantia, Citropsis, Limonia, Murraya, Bergera* and *Clausena*.	Fruit, flowers, leaves, stem.	*D. citri* is normally spread only locally by natural dispersal. Citrus and even rutaceous materials (budwood, grafted trees, rootstock, seedlings) from infected areas can carry eggs and/or nymphs over longer distances.	Widely distributed in Asia, the Americas, the Caribbean, Middle East, Africa, Oceania.[366]	HIGH	HIGH	HIGH	MEDIUM[367]	MEDIUM[368]
Dysmicoccus neobrevipes	Grey pineapple mealybug	Broad host range across over 100 genera in 53 families including pineapple, apple, citrus, banana, cotton, tomato, vegetables, maize, sugarcane, avocado, mango, ginger, grasses, and clover.	Leaves, stems, inflorescence, fruit.	First instar nymphs ('crawlers') can be wind dispersed. Long distance spread could be aided by infested plant materials and/or hitchhiking.	The Americas, Africa, Europe, Asia, Oceania.[369]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[370]
Halyomorpha halys	Brown marmorated stink bug (BMSB)	Very wide host range, preferring hosts with fruiting structures.[371]	Whole plant, leaves, fruit.	Adults capable of flight. Infested plant materials and hitchhiking. Regularly found in shipping containers.	Asia, Middle East, Europe, the Americas.[372]	HIGH	MEDIUM	MEDIUM	HIGH	MEDIUM[373]

[366] Kenya, Mauritius, Réunion, Tanzania, Afghanistan, Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Iran, Israel, Japan, Laos, Macau, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Taiwan, Thailand, United Arab Emirates, Vietnam, Yemen, Belgium, France, Netherlands, Slovenia, Antigua and Barbuda, Bahamas, Barbados, Belize, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Honduras, Jamaica, Martinique, Mexico, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, U.S. Virgin Islands, United States of America, American Samoa, Guam, Northern Mariana Islands, Papua New Guinea, Timor-Leste, Argentina, Brazil, Colombia, Paraguay, Uruguay, Venezuela.

[367] A vector of *Candidatus* Liberibacter asiaticus (huanglongbing).

[368] HPP for citrus.

[369] Uganda, China, India, Japan, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Italy, Lithuania, Antigua and Barbuda, Bahamas, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, American Samoa, Cook Islands, Fiji, Guam, Kiribati, Marshall Islands, Northern Mariana Islands, Samoa, Brazil, Colombia, Ecuador, Peru, Suriname.

[370] HPP for bananas and pineapples.

[371] Some hosts include apple, Asian pear, European pear, citrus, raspberry, blackberry, strawberry, pea, blueberry, peach, grapevine, cherry, bean, soybean, maize, cotton, sweetcorn, Phalaenopsis orchids, rose, hazelnut, pecan, walnut, maple, oak, fig, olive and vegetable crops (including solanaceous crops), okra, snapdragon, common burdock, horseradish, birch, nettle tree, dogwood, sunflower, hops, holly, crepe myrtle, apricot, plum (Bergmann et al., 2016; Penca & Hodges, 2019).

[372] China, Georgia, Japan, Kazakhstan, North Korea, South Korea, Taiwan, Turkey, Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Liechtenstein, Malta, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Canada, United States of America, Guam, Chile.

[373] HPP for apple and pear, berries (*Rubus* and strawberries), cherries, tree nuts, summerfruit, truffles, vegetables, viticulture.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Homalodisca vitripennis	Glassy-winged sharpshooter	Very broad host range of over 200 species.[374] Host lists continue to grow, primarily within ornamental plants.	Leaves, stems.	Wingless nymphs spread by jumping through the canopy or dropping from plants and walking to new hosts. Adults capable of flight over long distances. Most rapid and long-distance movement is as viable egg masses in nursery stock of either crop or ornamental plants.	United States of America, Mexico, French Polynesia, Easter Island, Cook Islands, Chile.	MEDIUM	HIGH	HIGH	LOW (without *Xylella fastidiosa*) HIGH (with *Xylella fastidiosa*)	LOW (without *Xylella fastidiosa*) HIGH (with *Xylella fastidiosa*)
Lycorma delicatula	Spotted lanternfly	The spotted lanternfly feeds on at least 70 species of crops, trees and woody ornamentals.[375] Preferred host is the Tree of Heaven (*Ailanthus altissima*).	Stems, branches.	Spotted lanternfly can disperse short distances by walking, jumping and flying. Long distance spread is mediated through human-assisted transport (e.g. cargo containers or host materials) of all life stages, especially egg masses that are encased in a waxy, brownish-grey secretion.[376]	China, India, Japan, Laos, South Korea, Taiwan, Vietnam, United States of America.	MEDIUM	MEDIUM[377]	HIGH	LOW	VERY LOW
Lygus hesperus	Western plant bug	Recorded on 110 hosts.[378]	Leaves, stems, inflorescence.	Adults fly. No indication of international spread has been determined. Infested host material(s) could facilitate the dispersal of all life stages.	United States of America.	LOW	HIGH	MEDIUM	MEDIUM	LOW
Lygus lineolaris	Tarnished plant bug	More than 300 host plants.[379]	Leaves.	Adults fly. No indication of international spread has been determined. Infested host materials could facilitate the dispersal of all life stages.	Georgia, Netherlands, Bermuda, Canada, El Salvador, Guatemala, Honduras, Mexico, United States of America.	LOW	HIGH	MEDIUM	MEDIUM	LOW
Lygus rugulipennis	European tarnished	Recorded hosts include 437 plant taxa from 57 families.[380]	Stems, branches,	Adults fly. No indication of international spread has been determined. Infested	Japan, Turkey, Bulgaria, Czechia, Finland, Hungary, Italy, Lithuania, Montenegro, Poland, Russia,	LOW	HIGH	MEDIUM	MEDIUM	LOW

[374] Some hosts include citrus, crape myrtle, *Prunus* spp., blackberry, bottlebrush, bougainvillea, camellia, acacia, daylily, dianthus, chrysanthemum, macadamia, pistachio and grapevine.

[375] Hosts include *Acer* spp. (maple), *Actinidia chinensis, Rhus chinensis, Toxicodendron vernicifluum, Aralia* spp., *Metaplexis japonica, Alnus incana, Betula platyphylla, Arctium lappa, Maackia amurensis, Robinia pseudoacacia, Quercus aliena* (oriental white oak), *Fagus grandifolia, Quercus montana, Philadelphus schrenkii, Juglans mandshurica, Juglans nigra, Juglans sinensis, Pterocarya stenoptera, Magnolia obovata, Magnolia kobus, Liriodendron tulipifera, Cedrela fissilis, Toona sinensis, Morus alba, Morus bombycis, Syringa vulgaris, Platanus occidentalis, Platanus orientalis, Malus, Prunus* spp., *Rosa* spp., *Rubus crataegifolius, Sorbus commixta, Sorbaria sorbifolia, Tetradium daniellii, Phellodendron amurense, Populus* spp., *Salix* spp., *Picrasma quassioides, Ailanthus altissima, Firmiana simplex, Styrax* spp., *Zelkova serrata, Angelica dahurica, Parthenocissus quinquefolia, Vitis* spp.

[376] (Keller et al., 2020; Wolfin et al., 2019).

[377] Counter-seasonal effects may lower the likelihood for successful establishment.

[378] Hosts include apple, pear, sugarbeet, tomato, cotton, strawberry, bean, grapevine, pistachio, carrot, lucerne, safflower, weeds, cucumber, pome and stone fruit.

[379] Host include fruit trees (apple, apricot, cherry, grape), beans, cotton, carrot, potato, cabbage, lettuce, pumpkin, *Medicago, Persea, Amaranthus*, cucumber and ornamental hosts.

[380] Host plant families include Amaranthaceae, Apiaceae, Asteraceae, Brassicaceae, Buxaceae, Cannabaceae, Cucurbitaceae, Cupressaceae, Ericaceae, Facaceae, Grossulariaceaem, Juglandaceae, Lamiaceae, Liliaceae, Malvaceae, Oleaceae, Poaceae, Polygonaceae, Rosaceae, Salicaceae, Solanaceae, Valerianaceae (Holopainen & Varis, 1991).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
	plant bug; Bishop bug		leaves, apical meristem.	host material could facilitate the dispersal of all life stages.	Slovakia, Serbia, Sweden, United Kingdom, Canada.					
Parabemisia myricae	Japanese bayberry whitefly	Polyphagous.[381]	Leaves, stems, fruit.	Adults are capable of flight. Infested plant material.	Africa, Europe, Middle East, Asia, the Americas.[382]	HIGH	HIGH	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Paracoccus marginatus	Papaya mealy bug	Broad host range, over 55 plant species.[383]	Fruit, leaves, stems and trunk.	Adult males can fly. First instar progeny ('crawlers') moves short distances by walking. Wind can disperse all instars considerable distances. Movement on infested plants and fruits may be an important international pathway.	Africa, Asia, the Americas, Oceania.[384]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM
Philaenus spumarius	Meadow froghopper; Meadow spittle bug	Broad host range including apple, Eucalyptus, sweet cherry, almond, peach, raspberry, red clover, blackberry, grapevine, olive, wormwood, tarragon, alfalfa, wheat, oats, corn, strawberry.	Stems.	Adults can actively disperse over moderate distances with modelling between 148–1,933 m spread over an individual's lifespan. Human-assisted movement on host materials and hitchhiking may be important long distance dispersal pathways.	Africa, Middle East, Asia, Europe, Northern America, Oceania.[385]	MEDIUM	MEDIUM	MEDIUM	MEDIUM[386]	LOW
Planococcus spp. (exotic[387])	Mealybugs	*P. ficus:* Fig, mulberry, pomegranate and grapevine. *P. kenyae: Acacia*, beetroot, *Citrus*, coffee, gardenia, sweet potato, *Passiflora*, beans, guava, *Solanum*.	Leaves, flowers, fruit.	Instars are the most active stages and dispersal between and within trees may occur at these stages. Movement of infested plant materials may be a mode of dispersal.	*Planococcus* species have ranging geographic distribution.[388]	MEDIUM	MEDIUM	MEDIUM	NEGLIGIBLE[389]	NEGLIGIBLE

[381] Including *Citrus* spp., avocado, peach, gardenia, *Morus alba*, *Rhododendron* spp., *Salix* spp., tomato, fig, and coffee.
[382] Algeria, Côte d'Ivoire, Egypt, Morocco, Tunisia, China, Hong Kong, India, Iran, Israel, Japan, Lebanon, Sri Lanka, Taiwan, Turkey, Vietnam, Cyprus, France, Greece, Italy, Portugal, Spain, Ukraine, Guadeloupe, Mexico, Trinidad and Tobago, United States of America, Papua New Guinea, Brazil, Venezuela.
[383] This includes papaya, avocado, citrus, mango, cherry, pomegranate, hibiscus, cotton, tomato, eggplant, bell pepper, bean, pea and sweetpotato.
[384] Benin, Cameroon, Gabon, Ghana, Kenya, Mauritius, Mozambique, Nigeria, Réunion, Tanzania, Togo, Bangladesh, Cambodia, China, India, Indonesia, Israel, Laos, Malaysia, Maldives, Oman, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, the Caribbean, Costa Rica, Cuba, Dominican Republic, Guatemala, Mexico, Puerto Rico, United States of America, Micronesia, Guam, Northern Mariana Islands, Palau, French Guiana.
[385] Algeria, Morocco, Tunisia, Afghanistan, Armenia, Azerbaijan, China, Georgia, Iran, Iraq, Japan, Kazakhstan, Kyrgyzstan, Mongolia, Syria, Turkey, Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America, New Zealand.
[386] Vector of *Xyllela fastidiosa*, *Candidatus* Phytoplasma mali and other phytoplasma diseases (EFSA PLH Panel, 2019).
[387] Including *P. ficus, P. kenyae*.
[388] *P. ficus*: India, Pakistan, Canary Islands, France, Italy, Greece, Turkey, Egypt, Iran, Israel, Tunisia, South Africa, United States of America, Mexico, Argentina, Brazil, Peru. *P. kenyae*: Burundi, Congo (DRC), Côte d'Ivoire, Ghana, Kenya, Malawi, Mauritius, Nigeria, Rwanda, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zimbabwe.
[389] Both vectors of grapevine and various cocoa viruses.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Pseudococcus spp. (exotic[390])	Mealybugs	Wide host range.[391]	Whole plant, leaves, stems, fruit.	Male adults capable of flight over short distances. Wind dispersal of crawlers over short distances. Infested plant material (including fruit) may facilitate long distance spread.	*Planococcus* species have ranging geographic distribution.[392]	MEDIUM	HIGH	HIGH	LOW[393]	LOW
Pseudotheraptus wayi	Coconut bug	Coconut, macadamia, cashew nut, carambola, pecan, cinnamon, loquat, mango, avocado, guava, and cocoa.[394]	Fruit, flowers.	Infested plant material.	Botswana, Côte d'Ivoire, Kenya, South Africa, Tanzania.	LOW	HIGH	HIGH	MEDIUM	LOW
Rastrococcus spp. (exotic[395])	Mealy bugs	Highly polyphagous taxa.[396]	Leaves, stems, flowers, fruit.	Adult males are capable of limited flight and early instars may be wind dispersed. Infested plant materials are likely involved in long distance spread.	*Rastrococcus* species have ranging geographic distribution.[397]	LOW	HIGH	LOW	NEGLIGIBLE	NEGLIGIBLE

[390] Including *P. comstocki, P. cryptus, P. maritimus.*

[391] Including apple, European pear, Asian pear, banana, citrus, peach, lemon, apricot, cherry, coffee, *Morus* spp., *Catalpa* spp., grapevine.

[392] *P. comstocki*: Saint Helena, Armenia, Azerbaijan, Cambodia, China, Georgia, Hong Kong, Japan, Kazakhstan, Kyrgyzstan, North Korea, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkmenistan, Uzbekistan, Vietnam, Croatia, France, Greece, Italy, Moldova, Portugal, Russia, Switzerland, Ukraine, Canada, Mexico, United States of America, Argentina, Brazil. *P. cryptus*: China, Hong Kong, India, Israel, Japan, Philippines, Sri Lanka, South America, Paraguay. *Pseudococcus maritimus*: Hungary, Netherlands, Poland, Russia, Mexico, United States of America, Chile.

[393] Transmits viruses such as Grapevine virus E and Grapevine leafroll-associated virus 3.

[394] (Egonyu et al., 2014).

[395] Including *R. iceryoides, R. invadens.*

[396] Host taxa including *Acanthus mollis, Aphelandra, Barleria involucrata, Pseuderanthemum, Sanchezia, Lannea coromandelica, Mangifera indica, Spondias dulcis, Spondias mombin, Sorindeia madagascariensis, Annona* spp., *Adenium obesum, Alstonia scholaris, Cascabela thevetia, Echites, Nerium oleander, Plumeria* spp., *Caladium bicolor, Colocasia antiquorum, Dieffenbachia, Monstera deliciosa, Philodendron, Xanthosoma, Schefflera, Areca catechu, Viguiera excelsa, Bignonia, Dacryodes edulis, Boswellia, Calophyllum inophyllum, Mammea americana, Capparis* spp., *Terminalia arjuna, Canna indica, Ipomoea batatas, Costus lucanusianus, Momordica foetida, Cucurbita pepo, Cycas, Dioscorea alata, Acalypha hispida, Codiaeum variegatum, Croton, Euphorbia, Mallotus, Acacia, Albizia* spp., *Anthocleista vogelii , Biancaea decapetala , Caesalpinia, Cajanus cajan, Cassia fistula, Centrosema, Crotalaria, Dalbergia* spp., *Derris malaccensis, Dialium holtzii, Erythrina variegata, Fagraea crenulata, Falcataria moluccana, Gentianaceae, Indigofera spicata, Lablab purpureus, Lonchocarpus, Millettia pinnata, Parkinsonia aculeata, Psoralea corylifolia, Samanea saman, Strongylodon, Tephrosia candida, Heliconia psittacorum, Hydrangea macrophylla, Clerodendrum johnstonii, Tectona grandis, Vitex, Persea americana, Torenia crustacea, Ceiba pentandra, Durio zibethinus, Gossypium hirsutum, Grewia, Heliocarpus americanus, Hibiscus mutabilis, Hibiscus rosa-sinensis, Sida acuta, Theobroma cacao, Thespesia, Khaya ivorensis , Artocarpus, Ficus* spp., *Morus, Streblus asper, Musa paradisiaca, Psidium guajava, Bridelia pustulata, Flueggea virosa, Phyllanthus* spp., *Cynodon dactylon, Polygala, Adiantum, Rosa, Canthium coromandelicum, Coffea* spp., *Gardenia jasminoides , Ixora, Morinda citrifolia , Mussaenda , Spermacoce verticillata, Wendlandia thyrsoidea, Citrus* spp., *Harrisonia abyssinica, Murraya koenigii, Osyris lanceolata, Deinbollia borbonica, Lecaniodiscus fraxinifolius, Nephelium lappaceum , Manilkara zapota, Mimusops elengi, Ailanthus excelsa, Solanum anguivi , Solanum tuberosum, Camellia sinensis, Vitis vinifera.*

[397] *R. iceryoides*: Kenya, Malawi, Tanzania, Bangladesh, India, Indonesia, Malaysia, Singapore, Sri Lanka. *R. invadens*: Benin, Burkina Faso, Congo (DRC), Côte d'Ivoire, Gabon, Ghana, Nigeria, Rwanda, Senegal, Sierra Leone, Togo, Bangladesh, Bhutan, China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, French Guiana.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Trialeurodes spp. (exotic[398])	Whiteflies	Wide host range.[399]	Leaves.	Adults are weak flyers but can disperse naturally. The movement of infested plants or fruits can lead to long-distance spread.	Africa, Middle East, Asia.[400]	MEDIUM	HIGH	MEDIUM	NEGLIGIBLE[401]	NEGLIGIBLE
Trioza erytreae	African citrus psyllid	Range of *Citrus* spp.[402]	Leaves.	Natural dispersal up to distances of 1.5 km. Citrus material (budwood, grafted trees, rootstock seedlings) from infected areas can carry eggs and/or nymphs over longer distances.	Africa, Middle East, Asia.[403]	LOW	HIGH	HIGH	NEGLIGIBLE[404]	NEGLIGIBLE
Hymenoptera (ants, bees and wasps)										
Brachyponera chinensis	Asian needle ant	-	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials. Alate males and females can disperse via flight.[405]	Russia, China, Korea, Japan, Cambodia, Laos, Taiwan, Thailand, Vietnam, Philippines, United States of America, New Zealand.	MEDIUM	HIGH[406]	MEDIUM	MEDIUM[407]	MEDIUM

[398] Including *T. ricini*.
[399] Many hosts including *Annona glabra* (pond apple), *Arbutus, Aristolochia bracteata* (wormkiller), *Bauhinia* (camel's foot), *Begonia, Boscia senegalensis, Breynia, Breynia rhamnoides, Calopogonium, Canavalia rosea, Carica papaya* (pawpaw), *Cichorium endivia* (endives), *Cissampelos owariensis, Corchorus* (jutes), *Cosmos bipinnatus* (garden cosmos), *Cucumis sativus* (cucumber), *Cucurbita maxima* (giant pumpkin), *Cucurbita pepo* (marrow), *Dalbergia sissoo, Desmodium leiocarpum, Euphorbia* (spurges), *Gardenia* spp. *Gossypium hirsutum* (Bourbon cotton), *Ipomoea batatas* (sweetpotato), *Lablab purpureus* (hyacinth bean), *Manihot esculenta* (cassava), *Manilkara zapota* (sapodilla*), Morelia senegalensis, Moringa oleifera* (horse radish tree), *Murraya koenigii* (curry leaf tree), *Peltophorum pterocarpum* (copperpod), *Phaseolus vulgaris* (common bean), *Phyllanthus, Piper umbellatum*, *Psidium* (guava), *Psidium guajava* (guava), *Ricinus communis* (castor bean), *Rosa* (roses), *Sesamum* (Sesame), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Sonchus oleraceus* (sowthistle), *Telfairia, Ziziphus mauritiana* (jujube).
[400] Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Egypt, Kenya, Madagascar, Malawi, Mali, Nigeria, Sierra Leone, Sudan, Uganda, Zimbabwe, Brunei, Cambodia, China, Hong Kong, India, Iran, Iraq, Israel, Malaysia, Myanmar, Pakistan, Philippines, Saudi Arabia, Singapore, Thailand, Yemen, Spain.
[401] Some species and populations could vector and transmit Tomato yellow leaf curl virus.
[402] This includes Australian finger lime, citron, orange, grapefruit, tangelo, kumquat, lemon, mandarin, Mexican key lime, pomelo, trifoliate orange, and citrus relatives *Calodendrum capense, Clausena anisata, Murraya* exotic*a, Toddalia asiatica, Triphasia trifolia, Vepris lanceolata, Zanthoxylum capense*.
[403] Angola, Cameroon, Comoros, Congo (DRC), Eritrea, Eswatini, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Réunion, Rwanda, Saint Helena, São Tomé and Príncipe, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Saudi Arabia, Yemen, Portugal, Spain.
[404] Vectors and transmits *Candidatus* Liberibacter africanus (Huanglongbing; Citrus greening).
[405] (Wang et al., 2016).
[406] Brachyponera chinensis is a predatory ant and a termite specialist with the unique ability to invade habitats in undisturbed forests.
[407] Invasive ants can have negative environmental, amenity and economic impacts. Ants may have significant ramifications for the nursery industry through operational changes and trade/market access constraints. *B. chinensis* has a painful sting that can cause severe allergic reactions.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Lasius neglectus	Invasive garden ant	Wide host range - primarily a secondary pest to plants.[408]	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials.	Africa, Middle East, Europe.[409]	MEDIUM	HIGH	MEDIUM	MEDIUM[410]	MEDIUM
Lepisiota canescens	-	-	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials.	Benin, Comoros, Eritrea, Ethiopia, Ghana, Guinea, Kenya, Saudi Arabia, Madagascar, Nigeria, Senegal, Somalia, Israel, Oman.	HIGH	HIGH	MEDIUM	MEDIUM[410]	MEDIUM
Lepisiota frauenfeldi	Browsing ant	-	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials.	Europe, Africa, Middle East, Asia, Australia (under eradication).[411]	HIGH[412]	HIGH	MEDIUM	MEDIUM[410]	MEDIUM
Lepisiota incisa	African black sugar ant	-	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials.	Angola, Congo (DRC), Kenya, South Africa, Zimbabwe, Saudi Arabia, Australia (under eradication).	HIGH[413]	HIGH	MEDIUM	MEDIUM[410]	MEDIUM
Myrmica rubra	European fire ant	*Myrmica rubra* is a eurytopic species - primarily a secondary pest to plants.	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials. Alate males and females can disperse via flight.[414]	Belgium, Denmark, Finland, France, Germany, Netherlands, Poland, Sweden, Czechia, Ireland, United Kingdom, Russia, Ukraine. United States of America, Canada, Japan.	MEDIUM	HIGH	MEDIUM	MEDIUM[410]	MEDIUM
Nylanderia fulva	Tawny crazy ant; Raspberry ant	Wide host range and can be a direct and indirect pest to ecological and agricultural systems.	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant	Canada, United States of America, Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Dominican Republic, Ecuador, French Guiana, Grenada, Guyana, Haiti, Mexico, Paraguay, Suriname, Uruguay.	MEDIUM	HIGH[416]	MEDIUM	MEDIUM[417]	MEDIUM

[408] Feeding is mainly based on sugary foods (aphid honeydew, nectar, vegetal juices).
[409] Georgia, Iran, Israel, Kyrgyzstan, Turkey, Uzbekistan, Andorra, Belgium, Bulgaria, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Romania, Spain, Switzerland, United Kingdom.
[410] Invasive ants can have negative environmental, amenity and economic impacts. Ants may have significant ramifications for the nursery industry through operational changes and trade/market access constraints.
[411] Albania, Armenia, Azerbaijan, Balearic Islands, Bulgaria, Croatia, Georgia, Greece, Iran, Israel, Malta, Montenegro, Spain, North Macedonia, Turkey, Afghanistan, India, Réunion.
[412] Under formal eradication programs and control in the NT (Darwin), Qld and localised areas in WA.
[413] Under formal eradication programs and control in Western Australia. Has also been detected on a shipping container from South Africa arriving in Norway.
[414] (Wang et al., 2016).
[416] *Nylanderia fulva* is often associated with hemipteran insects.
[417] *N. fulva* can have negative agricultural, environmental, amenity and economic impacts. Invasive ants may have significant ramifications for the nursery industry through operational changes and trade/market access constraints.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
				materials. Alate males and females can disperse via flight.[415]						
Solenopsis invicta	Red imported fire ants (RIFA)	-	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials. Alate males and females can disperse via flight.[415]	Europe, the Americas, Asia, Australia (under eradication).[418]	HIGH[419]	HIGH	MEDIUM	MEDIUM[420]	MEDIUM
Solenopsis spp. (exotic[421])	Black and southern imported fire ants.	-	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials. Alate males and females can disperse via flight.[415]	*S. richteri*: United States of America, Argentina, Chile, Paraguay, Uruguay. *S. xyloni*: United States of America, Mexico.	HIGH	HIGH	MEDIUM	MEDIUM[420]	MEDIUM
Wasmannia auropunctata	Electric ant; Little fire ant	Wide host range - primarily a secondary pest to plants.	-	Ants hitchhike on goods, equipment, and vehicles. They can move via shipping containers and cargo, soil, mulch, fertiliser, and plant materials. Alate males and females can disperse via flight.[415]	Europe, Middle East, Africa, the Americas, Oceania.[422]	HIGH[423]	HIGH	MEDIUM	MEDIUM[424]	MEDIUM
Lepidoptera (butterflies and moths)										
Acleris comariana	Strawberry tortrix	Strawberry.	Leaves.	Infested plant material and/or hitchhiking.	South Korea, Poland, Sweden, United Kingdom.	LOW	HIGH	MEDIUM	LOW	VERY LOW

[415] (Wang et al., 2016).
[418] China, United States of America, Anguilla, Antigua and Barbuda, Argentina, Aruba, Brazil, British Virgin Islands, Cayman Islands, Greater Antilles, Mexico, Montserrat, Netherlands Antilles, Paraguay, Puerto Rico, Saint Martin, Trinidad and Tobago, Turks and Caicos Islands, United States of America Virgin Islands.
[419] RIFA is under a formal eradication program in south-east Queensland and Western Australia (Fremantle Port).
[420] Fire ants can impart a range of negative agricultural, environmental, amenity and economic impacts. Invasive ants may have significant ramifications for the nursery industry through operational changes and trade/market access constraints. Fire ants impart a painful sting to humans.
[421] Including *S. richteri, S. xyloni*.
[422] Israel, Spain, Cameroon, Gabon, Sierra Leone, Canada, United States of America, Hawaii, Solomon Islands, Vanuatu, Australia (under eradication), New Caledonia, Antigua and Barbuda, Argentina, Aruba, Barbados, Belize, Bermuda, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, French Guiana, Galapagos Islands, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Lesser Antilles, Mexico, Netherlands, Antilles, Panama, Paraguay, Peru, Puerto Rico, Saint Lucia, Uruguay, Venezuela.
[423] *Wasmannia auropunctata* is under a formal eradication program within the electric ant biosecurity zone in Cairns, Queensland.
[424] *W. auropunctata* is a generalist feeder. Electric ants can have substantial agricultural, environmental, amenity and economic impacts. Invasive ants may have significant ramifications for the nursery industry through operational changes and trade/market access constraints. They can inflict a painful, long lasting, venomous sting. The reaction from their sting can range from moderate to severe pain and cause a severe allergic reaction (in rare cases).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Adoxophyes orana	Summer fruit tortrix	Wide host range.[425]	Whole plant leaves, fruits, flowers, growing points.[426]	Adults capable of flight over short distances.[427] Infested plant material (including fruit and leaves) or hitchhiking.	Europe, Middle East, Asia.[428]	LOW	HIGH	HIGH	MEDIUM	LOW
Agrotis segetum	Turnip moth	Wide host range.[429]	Leaves, stems, roots, seeds.	Adults capable of flight over long distances. Infested plant material, contaminated soil, tools, and machinery. Eggs are soilborne.	Asia, Europe, Africa.[430]	MEDIUM	MEDIUM	HIGH	MEDIUM	LOW
Amyelois transitella	Navel orangeworm	*Citrus*, English walnut, pistachio, almond, grapevine.	Nuts, leaves.	Adults capable of flight over long distances. Infested host materials (especially fruit) and hitchhiking may be key entry pathways.	Italy, Costa Rica, Mexico, United States of America.	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM
Autographa gamma	Silver Y moth	Polyphagous and can feed on at least 224 plant species.[431]	Leaves and growing points.	Infested plant material (eggs are laid on the underside of leaves) and adults are migratory (~300 km) and attracted to	Middle East, Asia, Europe.[433]	LOW	HIGH	HIGH	MEDIUM	LOW

[425] This includes apricot, plum, peach, Japanese plum, apple, Asian pear (*P. pyrifolia),* Ussurian pear (*P. ussuriensis*), European pear (*P. communis*), quince, blackcurrant, raspberry, roses, blueberry, cherry, hazelnut, soybean, oak.

[426] *A. orana* spins a leaf against fruit. The larva is often found in between those two plant organs and fruit damage is mostly found at the spots where leaf is attached to the fruit.

[427] The flying activity is often restricted to the night, and migration is limited, especially for females.

[428] Armenia, Azerbaijan, China, Georgia, Hong Kong, Japan, South Korea, Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

[429] This includes *Brassica* spp., bell pepper, daisy, chickpea, melon, carrot, carnation, freesia, cotton, sunflower, barley, sweet potato, lettuce, lucerne, spruce, pine, blackcurrant, tomato, potato, clovers, wheat, grapevine, corn.

[430] Algeria, Angola, Benin, Botswana, Cabo Verde, Congo (DRC), Côte d'Ivoire, Egypt, Ethiopia, Kenya, Libya, Malawi, Mali, Morocco, Mozambique, Namibia, Saint Helena, Senegal, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe, Afghanistan, Azerbaijan, Bangladesh, Bhutan, China, Georgia, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Mongolia, Myanmar, Nepal, North Korea, Pakistan, Philippines, Saudi Arabia, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Vietnam, Yemen, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

[431] Hosts include *Abutilon theophrasti* (velvet leaf), *Athyrium alpestre, Beta vulgaris* (beetroot), *Beta vulgaris* var. *saccharifera* (sugarbeet), *Borago officinalis* (Borage), *Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea* var. *botrytis* (cauliflower), *Brassica oleracea* var. *capitata* (cabbage), *Brassica oleracea* var. *gemmifera* (Brussels sprouts), *Brassica oleracea* var. *gongylodes* (kohlrabi), *Brassica oleracea* var. *italica* (broccoli), *Brassica oleracea* var. *viridis* (collards), *Brassica rapa* subsp. *chinensis* (Chinese cabbage), *Brassica rapa* subsp. *pekinensis, Cannabis sativa* (hemp), *Capsicum* (peppers), *Capsicum annuum* (bell pepper), *Chrysanthemum indicum* (chrysanthemum), *Cicer arietinum* (chickpea), *Cichorium intybus* (chicory), *Cynara cardunculus* var. *scolymus* (globe artichoke), *Daucus carota* (carrot), *Fragaria* (strawberry), *Glycine max* (soyabean), *Gossypium* (cotton), *Helianthus annuus* (sunflower), *Humulus* (hop), *Hyssopus officinalis* (Hyssop), *Lactuca sativa* (lettuce), *Linum usitatissimum* (flax), *Medicago sativa* (lucerne), *Nicotiana tabacum* (tobacco), *Pelargonium zonale* hybrids, *Petroselinum crispum* (parsley), *Rheum rhaponticum, Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Solidago altissima* (tall goldenrod), *Spinacia oleracea* (spinach), *Trifolium pratense* (red clover), *Triticum aestivum* (wheat), *Vitis vinifera* (grapevine), *Zea mays* (maize), *Zinnia elegans* (zinnia).

[433] Azerbaijan, China, India, Iran, Iraq, Israel, Japan, Kazakhstan, Korea, Saudi Arabia, Syria, Turkey, Uzbekistan, Algeria, Egypt, Libya, Morocco, Austria, Belgium, Bulgaria, Croatia, Czechia, Slovakia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, United Kingdom, Ukraine.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
				light.[432]						
Cacoecimorpha pronubana	Carnation tortrix	Wide host range across over 100 plant species.[434]	Leaves, inflorescences.	Adults capable of flight. *C. pronubana* may be carried on plants for planting or cut flowers (e.g. carnations, chrysanthemums, pelargoniums, roses) and other host plants.	Europe, Africa, Northern America.[435]	MEDIUM	MEDIUM	HIGH	LOW	VERY LOW
Carposina sasakii	Peach fruit moth	Stone fruit, apple, quince, pears, and other fruit trees.	Fruit, seeds.	Normally only flies short distances (100 to 225 m) but can travel up to 10 km. Larvae can survive for long periods in stored fruits, so imported fruits are the most likely means of entry.[436]	China, Japan, North Korea, South Korea, Russia.	LOW	MEDIUM	LOW	LOW	NEGLIGIBLE
Choristoneura rosaceana	Oblique-banded leafroller	Broad host range including apple, cherry, stonefruit, pistachio, blackberry, raspberry, poplar, holly, willows and rose.	Leaves, fruit.	Adults are capable of flight. Young larvae may balloon in the wind on a silk thread, spread by hibernating on dormant nursery stock, fruit, glasshouse ornamentals, cut flowers, growing mediums (regulated), or unregulated pathways.	Canada, Mexico, United States of America.	MEDIUM	MEDIUM	HIGH	LOW	VERY LOW
Epichoristodes acerbella	South African carnation tortrix	Broad host range including carnations, chrysanthemum, strawberry, pelargoniums, stone fruit, lucerne, sorrel, roses, and dock.	Leaves.	Adults are capable of flight. Infested plant material.[437]	Kenya, Madagascar, South Africa, Bulgaria, Croatia, Denmark, France, Italy, Romania, Serbia, Slovenia, Spain.	MEDIUM	MEDIUM	HIGH	LOW	VERY LOW
Helicoverpa zea	Corn earworm	Maize, sorghum, cotton, legumes, tomato, lettuce, strawberry, sunflower, zucchini, cucumber, field crops and ornamental plants.	Leaves, flowers.	Undergoes short-range, long-range, and migratory (seasonal, nocturnal, and facultative migrant) movements. Trade in plant materials/produce and hitchhiking are potential pathways of entry.	Asia, the Americas, the Caribbean.[438]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM

[432] (Chapman et al., 2012).
[434] This includes acacia, azalea, carnations, chrysanthemum, *Euphorbia, Jasminum, Pelargonium, Rhododendron*, roses, *Rubus*, potato and beans.
[435] Algeria, Libya, Morocco, South Africa, Tunisia, Azerbaijan, Israel, Turkey, Albania, Belgium, Croatia, Cyprus, Denmark, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States of America.
[436] (Ishiguri & Shirai, 2004).
[437] Unintentionally imported to United Kingdom several times as a larva in carnations (*Dianthus*).
[438] China, Antigua and Barbuda, Bahamas, Barbados, Bermuda, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, U.S. Virgin Islands, United States of America, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Islands, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Lymantria dispar (All subspecies or strains)	Spongy moth[439]	Spongy moths have an extremely wide host range.[440]	Leaves, flowers.	Potential pathways include clothing, footwear, wood packaging, containers, cars, and plants.	Europe, Asia, Middle East, the Americas.[441]	HIGH[442]	MEDIUM	HIGH	HIGH	HIGH[443]
Malacosoma disstria	Forest tent caterpillar	Broad host range including maple, alder, birch, beech, ash, liquidambar, poplar, oak, and apple.	Leaves.	Local dispersal takes place by wandering larvae and wind-assisted flight. In international trade, the eggs, young larvae, or pupae may be carried on hosts or plant materials.	Canada, United States of America.	LOW	MEDIUM	LOW	MEDIUM	VERY LOW
Mamestra brassicae	Cabbage moth	Highly polyphagous (more than 300 species). Primary hosts are taxa within the Brassicaceae.[444]	Leaves.	Adults can fly large distances and undertake migrations (at least 40 to 60 km). Infested plants or soil could contain adults, pupae (capable of diapause), larvae or eggs.[445]	Europe, Asia, Africa, Middle East.[446]	MEDIUM	HIGH[447]	MEDIUM	LOW	VERY LOW
Orgyia spp.	Tussock	Urban trees and plants, horticultural plants, and forest	Foliage.	Pathways include hitchhiking on host plants for complementary life stages	*Orgyia* species have ranging	LOW	MEDIUM	LOW	LOW	NEGLIGIBLE

[439] (Previously known as Asian gypsy moth).
[440] Oak species (*Quercus* spp.) are considered to be the preferred hosts, but heavy defoliation is also observed on *Carpinus*, *Castanea*, *Fagus*, *Malus*, *Populus*, *Prunus*, *Pyrus* and *Salix*. Other host genera include *Acacia, Acer, Alnus, Betula, Callistemon, Carya, Corylus, Corymbia, Diospyrus, Eucalyptus, Eugenia, Fraxinus, Glycine, Hamamelis, Larix, Leptospermum, Liquidambar, Litchi, Lithocarpus, Nothofagus, Ostrya, Picea, Pinus, Pistacea, Platanus, Pseudotsuga, Quercus, Robinia, Taxodium, Tilia, Ulmus, Vaccinium, Zea*.
[441] Algeria, Morocco, Tunisia, Afghanistan, Armenia, Azerbaijan, China, India, Iran, Iraq, Israel, Japan, Kazakhstan, Kyrgyzstan, Lebanon, Mongolia, North Korea, South Korea, Syria, Taiwan, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America.
[442] Hundreds of interceptions internationally. The most frequently intercepted Erebidae. The *Lymantria dispar* complex has a propensity to be transported on human-made objects, typically as egg masses.
[443] HPP for apple and pear, berries (*Rubus*), lychees, plantation forest, summerfruit, tree nuts.
[444] Hosts include *Allium sativum* (garlic), *Amaranthus retroflexus* (redroot), *Aquilegia vulgaris* (European columbine), *Betula pendula* (European white birch), *Bryonia alba* (white bryony), *Calendula* spp. (calendula), *Callistephus chinensis* (China aster), *Cannabis sativa* (hemp), *Capsella bursa-pastoris* (shepherd's purse), *Capsicum* spp. (peppers), *Chenopodium* spp., *Chrysanthemum* spp. (daisy), *Cucurbita pepo* (squash), *Dahlia* spp. (dahlia), *Daucus carota* (carrot), *Dianthus caryophyllus* (carnation), *Epilobium* spp. (fireweed), *Fagus* spp. (beech), *Fallopia convolvulus* (wild buckwheat), *Fragaria* spp. (strawberry), *Geum rivale* (purple avens), *Gladiolus* spp. (gladiolus), *Glycine max* (soybean), *Helianthus annuus* (sunflower), *Humulus lupulus* (hop), *Hyssopus officinalis* (hyssop), *Ipomoea batatas* (sweet potato), *Lactuca sativa* (lettuce), *Lamprocapnos spectabilis* (seal-flower), *Larix* spp. (larch), *Linum usitatissimum* (flax), *Lupinus* spp. (lupine), *Malus domestica* (apple), *Malus sylvestris* (European crab apple), *Medicago sativa* (alfalfa), *Nicotiana* spp., *Papaver somniferum* (poppy), *Pelargonium* spp. (geranium), *Phaseolus* spp. (beans), *Potentilla anserina* (silverweed), *Prunus padus* (European bird cherry), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Quercus* spp. (oak), *Quercus cerris* (European turkey oak), *Quercus robur* (English oak), *Rhaphanus sativus* (radish), *Rheum rhabarbarum* (rhubarb), *Rosa* spp. (roses), *Rubus idaeus* (raspberry), *Rudbeckia* spp. (coneflower), *Salix* spp. (willow), *Salix caprea* (goat willow), *Sambucus racemosa* (red elderberry), *Senecio vulgaris* (groundsel), *Silene chalcedonica* (maltesecross), *Silene latifolia* subsp. *alba*, *Solanum lycopersicum* (tomato), *Solanum melongena* (eggplant), *Solanum tuberosum* (potato), *Spinacia oleracea* (spinach), *Trifolium repens* (white clover), *Vicia* spp., *Vitis vinifera* (grape), *Zea mays* (corn).
[445] (Wu et al., 2015).
[446] Libya, Armenia, Azerbaijan, China, Georgia, India, Iran, Japan, Kazakhstan, Kyrgyzstan, Lebanon, Mongolia, North Korea, Pakistan, South Korea, Syria, Taiwan, Turkey, Uzbekistan, Austria, Belarus, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.
[447] (USDA-APHIS-PPQ-CPHST, 2007).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
(exotic[448])	moths	trees.[449]		(eggs, larvae, or pupae). [450]	geographic distribution.[451]					
Pandemis cerasana	Cherry brown tortrix	Quince, apple, peach, European pear, cherry, plum, nuts, blackcurrant, roses, and raspberry.	Leaves flowers, fruits.	Adults capable of flight, infested materials.	China, Bulgaria, Croatia, Czechia, Germany, Hungary, Italy, Lithuania, Poland, Russia, United Kingdom, Canada.	LOW	HIGH	HIGH	LOW	VERY LOW
Parasa lepida	Blue-striped nettle grub	Tea, coconut, rubber, cassava, mango, banana, bell pepper, gardenia, *Eugenia*, *Nephelium*, *Cassia, Rosa*, *Gliricidia*.	Leaves, fruit.	This pest could enter Australia by natural dispersal from the north or via human mediated transport of infested hosts or growing mediums.	Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam.	MEDIUM	HIGH	HIGH	LOW	LOW
Peridroma saucia	Variegated cutworm	Broad host range including Asteraceae, Brassicaceae, Fabaceae, Solanaceae.	Leaves, stems, fruit, seeds.	Adults capable of flight with migratory movements. Infested plant material or hitchhiking are potential entry pathways.	The Americas, Middle East, Europe, Asia.[452]	LOW	MEDIUM	LOW	MEDIUM	VERY LOW
Platynota stultana	Omnivorous leafroller	Citrus, bell pepper, cotton, lucerne, pomegranate, pear, grapevine, peach, and maize.	Leaves, fruit, flowers.	Adults capable of flight. Larvae can spread via ballooning. Infested plant materials (fruit/leaves/flowers). Border interceptions have occurred.	Spain, Mexico, United States of America.	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Prays oleae	Olive moth	Olive, jasmine, privet, Ranunculaceae, *Phillyrea*, windflower.	Leaves, inflorescence, fruit.	Adults capable of flight. Human mediated transport of infested hosts (leaves, flowers, fruit, pupae under bark) or growing mediums.	Middle East, Europe.[453]	HIGH	MEDIUM	HIGH	LOW	VERY LOW

[448] Including *O. antiqua* and *O. thyellina*.
[449] Hosts include *Abies* (firs), *Acer platanoides* (Norway maple), *Alnus* spp. (European alder), *Arbutus unedo* (arbutus), *Betula nana* (dwarf (arctic)- birch (United Kingdom)), *Betula* spp. (birches), *Caragana arborescens* (Siberian pea-tree), *Carpinus betulus* (hornbeam), *Castanea sativa* (chestnut), *Corylus avellana* (hazel), *Cotoneaster, Crataegus* (hawthorns), *Fagus sylvatica* (common beech), *Fragaria vesca* (wild strawberry), *Frangula alnus* (alder buckthorn), *Fraxinus excelsior* (ash), *Humulus lupulus* (hop), *Larix sibirica* (Siberian larch), *Malus domestica* (apple), *Picea abies* (common spruce), *Picea sitchensis* (Sitka spruce), *Pinus contorta* (lodgepole pine), *Populus tremula* (aspen (European)), *Prunus* spp., *Quercus robur* (common oak), *Ribes nigrum* (blackcurrant), *Rosa canina* (Dog rose), *Rubus* spp., *Rumex acetosella* (sheep's sorrel), *Salix* spp., *Sorbus aucuparia* (mountain ash), *Syringa vulgaris* (lilac), *Tilia europaea*, *Ulmus* (elms), *Vaccinium* spp.
[450] There have been no international interceptions of *Orgyia thyellina*. There have been occasional interceptions of other species in the same genus and a total of 54 species within Erebidae. Adult males capable of flight. Larvae can move via ballooning. Egg-laden cocoons are commonly spun up against bare twigs.
[451] *O. antiqua*: Armenia, China, Turkey, Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America, Chile. *O. thyellina*: China, Korea, Japan, Russia, Taiwan.
[452] Morocco, Tunisia, Armenia, China, Israel, Japan, South Korea, Sri Lanka, Syria, Taiwan, Turkey, Albania, Austria, Belgium, Bulgaria, Czechia, Denmark, Faroe Islands, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, United Kingdom, Bermuda, Canada, Costa Rica, Guatemala, Jamaica, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay, Venezuela.
[453] Algeria, Egypt, Libya, Morocco, Tunisia, Armenia, Azerbaijan, Georgia, Israel, Lebanon, Syria, Turkey, Albania, Austria, Croatia, Cyprus, Denmark, France, Greece, Italy, Malta, Montenegro, Portugal, Russia, Slovenia, Spain, Ukraine, United Kingdom.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Spilarctia obliqua	Jute hairy caterpillar	Field crops, vegetables, herbs, fibre plants, fruit trees, oil plants, hibiscus, liquidambar, pea, jute, tobacco, and bean.	Leaves.	Adults capable of flight. Human mediated transport of infested hosts or plant materials may be a pathway.	Bangladesh, China, Hong Kong, India, Myanmar, Nepal, Pakistan.	LOW	MEDIUM	MEDIUM	HIGH	MEDIUM
Spodoptera eridania	Southern armyworm	Wide host range of ~200 plants species.[454]	Leaves, fruit.	Adults capable of flight over moderate distances. Global trade can transport larvae, eggs, and pupae in soil.	The Americas, the Caribbean, Africa.[455]	LOW	HIGH	HIGH	MEDIUM	LOW
Spodoptera littoralis	Cotton leafworm	Wide host range across over 40 families.[456]	Leaves, fruit.	Adults capable of flight over moderate distances. Global trade can transport larvae, eggs, and pupae in soil.	Widespread in Europe, the Middle East, Africa, Asia.[457]	LOW	HIGH	HIGH	MEDIUM	LOW
Thaumatotibia leucotreta (syn. *Cryptophlebia leucotreta*)	False codling moth	Wide host range including pineapple, carambola, soursop, bell pepper, citrus, cotton, lychee, mango, avocado, peach, maize, and guava.	Fruit, leaves, seeds.	Adults are capable of flight. They are attracted to lights which may compel them to well-lit ports and airports resulting in hitchhiking. *T. leucotreta* may also move with infested plant materials.	Africa, Middle East, Europe.[458]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM

[454] Disproportionally from Asteraceae, Fabaceae, Solanaceae, Poaceae, Amaranthaceae and Malvaceae families.

[455] Benin, Cameroon, Gabon, Nigeria, Antigua and Barbuda, Bahamas, Barbados, Bermuda, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, Argentina, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

[456] Major hosts include *Abelmoschus esculentus* (okra), *Allium* spp. (onion), *Amaranthus* spp. (pigweed, amaranthus), *Apios* spp. (groundnut), *Arachis hypogaea* (peanut), *Beta vulgaris* (beet), *Brassica oleracea* (cabbage, broccoli), *Brassica rapa* (turnip), *Brassica* spp. (mustards), *Camellia sinensis* (tea), *Capsicum annuum* (pepper), *Chrysanthemum* spp., *Citrullus lanatus* (watermelon), *Citrus* spp., *Coffea arabica* (coffee), *Colocasia esculenta* (taro), *Corchorus* spp. (jute), *Cucumis* spp. (squash, pumpkin), *Cynara cardunculus* (artichoke), *Daucus carota* (carrot), *Dianthus caryophyllus* (carnation), *Ficus* spp. (fig), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Ipomoea batatas* (sweet potato), *Lactuca sativa* (lettuce), *Linum* spp. (flax), *Medicago sativa* (alfalfa), *Morus* spp. (mulberry), *Musa* spp. (banana, plantain), *Nicotiana tabacum* (tobacco), *Oryza sativa* (rice), *Pennisetum glaucum* (pearl millet), *Persea americana* (avocado), *Phaseolus* spp. (bean), *Pisum sativum* (pea), *Prunus domestica* (plum), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Raphanus sativus* (radish), *Rosa* spp. (rose), *Saccharum officinarum* (sugarcane), *Solanum lycopersicum* (tomato), *Solanum melongena* (eggplant), *Solanum tuberosum* (potato), *Sorghum bicolor* (sorghum), *Spinacia* spp. (spinach), *Theobroma cacao* (cacao), *Trifolium* spp. (clover), *Triticum aestivum* (wheat), *Vicia faba* (broad bean), *Vigna* spp. (cowpea, black-eyed pea), *Vitis vinifera* (grape), *Zea mays* (corn). Minor hosts include *Acacia* spp. (wattles), *Anacardium occidentale* (cashew), *Anemone* spp. (anemone), *Antirrhinum* spp., *Apium graveolens* (celery), *Asparagus officinalis* (asparagus), *Caladium* spp. (caladium), *Canna* spp. (canna), *Casuarina equisetifolia* (she-oak), *Convolvulus* spp. (morning glory, bindweeds), *Cryptomeria* spp. (Japanese cedar), *Cupressus* spp. (cypress), *Datura* spp. (jimsonweed), *Eichhornia* spp. (waterhyacinth), *Eucalyptus* spp. (eucalyptus), *Geranium* spp. (geranium), *Gladiolus* spp. (gladiolus), *Malus domestica* (apple), *Mentha* spp. (mint), *Phoenix dactylifera* (date palm), *Pinus* spp. (pine), *Zinnia* spp. (zinnia).

[457] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo (DRC), Côte d'Ivoire, Egypt, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, Saint Helena, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe, Bahrain, China, Iran, Iraq, Israel, Jordan, Lebanon, Oman, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen, Cyprus, France, Greece, Italy, Malta, Portugal, Spain.

[458] Angola, Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Réunion, Rwanda, Saint Helena, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe, Israel, Germany.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[262]	Entry potential	Est.[263] potential	Spread potential	Economic impact	Overall risk
Trichoplusia ni	Cabbage looper	Over 160 hosts.[459]	Leaves.	Adults are strong (primarily nocturnal) fliers with wind mediated migration patterns. Flight range has been estimated at approximately 200 km. Transport of infested hosts, soil or plant materials may be a potential pathway.	Mostly distributed worldwide (except for Australia and New Zealand).[460]	MEDIUM	HIGH	HIGH	LOW	LOW
Orthoptera (locusts and grasshoppers)										
Schistocerca spp. (exotic[461])	Locusts	Wide host range.[462]	Whole plant, above ground.	Capable of extensive dispersal (including instars and nymphs) and migration with gregarious phases (density dependant). Contaminated soil or hitchhiking on international transport may facilitate spread.	*Schistocerca* species have ranging geographic distribution.[463]	LOW	HIGH	HIGH	MEDIUM	LOW
Thysanoptera (thrips)										
Frankliniella spp. (exotic[464])	Thrips	Polyphagous including Solanaceae, Malvaceae, Rosaceae, Poaceae, Fabaceae, Brassicaceae, Asteraceae and Liliaceae.	Whole plant, above ground.	Infested plant material. Adults capable of flight, wind dispersal.	*Frankliniella* species have ranging geographic distribution. [465]	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW

[459] The primary hosts are cruciferous crops, cotton, cucurbits, tomato and spinach. Other secondary hosts are found within Apiaceae, Asteraceae, Caryophyllaceae, Chenopodiaceae, Convolvulaceae, Fabaceae, Geraniaceae, Iridaceae, Lamiaceae, Liliaceae, Malvaceae, Rosaceae, Rutaceae, Solanaceae.

[460] Algeria, Cabo Verde, Congo (DRC), Egypt, Ethiopia, Gambia, Kenya, Lesotho, Libya, Madagascar, Morocco, Nigeria, Senegal, Somalia, South Africa, Sudan, Tanzania, Tunisia, Afghanistan, Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Laos, Lebanon, Malaysia, Maldives, Myanmar, Pakistan, Saudi Arabia, South Korea, Syria, Taiwan, Thailand, Turkey, Vietnam, Austria, Bulgaria, Cyprus, France, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Romania, Russia, Spain, Sweden, Switzerland, United Kingdom, Barbados, Bermuda, Canada, Costa Rica, Cuba, Dominican Republic, Haiti, Jamaica, Mexico, Nicaragua, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, Argentina, Bolivia, Brazil, Chile, Colombia, Uruguay, Venezuela.

[461] Including *S. americana*, *S. gregaria, S. nitens.*

[462] including *Brassica*, cotton, sweetpotato, grains, rice, beans, citrus, sugarcane, acacia, grape, Malvaceae, *Helianthus*, Chenopodiaceae, *Dianthus*, pineapple.

[463] *Schistocerca americana*: India, Antigua and Barbuda, Barbados, Cuba, Dominica, Dominican Republic, Guadeloupe, Jamaica, Martinique, Mexico, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, United States of America, Argentina, Bolivia, Brazil, Guyana, Venezuela. *S. gregaria*: Algeria, Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC), Djibouti, Egypt, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Kenya, Libya, Mali, Mauritania, Mauritius, Morocco, Namibia, Niger, Nigeria, Senegal, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Western Sahara, Afghanistan, Armenia, Bahrain, China, India, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Pakistan, Philippines, Saudi Arabia, Syria, Tajikistan, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Yemen, France, Portugal, Spain, Venezuela. *S. nitens*: Nigeria, Pakistan, Costa Rica, Grenada, Guatemala, Mexico, Trinidad and Tobago, United States of America, Colombia, Venezuela.

[464] Including *F. bispinosa*, *F. fusca*, *F. intonsa*, *F. tritici.*

[465] *F. bispinosa*: Georgia, Puerto Rico, United States of America. *F. fusca*: Japan, Netherlands, Canada, Cuba, Martinique, Mexico, Puerto Rico, United States of America. *F. intonsa*: Algeria, Bangladesh, China, Georgia, Hong Kong, India, Iran, Iraq, Israel, Japan, Mongolia, Pakistan, Philippines, Qatar, South Korea, Taiwan, Thailand, Turkey, Albania, Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Greenland, United States of America, New Zealand. *F. tritici*: Georgia, Iraq, Kazakhstan, Czechia, Hungary, Poland, Romania, Russia, Slovakia, Spain, Ukraine, North America, Canada, Puerto Rico, United States of America.

Pathogens

Table 14. Production nursery pathogen threat summary table.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Bacteria										
Alder yellows phytoplasma	Alder yellows phytoplasma (AldY) (16SrV: Elm yellows group)	*Alnus* spp.	Often symptomless in European *Alnus* spp.	Spread of AldY occurs through infected planting materials, the leafhopper *Oncopsis alni* and potentially other vectors.	Germany, France, Italy, Montenegro, North Macedonia, Lithuania, Serbia.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW[468]	NEGLIGIBLE
Brenneria nigrifluens	Shallow bark canker	Walnut and sunflower.	Trunk, branches.	Infected plant materials, graft transmission.	Iran, Turkey, South Korea, Taiwan, France, Hungary, Italy, Serbia, Spain, United States of America, Argentina.	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE
Brenneria rubrifaciens	Deep bark canker	Walnut.	Trunk, branches.	Infected plant materials, graft transmission.	United States of America (California).	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE
Burkholderia caryophylli (syn. *Pseudomonas caryophylli*)	Bacterial wilt of carnation	Carnation, *Lisianthus*, baby's breath, sunflower, *Limonium* (sea pink).	Roots, leaves, stems.	Cuttings from infected but symptomless plants are the primary means of dispersal.	China, India, Japan, Taiwan, Italy, Serbia, United States of America, Argentina, Brazil, Uruguay.	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE[469]
Candidatus Liberibacter africanus	Huanglongbing; Citrus greening (African strain)	Citrus, sweet orange, mandarin, tangelo, sour orange, trifoliate orange, grapefruit, lemon, lime, kumquat, Australian native citrus, Cape chestnut (*Calodendrum capense*) and *Vepris* spp.	Leaves, stems, flowers, fruit, roots, whole plant.	Short and long-distance dispersal is primarily impingent on infected plant material and insect vectors that are harbouring the phytoplasma.	Burundi, Cameroon, Central African Republic, Comoros, Eswatini, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Réunion, Rwanda, Saint Helena, Somalia, South Africa, Tanzania, Uganda, Zimbabwe, Saudi Arabia, Yemen.	LOW	HIGH	HIGH	VERY LOW	NEGLIGIBLE

[466] (CABI, 2023).
[467] Establishment potential.
[468] AldY phytoplasma belongs to the same phylogenetic subclade as Flavescence dorée (FD) phytoplasma and Palatinate grapevine yellows (PGY) phytoplasma that cause economically important disease of grapevine in Europe (Katanić et al., 2016).
[469] Tissue cultures from international nursery stock minimises the risk of *Burkholderia caryophylli*.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Candidatus Liberibacter americanus	Huanglongbing; Citrus greening (American strain)	Citrus, sweet orange, mandarin, tangelo, sour orange, trifoliate orange, grapefruit, lemon, lime, kumquat, *Murraya* spp. and *Vepris* spp.	Leaves, stems, flowers, fruit, roots, whole plant.	Short and long-distance dispersal is primarily impingent on infected plant material and the insect vector(s)[470] that harbour the phytoplasma.	Brazil.	LOW	HIGH	HIGH	VERY LOW	NEGLIGIBLE
Candidatus Liberibacter asiaticus	Huanglongbing; Citrus greening (Asiatic strain)	*Citrus* spp. Australian native citrus, *Atalantia* spp., *Murraya* spp. *Clausena* spp., *Vepris* spp. and other rutaceous plants including ornamentals.	Leaves, stems, flowers, fruit, roots, whole plant.	Short and long-distance dispersal is primarily impingent on infected plant material and insect vectors that are harbouring the phytoplasma.	Asia, Middle East, the Americans, the Caribbean, Africa.[471]	HIGH	HIGH	HIGH	MEDIUM	MEDIUM[472]
Candidatus Liberibacter solanacearum	*Candidatus* Liberibacter solanacearum Haplotypes A & B: CLso Haplotypes C, D & E: CaLsol	Haplotypes A & B: Solanaceae family (bell pepper, potato & tomato). Haplotypes C, D & E: Apiaceae family (carrot, celery & parsley).	Whole plant.	Short and long-distance dispersal is primarily impingent on infected plant material and insect vectors that are harbouring the phytoplasma.	Africa, Middle East, Europe, the Americas, Oceania.[473]	MEDIUM [474]	HIGH	HIGH	LOW	LOW
Candidatus Phytoplasma asteris	Yellow disease phytoplasmas (16SrI - Aster yellows group)	Wide host range.[475]	Stems, leaves, whole plant.	Naturally transmitted by a range of leafhoppers.[476] Dispersed by infected propagating materials. Not seed-transmissible.	Asia, Europe, the Americas, Africa.[477]	LOW	HIGH	LOW	LOW	NEGLIGIBLE

[470] Vectored and transmitted by the African citrus psyllid (*Trioza erytreae*) and experimentally by the Asian citrus psyllid (*Diaphorina citri*).
[471] Ethiopia, Kenya, Mauritius, Réunion, Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Iran, Japan, Laos, Malaysia, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Sri Lanka, Taiwan, Thailand, Vietnam, Yemen, Barbados, Belize, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Guatemala, Honduras, Jamaica, Martinique, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, Papua New Guinea, Timor-Leste, Argentina, Brazil, Colombia, Paraguay, Venezuela.
[472] HPP for citrus.
[473] Morocco, Tunisia, Israel, Austria, Belgium, Estonia, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden, United Kingdom, Canada, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, United States of America, New Zealand.
[474] Haplotypes D and E were detected in imported parsley seeds imported to Australia in 2017 at the border.
[475] Hosts include grey dogwood, sandalwood, blueberry, mulberry, peach, cherry, olive, grapevine, maize, onion, gladiolus, oat, wheat, garlic, amaranth, celery, dill, beetroot, cabbage, bell pepper, pigeon pea, mandarin, navel orange, pumelo, creeping thistle, pawpaw, broccoli, hazel, African oil palm, loquat, torch ginger, strawberry, soybean, barley, lettuce, juniper, lily, cotton, lupins, mango, apple, cassava, macadamia, myrtle, prickly pear, parsley, common bean.
[476] *Macrosteles quadrilineatus* (syn. M. *fascifrons*) is reported to be the principal vector.
[477] South Africa, China, India, Indonesia, Iran, Japan, Lebanon, Malaysia, Myanmar, South Korea, Taiwan, Thailand, Turkey, Belarus, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Montenegro, Poland, Portugal, Romania, Russia, Serbia, Spain, Ukraine, United Kingdom, Bermuda, Canada, Cuba, Guatemala, Mexico, Saint Vincent and the Grenadines, United States of America, Argentina, Brazil, Colombia, Peru.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Candidatus Phytoplasma braziliense	Hibiscus witches'-broom (16SrXV: Hibiscus witches broom group)	Cauliflower, Madagascar periwinkle, China-rose, peach, basil.	Leaf chlorosis, shoot proliferation, decline, and plant death (species specific symptoms).	Likely transmitted by hemipteran vectors. Infected plants and propagative materials could facilitate long distance dispersal.	Azerbaijan, Lebanon, Brazil.[478]	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW (with vector)	NEGLIGIBLE
Candidatus Phytoplasma cocostanzania	Palm lethal yellowing phytoplasmas (16SrIV-C: Palm lethal yellows group)	*Cocos nucifera*.	Chronological succession of specific symptoms (fruit drop, flower necrosis, foliar yellowing, and canopy collapse) that results in the death of a palm in 3-5 months.[479]	Vectors are often leafhoppers, planthoppers and psyllids. The planthopper *Haplaxius crudus* (not in Australia) is a confirmed vector for the 16SrIV-A sub-group but other vectors are unknown.	Kenya, Tanzania.	LOW	LOW	NEGLIGIBLE (without vector) MEDIUM (with vector)	NEGLIGIBLE	NEGLIGIBLE
Candidatus Phytoplasma fraxini	Ash yellows; lilac witches'-broom (16SrVII: Ash yellows group)	*Fraxinus* spp., *Prunus persica*, *Syringia* spp., *Vitus vinifera*.	Roots, stems, growing points, inflorescence, fruit, whole plant.	Undetermined vectors (potentially leafhoppers). Infected plant materials. Graft transmission is possible.	Iran, Canada, United States of America, Chile, Colombia.	LOW	LOW	MEDIUM	LOW	NEGLIGIBLE
Candidatus Phytoplasma mali	Apple proliferation phytoplasma (16SrX: Apple proliferation group)	Madagascar periwinkle, bindweed, hazel, Bermuda grass, *Dahlia*, lily, apple, apricot, sweet cherry, plum, Japanese plum, European pear, grapevine.	Whole plant, leaves, stems, roots, fruit.	Vectored by psyllids.[480] Infected plant materials (e.g. plants, scion wood or rootstock) area long distance pathway. Graft transmissible and potentially symptomless.	Europe, Asia, Northern America.[481]	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Candidatus Phytoplasma noviguineense	Bogia coconut syndrome (16SrIV: Palm lethal yellows group)	*Cocos nucifera*, *Musa* spp., *Areca catechu*.	Chronological succession of specific symptoms (fruit drop, flower necrosis, foliar yellowing, and canopy	Hemipteran vectors are the most likely spread the syndrome locally.[482] Infected plant materials or vectors could facilitate long distance spread.	Papua New Guinea.	LOW	MEDIUM	NEGLIGIBLE (without vector)	NEGLIGIBLE	NEGLIGIBLE

[478] (Balakishiyeva et al., 2011).

[479] A succession of symptoms: (1) Premature drop of most or all fruits within a few days; (2) Inflorescence necrosis; (3) Foliar yellowing. Discoloration advances upwards through the canopy; (4) The spear leaf then collapses and dies; (5) The whole canopy of the palm withers and falls off leaving a bare trunk (the 'telegraph pole' stage). There may be an initial symptomless infection period of a few months (EFSA PLH Panel, 2017).

[480] *Cacopsylla picta*, *C. costalis*, *C. mali* and *C. melanoneura*.

[481] Tunisia, Syria, Turkey, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Moldova, Montenegro, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Canada.

[482] Six taxa belonging to four families (Derbidae, Lophopidae, Flatidae, and Ricaniidae) have been suggested as possible vectors, as phytoplasmas were detected in their saliva. Zophiuma *pupillata* was commonly caught in BCS-affected sites (Miyazaki et al., 2018).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
			collapse) that results in tree death.					MEDIUM (with vector)		
Candidatus Phytoplasma palmae	Palm lethal yellowing phytoplasmas (Palm lethal yellows group) 16SrIV-A-F	Host range varies depending on the sub-group.[483]	Chronological succession of specific symptoms (fruit drop, flower necrosis, foliar yellowing, and canopy collapse) that results in the death of a palm in 3-5 months.	Vectors are often leafhoppers, planthoppers and psyllids. The planthopper *Haplaxius crudus* (not in Australia) is a confirmed vector for the 16SrIV-A sub-group, but other vectors are unknown.	Geographic range depends on sub-group, found in the Americas, the Caribbean and Africa.[484]	LOW	LOW	NEGLIGIBLE (without vector) MEDIUM (with vector) [485]	NEGLIGIBLE	NEGLIGIBLE
Candidatus Phytoplasma palmicola	Awka disease (16SrXXII-A: Coconut lethal decline group)	*Cocos nucifera*.	Chronological succession of specific symptoms (fruit drop, flower necrosis, foliar yellowing, and canopy collapse) that results in the death of a palm tree.	Vectors of phytoplasmas are commonly leafhoppers, planthoppers and psyllids. Human dissemination can be from the movement of nuts, seedlings, or coconut embryos at local or regional level.	Nigeria, Cameroon, Mozambique.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW (with vector) [486]	NEGLIGIBLE
Candidatus Phytoplasma palmicola - related strain	Cape St Paul wilt disease (16SrXXII-B: Coconut lethal decline group)	*Cocos nucifera*.	Chronological succession of specific symptoms (fruit drop, flower necrosis, foliar yellowing, and canopy collapse) that results in the death of a palm tree.	In general, human dissemination of coconut varieties can be from the movement of nuts, seedlings, or coconut embryos at local or regional level.	Ghana, Cote d'Ivoire.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW (with vector)	NEGLIGIBLE
Candidatus Phytoplasma phoenicium	Almond witches'-broom (16SrIX - Pigeon pea witches broom group)	*Anthemis* (chamomile), *Prunus* spp. (apricot, almond, peach, nectarine), *Smilax aspera*.	Shoot proliferation on the main trunk. Perpendicular development of many auxiliary buds on branches with smaller	The leafhopper *Asymmetrasca decedens* and cixiids *Cixius* sp., *Tachycixius* spp., and *Eumecurus* spp. may be vectors. Infected plant materials (e.g. fresh almonds in shell) and vectors on	India, Lebanon, Iran, Italy, Costa Rica.	LOW	LOW	MEDIUM	LOW	NEGLIGIBLE

[483] 16SrIV-A: *Cocus nucifera*, *Roystonea regia, Acromonia Mexicana;* 16SrIV-B: *Acrocomia aculeata* (coyol palm), *C. nucifera;* 16SrIV-C: *C. nucifera;* 16SrIV-D: *Carludovica palmata, Pritchardia pacifica, Phoenix canariensis, P. dactylifera, P. sylvestris, P. reclinata, Sabal palmetto, Syagrus romanzoffiana;* 16SrIV-E: *Cocus nucifera;* 16SrIV-F: *Washingtonia robusta.*

[484] 16SrIV-A: Jamaica, Saint Martin, Saint Barthelemy, Saint Kitts, Nevis, Florida, Antigua, Cuba, Haiti, Honduras, Mexico; 16SrIV-B: Mexico; 16SrIV-C: Kenya, Tanzania; 16SrIV-D: Mexico, United States of America (Florida, Texas); 16SrIV-E: Dominican Republic; 16SrIV-F: United States of America (Florida).

[485] (EFSA PLH Panel, 2017).

[486] (Pilet et al., 2019).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
			and yellowish leaves. General decline and dieback.	hosts or non-host species (e.g. citrus) could spread phytoplasma.						
Candidatus Phytoplasma pruni	*Candidatus* Phytoplasma pruni (16SrIII - X Disease group)	Switch sorrel (*Dodonaea viscosa*), apple, delphinium, peach, chokecherry, Japanese plum, almond, plum, sweet cherry, sour cherry.	Whole plant above ground (leaves, stems, flowers, fruits).	Dispersed by infected plant materials. Spread and transmitted by vectors and grafting.	Canada, United States of America, United Kingdom, India.	LOW	MEDIUM	LOW (without vector) MEDIUM (with vector)	VERY LOW	NEGLIGIBLE
Candidatus Phytoplasma prunorum	European stone fruit yellows (16SrX - Apple proliferation group)	Stone fruit including peach, cherry, apricot, plum.	Leaves, stems.	Reportedly transmitted by one insect vector species, *Cacopsylla pruni* (Psyllidae). Long distance: Infected plant materials (e.g. plants, scion wood or rootstock) long distances. Transmitted by grafting and chip budding. Not seed transmissible.	Africa, Middle East, Europe.[487]	LOW	MEDIUM	MEDIUM	LOW[488]	VERY LOW
Candidatus Phytoplasma pyri	Pear decline (16SrX - Apple proliferation group)	Madagascar periwinkle, hazel, quince, apple, peach, Japanese plum, European pear, oriental pear tree.	Whole plant, leaves, stems, roots, fruit.	Pear decline can be transmitted by *Cacopsylla pyricola* and *C. pyri*. Infected plant materials (e.g. plants, scion wood or rootstock) could move the phytoplasma over long distances. Pear decline can be transmitted by grafting, budding and chip budding.	Africa, Middle East, Europe, the Americas.[489]	LOW	MEDIUM	MEDIUM	LOW[490]	VERY LOW
Candidatus Phytoplasma rubi	Witches'-broom; Rubus stunt (16SrV: Elm yellows group)	Rosaceae; primarily *Rubus* spp.	Roots, stems, growing points, inflorescence, fruit, whole plant.	Rubus leafhoppers of the genus *Macropsis*, including *M. fuscula*.[491] Not seed transmissible.	Belgium, Bulgaria, Denmark, France, Germany, Hungary, Italy, Netherlands, Norway, Portugal, Russia, Slovakia, Switzerland, United Kingdom.	LOW	MEDIUM	LOW (without vector) HIGH (with vector)	LOW	VERY LOW (with vector(s))

[487] Egypt, Tunisia, Azerbaijan, Iran, Turkey, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Spain, Switzerland, United Kingdom.

[488] (Marcone et al., 2010).

[489] Libya, Tunisia, Azerbaijan, Iran, Lebanon, Turkey, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Switzerland, United Kingdom, Canada, United States of America, Argentina, Chile.

[490] (Rid et al., 2016).

[491] *Macropsis* species occur in Australia, but the described vector *M. fuscula* has not been reported.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Candidatus Phytoplasma solani	Bois noir; stolbur phytoplasma (16SrX - Apple proliferation group)	Wide host range, more than 100 plant species.[492]	Whole plant; yellowing, reddening, decline, dwarfism, leaf malformation and degeneration.	Transmitted by a range of vectors.[493] Infected plants and propagative materials could facilitate long distance dispersal. Transmissible by grafting and vegetative propagation.	Europe, Middle East, Africa, South America, Asia.[494]	LOW	HIGH	MEDIUM	LOW	VERY LOW
Candidatus Phytoplasma trifolii	Clover proliferation group phytoplasmas (16SrVI: Clover proliferation group)	Wide host range.[495]	Roots, stems, growing points, inflorescence, fruit, whole plant.	Phloem-feeding insect vectors.[496] Infected plant materials (may be asymptomatic). Not seed transmittable.	Bangladesh, China, India, Iran, Lebanon, Malaysia, South Korea, Syria, Turkey, Uzbekistan, Italy, Russia, Spain, United Kingdom, Canada, Mexico, United States of America.	LOW	HIGH	LOW (without vector) MEDIUM (with vector)	LOW	VERY LOW (with vector(s))
Candidatus Phytoplasma ulmi	Elm yellows (16SrV: Elm yellows group)	*Ulmus* spp.	Rare occurrence of symptoms to leaf yellowing, (Europe) witches' broom formation, phloem necrosis and tree death (United States of America).	Vectored by leafhopper *Hishimonus sellatus*. Infected (potentially symptomless) plant materials.	Czechia, Germany, France, Italy, Serbia, Canada, United States of America.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW[497]	NEGLIGIBLE
Candidatus Phytoplasma vitis	Flavescence dorée phytoplasma (16SrV: Elm yellows group)	Grapevine (*Vitis* spp.).	Whole plant; leaf chlorosis, stems, inflorescence, roots, fruit.	Spread of Flavescence dorée occurs through infected grapevine planting material. its main vector, the cicadellid *Scaphoideus titanus*.	Austria, Croatia, France, Italy, Hungary, Portugal, Spain, Serbia, Slovenia, Switzerland.	LOW	LOW	LOW (without vector) HIGH (with vector)	LOW (with vector)	NEGLIGIBLE

[492] Hosts include grapevine, bindweed, hoary cress, black nightshade, kiwifruit, wild leek, dill, celery, beetroot, cauliflower, hemp, chicory, carrot, maiden pink, maize, sunflower, St John's wort, lavender, lilac, peppermint, lucerne, apple, peony, parsley, avocado, parsnip, common bean, tobacco, European pear, weeping willow, blackberry, plum, tomato, eggplant, potato, blueberry, *Eucalyptus*.
[493] (Chuche et al., 2016).
[494] Niger, Armenia, Azerbaijan, China, Georgia, India, Iran, Israel, Jordan, Kyrgyzstan, Lebanon, Saudi Arabia, South Korea, Syria, Tajikistan, Turkey, Uzbekistan, Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Greece, Hungary, Italy, Montenegro, North Macedonia, Poland, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Chile.
[495] Hosts include yellow allamanda, onion, garlic, spreading amaranth, windflower, celery, Norfolk Island pine, bloodflower, neem tree, beetroot, mustard, *Brassica napus*, cabbage, cauliflower, yercum fibre, *Cannabis sativa* subsp. *sativa*, bell pepper, safflower, Madagascar periwinkle, celosia, yellow starthistle, chickpea, mandarin, Canadian fleabane, cucumber, pumpkin, downy thorn apple, jimsonweed, strawberry, *Gladiolus grandiflorus*, soyabean, sunflower, China-rose, *Juniperus procumbens*, lettuce, lavender, lentil, garden lupin, lucerne, honey clover, common bean, date-palm, *Physalis ixocarpa*, rose moss, sweet cherry, peach, radish, rose madder, *Salix* spp., common saltwort, soapwort, *Sauropus androgynus*, *Senecio vulgaris*, sesame, bristly foxtail, tomato, aubergine, potato, Johnson grass, clovers, lesser bulrush, American elm, golden crownbeard, faba bean, grapevine, poisonous gooseberry, maize.
[496] Primary vectors are *Macrosteles fascifrons* and *Circulifer tenellus*.
[497] (Schneider et al., 2020).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Candidatus Phytoplasma ziziphi	Jujube witches'-broom (16SrV: Elm yellows group)	*Zizyphus jujuba* (Common jujube), *Styphnolobium japonicum* (pagoda tree), *Prunus avium* (sweet cherry), *Malus* spp. (apple), *Diospyros kaki* (persimmon).	Witches' broom (branches) and yield reductions.	Dispersal via the vector leafhopper *Hishimonus sellatus*. Infected plant materials.	China, Korea.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	LOW	NEGLIGIBLE
Clavibacter michiganensis subsp. *sepedonicus*	Ring rot	Potato, tomato, *Lycopersicon pimpinellifolium* (currant tomato), eggplant.	Whole plant.	Infected plant materials (e.g. potato tubers or plants) and equipment. Insects can transmit the disease.	Europe, Asia, Middle East, Northern America.[498]	LOW	HIGH	HIGH[499]	LOW	VERY LOW
Dickeya spp. (exotic strains[500])	Bacterial wilts and rots	Vegetable and ornamental crops.[501]	Tubers, bulbs, roots, stems, leaves, fruit, whole plant.	Soilborne. Transmitted through infected plant material, machinery and spread through irrigation water. Vectored by nematodes (*Meloidogyne* and *Radopholus* spp.) and weevil borers.	*Dickeya* species have ranging geographic distribution.[502]	MEDIUM	MEDIUM	MEDIUM	MEDIUM	LOW
Erwinia amylovora	Fire blight	Apples, pears, *Rubus* spp. quince, *Pyacantha* spp., cotoneaster, hawthorns, other ornamental plants.	Leaves, stems, fruit, flowers.	Transmitted by infected plant material, wind, rain, insects, or birds.	Middle East, Europe, United States of America, Oceania.[503]	HIGH	HIGH	HIGH	HIGH	HIGH[504]

[498] China, Japan, Kazakhstan, Nepal, North Korea, Pakistan, South Korea, Taiwan, Turkey, Uzbekistan, Belarus, Bulgaria, Czechia, Estonia, Finland, Germany, Greece, Hungary, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Ukraine, Canada, Mexico, United States of America.

[499] Spread by contact via machinery and other equipment, with cutting knives, picker-type planters, contaminated grading machines and transport trucks important. Water can also spread the pathogen.

[500] Including *D. paradisiaca*, *D. solani*.

[501] This includes begonia, bell pepper, carnation, carrot, chrysanthemum, cyclamen, dahlia, garlic, hyacinth, iris, leek, onion, pelargonium, petunia, philodendron, pineapple, poinsettia, potato, tomato, tulip.

[502] *D. paradisiaca*: India, Cuba, Guatemala, Honduras, Jamaica, Panama, Papua New Guinea, Colombia, Venezuela. *D. solani*: Georgia, Israel, Turkey, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Netherlands, Norway, Poland, Russia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Brazil. *Dickeya dadantii*, *D. dianthicola* and *D. zeae* may be present in Australia (Tesoriero, 2018).

[503] Algeria, Egypt, Morocco, Tunisia, Armenia, Georgia, Iran, Israel, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, South Korea, Syria, Turkey, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Bermuda, Canada, Guatemala, Mexico, United States of America, New Zealand.

[504] HPP for apple and pear.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Erwinia tracheiphila	Cucurbit bacterial wilt	Cucumber, pumpkin, zucchini, gourd, honeydew, melons.	Whole plant.	Obligately dispersed and transmitted by cucumber beetles of the Chrysomelidae.[505]	Congo (DRC), South Africa, China, Iran, Iraq, Japan, North Korea, South Korea, Taiwan, Thailand, Czechia, Slovakia, Lithuania, Canada, United States of America.	LOW	MEDIUM	LOW[506]	LOW	NEGLIGIBLE
Palatinate grapevine yellows phytoplasma	Palatinate grapevine yellows (PGY) phytoplasma (16SrV: Elm yellows group)	*Vitis vinifera*.	Whole plant; leaf chlorosis, stems, inflorescence, roots, fruit.	Spread of PGY occurs through infected planting materials and through the leafhopper, *Oncopsis alni* which populates alder.	Germany, France, Hungary, Serbia.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW[507] (with vector)	NEGLIGIBLE
Pseudomonas syringae pv. *syringae* (exotic races/strains)	Bacterial canker	Broad host range.[508]	Attacks plants from the seedling stage through to maturity including leaves, inflorescence, stems, pods, seeds, flowers, and fruit.	Local dispersal is likely via wind, rain, aerosols and insects or contaminated equipment. In international trade, infected plant materials including pollen, seeds and budwood can carry the bacteria.[509]	Widely distributed worldwide.[510]	HIGH	HIGH	HIGH	HIGH[511]	HIGH
Spiroplasma citri	Citrus stubborn disease	Amaranthaceae, horseradish, brassicas, citrus, plantain, wild radish, Johnston grass.	Whole plant.	Naturally transmitted by leafhoppers.[512] International spread is most likely to occur with infected plants or budwood.	Africa, Europe, Middle East, Central America, Oceania.[513]	LOW	MEDIUM	LOW	NEG	NEGLIGIBLE

[505] (Shapiro et al., 2018).
[506] Known to be vectored by *Acalymma vittatum* and *Diabrotica undecimpunctata howardi* which are not present in Australia.
[507] (Katanić et al., 2016).
[508] Hosts include onion, leek, bell pepper, chrysanthemum, citrus, cucumber, pumpkin, garden dahlia, hibiscus, walnut, lettuce, magnolia, mango, lucerne, rice, passionfruit, avocado, bean, poplar, stonefruit, azalea, roses, tomato, willows, clover, blueberries, grapevine, and maize.
[509] (Upper et al., 2003).
[510] Algeria, Egypt, Ethiopia, Kenya, Lesotho, Libya, Malawi, Morocco, Nigeria, South Africa, Tanzania, Tunisia, Uganda, Zimbabwe, Afghanistan, Azerbaijan, Bangladesh, China, Georgia, India, Iran, Israel, Japan, Kazakhstan, Kyrgyzstan, Lebanon, North Korea, Pakistan, South Korea, Sri Lanka, Thailand, Turkey, Uzbekistan, Vietnam, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Barbados, Canada, El Salvador, Guatemala, Honduras, Mexico, Panama, Puerto Rico, United States of America, New Zealand, Argentina, Brazil, Chile, Uruguay, Venezuela.
[511] *Pseudomonas syringae* pv. *syringae* has broad host and geographic ranges. Exotic races may be more virulent than those currently present in Australia which could result increased damage to crops and market access issues.
[512] *Circulifer tenellus, Scaphytopius nitridus* and *S. acutus delongi* (United States of America). *Neoaliturus haematoceps* and *C. tenellus* (Europe).
[513] Algeria, Egypt, Libya, Morocco, Somalia, Sudan, Tunisia, Iran, Iraq, Israel, Jordan, Lebanon, Malaysia, Oman, Pakistan, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen, Cyprus, France, Italy, Spain, Mexico, United States of America, New Zealand.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Virginia grapevine yellows I (NAGY I)	North American grapevine yellows (NAGY) (16SrI - Aster yellows group)	*Vitis vinifera*.	Leaves, shoots, canes, trunk.	Infected plant materials and potentially a leafhopper vector (unconfirmed).	Canada, United States of America.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW	NEGLIGIBLE
Western X Virginia grapevine yellows III (NAGYIII)	North American grapevine yellows (NAGY) (16SrIII - X Disease group)	*Vitis vinifera*.	Leaves, shoots, canes, trunk.	Infected plant material and insect vector(s) including the leafhopper, *Jikradia olitoria* in an artificial feeding assay.	Canada, United States of America.	LOW	LOW	LOW (without vector) MEDIUM (with vector)	VERY LOW	NEGLIGIBLE
Xanthomonas axonopodis (exotic pathovars[514])	Xanthomonas leaf blight	*Xanthomonas axonopodis pv. allii*: Onion, garlic, leek, chives, shallot, Welsh onion. *X. axonopodis* pv. *dieffenbachiae*: *Anthurium*, *Philodendron* spp.	Stems, leaves, flowers.	Natural dispersal of the bacterium only occurs on a very local scale. The most likely pathway for international movement is in planting or breeding material which may be latently infected.	*Xanthomonas axonopodis* species have ranging geographic distribution.[515]	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE
Xanthomonas campestris pv. *cannabis*	Leaf spot	Hemp, cucumber, soybean, mulberry, tobacco, beans.	Leaves, seeds.	Local dispersal is likely via wind, rain, aerosols and insects or contaminated equipment. In international trade, infected plant materials (e.g. seed[516]) are a likely dispersal pathway.	Romania, Japan.	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE

[514] Including pv. *allii* and pv. *dieffenbachiae*.
[515] *X. a.* pv. *allii*: Mauritius, Réunion, South Africa, Japan, Myanmar, Barbados, Cuba, Saint Kitts and Nevis, United States of America, Brazil. *X. a.* pv. *dieffenbachiae*: Réunion, South Africa, China, Philippines, Sri Lanka, Taiwan, Turkey, Germany, Italy, Netherlands, Poland, Romania, the Caribbean, Canada, Costa Rica, Puerto Rico, United States of America, French Polynesia, New Caledonia, Brazil, Venezuela.
[516] (An et al., 2019).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Xanthomonas citri subsp. *citri*	Citrus canker	Most species of citrus and other Rutaceae.[517]	Whole plant.	Local spread via:, weather (e.g. rain splash, wind) and overhead irrigation[518], birds, insects and contaminated tools, equipment, and workers. Long distance spread via the movement of infected plant materials (i.e. seedlings, budwood, rootstock) or contaminated soil/mulch.	Widespread disease in citrus-producing areas of the tropics and subtropics.[519]	HIGH[520]	HIGH	HIGH	LOW	LOW
Xanthomonas fragariae	Angular leaf spot	Cultivated strawberry.	Leaves, growing points.	The pathogen is dispersed in rain splash (natural and overhead irrigation) and spread is promoted by wind. Infected plant materials (e.g. commercial runners used for planting) could be a likely entry pathway.	Ethiopia, China, Iran, South Korea, Taiwan, Austria, Belgium, Bulgaria, France, Germany, Italy, Netherlands, Portugal, Spain, Switzerland, Canada, Mexico, United States of America, Argentina, Brazil, Paraguay, Uruguay, Venezuela.	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Xylella fastidiosa	Pierce's disease	Wide host range of at least 343 plant species.[521]	Whole plant.	Infected plant material, insect vectors.[522]	The Americas, Middle East, Europe, Asia.[523]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM[524]
Xylophilus ampelinus	Bacterial blight	Grapevine.	Leaves, stems.	Local spread is associated with contaminated equipment and pruning. Dispersal over large distances is likely via the trade of host plants (potentially latent infections) and plant materials.	South Africa, Japan, France, Greece, Italy, Moldova, Slovenia.	LOW	HIGH	MEDIUM	LOW	VERY LOW

[517] (Patané et al., 2019).
[518] Severe weather events and cyclones can spread citrus canker long distances which is a specific risk to northern Australia.
[519] Benin, Burkina Faso, Comoros, Congo (DRC), Côte d'Ivoire, Ethiopia, Gabon, Madagascar, Mali, Mauritius, Mayotte, Réunion, Senegal, Seychelles, Somalia, Sudan, Tanzania, Afghanistan, Bangladesh, Cambodia, China, Cocos Islands, Hong Kong, India, Indonesia, Iran, Iraq, Japan, Laos, Malaysia, Maldives, Myanmar, Nepal, North Korea, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, Turkey, United Arab Emirates, Vietnam, Yemen, British Virgin Islands, Martinique, United States of America, Federated States of Micronesia, Fiji, Guam, Marshall Islands, Palau, Papua New Guinea, Solomon Islands, Timor-Leste, Argentina, Bolivia, Brazil, Paraguay, Uruguay.
[520] Citrus canker was detected in the NT during 2018. An emergency response was declared to eradicate the disease. In 2021, the NT has been officially declared free of citrus canker.
[521] Host families include Altingiaceae, Apocynaceae, Araliaceae, Asteraceae, Betulaceae, Brassicaceae, Caryophyllaceae, Celastraceae, Cornaceae, Ericaceae, Fabaceae, Fagaceae, Ginkgoaceae, Juglandaceae, Lamiaceae, Lythraceae, Magnoliaceae, Malvaceae, Moraceae, Oleaceae, Persea, Plantaginaceae, Poaceae, Rutaceae, Sapindaceae, Ulmaceae, Urticaceae, Vitaceae (European Food Safety Authority, 2020).
[522] Vectored and transmitted by known xylem feeding hemipteran insects in the Cicadellidae, Cicadidae, Aphrophoridae, and Cercopidae. The glassy-winged sharpshooter, *Homalodisca vitripennis* is a key vector (Cornara et al., 2019).
[523] Iran, Israel, Taiwan, France, Germany, Italy, Portugal, Spain, Switzerland, Canada, Costa Rica, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Paraguay, Venezuela.
[524] HPP for berries (blueberries and *Rubus*), cherries, citrus, coffee, olives, summerfruit, tree nuts, viticulture.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Fungi										
Anisogramma anomala	Filbert blight	Hazelnut, *Corylus* spp.	Branches, stems.	Local spread from rain splash droplets and wind. Long distance dispersal via Infected plant materials.	Canada, United States of America.	MEDIUM	MEDIUM	LOW	LOW	NEGLIGIBLE
Apiosporina morbosa	Black knot	*Prunus* spp.	Branches, stems.	Airborne spores dispersed by wind and rain. Infected plant material.	Canada, Mexico, United States of America.	LOW	MEDIUM	LOW	LOW	NEGLIGIBLE
*Austropuccinia psidii sensu lato (*syn. *Puccinia psidii) (*exotic variants*)*	Myrtle rust; Guava rust; Eucalyptus rust	Myrtaceae.	Leaves, young branches, epicormic shoots, coppice, and stem blight. Severe infection and crown loss; dieback and mortality has been reported for certain myrtaceous species.[525]	*A. psidii* can be dispersed over long distances by wind and animal vectors; infected or contaminated plant materials; contaminated plant waste, timber, wood packaging and dunnage; contaminated equipment and tools, and personal possessions.	The Americas, New Caledonia, the Caribbean, South Africa, Indonesia, Japan, China, Singapore, New Zealand. Only one strain of *A. psidii* is present in Australia which is Myrtle rust.[526]	MEDIUM	HIGH	HIGH	HIGH	HIGH
Blumeriella jaapii	Cherry leaf spot	*Prunus* spp. including sweet cherry, sour cherry, Japanese plum, apricot, plum, almond.	Leaves.	Transmitted by infected plant material. Transmitted by airborne and rain splash dispersed spores.	Asia, Canada, United States of America, Europe, South Africa.	LOW	MEDIUM	LOW	LOW	NEGLIGIBLE
Botrytis squamosa	Leaf blight	Onion, Japanese bunching onion (Welsh onion), leek and garlic.	Leaf, bulbs, seed.	Contaminated soil, plant material, wind, and rain.	Middle East, Asia, Europe, the Americas, Oceania.[527]	MEDIUM[528]	MEDIUM	HIGH	LOW	VERY LOW
Calonectria morganii (*Cylindrocladium scoparium* anamorph)	Sheath net-blotch	Wide host range.[529]	Damping off, root rots, stem lesions, leaf spots/blights, and post-harvest fruit decay.	Contaminated soil, plant material, wind, and rain.	South Africa, India, Malaysia, Germany, Italy, Poland, Canada, United States of America, New Zealand, Argentina, Brazil, Chile, Colombia.	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM

[525] (Fernandez Winzer et al., 2017; Pegg et al., 2017).
[526] (Makinson et al., 2020).
[527] Mauritius, China, Hong Kong, Japan, North Korea, South Korea, Belgium, Bulgaria, Czechia, France, Germany, Ireland, Italy, Netherlands, Poland, United Kingdom, Canada, United States of America, New Caledonia, New Zealand, Brazil.
[528] Detected at the border on several occasions.
[529] Including azalea, *Cuphea hyssopifolia* (false heather), *Eucalyptus*, *Melaleuca quinquenervia* (paperbark tree), *Pelargonium* (pelargoniums), *Pinus* (pines), *Pistacia lentiscus* (mastic tree), *Rosa* (roses), *Theobroma cacao* (cocoa).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Calonectria pseudonaviculata	Buxus blight	*Buxus* spp. and cultivars, *Pachysandra* spp., *Sarcococca* spp.	Leaf and stem lesions resulting in defoliation and dieback of boxwood.	*Calonectria pseudonaviculata* spores are dispersed by the splash of water droplets at air speeds of 9.0 to 19.8 m/s. long distance dispersal is likely from the introduction of asymptomatic planting materials.	Middle East, Europe, North America, Oceania.[530]	LOW	LOW	LOW	LOW[531]	NEGLIGIBLE
Ceratocystis fagacearum	Oak wilt	Oak trees, chestnut.	Leaves, stems.	Local spread is primarily through natural root grafting between trees. Transmission over distances is mediated by sap and bark beetle species or the transport of infected plant material(s).	Spain, United States of America.	LOW	MEDIUM	HIGH	LOW	VERY LOW
Chrysoporthe spp. (exotic strains[532])	Eucalyptus canker disease; Chyrsoporthe canker disease	*Tibouchina* spp., *Corymbia* spp., *Eucalyptus* spp., *Syzygium* spp.	The girdling of stems, wilting, and eventual death of infected trees, cankers also form in various areas on the trees.[533]	*Chrysoporthe* spp. infect trees through wounds. Rain splash is thought to disperse asexual spores and wind may disseminate sexual spores. The movement of infected plant material or spores may facilitate long distance dispersal.[534]	*Chrysoporthe* species have ranging geographic distribution.[535]	MEDIUM	HIGH	HIGH	LOW[536]	LOW
Ciborinia camelliae	Camellia petal blight	Camellia (*Japonica* and *Sasanqua* types).	Leaves.	Natural dispersal of *C. camelliae* is by wind-borne ascospores. The fungus can be moved long-distance on infected cut flowers, on plants with open flowers and as sclerotia in soil.	Japan, France, Germany, Guernsey, Ireland, Italy, Netherlands, Portugal, Spain, Switzerland, United Kingdom, United States of America, New Zealand.	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE

[530] Georgia, Iran, Turkey, Austria, Belgium, Croatia, Czechia, Denmark, France, Germany, Ireland, Italy, Netherlands, Norway, Russia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Canada, United States of America, New Zealand.

[531] Fungicide products containing propiconazole, myclobutanil, thiophanate-methyl, fludioxonil, pyraclostrobin, kresoxim-methyl, and chlorothalonil have significant efficacy. The combination of systemic plus protectant fungicides in a single application result in effective disease control (LaMondia, 2015).

[532] Including *C. austroafricana* and *C. cubensis*.

[533] *C. austroafricana* causes cankers at the bases and root collars of eucalypts. Cankers caused by *C. cubensis* and *C. deuterocubensis* are found at varying heights on the stem. (Burgess & Wingfield, 2016; Nakabonge et al., 2005).

[534] (FAO, 2009)

[535] *Chrysoporthe* spp. has been reported in the Americas, Asia, Africa, Australia (Cairns and WA - no reports of the canker disease on eucalypts in Australia). *C. austroafricana* is not known outside of Africa whereas, *C. cubensis* is known from western Africa, the Americas and *C. deuterocubensis* has been identified in Asia, Australia, Hawaii and eastern Africa (van der Merwe, 2010; 2012).

[536] Chrysoporthe canker disease has been successfully managed in plantations by breeding disease-resistant hybrids and planting in lower risk areas.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Coleosporium asterum	Needle cast	Aster, China aster, fleabane, *Gaillardia*, *Heterotheca*, *Inula*, *Pinus* spp., *Solidago*.	Foliage.	The infective spores are windborne between hosts (e.g. Asteraceae, *Pinus* spp.). Infected plant material or hitchhiking could facilitate spread.	China, India, Korea, Canada, United States of America.	HIGH	MEDIUM	HIGH	LOW	LOW
Colletotrichum higginsianum	Anthracnose	Brassicas including swede, mustard greens, Chinese cabbage, turnips, radish.	Leaves.	Proximate dispersal from water splash and airborne spread. International movement via seeds (seed borne), infested plant matter and contaminated soil (saprobic).[537]	China, Singapore, Guadeloupe, Jamaica, Martinique, Puerto Rico, United States of America, American Samoa, Argentina.	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Cronartium spp.	Pine rusts	*Pinus* spp.	Pine needles, stems, branches, cones.	Rust aeciospores, urediniospores and sporidia (basidiospores) are distributed by wind. Introduction could be possible if seedlings or young trees are transported while the systemic infections are latent which is regulated through post-entry quarantine.	Northern hemisphere in Asia, Europe and primarily North America.	LOW	LOW	MEDIUM	LOW	NEGLIGIBLE
Discula destructiva	Dogwood anthracnose	*Cornus* spp. (dogwoods).	Leaves, stems.	Short distance dispersal via rain splash, coccinellids (e.g. *Hippodamia convergens*), birds and other animals may be possible. Fruits and/or seeds can contain the pathogen. Trade of infected plant materials facilitates long distance spread.	Germany, Italy, Switzerland, Canada, United States of America.	LOW	LOW	LOW	LOW	NEGLIGIBLE
Endocronartium spp. (exotic strains[538])	Pine rusts: Example: Western gall rust	Restricted to *Pinus* spp. (including *Pinus radiata*).[539]	Branches, stems, seedlings.	Nursery stock, lumber, and wood packaging. Latent infections easily go undetected unless post-entry quarantine is applied.	Europe, North America, and Japan. *Endocronartium harknessii*: Canada, Mexico, United States of America.	MEDIUM	LOW	LOW	LOW	NEGLIGIBLE
Exobasidium vexans	Tea blister blight	Tea camellia (*Camellia sinensis*).	Leaves, stems.	Airborne dissemination of basidiospores is the most common dispersal mechanism. Introduction of infected scions and cuttings for vegetative	Bangladesh, Cambodia, China, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, Sri Lanka, Taiwan, Thailand, Vietnam.	HIGH	MEDIUM	LOW	NEGLIGIBLE	NEGLIGIBLE

[537] (Cannon et al., 2012).
[538] Including *E. harknessii*.
[539] There is no apparent risk in the movement of *Pinus* seeds or pollen.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
				propagation will pose a high risk of spreading the disease into new areas. Not seed borne.						
Fusarium circinatum	Pitch canker	Pines, Douglas fir.	Branches, exposed roots, and tree trunks.[540]	*Fusarium circinatum* spreads via spores which are disseminated by wind and insects through the year. The pathogen can be brought to new areas mainly by seeds, seedlings[541], soil and plant material.	Japan, Korea, South Africa, Mexico, United States of America, Haiti, Chile, Uruguay, Portugal, Spain.	MEDIUM	HIGH	HIGH	LOW	LOW
Fusarium oxysporum ff. spp. (exotic races)	Fusarium wilt	Formae speciales may be expressed on wide range of hosts. *Fusarium oxysporum* f. sp.[542] are typically adapted to a specific sub-set or group of hosts.[543]	Roots, stem, leaves, whole plant.	*Fusarium* spp. can be dispersed by one of several means including the movement of seed, corms, bulbs or infected cuttings and transplants.[544] Movement by wind and water is possible. Contaminated soil and equipment which can facilitate dispersal.	*Fusarium oxysporum* ff. spp. has a largely global distribution. *Forma specialis* groups and races tend to have more constrained geographic distributions.	MEDIUM	HIGH	MEDIUM	LOW	VERY LOW
Fusarium solani (exotic strains[545])	Bean, cucurbit, and pea root rot.	Host ranges between species include Fabaceae and Cucurbitaceae.[546]	Roots, stem, leaves, whole plant.	Infected plant material, contaminated soil, and equipment. Airborne spores and rain-splash dispersal.	*Fusarium solani* species have ranging geographic distribution.[547]	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Ganoderma zonatum	Basal stem rot	*Eucalyptus* spp. and ornamental palms (including coconut, African oil palm and betelnut palm).	Roots, stem, or bole.	Soil, infected wood, wind.	United States of America.	LOW	HIGH	HIGH	LOW	VERY LOW

[540] Characteristic sunken cankers produce abundant resin in branches and the main stem. Above the infection point, needles are brown and necrotic which cause partial discoloration and the defoliation of branches (dieback). Multiple infection points may cause severe defoliation. Severe infections result in extensive tree mortality, reduced tree growth and reduced timber quality. Natural infections are often associated with wounds (Dvorák et al., 2017; Vettraino et al., 2018).

[541] Pine seeds and seedlings are considered the major pathways of introduction into new countries (Dvorák et al., 2017; Vettraino et al., 2018).

[542] The determination of most exotic *Fusarium oxysporum* f. sp. remains difficult without comprehensive diagnostic tools and baseline surveys.

[543] Hosts include ornamentals taxa (chrysanthemums, daisy, gerbera, lily, lisianthus), Asteraceae (lettuce), Cucurbitaceae (watermelon, cucumber, pumpkin, bottle gourd), Fabaceae (pigeon pea, cowpea, lucerne) Solanaceae (capsicum).

[544] Infected seed or cuttings are the most likely long-distance pathway for the dispersal of host specific fungi.

[545] Including f.sp. *phaseoli,* f.sp. *cucurbitae,* f.sp. *pisi.*

[546] *F. s.* f.sp. *phaseoli*: common bean, soybean, runner bean. *F. s.* f.sp. *cucurbitae*: watermelon, cucumber, giant pumpkin, pumpkin, marrow. *F. s.* f.sp. *pisi*: pea.

[547] *F. s.* f. sp. *phaseoli*: Malawi, Japan, France, Poland, Barbados, Canada, Martinique, United States of America, Brazil. *F. s.* f. sp. *cucurbitae*: Iraq, Austria, Greece, Italy, Netherlands, Spain. *F. s.* f.sp. *pisi*: China, Netherlands, United Kingdom, Canada, United States of America.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Gremmeniella abietina	Scleroderris canker; Brunchorstia dieback	Various conifers, including *Abies* spp, *Larix* spp., *Picea* spp., *Pinus* spp., Douglas fir (*Pseudotsuga menziesii*).	Leaves, stems.	Wind-blown ascospores, rain-splashed conidia, plants for planting.	Asia, Europe, the Americas.[548]	LOW	LOW	MEDIUM	LOW[549]	VERY LOW
Gymnosporangium spp. (exotic strains[550])	Apple and pear rusts	Apple, pear and other woody Rosaceae trees, junipers, other Cupressaceae species.	Leaves, stems.	Heavy rainfall and strong winds promote sporidial dispersal. Carried in cuttings and can be symptomless. Spread potential dependant on availability of alternate hosts.[551]	Worldwide (primarily northern hemisphere) but not well defined.	MEDIUM	LOW	MEDIUM	LOW	VERY LOW
Monilinia fructigena	Brown rot	*Malus* spp., *Pyrus* spp., *Prunus* spp. and other Rosaceae. Also reported on *Vitis vinifera* (Vitaceae).	Fruit, blossoms, stems, leaves.	Localised spread primarily occurs by fungal spores carried by wind, rain-splash and/or insect vectors. Longer distance spread is most likely to occur with the movement of infected plant material(s) or fruit.	Europe, Japan, China, Brazil, Uruguay, North America.	LOW	HIGH	HIGH	LOW	VERY LOW
Monilinia polystroma	Asiatic brown rot	Apple, pear, stone fruit, quince.	Fruit, blossoms, stems, leaves.	Dispersed through infected plant materials, wind, or rain-splashed spores. Insects or birds may carry the conidia (non-specifically) on their bodies.	China, Czechia, Hungary, Italy, Netherlands, Poland, Serbia, Slovenia, Switzerland.	LOW	MEDIUM	HIGH	LOW	VERY LOW
Neonectria ditissima	European canker	Wide host rage affecting more than 60 species.[552]	Stems and branches.	Spores are dispersed by wind/rain/water. Long distance dispersal via plant materials.[553]	Most regions of commercial apple and pear production throughout the world except Australia.[554]	HIGH	MEDIUM	MEDIUM	LOW	VERY LOW

[548] Japan, Korea, Austria, Belarus, Belgium, Bulgaria, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Iceland, Italy, Lithuania, Montenegro, Norway, Poland, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Netherlands, United Kingdom, Canada, United States of America.

[549] (EFSA PLH, 2017).

[550] Around 57 species have been reported worldwide in this genus. 14 species (including 12 known species and two undescribed species) are known to have their aecial stage on *Malus* species (Zhao et al., 2016; Lāce, 2017).

[551] Pathogens of *Gymnosporangium* develop the aecia stage on the Rosaceae host (secondary or alternate host) and the telia stage on cedars and junipers (primary or telia host).

[552] Host include including apple, European pear (*Pyrus communis*), Asian pear (*Pyrus pyrifolia*), loquat, walnut, oak, maple, horse chestnut, alder, birch, hickory, dogwood, hazel, beech, ash, walnut, butternut, tulip tree, aspen, cherry, rose, willow, rowan tree, elm.

[553] Fruit, bark, above ground shoots, stems and branches can either internally or externally disperse the pathogen.

[554] Afghanistan, India, Indonesia, Iran, Iraq, Japan, Lebanon, Saudi Arabia, South Korea, Syria, Taiwan, Austria, Belgium, Bulgaria, Czechia, Denmark, Estonia, Faroe Islands, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Mexico, United States of America, New Zealand, Argentina, Chile, Uruguay.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Oidium spp. (exotic strains[555])	Powdery mildew	*Citrus* spp. (mandarin and sweet orange most susceptible), golden apple, *Pleiospermium alatum, Atalantia buxifolia, Murraya* (excluding *Bergera*).	Leaf and shoot distortion, premature leaf and fruit drop, and twig and branch dieback.	Infected plant material, contaminated soil and equipment. Airborne spores and rain splash dispersal.	Uganda, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Israel, Malaysia, Nepal, Philippines, Sri Lanka, Taiwan, Vietnam, Costa Rica, Cuba, Antigua, Guatemala, Honduras, Mexico, Panama, United States of America, Brazil.	MEDIUM	HIGH	HIGH	LOW	LOW
Ophiostoma ulmi, O. himal-ulmi and *O. novo-ulmi*	Dutch elm disease	*Ulmus* spp. and *Zelkova* spp. (elms).	Leaves, stems, roots.	The pathogen can be dispersed by many species of elm bark beetles, natural root grafts, contaminated tools or machinery, plants materials (e.g. seed) or wood products (especially with bark).[556]	North America, Europe, Central Asia, Russia, Japan, New Zealand.[557]	LOW	HIGH	HIGH	LOW	VERY LOW
Phakopsora euvitis	Grapevine leaf rust	*Vitis* spp., *Meliosma dilleniifolia* subsp. *cunefoia.*	Leaves, fruit.	Wind, infected plant material, contaminated tools, and machinery.	Asia, the Americas, the Caribbean.[558]	MEDIUM	LOW	LOW	NEGLIGIBLE[559]	NEGLIGIBLE
Phymatotrichopsis omnivora	Texas root rot	Wide host range of over 2000 species.[560]	Leaves, roots, stems.	Sclerotia are the primary inoculum source which can survive in soil for years. Infected plant material, contaminated growing mediums, machinery and tools could facilitate long distance dispersal.	Libya, Mexico, United States of America, Venezuela.	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM

[555] Including *O. tingitaninum, O. citri.*

[556] Fungal spores are spread by many species of elm bark beetles. For instance, the European elm bark beetle (*Scolytus multistriatus* - found in Australia since 1974) is an insect vector for the Dutch elm disease. Natural root grafts can facilitate spread as well as non-disinfected tools or machinery. Dutch elm disease fungi or vectors are spread by infected bark mulch, firewood, dunnage, logs and timber. Furniture and handicrafts may also be a pathway. The disease may be dispersed with *Ulmus*, *Zelkova* and *Planera* nursery stock and with seed of these genera. The highest risk of disease introduction comes from infected bark, which can carry both the Dutch elm disease fungi and the elm bark beetle vectors.

[557] Armenia, Azerbaijan, Georgia, India, Iran, Japan, Tajikistan, Turkey, Uzbekistan, Albania, Austria, Belarus, Belgium, Bulgaria, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, North America, Canada, United States of America, New Zealand.

[558] Bangladesh, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Philippines, Sri Lanka, Taiwan, Thailand, United States of America, East Timor, Costa Rica, Barbados, Jamaica, Brazil, Russia.

[559] *Phakopsora euvitis* thrives in tropical/sub-tropical climates and would not be expected to have much impact under southern Australian climates. *P. euvitis* is a leaf inhabiting fungus and therefore, would not directly affect the fruit. Routine spraying would likely help control the effects of leaf infections. Published losses of grape products are not available in the literature despite it being a globally distributed pathogen. Previously eradicated from Australia.

[560] Including cotton, avocado, olive, apple, pear, grains, peanuts, soybeans, common beans, lucerne, oak, walnut, almond, fig, pistachio, *Rubus* spp., *Prunus* spp., poplar, elm, grapevine, tomato, beetroot.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Plenodomus tracheiphilus	Mal secco	Rutaceae: *Citrus*, *Citrofortunella* spp., macrocarpa, kumquats and *Poncirus* spp.	Fruit, leaves, stems.	Conidia are spread by rain splash or overhead irrigation, and some can be airborne (wind assisted).	Algeria, Egypt, Libya, Tunisia, Armenia, Georgia, Iraq, Israel, Lebanon, Syria, Turkey, Yemen, Albania, Cyprus, France, Greece, Italy, Russia, Spain.	MEDIUM	MEDIUM	MEDIUM	LOW	VERY LOW
Pseudopezicula spp. (exotic strains[561])	Leaf scorch	Grapevine.	Foliage.	Ascospores are forcibly discharged into the air from the rehydrated apothecia at the end of rain events. Infested plant material is the most likely primary pathway.	P. tetraspora: United States of America. P. tracheiphila: Jordan, Turkey, Tunisia, Brazil, Austria, France, Germany, Hungary, Moldova, Romania, Russia, Serbia, Spain, Ukraine, Slovenia, Slovakia, Montenegro, North Macedonia.	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Teratosphaeria destructans (syn. *Kirramyces destructans; Phaeophleospora destructans)*	Eucalypt leaf blight	*Eucalyptus* spp.	Serious leaf, bud and shoot blight, leading to premature defoliation and in some instances tree mortality.[562]	Wind dispersed spores. A possible long-distance pathway is plants for planting (and possibly seeds).[563]	China, East Timor, Indonesia, Laos, Thailand, Vietnam, South Africa, and Australia.[564]	HIGH	HIGH	MEDIUM	LOW	LOW
Teratosphaeria zuluensis and *T. gauchensis*	Coniothyrium eucalypt canker	*Eucalyptus* spp.	Tree stems, trunks, leaves.[565]	Asymptomatic infection of live plants and seed.[566]	*Teratosphaeria* species have ranging geographic distribution.[567]	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Nematodes										
Belonolaimus longicaudatus	Sting nematode	Wide host range including blueberry, peanuts, watermelon,	Roots, whole plant.	Migratory ectoparasite in sandy soil types. Contaminated soil, plants with residual soil (e.g. turf,	Pakistan, Saudi Arabia, Turkey, Bahamas, Bermuda, Costa Rica, Mexico, Puerto	MEDIUM	MEDIUM	HIGH	LOW	VERY LOW

[561] Including *P. tetraspora, P. tracheiphila.*
[562] (Andjic et al., 2011; 2019).
[563] The dispersal of *Teratosphaeria* spp. is likely to be dependent on climatic factors, such as temperature and moisture (relative humidity and rainfall). *Teratosphaeria nubilosa* spores can be ejected from ascomata. This allows the spores to be spread over considerable distances. A possible long-distance pathway is plants for planting (and possibly seeds) (Hunter et al., 2009; Andjic et al., 2011; 2019).
[564] Absent in Australia, previously misidentified as *Teratosphaeria destructans,* however following DNA analysis and haplotype mapping the cryptic species in Australia were identified - novel taxa: *T. novaehollandiae* and *T. tiwiana* spp. nov. (Andjic et al., 2016).
[565] Often discrete sunken lesions can form and merge into large necrotic cankers on susceptible trees. Abundant kino exudation and formation of kino pockets in the xylem are caused by the disease. The lesions restrict bark peeling prior to pulping (Cortinas et al., 2011).
[566] (Jimu et al., 2015).
[567] *Teratosphaeria zuluensis:* South Africa, Malawi, Uganda, Mozambique, Zambia, Thailand, Vietnam, China, Mexico. *T. gauchensis:* Kenya, Ethiopia, Uganda, Zimbabwe, Hawaii, Portugal, Argentina, Uruguay (Aylward et al., 2019).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
		onion, pea, bean, potato, grape, citrus, melon, carrot, strawberry, cotton, corn, tomato and turfgrass.		tubers, bulbs etc.) and equipment could facilitate long distance spread.	Rico, United States of America.					
Bursaphelenchus spp. (exotic strains[568])	Pinewood nematode species complex	Mainly *Pinus* spp. but also conifers such as *Abies*, *Cedrus*, *Larix*, *Picea* and *Pseudotsuga* spp.	Roots, bark, wood, and buds but not leaves, cones or fruit.	Insect vectors.[569] Movement on wood (particularly in association with blue stain fungi) is also an important pathway.[570]	The genus *Bursaphelenchus* currently includes more than 100 species worldwide.[571]	HIGH	HIGH[572]	HIGH	LOW[573]	LOW
Ditylenchus destructor	Stem and bulb nematode	Around 70 crops and weeds and a similar number of fungus species have been recorded as hosts.	Stems and bulbs, whole plant.	Wind, water, or soil movement (including contaminated equipment) facilitates local spread. Infected plant materials (e.g. seed in some sp.), soil and equipment are modes of long-distance dispersal.	Asia, Africa, Europe, Middle East, the Americas, Oceania.[574]	MEDIUM	HIGH	MEDIUM	LOW	VERY LOW
Ditylenchus dipsaci (exotic strains)	Stem and bulb nematode	Broad host range across over 450 plant species including *Brassica* spp., *Allium* spp., pea, bean, potato, parsley, strawberry, hyacinth,	Stems and bulbs, whole plant.	Wind, water, or soil movement (including contaminated equipment) facilitates local spread. Infected plant materials, soil, machinery, and tools are modes of long-distance	Africa, Asia, Europe, Middle East, the Americas, the Caribbean.[576]	MEDIUM	HIGH	MEDIUM	LOW[577]	VERY LOW

[568] Including *B. xylophilus*.
[569] Insect vectors are mainly beetles from a range of families, such as the Cerambycidae, Curculionidae (including subfamily Scolytinae) and Buprestidae. Movement of insect vectors in the international trade of wood and host plants is considered a main pathway for *Bursaphelenchus* species dispersal (d'Errico et al., 2015).
[570] Increasing trade and use of low-quality timber dunnage/timber pallets may facilitate the spread of *B. xylophilus* to new countries.
[571] *B. xylophilus*: China, Japan, Korea, Taiwan, South Africa, Canada, Mexico, United States of America, Portugal, Spain.
[572] The establishment of pinewood nematode requires complex interactions between a pathogenic agent (Pine wood nematode), the insect vector (typically *Monochamus* species), a susceptible tree host (often pine) with associated microbiota (bacteria and ophiostomatoid fungi).
[573] Impact on young plants limited, hence the economic impact on production nurseries is limited.
[574] South Africa, Azerbaijan, China, Iran, Japan, Kazakhstan, Kyrgyzstan, Pakistan, Saudi Arabia, South Korea, Tajikistan, Turkey, Uzbekistan, Albania, Austria, Belarus, Belgium, Bulgaria, Czechia, Estonia, France, Germany, Greece, Hungary, Ireland, Jersey, Latvia, Luxembourg, Moldova, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Mexico, United States of America, New Zealand.
[576] Algeria, Kenya, Morocco, Réunion, South Africa, Tunisia, Armenia, Azerbaijan, China, Georgia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Oman, Pakistan, South Korea, Syria, Turkey, Uzbekistan, Yemen, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Costa Rica, Dominican Republic, Haiti, Mexico, United States of America, Australia (some strains present), New Zealand, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela.
[577] A range of nematodes (and other 'pests') are already being controlled in production nurseries. A range of mitigation activities (including trade restrictions) can be used to reduce the risk and economic impact to the production nursery industry.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
		daffodil, tulip, and corn.[575]		dispersal. Desiccation resistant and seed-borne in some taxa.						
Globodera pallida	Potato cyst nematode (white or pale).[578]	The major hosts of restricted to the Solanaceae family, in particular potato, tomato, and eggplant.	Whole plant, leaves, roots.	Wind, water, or soil movement facilitates local spread. Contaminated plant materials (e.g. seed), soil, machinery and tools are modes of long distance dispersal. *G. pallida* withstands desiccation.[579]	Africa, Asia, Europe, Middle East, the Americas, Oceania.[580]	HIGH	HIGH	HIGH	LOW	LOW
Globodera rostochiensis (exotic strains)	Potato cyst nematode (golden). There are five strains (Ro1, Ro2, Ro3, Ro4 and Ro5).	Main hosts restricted to the Solanaceae, family, in particular potato, tomato, and eggplant.	Whole plant, leaves, roots.	Wind, water, or soil movement (including contaminated equipment) facilitates local spread. Infected plant materials, soil, machinery, and tools are modes of long-distance dispersal. *G. rostochiensis* withstands desiccation for long periods.[581]	Africa, Asia, Middle East, Europe, the Americas, Oceania.[582]	HIGH	HIGH	HIGH	LOW	LOW
Heterodera carotae	Carrot cyst nematode	Carrot, other *Daucus* spp., *Torilis* spp. and olives.	Roots.	Contaminated soil, plant material and machinery. Dehydrated cysts remain infective in the soil or adhering to roots for extended periods.	France, Italy, Portugal, Switzerland, United States of America.	MEDIUM	HIGH	HIGH	LOW	LOW

[575] Strains of this nematode tend to have restricted plant host ranges. However, these strains are not reproductively isolated. Many strains can interbreed to create novel strains with different host ranges to either parent.

[578] There are two strains: PA1 and PA2. Cysts are very difficult to detect and are resistant to most disinfestation methods (Mike Hodda, pers. comm.).

[579] (Mburu et al., 2020).

[580] Algeria, Kenya, Tunisia, India, Iran, Japan, Pakistan, Turkey, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Faroe Islands, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Canada, Costa Rica, Panama, United States of America, New Zealand, Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, Venezuela.

[581] This could introduce new strains/pathotypes into established populations (Mburu et al., 2020).

[582] Algeria, Egypt, Kenya, Libya, Rwanda, Sierra Leone, South Africa, Tunisia, Armenia, Georgia, India, Indonesia, Iran, Japan, Lebanon, Oman, Pakistan, Philippines, Sri Lanka, Tajikistan, Turkey, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Faroe Islands, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Mexico, Panama, United States of America, Australia (only Ro1 is present and restricted in Vic.), New Zealand, Bolivia, Chile, Colombia, Ecuador, Peru, Venezuela.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Longidorus elongatus	Tomato black ring eelworm; Needle nematode; Thorne's needle nematode.	Wide host range.[583]	Roots[584], whole plant.	Spreads with infested plant materials, contaminated soil[585], equipment and water.	Africa, Asia, Middle East, Europe, the Americas, Oceania.[586]	MEDIUM	MEDIUM	MEDIUM	LOW	VERY LOW
Meloidogyne chitwoodi	Columbia root knot nematode	Wide host range including carrot, common bean, pea, potato, sweet corn, grasses, barley, lucerne, maize, oats, quinoa, tomato, wheat.	Roots, whole plant.	*Meloidogyne* spp. are sedentary endoparasites. The main routes for nematode dissemination are by infested planting material and soil, such as traded host plants or cuttings with roots, traded soil bearing products (e.g. potatoes), soil attached to equipment and machinery or irrigation water.[587]	Mozambique, South Africa, Turkey, Belgium, France, Germany, Italy, Netherlands, Portugal, Sweden, Mexico, United States of America, Argentina.	MEDIUM	HIGH	MEDIUM	LOW	VERY LOW
Meloidogyne enterolobii	Guava root-knot nematode	Polyphagous including herbaceous and woody plants.[588]	Roots, whole plant.	*Meloidogyne* spp. are sedentary endoparasites. The main routes for nematode dissemination are by infested planting materials and soil[589], such as traded host plants or cuttings with roots, traded soil bearing products, and irrigation water.[587]	Africa, Asia, Europe, South America, the Caribbean.[590]	HIGH	HIGH	HIGH	LOW	LOW
Meloidogyne ethiopica	Root-knot nematode	Wide host range including carrot, common bean, pea, potato, sweet corn,	Roots, whole plant.	Infested planting material and soil (e.g. traded host plants, cuttings with roots, traded soil	Ethiopia, Kenya, Mozambique, South Africa, Tanzania, Zimbabwe, Turkey,	MEDIUM	HIGH	MEDIUM	LOW	VERY LOW

[583] Including *Allium* spp., dog fennel, celery, groundnut, oats, beetroot, cabbage, turnip, fat hen, carrot, black bindweed, common fig, strawberry, wild strawberry, barley, lettuce, apple, lucerne, peppermint, radish, black currant, roses, tomato, stinging nettle, grapevine.

[584] Direct feeding causes severe stunting, galling of root system (Hodda et al., 2012).

[585] Lifecycle takes 9 weeks at 30ºC producing one generation per year (Hodda et al., 2012). Limited by soil type, if soil type is right the nematode is present and will feed on anything (M. Hodda pers. comm. July 2017).

[586] South Africa, India, Kazakhstan, Pakistan, Tajikistan, Turkey, Uzbekistan, Vietnam, Austria, Belgium, Bulgaria, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America, New Zealand.

[587] (OEPP/EPPO, 2016).

[588] The principal hosts are bean, coffee, cotton, eggplant, guava, papaya, pepper, potato, soybean, sweet potato, tobacco, tomato, watermelon.

[589] Generally, root knot is more severe in sandy textured and muck soils than in clay soils.

[590] Benin, Burkina Faso, Congo (DRC), Côte d'Ivoire, Kenya, Malawi, Mozambique, Niger, Nigeria, Senegal, South Africa, Togo, China, India, Singapore, Thailand, Vietnam, Portugal, Switzerland, Costa Rica, Cuba, Guadeloupe, Guatemala, Martinique, Mexico, Puerto Rico, Trinidad and Tobago, United States of America, Brazil, Venezuela. Detected in Australia in 2022 (NT & Qld), isolated detections and still considered exotic.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
		grasses, barley, lucerne, maize, oats, quinoa, tomato, wheat, melons, cucurbits, strawberry, peach, *Helianthus*.		bearing products, and irrigation water. [591]	Greece, Slovenia, Brazil, Chile, Peru.					
Meloidogyne exigua	Coffee root-knot nematode	Coffee, banana, watermelon, pepper, tomato, onion, sugarcane, citrus, rice, rubber tree, and weeds (e.g., *Taraxacum officinale*, *Amaranthus deflexus*, and *Euphorbia heterophylla*).	Roots, whole plant.	Infested planting material and soil (e.g. traded host plants, cuttings with roots, traded soil bearing products, and irrigation water.[591]	Turkey, Costa Rica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Honduras, Martinique, Nicaragua, Puerto Rico, Trinidad and Tobago, Bolivia, Brazil, Colombia, French Guiana, Peru, Suriname, Venezuela.	MEDIUM	HIGH	MEDIUM	LOW	VERY LOW
Meloidogyne floridensis	Root-knot nematode	Peach, bell pepper, watermelon, eggplant, and tomato.	Roots, whole plant.	Infested planting material and soil (e.g. traded host plants, cuttings with roots, traded soil bearing products, and irrigation water.[591]	United States of America (Florida).	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Meloidogyne graminicola	Rice root-knot nematode	At least 98 host plants.[592]	Roots, whole plant.	Infested planting material and soil (e.g. traded host plants, cuttings with roots, traded soil bearing products, and irrigation water.[591]	Madagascar, South Africa, Bangladesh, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Italy, United States of America, Brazil, Colombia, Ecuador.	HIGH	HIGH	HIGH	LOW	LOW
Meloidogyne incognita (exotic strains)	Root knot nematode	Broad host range including many ornamentals and	Roots.	Infested planting material and soil (e.g. traded host plants, cuttings with roots, traded soil	Predominantly a worldwide distribution.[593]	MEDIUM	HIGH	HIGH	LOW	LOW

[591] (OEPP/EPPO, 2016).

[592] Rice (primary) and cereals/grasses, including weeds. Cultivated plant spp. belonging to Asteraceae, Cucurbitaceae, Fabaceae, Solanaceae, Amaryllidaceae (Allium) (Curto, 2017).

[593] Algeria, Angola, Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Congo (DRC), Côte d'Ivoire, Egypt, Eritrea, Ethiopia, Gambia, Ghana, Guinea, Kenya, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Réunion, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe, Afghanistan, Armenia, Azerbaijan, Bangladesh, Brunei, China, Georgia, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, Uzbekistan, Vietnam, Yemen, Albania, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Czechia, Estonia, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Malta, Moldova, Montenegro, Netherlands, North Macedonia, Poland, Portugal, Romania,

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
		vegetables, cotton, and tobacco.		bearing products, and irrigation water.[591]						
Nacobbus aberrans	False root-knot nematode	Approximately 17 plant families and 69 plant species.[594]	Roots (galls), whole plant.	Spreads with infested plant materials, contaminated soil, and equipment.	Egypt, Mexico, United States of America, Argentina, Bolivia, Chile, Ecuador, Peru.	LOW	MEDIUM	MEDIUM	LOW	VERY LOW
Xiphinema diversicaudatum	Dagger nematode	Wide host range.[595]	Roots, whole plant.	Spreads with infested plant materials, contaminated soil, equipment, and water.[596]	Africa, Middle East, Europe, Northern America, Oceania.[597]	MEDIUM[598]	MEDIUM	MEDIUM	LOW[599]	VERY LOW
Oomycetes										
Phytophthora spp. (exotic species[600])	Root rot, dieback	The genus has wide host range including trees, shrubs, palms, annuals, and vegetables.[601]	Leaves, stems, inflorescence.	Spread via water in the soil, irrigation or as wind assisted rain splash. Infected plant materials, contaminated growing mediums, or equipment are the primary pathways for long distance spread.	Worldwide distribution[602] of at least 124 described species.[603]	MEDIUM	HIGH	HIGH	MEDIUM	MEDIUM
Phytophthora	Potato late	Potato, tomato, and	Whole plant.	Spores can disperse via wind and	Late blight *P. infestans* is	MEDIUM	HIGH[606]	HIGH	LOW	LOW

Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, United Kingdom, Antigua & Barbuda, Barbados, Belize, Bermuda, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad & Tobago, United States of America, American Samoa, Australia (some strains present), Fiji, Kiribati, New Caledonia, New Zealand, Niue, Norfolk Island, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, South America, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

[594] It includes members of the families Brassicaceae, Cactaceae, Chenopodiaceae, Cucurbitaceae, Fabaceae, Solanaceae, Umbelliferae and Zygophyllaceae, and common crops such as potatoes, tomatoes, sugarbeet, cabbages, broccoli, turnips, lettuces, cucumbers, peas, carrots, aubergines and bell pepper.

[595]This includes leek, beetroot, cauliflower, cabbage, cucumber, carrot, common beech, strawberry ash, barley, hop, lettuce, corn mint, pea, plum, peach, Japanese plum, blackthorn, rose, blackberry, raspberry, tomato, potato, purple clover, colt's-foot, grapevine.

[596] Causes galling at root tip, reduction in root system and overall plant dwarfing. Biggest restriction on this nematode is soil, if soil type is right the nematode is present and will feed on anything (M. Hodda pers. comm. July 2017).

[597] Morocco, South Africa, Turkey, Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, France, Germany, Ireland, Italy, Moldova, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, United States of America, New Zealand.

[598] Dagger nematode detected in roses in Vic in 1963, now reported as eradicated (APPD, 2023).

[599] Can vector Cherry leafroll virus (*Nepovirus*), Strawberry latent ringspot virus (*Sadwavirus*), Arabis mosaic virus (*Nepovirus*); (syn. Raspberry yellow dwarf virus).

[600] Including *P. phaseoli, P. plurivora, P. occultans, P. terminalis*.

[601] *Phytophthora phaseoli*: Lima bean, common bean, butter bean. *P. plurivora*: Norway maple, European alder, ash, olive, common oak, northern red oak, azalea, small-leaf lime. *P. occultans*: American boxwood, *Ceanothus, Boxwood, Rhododendron*, and ornamental hosts. *P. terminalis*: *Pachysandra terminalis, Buxus sempervirens, Acer palmatum, Choisya ternata* and *Taxus* (Man in't Veld et al., 2015).

[602] *Phytophthora phaseoli*: Congo (DRC), Philippines, Sri Lanka, Italy, Russia, Mexico, Puerto Rico, United States of America. *P. plurivora*: Turkey, Czechia, Italy, Norway, Russia. *P. occultans*: United States of America, Netherlands, Germany, Romania, Turkey. *P. terminalis*: Netherlands, Belgium, United Kingdom, Asia.

[603] (Dunstan et al., 2016).

[606] Exotic strains of A1 and A2 mating types tend to be resistant to metalaxyl compared with old A1 populations. Newer strains are more aggressive within a wider range of environmental parameters. They can infect the main stem and petiole stems directly, as well as the petioles. Disease will occur earlier in the crops and disease potential will be substantial.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
infestans (exotic strains)	blight	other *Solanum* spp.		water (e.g. rain-splash). *P. infestans* is seed-borne for tomato and potato tuber 'seed'. Infested plant materials or contaminated soil and equipment can also transport spores long distances.	distributed around the world. The A1 mating type is widely distributed globally.[604] The A2 mating type has a smaller geographic range.[605]					
Phytophthora kernoviae	Phytophthora blight	Broad host range (at least 17 plant genera).[607]	Leaf blight, dieback, and bleeding cankers.	Local spread via wind and rain-splash. Potential long-distance dispersal on wood products (even without bark) and nursery stock (incl. potting mix and latent infections).[608]	Ireland, United Kingdom, New Zealand, Chile.	HIGH	HIGH	MEDIUM	HIGH	HIGH
Phytophthora ramorum	Sudden oak death	Broad host range across 70 genera.[609] The known host range continues to expand with more research.	Stems, branches, leaves.[610]	Wind-blown rain or rain splash are likely mechanisms for local spread.[611] Potential long-distance pathways: plants for planting, cut branches or contaminated soil and/or water.	Asia, Europe, North America.[612]	MEDIUM	HIGH	HIGH	HIGH	HIGH
Phytophthora tentaculata	Root and stalk rot	At least seventeen plant	Stunted growth, sparse, chlorotic foliage, stem collar lesions, plant death.	Spread via water in the soil, irrigation or as wind assisted rain splash. Infected plant materials and contaminated growing	Germany, Italy, Spain, United Kingdom, China, United States of America.	MEDIUM	HIGH	MEDIUM	LOW	VERY LOW

[604] Algeria, Angola, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mauritius, Morocco, Nigeria, Réunion, Rwanda, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Bangladesh, China, Georgia, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Laos, Lebanon, Malaysia, Nepal, North Korea, Pakistan, Philippines, Saudi Arabia, South Korea, Sri Lanka, Taiwan, Thailand, Turkey, Vietnam, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Moldova, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Antigua and Barbuda, Bahamas, Barbados, Bermuda, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, American Samoa, Australia (some strains present), Cook Islands, Fiji, New Caledonia, New Zealand, Norfolk Island, Papua New Guinea, Samoa, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Uruguay, Venezuela.

[605] Mexico, Burundi, Canada, Colombia, Ecuador, western Europe, Japan, Korea, Rwanda, United States of America. The A2 mating type is not present in Australia.

[607] Host include rhododendron, *Drimys winteri, Fagus sylvatica, Gevuina avellana, Hedera helix, Ilex aquifolium, Liriodendron tulipifera, Magnolia* spp., *Michelia doltsopa, Pieris formosa, Quercus ilex, Quercus robur* and *Vaccinium myrtillus*.

[608] Chlamydospores have not been reported for this species (USDA Agricultural Research Services, 2008).

[609] Some hosts include oak trees, *Arbutus*, *Lithocarpus* spp., fir, maple plants in Ericaceae family, *Eucalyptus gunnii*, beech, bay laurel, magnolia and yew.

[610] Infectious airborne sporangia were not produced in significant numbers on the bole lesions responsible for oak and tanoak mortality but were extremely abundant on foliar lesions of other hosts (Garbelotto & Hayden, 2012; Davidson et al., 2002)

[611] *P. ramorum* has been recovered from plants, rain, soil, litter, and stream water from forests with suitable host taxa.

[612] Vietnam, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Canada, United States of America.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
		species.[613]	Necrotic root system with sunken lesions.	mediums or equipment can facilitate long distance spread.						
Phytophthora tropicalis	-	Wide host range affecting plants in 32 families, including woody nursery or perennial crops.[614]	Roots, stem, leaves, fruits.	Spread via water in the soil, irrigation or as wind assisted rain splash. Infected plant materials and contaminated growing mediums or equipment can facilitate long distance spread.	Taiwan, Vietnam, Germany, Italy, Netherlands, Poland, Spain, Mexico, United States of America, French Polynesia, Brazil.	MEDIUM	HIGH	MEDIUM	MEDIUM	LOW
Viruses and viroids[615]										
Alphaflexiviridae										
Pepino mosaic virus (*Potexvirus*)	Pepino mosaic virus (PepMV)	Primarily infects Solanaceous plants eg. tomato, pepino, potato and eggplant.	Leaves (spots, mottles, curling), fruit discolouration.	Mechanically transmissible. Movement via contaminated soil, water e.g. seeds, fruit, plants.[616] Potential for insect transmission (e.g. bumblebees[617]).	Africa, Middle East, Europe, the Americas.[618]	MEDIUM[619]	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Betaflexiviridae										
Cherry mottle leaf virus (*Trichovirus*)	Cherry mottle leaf virus (CMLV)	*Prunus* spp.	Can be asymptomatic, may cause leaf chlorosis, distortion and/or fruit/plant stunting.	Cherry mottle leaf virus is transmitted by budding or grafting.[620]	United States of America (Pacific Northwest), China.[621]	LOW[622]	LOW	MEDIUM	NEGLIGIBLE	NEGLIGIBLE

[613] *Artemisia douglasiana* (mugwort), *A. dracunculus* (tarragon), *A. californica* (California sagebrush), *Salvia sp.* (sage), *Ceanothus cuneatus* (buck brush), *Frangula californica* (California coffeeberry), *Monardella villosa* (coyote-mint), *Heteromeles arbutifolia* (toyon), *Diplacus aurantiacus* (orange bush monkeyflower), *Apium graveolens* (celery), *Saussurea costus* (costus root), *Cichorium intybus* (chicory), *Chrysanthemum* sp. (hybrids, marguerite, oxeye daisy), *Consolida ajacis* (rocket larkspur), *Gerbera jamesonii* (Barberton daisy), *Origanum vulgare* (oregano), *Santolina chamaecyparissus* (lavender cotton), *Verbena* sp. (vervain hybrids).

[614] Hosts include carnation, periwinkle, papaya, rubber, rosemary, breadfruit, macadamia, apricot, eggplant, *Leucospermum*, cyclamen, verbena, camellia, rhododendron (Lamour et al., 2012).

[615] (ICTV, 2023).

[616] Imports of tomato seed support Australian agriculture as most tomato fruit production crops in Australia are grown from imported seed, and almost all tomato breeding is done overseas. On average 760 kilograms of tomato seed is imported into Australia annually, which is grown into more than 200 million tomato plants.

[617] *Bombus terrestris* present in Tasmania.

[618] Morocco, South Africa, China, Israel, Syria, Turkey, Austria, Belgium, Bulgaria, Cyprus, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Spain, Switzerland, Ukraine, United Kingdom, Canada, Guatemala, Mexico, United States of America, Chile, Ecuador, Peru.

[619] Standard disinfection and hygiene protocols that apply for Potato virus X (PVX) are also expected to be sufficient for PepMV.

[620] CMLV has also been experimentally transmitted by a microscopic eriophyid mite, *Eriophyes inaequalis*.

[621] (Ma et al., 2014).

[622] Controlled by certification programs.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Bromoviridae										
Apple necrotic mosaic virus (*Ilarvirus*)	Apple necrotic mosaic virus (ApNMV)	*Malus* spp., *Crataegus* spp. (Hawthorns).	Leaf chlorosis and necrosis.[623]	Movement of plant materials and grafting.	China, Japan, Korea, India.	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE
Blackberry chlorotic ringspot virus (*Ilarvirus*)	Blackberry chlorotic ringspot virus (BCRV)	Rosaceae: *Rubus* spp., rose, apple.	Leaf chlorosis, mosaic and rosetting in rose.[624]	Transmitted by seed.[625]	United Kingdom, United States of America.	MEDIUM	LOW	MEDIUM	VERY LOW	NEGLIGIBLE
Tulare apple mosaic virus (*Ilarvirus*)	Tulare apple mosaic virus (TAMV)	*Corylus avellana*, *Malus sylvestris*.	Obvious leaf chlorosis.	Virus transmitted by mechanical inoculation; not transmitted by seed.	France, United States of America.	LOW	LOW	LOW	NEGLIGIBLE	NEGLIGIBLE
Closteroviridae										
Citrus tristeza virus (exotic strains) (*Closterovirus*)	Citrus tristeza virus (CTV)	Rutaceae (*Citrus* spp., *Fortunella margarita*), *Passiflora*.	Roots, stems, leaves, fruit.	Primarily spread through the propagation of infected budwood and by aphids. CTV is not seedborne.	Wide global distribution.[626]	LOW	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE
Cucurbit chlorotic yellows virus (*Crinivirus*)	Cucurbit chlorotic yellows virus (CCYV)	Cucurbitaceae: melons, cucumber, pumpkin, zucchini and weeds (e.g. *Malva*, *Lactuca* and *Medicago* spp., *Sonchus oleraceus*).	Chlorotic leaf spots and yellowing of leaves, leaf brittleness, yield loss, reduces sugar content in melon affecting marketability.	Transmitted by the whitefly (*Bemisia tabaci*[627]).	Algeria, Egypt, Sudan, China, Iran, Japan, Lebanon, Saudi Arabia, Taiwan, Greece, United States of America, Israel, Korea, Taiwan, Cyprus, Turkey.[628]	LOW	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE
Cucurbit yellow stunting disorder	Cucurbit yellow stunting disorder	Cucurbitaceae: watermelon, melon,	Chlorotic mottling, yellowing, and	The main pathways of CYSDV dispersal are through infected	China, Turkey, UAE, Cyprus, Greece, Italy, Portugal, Spain,	LOW	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE

[623] Primary impact seems to be foliar; severe economic losses not mentioned. Possibly more widespread than first thought as often occurs in mixed infection with Apple mosaic virus (ApMV).
[624] Worse symptoms when in mixed infections with other viruses.
[625] (Poudel et al., 2014).
[626] Algeria, Angola, Benin, Cameroon, Central African Republic, Chad, Comoros, Congo (DRC), Côte d'Ivoire, Egypt, Eswatini, Ethiopia, Gabon, Ghana, Kenya, Madagascar, Mauritius, Morocco, Mozambique, Nigeria, Réunion, São Tomé and Príncipe, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Afghanistan, Brunei, China, Georgia, India, Indonesia, Iran, Israel, Japan, Jordan, Lebanon, Malaysia, Nepal, Oman, Pakistan, Philippines, Saudi Arabia, South Korea, Sri Lanka, Syria, Taiwan, Thailand, Turkey, United Arab Emirates, Vietnam, Yemen, Albania, Bosnia and Herzegovina, Croatia, Cyprus, France, Greece, Italy, Montenegro, Netherlands, Portugal, Serbia, Spain, Antigua and Barbuda, Aruba, Bahamas, Belize, Bermuda, British Virgin Islands, Costa Rica, Cuba, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Saint Lucia, Trinidad and Tobago, United States of America, American Samoa, Australia (some strains present), Fiji, French Polynesia, New Caledonia, New Zealand, Papua New Guinea, Samoa, Tonga, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.
[627] Vector present in Australia.
[628] (Tang et al., 2017).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
virus (*Crinivirus*)	virus (CYSDV)	cucumber, eggplant, and other experimental hosts.	stunting.	plants for planting and the vector (*Bemisia tabaci*[629]).	Mexico, United States of America.					
Lettuce chlorosis virus (*Crinivirus*)	Lettuce chlorosis virus (LCV)	*Beta vulgaris*, *Carica papaya*, *Catharanthus roseus*, *Lactuca sativa*, *Solanum lycopersicum*, *Cannabis sativa.*[630]	Leaves can exhibit severe yellowing, rolling, brittleness, and vein-clearing. Plants infected early are stunted.	The main pathways of LCV dispersal are through infected plants for planting and the vector (*Bemisia tabaci*[629]).	United States of America, Brazil, Israel, Spain, China.	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Lettuce infectious yellows virus (*Crinivirus*)	Lettuce infectious yellows virus (LIYV)	Lettuce, cucurbits, and other vegetable crops.[631]	Leaf chlorosis and necrosis. Plants may be stunted, exhibit poor fruit set and/or incomplete fruit development.	The main pathways of LIVY dispersal are through infected plants for planting and the vector (*Bemisia tabaci*[629]).	Mexico, United States of America.	LOW	HIGH	HIGH	HIGH	MEDIUM
Sweetpotato chlorotic stunt virus (*Crinivirus*)	Sweetpotato chlorotic stunt virus (SPCSV)	Sweetpotato, *Ipomea* spp.	Leaf chlorosis, vein distortion, leaf rolling, yield loss and stunting when SPFMV is present with other viruses.	SPCSV is disseminated in infected tubers and vegetatively produced propagules (stem cuttings and roots). Transmission by *Bemisia tabaci*[629] and *Trialeurodes abutiloneus.*[632]	Africa, Asia, South America.[633]	LOW	LOW	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Tomato chlorosis virus (*Crinivirus*)	Tomato chlorosis virus (ToCV)	Primary host is *Solanum lycopersicum* (tomato).[634]	Irregular chlorotic mottle and necrotic flecks. Yield loss.	ToCV spread is likely through infected plant materials and the whitefly vectors (*Trialeurodes vaporariorum*[629], *T. abutiloneus*[632] and *Bemisia tabaci*[629]).	Africa, Middle East, Europe, Asia, the Americas.[635]	LOW	HIGH	MEDIUM	LOW	VERY LOW
Tomato infectious	Tomato infectious	Primary host is *Solanum*	Interveinal yellowing,	The main pathways of TICV spread is likely through infected	Tunisia, Indonesia, Japan, Jordan, Taiwan, Bulgaria,	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE

[629] Vector present in Australia.
[630] Infects various other vegetable crops and cannabis which is an important and emerging crop (Hadad et al., 2019).
[631] *Beta vulgaris* var. *saccharifera* (sugarbeet), *Chenopodium* (Goosefoot), *Chenopodium album* (fat hen), *Citrullus lanatus* (watermelon), *Cucumis melo* (melon), *Cucurbita maxima* (giant pumpkin), *Cucurbita moschata* (pumpkin), *Cucurbita pepo* (marrow), *Daucus carota* (carrot), *Helianthus annuus* (sunflower), *Lactuca sativa* (lettuce), *Lactuca serriola* (prickly lettuce), *Portulaca oleracea* (purslane), *Sonchus oleraceus* (common sowthistle), *Taraxacum* (dandelion).
[632] Vector exotic to Australia.
[633] Egypt, Ethiopia, Gabon, Kenya, Madagascar, Nigeria, Rwanda, Tanzania, Uganda, Zambia, China, Israel, North Korea, South Korea, Taiwan, Spain, Costa Rica, United States of America, Argentina, Brazil, Peru.
[634] Other host include taxa within the Solanaceae, Brassicaceae, Rutaceae, Plantaginaceae, Phytolaccaceae, Cucurbitaceae, Chenopodiaceae, Asteraceae.
[635] Egypt, Kenya, Mauritius, Mayotte, Morocco, Nigeria, Réunion, South Africa, Sudan, Tunisia, China, Indonesia, Israel, Japan, Jordan, Lebanon, Pakistan, Saudi Arabia, South Korea, Taiwan, Turkey, Cyprus, France, Greece, Hungary, Italy, Netherlands, Portugal, Spain, Costa Rica, Cuba, Mexico, Puerto Rico, United States of America, Brazil, Uruguay.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
chlorosis virus (*Crinivirus*)	chlorosis virus (TICV)	*lycopersicum* (tomato).[636]	necrosis, and stunting.	plants and the whitefly vector (*Trialeurodes vaporariorum*[637]).	France, Greece, Italy, Mexico, United States of America.					
Fimoviridae										
Rose rosette virus (*Emaravirus rosae)*	Rose rosette virus (RRV)	*Rosa* spp.[638]	Witches' broom (branch proliferation), malformations, excessive thorn production and eventually plant death.	RRV is transmitted by the eriophyid mite, *Phyllocoptes fructiphilus* and by grafting. Rose trade between countries is the most likely pathway of introduction.	India, Turkey, Canada, United States of America.	LOW	LOW	LOW	VERY LOW	NEGLIGIBLE
Geminiviridae										
Beet curly top virus (*Curtovirus*)	Beet curly top virus (BCTV)	Wide host range (300 plant species from 44 different families).[639]	Distorted leaves, root stunting, necrotic phloem.[640]	BCTV spread are through infected plants and the vectors (leafhoppers; *Circulifer tenellus* and *C. opacipennis*).	Côte d'Ivoire, Egypt, India, Iran, Japan, Turkey, Cyprus, Italy, Canada, Costa Rica, Mexico, United States of America, South America.	LOW	HIGH	MEDIUM	MEDIUM	LOW
Chilli leaf curl virus (*Begomovirus*)	Chilli leaf curl virus (ChiLCV)	Primarily *Capsicum annum*. Minor hosts include *Petunia hybrida*, *Mentha spicata*, *Mirabilis jalapa*, *Solanum lycopersicum*.[641]	Stunting of the whole plant with significant yield reductions.[642]	The main pathways for ChiLCV spread is likely through infected plant materials and via the whitefly vector, *Bemisia tabaci*.[637]	India, Oman.[643]	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Chino del tomate virus (*Begomovirus*)	Chino del tomate virus (CdTV)	*Solanum lycopersicum*, *Capsicum annuum*, beans. Weed hosts in the Solanaceae and Malvaceae.	Curling and rolling of leaves. Leaf chlorosis. Plants may be severely stunted and distorted if infected at an early	The main pathways of CdTV dispersal are through infected plants for planting and the vector (*Bemesia tabaci*[637]). Mechanical transmission of the	Mexico, United States of America.	LOW	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE

[636] Other hosts are *Cynara cardunculus* var. *scolymus* (globe artichoke), *Lactuca sativa* (lettuce), *Lycopersicon pimpinellifolium* (currant tomato), *Petunia hybrida*, *S. tuberosum* (potato), *Zinnia elegans* (zinnia).
[637] Vector present in Australia.
[638] (Vazquez-Iglesias et al., 2020).
[639] Hosts including *Apium graveolens* (celery), *Beta vulgaris* (beetroot), *Beta vulgaris* var. *saccharifera* (sugarbeet), *Capsicum annuum* (bell pepper), *Capsicum frutescens* (chilli), *Cucumis sativus* (cucumber), Cucurbitaceae (cucurbits), *Phaseolus vulgaris* (common bean), *Solanum lycopersicum* (tomato), *Vigna unguiculata* (cowpea), *Spinacia oleracea* (spinach).
[640] Dwarfed and malformed/distorted leaves. Underside of leaves are roughened and often produce swellings or spine-like outgrowths. Root stunting with the proliferation of secondary rootlets. Phloem tissues can become necrotic.
[641] Research is underway to develop resistant Solanaceous lines (Thakur et al., 2018).
[642] This includes leaf curling, rolling and puckering. Blistering of interveinous areas with the swelling and thickening of leaf veins. Internode and petiole shortening resulting in a crowding of leaves. (Thakur et al., 2018).
[643] (Saeed & Samad, 2016).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
			stage. Reduced fruit set.	disease has not been demonstrated.						
Citrus chlorotic dwarf-associated virus (*Citlodavirus*[644])	Citrus chlorotic dwarf-associated virus (CCDaV)	*Citrus* spp.	V shaped notch and chlorotic flecking on young leaves. Mature leaves can display warping, crinkling, inverted cupping and/or variegation.	CCDaV is transmitted through vegetative propagation (infected buds, scion, or rootstocks) and stem-slash inoculation. CCDaV may also be insect transmitted. The movement of plant materials and/or infected vectors could facilitate long distance dispersal.	Turkey, Thailand, China.[645]	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Cucurbitaceae infecting begomoviruses [646]	CuLCrV[647], LYMV[648], MCLCuV[649], SLCCV[650], SLCV[651], SLCuYV[652], SMLCV[653], WmCSV[654]	Cucurbitaceae; including cucumber, zucchini, melon, pumpkin, squash, common beans, gourd, tomato.	Symptoms include severe plant stunting, Leaves: upward curling, chlorotic mosaic/mottling, vein swelling. Fruit: quality/yield decreases, discoloured/deformed.	The main pathways for these viruses spreading are likely through infected plants and the whitefly vector, *Bemisia tabaci*[655] and/or *B. tabaci* (B biotype).	Egypt, Iraq, Israel, Jordan, Sudan, Iran, Lebanon, Saudi Arabia, Taiwan, East Timor, India, Pakistan, Costa Rica, Dominican Republic, Guatemala, Honduras, Mexico, Nicaragua, United States of America, China, Vietnam, Philippines.	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Euphorbia leaf curl virus (*Begomovirus*)	Euphorbia leaf curl virus (EuLCV)	*Euphorbia pulcherrima*, *Passiflora edulis*, *Carica papaya*, *Solanum lycopersicum*, *Petunia* spp.	Yellow chlorotic spots and leaf curling. Symptoms can regress in warmer weather.	The main pathways for EuLCV spread is likely through infected plant materials and via the whitefly vector, *Bemisia tabaci*[655] and *B. tabaci* (Biotype B).	China, Taiwan, South Korea.[656]	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE

[644] (Randa Zelyüt et al., 2022).
[645] (Zhou et al., 2017).
[646] Cucurbit leaf crumple virus; Loofah yellow mosaic virus; Melon chlorotic leaf curl virus; Squash leaf curl China virus; Squash leaf curl virus (complex); Squash leaf curl Yunnan virus; Squash mild leaf curl virus; Watermelon chlorotic stunt virus.
[647] Cucurbit leaf crumple virus.
[648] Loofah yellow mosaic virus. Almost no data published on this species.
[649] Melon chlorotic leaf curl virus. Related strains include Squash yellow mild mottle virus (SYMMoV), can be asymptomatic in melon and cucumber (Maliano et al., 2021).
[650] Squash leaf curl China virus. Appears there is a Thailand strain and an Indian strain of this virus as well (Maina et al., 2017).
[651] Squash leaf curl virus (complex). Symptoms of each species/strain can vary somewhat with the host species and the developmental stage of the plant at the time of infection (Idris et al., 2008).
[652] Squash leaf curl Yunnan virus.
[653] Squash mild leaf curl virus.
[654] Watermelon chlorotic stunt virus.
[655] Vector present in Australia.
[656] (Kil et al., 2016).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Rose leaf curl virus (*Begomovirus*)	Rose leaf curl virus (RoLCuV)	*Rosa* spp.	Dwarfing, leaf curling.	The main pathways for RoLCuV spread is likely through infected plant materials and via the whitefly vector, *Bemisia tabaci*[657] and *B. tabaci* (B biotype).	India, Pakistan.[658]	LOW	LOW	MEDIUM	VERY LOW	NEGLIGIBLE
Tomato mottle virus (*Begomovirus*)	Tomato mottle virus (ToMoV)	Tomato (*Solanum lycopersicum*).	Shoots, leaves fruit, whole plant.[659]	The main pathway for ToMoV spread is likely through (infected) plants and the whitefly vector, *Bemisia tabaci*[657] and/or *B. tabaci* (Biotype B).	Kuwait, Mexico, Puerto Rico, United States of America, Venezuela.	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Tobacco leaf curl virus (*Begomovirus*)	Tobacco leaf curl virus (TLCV)	Moderate host range spanning 8 plant families.[660]	Leaf thickening, downward leaf curling, vein swelling as well as stunting symptoms.	The main pathways of TLCV dispersal are likely through infected plants for planting and the vector whitefly vector, *Bemisia tabaci*[657] and/or *B. tabaci* (Biotype B).	Africa, Asia, Middle East, Europe, the Americas.[661]	MEDIUM	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE
Kitaviridae										
Citrus leprosis virus (*Cilevirus leprosis & Cilevirus colombiaense*)	Citrus leprosis virus cytoplasmic (CiLV-C); Citrus leprosis virus cytoplasmic type 2 (CiLV-C2)	*Citrus* spp.	Chlorotic and necrotic lesions are seen on fruits, leaves, and twigs.[662]	The main pathways of CiLV-C spread are through vectors (*Brevipalpus* spp.[663]).	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Argentina, Bolivia, Brazil, Colombia, Paraguay, Uruguay, Venezuela.	MEDIUM	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE

[657] Vector present in Australia.
[658] (Saeed & Samad, 2016).
[659] Plants may develop distorted shoots and leaves with interveinal, chlorotic mottling symptoms. Fruit may be discoloured or malformed. Plants can exhibit severe stunting and reduced yield.
[660] Hosts include; *Acanthospermum hispidum* (bristly starbur), *Ageratum conyzoides* (billy goat weed), *Capsicum annuum* (bell pepper), *Carica papaya* (pawpaw), *Chromolaena odorata* (Siam weed), *Crotalaria juncea* (sunn hemp), *Datura stramonium* (jimsonweed), *Euphorbia hirta* (garden spurge), *Gynandropsis gynandra, Lonicera japonica* (Japanese honeysuckle), *Malachra, Nicotiana tabacum* (tobacco), *Physalis peruviana* (Cape gooseberry), *Sesamum indicum* (sesame), *Sida rhombifolia, Solanum lycopersicum* (tomato), *Spinacia oleracea* (spinach), *Withania somnifera* (poisonous gooseberry), *Zinnia elegans* (zinnia), *Solanum nigrum, Vernonia cinerea*.
[661] Burkina Faso, Cameroon, Comoros, Congo (DRC), Egypt, Ghana, Madagascar, Malawi, Mauritius, Morocco, Mozambique, Nigeria, Sierra Leone, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Cambodia, China, Georgia, India, Indonesia, Iraq, Japan, Malaysia, Myanmar, Pakistan, Philippines, South Korea, Sri Lanka, Taiwan, Thailand, Yemen, Denmark, Romania, Spain, Switzerland, Cuba, Jamaica, Panama, Puerto Rico, United States of America, Papua New Guinea, Colombia, Venezuela.
[662] Symptoms of citrus leprosis disease are caused by CiLV-C in combination with a nuclear dichorhavirus - Citrus leprosis dichorhavirus N (Ramos-Gonzalez et al., 2017). Strains of the Orchid fleck virus have also been seen to cause the same symptoms in citrus (Roy et al., 2015; 2020). Citrus leprosis virus Cytoplasmic Type 2 (CiLV-C2) is a bipartite RNA virus related to CiLV-C.
[663] A false spider mite vector (*Brevipalpus phoenicis*) is present in Australia.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Potyviridae										
Banana bract mosaic virus (*Potyvirus*)	Banana bract mosaic virus (BBrMV)	Cultivated and wild bananas (Musaceae).	Green or red-brown streaks or spindle-shaped lesions on leaf stalks and/or midribs of new banana leaves. Red-brown streaks can be seen on the exposed stem. Reduce fruit yield.	Long distance dispersal of BBrMV is likely via infected banana planting materials (including suckers, bits, corms, and uncertified tissue culture plantlets). Aphids (*Pentalonia nigronervosa*, *Rhopaloshiphum maidis*, *Aphis gossypii*, *A. craccivora*) transmit BBrMV.	India, Philippines, Sri Lanka, Thailand, Vietnam, Samoa, Ecuador.	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Cucumber vein yellowing virus (*Ipomovirus*)	Cucumber vein yellowing virus (CVYV)	*Citrullus lanatus* (watermelon), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita moschata* (pumpkin), *Cucurbita pepo* (marrow).	Vein clearing, chlorosis and finally general necrosis of the affected plant.	The main pathways of CVYV spread are through infected plants and the whitefly vector (*Bemisia tabaci*[664]).	Egypt, Sudan, Tunisia, India, Iran, Israel, Jordan, Lebanon, Oman, Turkey, Cyprus, Portugal, Spain.	LOW	MEDIUM	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
East Asian Passiflora virus (*Potyvirus*)	East Asian Passiflora virus (EAPV)	*Passiflora edulis* (passionfruit) and hybrids.	Mosaic symptoms on leaves and severely malformed and woody fruits.	Trade and transport of host plants may spread EAPV. Aphids (e.g. *Aphis gossypii*, *Hyperomyzus lactucae*, *Myzus persicae*) can vector the virus.	China, Japan, Taiwan, Malaysia.	LOW	LOW	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Passiflora chlorosis virus (*Potyvirus*)	Passiflora chlorosis virus (PaChV)	*Passiflora* spp., *Bituminaria bituminosa* (Fabaceae)	Chlorotic leaves.	Trade and transport of host plants may spread PaChV. Aphids (e.g. *Aphis gossypii*, *Hyperomyzus lactucae*, *Myzus persicae*) can vector the virus.	United States of America, France, Italy, Spain, Germany, Israel.[665]	LOW	LOW	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Pepper veinal mottle virus (*Potyvirus*)	Pepper veinal mottle virus (PVMV)	*Capsicum annuum, C. frutescens, Datura stramonium, Petunia* × hybrida, *Datura metel, Nicotiana tabacum, Solanum* spp.	Mottle/mosaic, necrotic or chlorotic spots and malformation of leaves and/or fruit.	Trade and transport of host plants may spread PVMV. Aphids (*Aphis gossypii*, *A. spiraecola*, *Myzus persicae*, *Toxoptera citricidus*, *Rhopalosiphum maidis*) can locally transmit the virus.	Africa, Middle East, Asia.[666]	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE

[664] Vector present in Australia.
[665] (Fresnillo et al., 2022).
[666] Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Liberia, Mali, Nigeria, Rwanda, Senegal, South Africa, Togo, Tunisia, Afghanistan, China, India, Iran, Japan, South Korea, Taiwan, Yemen.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Plum pox virus (*Potyvirus*)	Plum pox virus (PPV)	The main woody hosts are the fruit-producing and ornamental species of *Prunus*.	Vein clearing in leaves. Chlorotic spots, bands, rings and/or deformation of leaves and fruit.[667]	Primarily distributed through latent budwood used for grafting and planting materials. Several aphids can transmit the virus.[668]	Europe, Asia, Middle East, the Americas.[669]	MEDIUM	HIGH	HIGH	HIGH	HIGH
Tobacco etch virus (*Potyvirus*)	Tobacco etch virus (TEV)	Primarily *Nicotiana tabacum* (tobacco), *Capsicum annuum* (bell pepper), *Solanum lycopersicum* (tomato). Many weed species (Amaranthaceae, Asteraceae, Fabaceae) are alternate hosts.	Symptoms vary depending on time of infection, virus strain and host cultivar.[670]	Multiple aphid species transmit the virus from Solanaceae crops and weed hosts. The virus may be transmitted mechanically via staking, pruning, or handling infected plants. Infected plants, insects and equipment could facilitate long distance dispersal. Not transmissible by seed.	Nigeria, Sudan, Tunisia, China, India, Singapore, Turkey, Cyprus, France, Hungary, Russia, Spain, Canada, Cuba, El Salvador, Guatemala, Jamaica, Mexico, Puerto Rico, Trinidad and Tobago, United States of America, Venezuela.	LOW	HIGH	HIGH	VERY LOW[671]	NEGLIGIBLE
Secoviridae										
Artichoke Italian latent virus (*Nepovirus italiaense)*	Artichoke Italian latent virus (AILV)	*Cynara cardunculus* var. *scolymus* (globe artichoke) is a main host.[672]	General leaf chlorosis, malformation, and stunting.	Virus transmitted by mechanical inoculation and a nematode, *Longidorus apulus.* Potential for seed transmission. Uncontrolled distribution of virus-infected propagating material plays a major role in long distance spread.	Bulgaria, Greece, Italy.	LOW	LOW	LOW	VERY LOW	NEGLIGIBLE

[667] Symptoms do not appear for several months leading to establishment of the disease before obvious symptoms appear.
[668] Aphid vectors include *Aphis craccivora, A. fabae, A. gossypii, A. hederae, A. spiraecola, Brachycaudus cardui, B. helichrysi, B. persicae, Hyalopterus pruni, Metopolophium dirhodum, Myzus persicae, M. varians, Phorodon humuli, Rhopalosiphum padi*.
[669] Egypt, Tunisia, China, India, Iran, Israel, Japan, Jordan, Kazakhstan, Pakistan, South Korea, Syria, Turkey, Uzbekistan, Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, United Kingdom, Canada, Argentina, Chile, Brazil.
[670] Symptoms are expressed on roots (wilting, necrosis), leaves (vein banding, chlorosis, mottle, distortion and/or necrosis), stem/branches (stunting), fruit (deformation, mottle, rugosity) and the whole plant (yield reduction, death).
[671] Resistant varieties are commercially available in both hot and sweet peppers. Resistant varieties are not effective against all isolates of this virus.
[672] It also affects *Cichorium intybus* (chicory), *Crepis neglecta, Gladiolus hybrids* (sword lily), *Helminthea echioides, Hypochaeris achyrophorus, Lactuca virosa* (bitter lettuce), *Lamium amplexicaule* (henbit deadnettle), *Papaver rhoeas* (common poppy), *Pelargonium zonale* hybrids, *Sonchus* (Sowthistle), *Sonchus arvensis* (perennial sowthistle), *Urospermum dalechampii, Vitis vinifera* (grapevine).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Artichoke yellow ringspot virus *(Nepovirus cynarae)*	Artichoke yellow ringspot virus (AYRV)	Wide host range.[673]	Chlorotic lesions, mottling and ringspot symptoms with plant stunting.	AYRV can be spread through infected propagative materials and growing mediums. AYRV can be transmitted through seed. Nematode vectors are likely.	Turkey, Greece, Italy.	VERY LOW	HIGH[674]	MEDIUM	VERY LOW	NEGLIGIBLE
Cherry rasp leaf virus (*Cheravirus avii*)	Cherry rasp leaf virus (CRLV)	*Malus domestica, Prunus avium, P. cerasus, P. mahaleb, P. persica*, *Rubus* (symptomless) and herbaceous hosts (e.g. Asteraceae).	Leaves, stunting of stem/branches and fruit. Branch infection and dieback. Reduced fruit yield and dieback.[675]	Presence of CRLV in weeds or other native hosts (virus reservoir and transmission via seed) and transmission by nematodes (e.g. *Xiphinema* spp.) facilitate local spread. Long distance spread of CRLV could be via infected propagating materials and/or growing mediums.	China, Canada, United States of America.	LOW	MEDIUM	MEDIUM[676]	VERY LOW	NEGLIGIBLE
Grapevine chrome mosaic virus (N*epovirus chromusivum)*	Grapevine chrome mosaic virus (GCMV)	*Apium graveolens* (celery), *Vitis vinifera* (grapevine).	Malformed, asymmetrical, and chlorotic leaves. Diseased vines can be stunted and often display a progressive decline that leads to fruitlessness or death of the plant.	Virus moves over longer distances through infected propagative material.	Austria, Croatia, Czechia, Hungary.	LOW	LOW	MEDIUM	VERY LOW	NEGLIGIBLE
Grapevine fanleaf virus *(Nepovirus foliumflabelli)*	Grapevine fanleaf virus (GFLV)	*Vitis vinifera* (grapevine) and many other secondary herbaceous hosts.	Malformation and yellow mosaic of leaves. Vines may become stunted with a reduction in vigour	Virus moves over longer distances through infected propagative materials and growing mediums. Potentially seed transmissible (not known	Africa, Middle East, Europe, Asia, the Americas,	LOW[679]	HIGH	LOW	NEGLIGIBLE	NEGLIGIBLE

[673] *Ammi majus* (Bishop's-weed), *Anethum graveolens* (dill), *Beta vulgaris* (beetroot), *Calendula arvensis, Chenopodiastrum murale* (nettleleaf goosefoot), *Chrysanthemum segetum, Cirsium arvense* (creeping thistle), *Cucumis sativus* (cucumber), *Cynara cardunculus* (cardoon), *Cynara cardunculus* subsp. *flavescens, Cynara cardunculus* var. *scolymus* (globe artichoke), *Eryngium creticum, Fallopia convolvulus* (black bindweed), *Geranium molle* (dovefoot geranium), *Lepidium draba* (hoary cress), *Lactuca sativa* (lettuce), *Malva* (mallow), *Melilotus* (melilots), *Mercurialis annua*, *Nicotiana glauca* (tree tobacco), *Nicotiana tabacum* (tobacco), *Papaver rhoeas* (common poppy), *Parietaria officinalis, Phaseolus vulgaris* (common bean), *Reseda alba* (white mignonette), *Scolymus maculatus, Silene, Sinapis* (mustard), *Sisymbrium officinale* (Hedge mustard), *Sonchus oleraceus* (common sowthistle), *Stellaria media* (common chickweed), *Torilis nodosa, Urospermum dalechampii, Urtica dioica* (stinging nettle), *Vicia faba* (faba bean), *Vicia faba* var. *major* (broad bean).

[674] (Karapetsi et al., 2020).

[675] Leaves become narrow and deformed (folded, puckered or distorted) with rasp-leaf enations. Stunting of stems/branches, fruit. Infected branches (particularly on lower branches) can die which leads to a reduction in fruit yield and quality.

[676] Some vectors are present in Australia. Primary vectors are dagger nematodes: *Xiphinema americanum*, *X. californicum* and *X. rivesi*.

[679] Material import is inspected on arrival, fumigated, surface sterilised, grown on for 9-16 months in a Post Entry Quarantine (PEQ) facility tested for key pathogens.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
			and fruit yield. New growth is dwarfed or deformed.	for grapevine seeds). GFLV can be transmitted mechanically to around 50 herbaceous species. *Xiphinema index* and *X. italiae* can vector GFLV.[677]	Oceania.[678]					
Peach rosette mosaic virus (*Nepovirus persicae)*	Peach rosette mosaic virus (PRMV)	*Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Taraxacum* (dandelion), *Vaccinium corymbosum* (blueberry), *Vitis labrusca* (fox grape), *Vitis vinifera* (grapevine).	Leaves: mottled, narrow, distorted. Buds: Delayed bud break, little or no fruit growth. Stems: Shoot internodes are stunted.	PRMV is graft transmissible and persists seeds, budwood, rootstocks, grafted nursery plants which allow for spread. Dispersal can also occur through the movement of nematode vectors.[680]	Egypt, Turkey, Canada, United States of America.	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Raspberry ringspot virus (*Nepovirus rubi)*	Raspberry ringspot virus (RpRSV)	Initially reported in *Rubus idaeus* (raspberry). Now more host plants express RpRSV.[681]	Vein yellowing. Leaf mosaic, chlorotic ringspots, flecks, or leaf curling symptoms. Some necrosis and die-back may occur.	RpRSV moves distances through infected propagative materials and growing mediums. It is seed transmitted; many seedlings are symptomless. It is also vectored by *Longidorus* spp.	Middle East, Europe.[682]	MEDIUM	MEDIUM	HIGH	LOW	VERY LOW
Strawberry latent ringspot virus (*Stralarivirus fragariae)*	Strawberry latent ringspot virus (SLRSV)	SLRSV has a wide host range. Strawberries and other fruit crops are the significant hosts.[683]	Chlorotic mottling, ringspots, distortion of leaves and stunting of stems/branches.	Spread through infected propagative materials and contaminated growing mediums. SLRSV is transmitted by *Xiphinema diversicaudatum*.	Middle East, Asia, Europe, Northern America, Oceania.[684]	MEDIUM	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE

[677] Vector can remain viruliferous for many years even in the absence of host crops.

[678] Algeria, Egypt, Madagascar, Morocco, Nigeria, South Africa, Tunisia, Armenia, China, Iran, Israel, Japan, Jordan, Kazakhstan, Lebanon, Pakistan, Palestine, Philippines, Syria, Turkey, Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, France, Germany, Greece, Hungary, Italy, Malta, Moldova, Montenegro, North Macedonia, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Ukraine, United Kingdom, Canada, Mexico, United States of America, New Zealand, Argentina, Bolivia, Brazil, Chile, Venezuela.

[680] *Xiphinema americanum*, *Longidotus diadecturus*, *L. elongatus*.

[681] *Cynara cardunculus* var. *scolymus* (globe artichoke), *Daphne, Forsythia* (golden bells), *Fragaria ananassa* (strawberry), *Ligustrum vulgare* (common privet), *Narcissus* (daffodil), *Phlox*, *Prunus avium* (sweet cherry), *Ribes* (currants), *Rosa hybrida, Sambucus nigra* (elder), *Vitis vinifera* (grapevine), *Weigela* (cardinal-shrub) and many wild/weed plant species.

[682] Iran, Kazakhstan, Turkey, Albania, Belarus, Bulgaria, Czechia, Finland, France, Germany, Greece, Ireland, Latvia, Luxembourg, Montenegro, Netherlands, Norway, Portugal, Russia, Serbia, Switzerland, United Kingdom.

[683] Host include *Aesculus* (buckeye), *Anemone* (windflower), *Apium graveolens* (celery), *Asparagus officinalis* (asparagus), *Capsella bursa-pastoris* (shepherd's purse), *Fragaria ananassa* (strawberry), *Fragaria vesca* (wild strawberry), *Humulus lupulus* (hop), *Impatiens walleriana* (busy lizzy), *Lamium amplexicaule* (henbit deadnettle), *Lilium* (lily), *Mentha gracilis, Narcissus* (daffodil), *Pastinaca sativa* (parsnip), *Prunus* armeniaca (apricot), *Prunus avium* (sweet cherry), *Prunus domestica* (plum), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Rheum hybridum* (rhubarb), *Ribes nigrum* (blackcurrant), *Ribes rubrum* (red currant), *Rosa* (roses), *Rubus fruticosus* (blackberry), *Rubus idaeus* (raspberry), *Solanum muricatum* (melon pear), *Stellaria media* (common chickweed), *Tibouchina, Trifolium repens* (white clover), *Urtica dioica* (stinging nettle), *Vaccinium darrowii, Vitis vinifera* (grapevine).

[684] Egypt, India, Lebanon, Syria, Taiwan, Turkey, Albania, Belarus, Belgium, Croatia, Czechia, Finland, France, Germany, Hungary, Ireland, Italy, Luxembourg, Montenegro, Netherlands, Poland, Portugal, Serbia, Spain, Switzerland, United Kingdom, Canada, Mexico, United States of America, New Zealand.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Tomato black ring virus (*Nepovirus nigranuli)*	Tomato black ring virus (TBRV)	Wide host range.[685]	TBRV causes chlorotic mottling, ring-spotting, or leaf curling. Stunting may occur. Fruit may become deformed.	TBRV can be spread through infected propagative material, growing mediums, seed and transmitted by nematodes (*Longidorus* spp.). Most infected seedlings are asymptomatic.	Asia, Europe.[686]	MEDIUM	HIGH	HIGH	LOW	LOW
Tomato chocolate spot virus (*Torradovirus*)	Tomato chocolate spot virus (ToCSV[687])	*Solanum lycopersicum* L. (tomato).	Necrotic spots on leaves, stems and petioles that eventually expand and cause a dieback of apical tissues and leave brown patches on fruit.	ToCSV can spread via infected propagative materials, vectored by whiteflies (*Bemisia tabaci*[688], *Trialeurodes abutilonea*[689] and *T. vaporariorum*[688]) and may be seed transmitted.	Guatemala.	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Tomato marchitez virus (*Torradovirus marchitezum)*	Tomato marchitez virus (ToMarV)	Tomato (*Solanum lycopersicum*), pepper (*Capsicum* spp. and cv.).	Yellow mosaic, upward leaf curling, crinkling/withering, necrosis, and stunting.	ToMarV can spread via infected propagative materials, vectored by whiteflies (*Bemisia tabaci*[688], *Trialeurodes abutilonea*[689] and *T. vaporariorum*[688]), and may be seed transmitted.	Mexico.	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE
Tomato necrotic dwarf virus (*Torradovirus*)	Tomato necrotic dwarf virus (ToNDV)	Tomato (*Solanum lycopersicum* L.).	Yellow mosaic, upward leaf curling, crinkling/withering, necrosis on leaves and fruit and stunting.	ToNDV can spread via infected propagative materials, vectored by whiteflies (*Bemisia tabaci*[688], *Trialeurodes abutilonea*[689] and *T. vaporariorum*[688]), and may be seed transmitted.	United States of America (California).	LOW	MEDIUM	MEDIUM	VERY LOW	NEGLIGIBLE

[685] *Allium ampeloprasum* (wild leek), *Allium cepa* (onion), *Allium porrum* (leek), *Apium graveolens* (celery), *Astilbe arendsii* (hybr.), *Beta vulgaris* var. *saccharifera* (sugarbeet), *Brassica napus* var. *napobrassica* (swede), *Brassica rapa* subsp. *rapa* (turnip), *Capsella bursa-pastoris* (shepherd's purse), *Capsicum* (peppers), *Clematis, Cucumis sativus* (cucumber), *Cucurbita pepo* (marrow), *Cynara cardunculus* var. *scolymus* (globe artichoke), *Forsythia intermedia* (Golden bells), *Fragaria ananassa* (strawberry), *Fragaria vesca* (wild strawberry), *Gladiolus hybrids* (sword lily), *Herbaceous hosts*, *Hosta*, *Lactuca sativa* (lettuce), *Lamium amplexicaule* (henbit deadnettle), *Lamprocapnos spectabilis, Narcissus* (daffodil), *Nicotiana clevelandii, Pelargonium* (pelargoniums), *Petunia hybrida, Phaseolus vulgaris* (common bean), *Phlox paniculata* (summer perennial phlox), *Prunus dulcis* (almond), *Prunus persica* (peach), *Ribes* (currants), *Robinia pseudoacacia* (black locust), *Rubus* (blackberry, raspberry), *Rubus idaeus* (raspberry), *Sambucus nigra* (elder), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Sorbus aucuparia* (mountain ash), *Syringa vulgaris* (lilac), *Tagetes erecta* (Mexican marigold), *Tagetes patula* (French marigold), *Viola* (violet), *Vitis vinifera* (grapevine).

[686] India, Japan, Turkey, Albania, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Finland, France, Germany, Greece, Hungary, Ireland, Lithuania, Moldova, Montenegro, Netherlands, Norway, Poland, Russia, Serbia, Slovakia, Sweden, Switzerland, United Kingdom.

[687] Possible strain of Tomato marchitez virus (ToMarV) (Batuman et al., 2010).

[688] Vector present in Australia.

[689] Vector exotic to Australia.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Tomato ringspot virus *(Nepovirus lycopersici)*	Tomato ringspot virus (ToRSV)	Wide host range.[690]	Oakleaf, ringspot, or yellow blotch patterns on the foliage. General decline in plant growth and a reduction in fruit set.	TBRV can be spread through infected propagative materials and growing mediums. It can also be transmitted through seed. Most infected seedlings show no obvious symptoms. TBRV is also transmitted by the dagger nematodes (*Xiphinema* spp. [691]), some species are present in Australia.	Middle East, Asia, Europe, the Americas, Oceania.[692]	MEDIUM	HIGH	HIGH	LOW	LOW
Tombusviridae										
Moroccan pepper virus (*Tombusvirus moroccoense*)	Moroccan pepper virus (MPV)	Clematis, pepper, tomato, pelargonium, eggplant, escarole, lisianthus, pear, and lettuce.[693]	Leaf chlorosis (yellowing), mottling, mosaic, and vein yellowing. Some hosts display severe necrosis/rotting.	MPV can be spread through infected propagative materials and contaminated growing mediums (soil, water, plant debris).	Iran, Russia, United States of America.	LOW	LOW	MEDIUM	VERY LOW	NEGLIGIBLE
Pelargonium flower break virus (*Alphacarmovirus pelargonii*)	Pelargonium flower break virus (PFBV)	*Pelargonium* spp. (geranium).	Chlorotic mottling of leaves and 'flower break'. PFBV-infected plants do not always express symptoms.	Transmitted by sap inoculation, contaminated tools, surface contaminated pollen, thrips in the presence of infected pollen, recirculating nutrient solutions and vegetative propagation. It is not transmitted by aphids or seed.	United Kingdom, Denmark, Spain, Germany, Netherlands, Italy, Czechia, Kenya, Israel, United States of America, Russia, China.[694]	LOW	LOW	MEDIUM	NEGLIGIBLE	NEGLIGIBLE
Petunia asteroid mosaic virus	Petunia asteroid mosaic virus	Petunia, hop, cherry, plum, spinach,	Yellow mottling and necrotic lesions on	The virus is transmitted by mechanical inoculation or by	Germany.	LOW	LOW	MEDIUM	NEGLIGIBLE	NEGLIGIBLE

[690] *Buddleja davidii* (butterfly bush), *Capsicum* (peppers), *Capsicum frutescens* (chilli), *Cornus* (Dogwood), *Cucumis sativus* (cucumber), *Cydonia oblonga* (quince), *Daphne mezereum* (mezereon), *Fragaria chiloensis* (Chilean strawberry), *Fraxinus americana* (white ash), *Gladiolus hybrids* (sword lily), *Hydrangea* (hydrangeas), *Lilium* (lily), *Lotus corniculatus* (bird's-foot trefoil), *Malus domestica* (apple), *Nicotiana tabacum* (tobacco), Orchidaceae (orchids), *Pelargonium* (pelargoniums), *Prunus* (stone fruit), *Prunus armeniaca* (apricot), *Prunus avium* (sweet cherry), *Prunus cerasus* (sour cherry), *Prunus domestica* (plum), *Prunus dulcis* (almond), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Ribes* (currants), *Rubus* (blackberry, raspberry), *Rubus idaeus* (raspberry), *Rubus procerus, Sambucus* (Elderberry), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Taraxacum officinale* complex (dandelion), *Vaccinium corymbosum* (blueberry), *Vitis vinifera* (grapevine).

[691] Primary vectors are dagger nematodes: *Xiphinema americanum, X. californicum* and *X. rivesi*.

[692] Egypt, Togo, China, India, Iran, Japan, Jordan, Oman, Pakistan, South Korea, Taiwan, Turkey, Belarus, Croatia, France, Germany, Lithuania, Montenegro, Netherlands, Poland, Russia, Serbia, Slovakia, Canada, Mexico, Puerto Rico, United States of America, Fiji, New Zealand, Brazil, Chile, Colombia, Peru, Venezuela.

[693] (Zakubanskiy et al., 2018).

[694] (Wei et al., 2015).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
(*Tombusvirus petunia)*	(PeAMV)	grapevine.	leaves, leaf and shoot distortion, stunting, and fruits with sunken pits.	grafting. Long distance spread through infected propagative materials and contaminated growing medium (e.g. soil/water).						
Tomato bushy stunt virus (*Tombusvirus lycopersici)*	Tomato bushy stunt virus (TBSV)	Wide host range (experimentally). Narrower natural range including some vegetable and ornamental crops.[695]	Bushy growth, chlorotic spots, leaf deformation and stunting. The quantity and quality (chlorotic blotching, rings, line patterns, necrotic spots, deformations) of fruit is reduced.	TBSV can be spread through infected propagative materials and contaminated growing mediums. The virus can be transmitted in the seed of several taxa.	Morocco, Tunisia, Japan, Pakistan, Singapore, Austria, Bosnia and Herzegovina, Czechia, Germany, Greece, Ireland, Italy, Portugal, Spain, United Kingdom, Canada, Mexico, United States of America, Argentina, Peru, Suriname.	LOW	MEDIUM	MEDIUM	LOW	NEGLIGIBLE
Tospoviridae										
Chrysanthemum stem necrosis virus (*Orthotospovirus chrysanthinecrocaulis)*	Chrysanthemum stem necrosis virus (CSNV)	*Chrysanthemus*, *Lisianthus*, tomato.	Mild or severe necrosis on the stem, wilting of leaves and stems, and chlorotic or necrotic spots and rings on some leaves.	CSNV is transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[696]) in plants, fields or glasshouses. The virus could be disseminated over long distances in cuttings and other vegetative plants for planting.	Iran, Japan, South Korea, Brazil.	LOW	LOW	HIGH	VERY LOW	NEGLIGIBLE
Groundnut bud necrosis virus (*Orthotospovirus arachinecrosis)*	Groundnut bud necrosis virus (GBNV)	Many vegetable, horticulture, and ornamental taxa.[697]	Mild chlorosis to severe bud necrosis. Plant becomes stunted with short internodes. Plants can die after infection of GBNV.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. GBNV is transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[696]).	Bangladesh, China, India, Indonesia, Iran, Nepal, Pakistan, Sri Lanka, Thailand, Vietnam.	LOW	HIGH	HIGH	NEGLIGIBLE	NEGLIGIBLE

[695] Host include *Capsicum annuum* (bell pepper), *Cornus sanguinea* (dogwood), *Malus sylvestris* (crab-apple tree), *Nicotiana glauca* (tree tobacco), *Poa annua* (annual meadowgrass), *Prunus avium* (sweet cherry), *Pyrus communis* (European pear), *Solanum lycopersicum* (tomato), *Solanum mammosum* (nipplefruit nightshade), *Solanum melongena* (aubergine), *Stellaria media* (common chickweed), *Tolmiea menziesii* (pick-a-back plant), *Tulipa fosterana* hybrids, *Urtica urens* (annual nettle).

[696] Western flower thrips (*Frankliniella occidentalis*), Tomato thrips (*Frankliniella schultzei*), Melon thrips (*Thrips palmi*), Onion thrips (*Thrips tabaci*) are present and transmit *Orthotospoviruses* in Australia.

[697] *Arachis* spp. (groundnut), *Arachis hypogaea* (peanut), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Acalypha indica* (copperleaf), *Acanthospermum hispidum* (bristly starbur), *Ageratum conyzoides* (tropic ageratum), *Allium cepa* (onion), *Alysicarpus* spp. (moneywort), *Amaranthus* spp. (amaranthus), *Calotropis gigantea* (giant milkweed), *Citrullus vulgaris* (watermelon), *Commelina benghalensis* (Benghal dayflower), *Colocasia esculenta* (taro), *Corchorus capsularis* (white jute), *Corchorus trilocularis* (jew's mallow*), Cucumis sativus* (cucumber), *Eclipta alba* (false daisy), *Glycine max* (soybean), *Jasminum sambac* (jasmine), *Lagascea mollis* (silkleaf), *Lochnera pusilla*, *Phaseolus vulgaris* (bean), *Physalis minima* (cape gooseberry), *Pisum sativum* (pea), *Sesamum indicum* (sesame), *Sesbania rostrata* (sesbania), *Vigna mungo* (black gram, urd-bean), *Vigna radiata* (mung bean), *Vigna triloba*, *Vigna unguiculata* (cowpea).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Groundnut ringspot virus (*Orthotospovirus arachianuli)*	Groundnut ringspot virus (GRSV)	Tomato, bell pepper, tomatillo, eggplant, peanut, coriander, lettuce.	Ringspots, necrotic and chlorotic areas on leaves. Necrotic lesions on stem and petiole. Fruit may deform and unevenly ripen.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. Thripidae vectors (e.g. *Frankliniella* spp.[698]) spread GRSV.	Ghana, South Africa, United States of America, Argentina, Brazil.	LOW	MEDIUM	HIGH	VERY LOW	NEGLIGIBLE
Melon severe mosaic virus (*Orthotospovirus melotessellati)*	Melon severe mosaic virus (MSMV)	Cucurbitaceae: melon, watermelon.	Leaf mosaic, blistering, deformation, and fruit splitting.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. MSMV is likely transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[698]).	Mexico.	LOW	LOW	HIGH	VERY LOW	NEGLIGIBLE
Melon yellow spot virus (*Orthotospovirus meloflavi)*	Melon yellow spot virus (MYSV)	Cucurbitaceae: melon, watermelon, cucumber, bitter gourd.	Spotted wilt symptoms and a severe chlorosis on melon crops.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. MYSV is likely transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[698]).	Japan, China, Taiwan, Thailand, Ecuador.	LOW	LOW	HIGH	VERY LOW	NEGLIGIBLE
Pepper necrotic spot virus (*Orthotospovirus capsicimaculaflavi*)	Pepper necrotic spot virus (PNSV)	Bell pepper, tomato.	Necrotic spots on leaves and stems.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. PNSV is likely transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[698]).	Peru.	LOW	LOW	HIGH[699]	VERY LOW	NEGLIGIBLE
Tomato chlorotic spot virus (*Orthotospovirus tomatoflavi)*	Tomato chlorotic spot virus (TCSV)	Tomato, bell pepper, jimsonweed, lettuce, peanut, bean, pea, cowpea, potato, coriander, *Impatens* spp., *Cichorium endivia*, *Emilia sonchifolia*, *Epidendron* spp., *Phalaenopsis* spp.	Ringspots, necrotic and chlorotic areas on leaves. Necrotic lesions on stem and petiole may also be present. Developing fruit may be deformed and show uneven ripening. [700]	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. TCSV is transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[698]).	South Africa, Iran, Germany, Cuba, Dominican Republic, Haiti, Puerto Rico, United States of America, Argentina, Brazil.	MEDIUM	HIGH	HIGH	VERY LOW	VERY LOW
Watermelon bud	Watermelon bud	Cucurbitaceae:	Crinkling, mottling,	A likely pathway of entry is the	India.	LOW	LOW	HIGH	VERY LOW	NEGLIGIBLE

[698] Western flower thrips (*Frankliniella occidentalis*), Tomato thrips (*Frankliniella schultzei*), Melon thrips (*Thrips palmi*), Onion thrips (*Thrips tabaci*) are present and transmit *Orthotospoviruses* in Australia.
[699] (Torres et al., 2012).
[700] (Polston et al., 2013).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
necrosis virus (*Orthotospovirus citrullonecrosis)*	necrosis virus (WBNV)	Watermelon (*Citrullus lanatus*).	yellowing, and necrotic streaks on vines; shortened internodes; upright branches; and necrosis and dieback of the buds.	transport of infected plant materials and/or insect vectors. WBNV is transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[701]).						
Watermelon silver mottle virus (*Orthotospovirus citrullomaculosi)*	Watermelon silver mottle virus (WSMV)	Cucurbitaceae: Watermelon (*Citrullus lanatus*).	Silver mottling on leaves and chlorotic mottling on fruits that were malformed. Stunting, tip necrosis and dieback can occur.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. WSMV is transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[701]).	Japan, Taiwan.	LOW	LOW	HIGH	VERY LOW	NEGLIGIBLE
Zucchini lethal chlorosis virus (*Orthotospovirus cucurbichlorosis)*	Zucchini lethal chlorosis virus (ZLCV)	Cucurbitaceae: *Cucurbita* spp., *Cucumis* spp.	Leaf chlorosis and necrosis.	A likely pathway of entry is the transport of infected plant materials and/or insect vectors. WSMV is transmitted and spread by Thripidae vectors (e.g. *Frankliniella* spp.[701]).	Brazil.	LOW	LOW	HIGH	VERY LOW	NEGLIGIBLE
Virgaviridae										
Cucumber fruit mottle mosaic virus (*Tobamovirus*)	Cucumber fruit mottle mosaic virus (CFMMV)	Cucurbitaceae: *Citrillus* spp., *Cucumis* spp., *Cucurbita* spp.).	Leaf symptoms include severe mosaic, vein banding, and yellow mottling. Fruits can display bright mottling or mosaic patterns. [702]	CFMMV can be spread through infected propagative materials (including seed) and contaminated growing mediums.	Israel.	LOW[703]	MEDIUM	HIGH	VERY LOW	NEGLIGIBLE
Cucumber mottle virus (*Tobamovirus*)	Cucumber mottle virus (CuMoV)	Cucurbitaceae: *Cucumis sativus.*	Severe mosaic distortion on leaves and fruit.[704]	CuMoV is spread through cuttings, seedlings, plants, and seeds. CuMoV is highly infectious and may be spread rapidly during crop operations on hands, tools and equipment moving into and/or within the crop.	Japan.	LOW	MEDIUM	HIGH	VERY LOW	NEGLIGIBLE

[701] Western flower thrips (*Frankliniella occidentalis*), Tomato thrips (*Frankliniella schultzei*), Melon thrips (*Thrips palmi*), Onion thrips (*Thrips tabaci*) are present and transmit *Orthotospoviruses* in Australia.
[702] (Antignus et al., 2001).
[703] Controlled at border. Closely related to Kyuri green mottle mosaic virus (KGMMV).
[704] (Orita et al., 2007).

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
Kyuri green mottle mosaic virus (*Tobamovirus*)	Kyuri green mottle mosaic virus (KGMMV)	Cucurbitaceae: *Cucumis sativus*.	Chlorotic mottle of leaves and fruit.	KGMMV is transmitted mechanically and through seeds and soil.[705]	Japan.	LOW	MEDIUM	HIGH	VERY LOW	NEGLIGIBLE
Ribgrass mosaic virus (*Tobamovirus*)	Ribgrass mosaic virus (RMV)	Brassicas, radish, tomato, plantago as well as rosid and asterid groups.[706]	Necrotic ring spots, midrib streak and malformation, leaf mosaic leaf mottling, internal browning of fruit (dependant on host taxa).	Spread through cuttings, seed, seedlings, or plants. RMV can spread from crop operations and equipment moving into and/or within the crop. [707]	Asia, Europe, North America, Russia, Japan New Guinea.	MEDIUM	HIGH	HIGH	VERY LOW	VERY LOW
Tobacco rattle virus (*Tobravirus*) (exotic strains)	Tobacco rattle virus (TRV)	Wide host range - over 400 species of plants from 50 families.[708]	Leaves show mottling, distortion, curling, crumple and/or necrosis.	TRV is mainly transmitted by two nematodes, *Trichodorus* sp. and *Paratrichodorus* sp.[709] TRV can also be spread via seeds. Long distance dispersal of TRV is likely through seed and vectors on plant materials and within soil.	Africa, Middle East, Europe, Asia, the Americas, Oceania.[710]	MEDIUM	HIGH	MEDIUM	VERY LOW	NEGLIGIBLE
Tomato brown rugose fruit virus (*Tobamovirus*)	Tomato brown rugose fruit virus (ToBRFV)	Natural infections of tomato (*Solanum lycopersicum*), pepper (*Capsicum annuum*).	Younger leaves can show yellow mottling and leaf deformation. Mosaic with dark green blistering in	ToBRFV can simply be transmitted mechanically via agricultural practices in fields and greenhouses. Contaminated soils, irrigation water and crop	China, Israel, Jordan, Palestine, Turkey, Cyprus, France, Germany, Greece, Italy, Netherlands, Belgium, Czechia, Poland, Spain,	MEDIUM [711]	MEDIUM	HIGH	VERY LOW	NEGLIGIBLE

[705] (Fukuta et al., 2012).
[706] Rosid and asterid groups with host taxa include Actinidiaceae, Balsaminaceae, Brassicaceae, Caryophyllaceae, Liliaceae, Plantaginaceae and Scrophulariaceae.
[707] (Kim et al., 2010; Chavan & Pearson, 2016).
[708] *Allium cepa* (onion), *Allium sativum* (garlic), *Alstroemeria* (Inca lily), *Amaranthus* (amaranth), *Anemone* (windflower), *Aquilegia* (columbines), *Artemisia* (wormwoods), *Artemisia vulgaris* (mugwort), *Beta vulgaris* var. *saccharifera* (sugarbeet), *Brassica* spp., *Capsella bursa-pastoris* (shepherd's purse), *Capsicum annuum* (bell pepper), *Cyclamen, Cynara cardunculus* var. *scolymus* (globe artichoke), *Daucus carota* (carrot), *Dicentra spectabilis* (bleeding heart), *Fraxinus* (ashes), *Freesia, Galium mollugo* (Hedge bedstraw), *Gladiolus* hybrids (sword lily), *Hosta* spp., Iris (irises), *Lactuca sativa* (lettuce), *Lamprocapnos spectabilis, Lilium candidum* (madonna lily), *Lilium longiflorum* (Easter lily), *Malva* (mallow), *Narcissus* (daffodil), *Nicotiana tabacum* (tobacco), *Paeonia* (peonies), *Paeonia lactiflora* (Chinese peony), *Peperomia, Phaseolus vulgaris* (common bean), *Phlox, Phlox paniculata* (summer perennial phlox), *Physalis* (Groundcherry), *Plantago* (Plantain), *Portulaca oleracea* (purslane), *Rumex* (Dock), *Secale cereale* (rye), *Sedum* (stonecrop), *Solanum nigrum* (black nightshade), *Solanum tuberosum* (potato), *Sonchus* (Sowthistle), *Spinacia oleracea* (spinach), *Stellaria media* (common chickweed), *Tulipa* (tulip), *Tussilago* farfara (Colt's-foot), *Viola arvensis* (field pansy).
[709] A total of 14 species have been found to transmit the virus, *T. primitivus*, *T. similis* and *P. pachydermus* being the most widespread vectors.
[710] Burundi, Egypt, South Africa, Tunisia, Bangladesh, China, India, Japan, Uzbekistan, Austria, Belarus, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Russia, Serbia, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Cuba, United States of America, Australia (Victoria), New Zealand, Bolivia, Brazil, Venezuela.
[711] Currently emergency measures require tomato and bell pepper seeds are tested for ToBRFV before entry into Australia.

Scientific name	Common name	Host(s)	Affected plant part	Movement and dispersal	Geographic distribution[466]	Entry potential	Est.[467] potential	Spread potential	Economic impact	Overall risk
			older fully developed leaves. Stem necrosis possible. Fruits can be deformed with severe discolouration.	debris can disseminate ToBRFV long after initial contamination. ToBRFV could be carried by pollinators (e.g. *Bombus terrestris*). ToBRFV dissemination over long distances could occur via contaminated seeds or fruits.	United Kingdom, Mexico, United States of America, Canada.					
Tomato mottle mosaic virus (*Tobamovirus*)	Tomato mottle mosaic virus (ToMMV)	Natural infections of tomato (*Solanum lycopersicum*), pepper (*Capsicum annuum*), eggplant (*Solanum melongena*), chickpea (*Cicer arietinum*).	Severe necrotic lesions, chlorosis, leaf distortion, mottle and systemic crinkling symptoms and fruit necrosis.	It is transmitted through propagation materials (seeds, plants for planting, grafts, cuttings), and spreads locally by contact including direct plant-to-plant contact, contaminated tools, hands, or clothing and potentially by insect vectors.	China, Iran, Israel, Spain, Mexico, United States of America, Brazil.	MEDIUM [712]	MEDIUM	HIGH	VERY LOW	NEGLIGIBLE
Watermelon green mottle mosaic virus (*Tobamovirus*)	Watermelon green mottle mosaic virus (WGMMV)	Cucurbitaceae: *Citrullus lanatus.*	Leaf mottling, mosaicism, and crinkling.[713]	Seed transmission is suspected but currently unconfirmed.	Taiwan.	LOW	MEDIUM	HIGH	LOW	VERY LOW
Zucchini green mottle mosaic virus (*Tobamovirus*)	Zucchini green mottle mosaic virus (ZGMMV)	Cucurbitaceae: *Cucurbita pepo, Lagenaria siceraria.*	Chlorotic mottle of leaves and fruit.	ZGMMV can be spread through infected plant materials and seed.	Korea, Saudi Arabia, China.	LOW	MEDIUM	HIGH	LOW	VERY LOW

[712] Currently emergency measures require tomato and bell pepper seeds are tested for ToMMV before entry into Australia.
[713] (Cheng et al., 2019).

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