Biosecurity Plan
for the Cotton Industry

A shared responsibility between government and industry

Version 4.0 August 2024

CRDC

COTTON AUSTRALIA

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Revision history

Version	Date	Details
1.0	November 2006	*National Cotton Industry Biosecurity Plan.*
2.0	February 2010	*Biosecurity Plan for the Cotton Industry.*
3.0	August 2015	*Biosecurity Plan for the Cotton Industry.*
4.0	August 2024	*Full revision of the Biosecurity Plan for the Australian Cotton Industry.*

Acknowledgements

The review and development of the *Biosecurity Plan for the Australian Cotton Industry* was coordinated by Plant Health Australia in collaboration with CRDC 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 Cotton Industry* (*Version 4.0*) was formally endorsed by the cotton industry (through Cotton Australia) in April 2024, and all state and territory governments through the Plant Health Committee (PHC) in August 2024. 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, Fisheries and Forestry 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.

EXOTIC PLANT PEST HOTLINE
1800 084 881

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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 system
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
CA	Cotton Australia
CRDC	Cotton Research and Development Corporation
CPHM	State 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 Environment (now DAFF)
DEECA Vic	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 WA	Department of Primary Industries and Regional Development, Western Australia
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
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
MIA	Murrumbidgee Irrigation Area
MICOR	Manual of Importing Country Requirements
NAQS	Northern Australian Quarantine Strategy
NDP	National Diagnostic Protocol

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
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
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. Established 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. A HPP should have a High or Extreme overall rating through the Biosecurity Planning process. For more information on risk ratings please refer to page 37.

EXECUTIVE SUMMARY

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

The *Biosecurity Plan for the Australian Cotton Industry* V4.0 was developed in consultation with the Cotton Technical Expert Group (TEG) and Cotton Biosecurity Implementation Group (BIG) which consisted of plant health, biosecurity experts and industry representatives. These groups were coordinated by Plant Health Australia (PHA) and included representatives from Cotton Australia, Cotton Research Development Corporation, relevant state and territory agriculture agencies and other stakeholders.

The development of Threat Summary Tables (TST), constituting a list of over 170 exotic plant pests and pathogens was central to the biosecurity planning process. Each pest on the list was given an overall risk rating based on four criteria; entry, establishment, spread potential, and economic impact. In this biosecurity plan, important established pests of the cotton industry were also identified, as good biosecurity practices are beneficial for ongoing monitoring and management as well as mitigating risk and impacts to growers.

This 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 cotton industry. This enables identification of gaps and prioritises specific actions, as listed in the Biosecurity Implementation Plan. The implementation of strategies and activities outlined in this implementation plan will increase the Australian cotton industry's biosecurity preparedness and response capability undertaken through a partnership between industry and government.

This biosecurity plan is principally designed for decision makers. It provides the Australian cotton industry and government with a mechanism to identify exotic plant pests as well as to address the strengths and weaknesses of the cotton industry's current biosecurity position. It is envisaged that regular reviews of this 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 cotton 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.

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 tri-partisan 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 Australian cotton 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.

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.

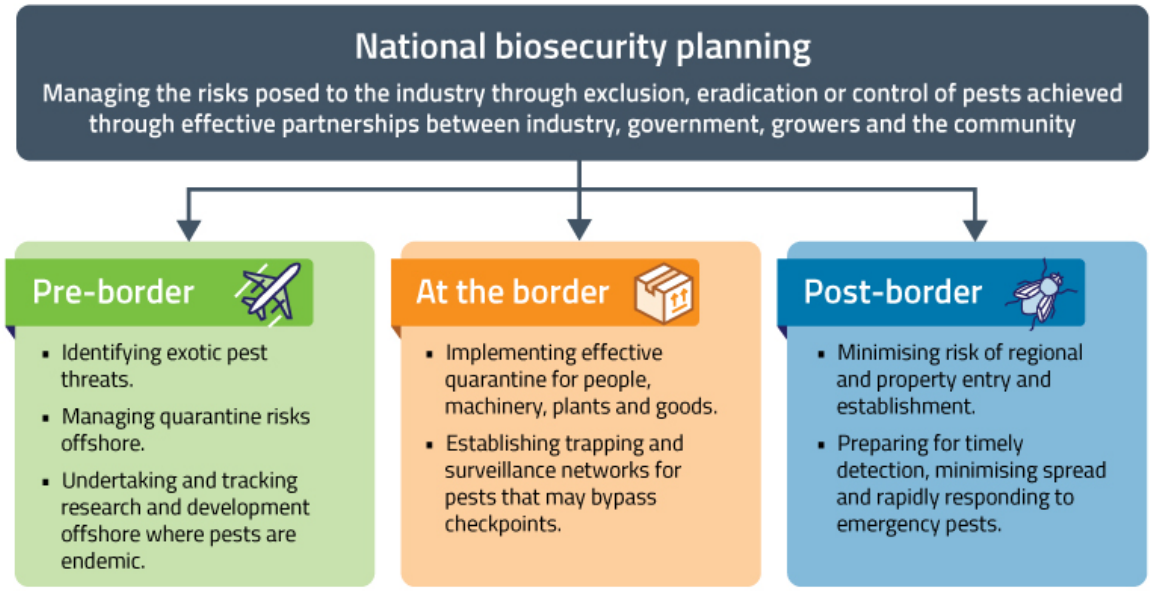

Figure 1. Biosecurity: a shared responsibility.

COTTON INDUSTRY PROFILE

Cotton Australia

Cotton Australia is the peak representative body for the Australian cotton industry. Established in 1972 (as the Australian Cotton Foundation), Cotton Australia merged with the Australian Cotton Growers Research Association in 2008 to provide representation for cotton growers across research, stewardship, natural resource management and cotton production issues. Cotton Australia holds the official role for biosecurity stewardship in the Australian cotton industry and works with the Australian Government to manage this national priority through its membership with Plant Health Australia.

Cotton Australia represents the biosecurity interests of cotton producers and the industry. They are members of Plant Health Australia and signatories to the Emergency Plant Pest Response Deed. Their responsibilities include:

- Biosecurity planning and implementation at the national and farm levels.
- Consulting with federal and state governments on trade issues.
- Funding and supporting biosecurity initiatives.
- Participating in national committees and response efforts in an emergency.

Cotton Research & Development Corporation

The Cotton Research and Development Corporation (CRDC) delivers outcomes in cotton research, development and extension (RD&E) for the Australian cotton industry. A partnership between the Australian Government and cotton growers, CRDC invests in world-leading RD&E to benefit Australia's dynamic cotton industry, and the wider community. RD&E and its resulting innovations are a key driving force behind our industry's continued success - and CRDC's purpose is to power the success of Australian cotton through this world-leading RD&E by investing in innovation and transformative technologies to deliver impact.

Cotton industry biosecurity

Cotton Australia, CRDC and PHA work across multiple sectors to develop and deliver a comprehensive national approach to managing biosecurity risks in the cotton industry. Valuable assistance is received from researchers and staff from CSIRO, NSW Department of Primary Industries (NSW DPI), Queensland Department of Agriculture and Fisheries (DAF), Biosecurity Queensland, Cotton Seed Distributors (CSD), the Australian Government (Department of Agriculture, Fisheries and Forestry) and a number of Universities. Further information on the focus of Cotton industry biosecurty is included in Appendix 1 (page 71).

Cotton production

The cotton industry is an integral part of the Australian economy, worth on average more than $2 billion per annum. Almost the entire Australian cotton crop is exported, with the majority sold to China and the remainder to spinning mills in other parts of Asia. In 2020-21 financial year, approximately 515 million tonnes of cotton were produced with an estimated gross value of almost $1.5 billion (ABARES, 2022).

Cotton is predominantly grown as an annual irrigated summer crop, with rain-grown cotton representing approximately 20 per cent of the total planted area. There are approximately 1500 cotton farms in Australia with around 60 per cent of the national crop grown in New South Wales. The remainder is grown in Queensland with a small number of cotton fields in Victoria. Cotton is grown in more than 100 regional communities with around 90 per cent of Australia's cotton businesses being family farms.

Major cotton production areas include the Central Highlands, Darling Downs, Border Rivers, St George, Mungindi and Dirranbandi regions of Queensland, and the Gwydir, Namoi, Macquarie, Murrumbidgee, Murray, and Lachlan valleys of New South Wales (Figure 2; Cotton Australia, 2022).

Australia is a small global cotton producer, but the world's third-largest cotton exporter in a good season. The major buyers of Australian cotton are currently China, Bangladesh, Vietnam, India, Indonesia, Turkey, and Thailand (Australian Cotton Shippers Association, 2022).

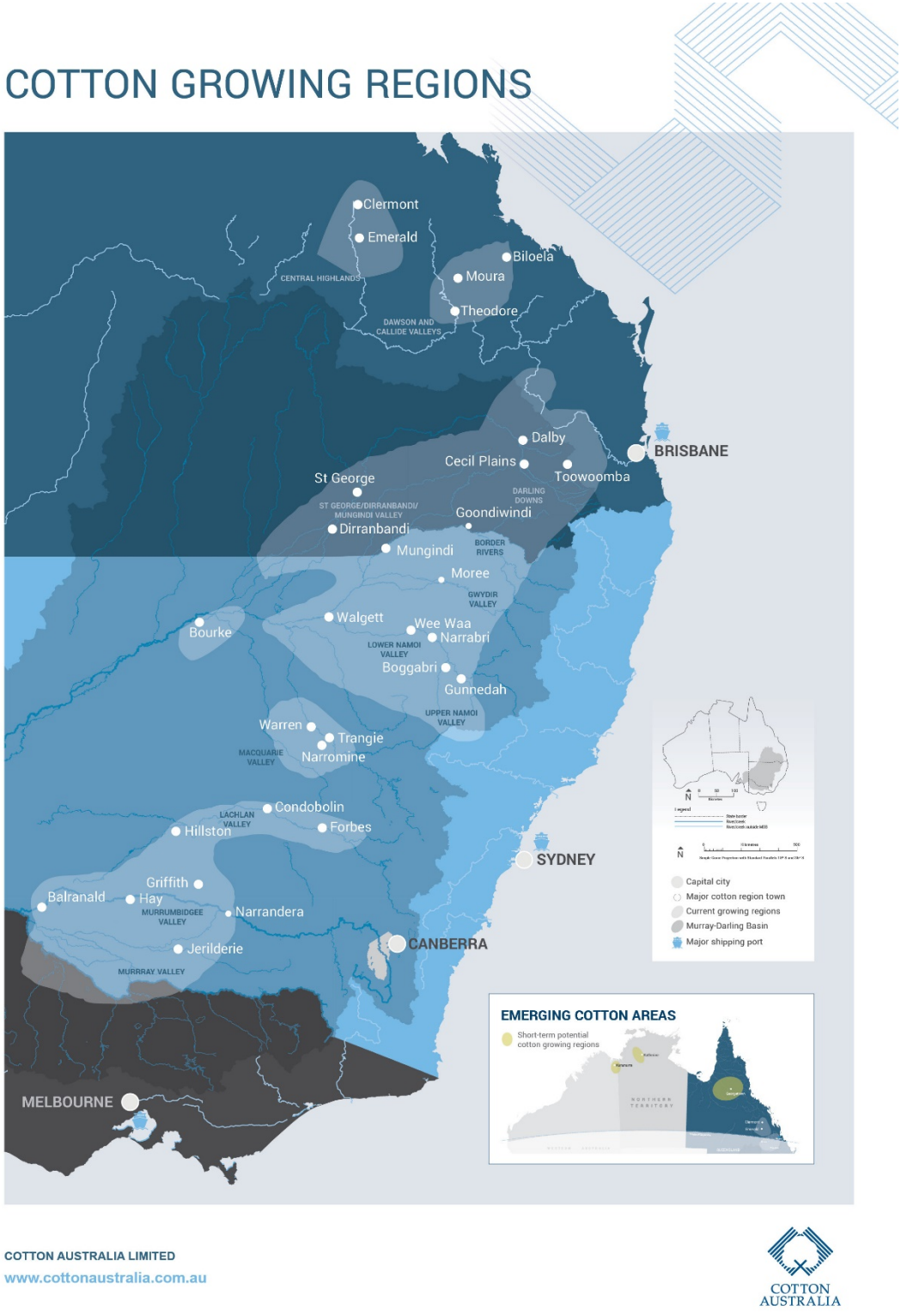

Figure 2. Principal cotton growing and production regions in Australia (Cotton Australia, 2022).

DOCUMENT OVERVIEW

Biosecurity for the cotton 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 important established pests

A key outcome of this biosecurity plan is the identification of the exotic High Priority Pests (HPP) and established pests of biosecurity significance for the Australian cotton industry. This section includes:

- the HPPs which are considered to present the most significant potential pest threats to the cotton industry (page 15), as identified through a pest risk identification and prioritisation process, and
- the important established pests which have been identified in consultation with the Australian cotton industry (page 25).

The identification of HPPs and important established pests will allow industry and government to better prioritise and implement preparedness activities (page 52). 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 cotton industry 2023-2028

Key to improving industry preparedness is the development of the Biosecurity Implementation Plan (Table *4*) and understanding the current level of preparedness for the high priority pests (Table *5*). The Biosecurity Implementation Group (BIG), comprised of both industry and government representatives, developed the implementation plan that describes the shared biosecurity goals and objectives over the next five years. It is intended that the Biosecurity Implementation Plan 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 (page 43). 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 identified exotic cotton biosecurity pest threats in the biosecurity plan are detailed in the Threat Summary Tables (TSTs) (Table 14; Table 15). From the prioritisation process undertaken developing the TSTs, pests with a high or extreme overall risk rating were identified as a HPP.

Risk mitigation and preparedness

A summary of activities to mitigate the impact of pest threats on the industry, along with a set of guidelines for managing risk at all operational levels is provided in this plan. 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 *5*). 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

A summary of the processes in place to respond to emergency plant pest (EPP)[1] incursions that would affect the industry is provided. 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

One of the primary goals of the biosecurity plan is to identify the high priority exotic pests, exotic pests to monitor and established pests of biosecurity significance to the cotton industry. These pest lists are outlined in this section and were developed in consultation with industry, government and stakeholders. Pests of biosecurity significance assist in the prioritisation of resources for risk mitigation and pest management activities.

The exotic pests identified as High Priority Pests (HPPs) are included in Table 1. Further details on each pest along with the basis for the likelihood ratings are provided in 'Threat identification and pest risk assessments' (page 43) and the TSTs (page 75). Assessments may change due to increased understanding of pest biology, changes to pest/host interactions, or production methods. The HPP list may be reviewed on a regular basis through the Biosecurity Reference Panel (BRP). An explanation of the method used for calculating the overall risk can be found on the PHA website.[2]

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

Cotton Industry High Priority Pests

Table 1. High Priority Pests of the cotton industry.

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution [3]	Entry potential	Est. [4] potential	Spread potential	Economic impact	Overall risk
Invertebrates										
Coleoptera (beetles and weevils)										
Anthonomus grandis	Boll weevil	Wide host range [5] including *Gossypium* spp. (cotton) such as *Gossypium barbadense* (Gallini cotton), and *Gossypium hirsutum* (upland cotton).	Floral bud, boll.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Widespread in North America, Central America and South America. [6]	MEDIUM	HIGH [7]	HIGH	HIGH [8]	**HIGH**
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)										
Amrasca biguttula [9]	Indian cotton jassid; Indian green jassid; Okra leafhopper; Cotton leafhopper	Wide host range [10] including *Gossypium* spp. (cotton).	Above ground plant parts: Feeding can damage leaves (hopper burn) and cause stunted growth. Feeding can	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most	Ghana, Afghanistan, Bangladesh, China, India, Indonesia, Iraq, Japan, Laos, Myanmar, Nepal, Pakistan, Philippines,	HIGH	HIGH	HIGH	HIGH	**HIGH**

[3] CABI (2022).
[4] Establishment potential.
[5] *Abutilon spp. (Indian mallow), Cienfuegosia spp., Eragrostis curvula (weeping lovegrass), Gossypium spp. (cotton), Gossypium barbadense (Gallini cotton), Gossypium hirsutum (upland cotton), Hampea nutricia, Hibiscus spp. (rosemallows), Hibiscus syriacus (shrubby Althaea), Opuntia lindheimeri (Lindheimer prickly pear), Poaceae (grasses), Prosopis glandulosa (honey mesquite), Thespesia populnea (portia tree).*
[6] Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Martinique, Mexico, Nicaragua, Saint Kitts and Nevis, United States of America (Arkansas, Kansas, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Tennessee, Texas), Argentina, Brazil, Colombia, Paraguay, Venezuela.
[7] Based on this species distribution in the United States of America, Australian cotton growing areas would be suitable for the establishment of *Anthonomus grandis*. Cotton volunteers present in Australian growing regions could facilitate establishment and have been a problem in the United States of America. Native Malvaceae may act as hosts which has been observed overseas.
[8] *Anthonomus grandis* would have large impact on the industry through direct and significant yield loss (EFSA, 2017), and additional chemical control costs.
[9] Synonyms include: *Amrasca devastans*, *Amrasca biguttula biguttula*, *Empoasca devastans*.
[10] *Abelmoschus esculentus (okra), Amaranthus spp. (amaranth), Arachis hypogaea (peanut), Beta vulgaris var. saccharifera (sugarbeet), Cajanus cajan (pigeon pea), Calendula spp. (marigolds), Cassia spp. (sennas), Chloris gayana (Rhodes grass), Corchorus spp. (jutes), Crotalaria juncea (sunn hemp), Glycine max (soybean), Gossypium spp. (cotton), Guizotia abyssinica (niger), Helianthus annuus (sunflower), Hibiscus cannabinus (kenaf), Hibiscus sabdariffa (roselle), Morus alba (white mulberry), Phaseolus vulgaris (common bean), Raphanus sativus (radish), Solanum lycopersicum (tomato), Solanum melongena (aubergine), Solanum tuberosum (potato), Sorghum bicolor (sorghum), Vigna radiata (mung bean), Vigna unguiculata (cowpea), Zea mays (maize).*

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[3]	Entry potential	Est.[4] potential	Spread potential	Economic impact	Overall risk
			also cause honeydew and secondary pathogens to develop on the lint.	likely pathways for long distance spread.	Taiwan, Thailand, Vietnam, Christmas Island, Guam.					
Lygus hesperus	Western plant bug	Wide host range (over 100 hosts) including *Daucus carota* (carrot), *Gossypium hirsutum* (upland cotton), *Medicago sativa* (lucerne), *Solanum lycopersicum* (tomato).	Squares, bolls.[11]	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Canada, United States of America, Mexico.	MEDIUM[12]	HIGH	HIGH	HIGH[13]	**HIGH**
Lygus lineolaris	Tarnished plant bug	Wide host range[14] (over 700 species)[15] including *Gossypium hirsutum* (upland cotton).	Squares, bolls.[15]	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Georgia (Asia), Romania, Bermuda, Canada, El Salvador, Guatemala, Honduras, Mexico, United States of America.	MEDIUM	HIGH	HIGH	HIGH[16]	**HIGH**
Lepidoptera (butterflies and moths)										
Helicoverpa zea	American cotton	Wide host range	Above ground plant	Flying (adults) allows for	Widespread in North	MEDIUM	HIGH	HIGH	HIGH[19]	**HIGH**

[11] Lygus bugs can threaten a cotton crop from earliest squaring, through cut-out and final boll set. If many squares drop, the plant may redirect its resources into vegetative growth. Feeding can cause damage to squares and reproductive structures. Lygus bugs may pierce the walls of young bolls to feed on seeds which may fail to develop. Lint around the injured seeds is often stained yellow and may not mature normally.

[12] Eggs could be laid in plant material.

[13] Significant pest of cotton overseas which reduces lint quality and yield.

[14] Other hosts include *Amaranthus cruentus (red amaranth), Anethum graveolens (dill), Apium graveolens (celery), Apium graveolens var. dulce (celery), Asparagus officinalis (asparagus), Aster spp., Aster pilosus (white heath aster), Bellis perennis (common daisy), Beta vulgaris (beetroot), Brassica napus var. napus (rape), Brassica oleracea var. botrytis (cauliflower), Brassica oleracea var. capitata (cabbage), Calendula officinalis (pot marigold), Cosmos spp., Cucumis sativus (cucumber), Dahlia hybrids, Daucus carota (carrot), Erigeron spp. (fleabanes), Fragaria ananassa (strawberry), Gladiolus hybrids (sword lily), Glycine max (soybean), Gossypium hirsutum (upland cotton), Helianthus spp. (sunflower), Lespedeza juncea var. sericea (Perennial lespedeza), Malus spp. (ornamental species apple), Medicago sativa (lucerne), Papaver nudicaule (Iceland poppy), Phaseolus lunatus (lima bean), Phaseolus vulgaris (common bean), Pinus echinata (shortleaf pine), Populus spp. (poplars; aspens; cottonwoods), Prunus persica (peach), Pyrus communis (European pear), Rheum hybridum (rhubarb), Rubus spp. (blackberry, raspberry), Salvia officinalis (common sage), Sinapis alba (white mustard), Solanum tuberosum (potato), Tragopogon porrifolius (oysterplant), Trifolium incarnatum (Crimson clover), Verbena spp. (vervain), Vicia sativa (common vetch), Zea mays subsp. mays (sweetcorn), Zinnia elegans (zinnia).*

[15] George et al. (2021).

[16] Significant pest of cotton overseas which reduces lint quality and yield (George et al., 2021).

[19] *Helicoverpa zea* (and *H. armigera*) has also shown reduced susceptibility to groups of insecticides including carbamates, organophosphates, pyrethroids, and *Bacillus thuringiensis* proteins (e.g. Cry1A,

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[3]	Entry potential	Est.[4] potential	Spread potential	Economic impact	Overall risk
	bollworm[17]; Corn earworm	including cotton, pigeon pea, capsicum, soybean, sunflower, common bean, tomato, sorghum, maize, peanut, chickpea, millet, cowpea.	parts.	local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance dispersal.	America, Central America, the Caribbean, and South America.[18]					
Pathogens										
Bacteria										
Xanthomonas citri subsp. *malvacearum*[20] (exotic and hypervirulent races)	Cotton bacterial blight; Angular leaf spot (exotic[21] and hypervirulent races)[22]	Cotton.	Leaves, stem and bolls.	Locally dispersed via rain-splash. The movement of infected seed and plant materials[23] could facilitate long distance dispersal.	North America, Asia, Africa, Europe, Australia (some races are present in Australia).[24]	MEDIUM	HIGH	HIGH	HIGH[25]	**HIGH**
Fungi										
Fusarium oxysporum f.	Fov; Fusarium wilt (exotic	Cotton.	Roots, stem, leaves, whole plant.	*Fusarium oxysporum* f. sp. *vasinfectum* could be	United States of America, Central	MEDIUM	HIGH	HIGH	HIGH[29, 30]	**HIGH**

Cry2A) (da Silva et al., 2020; Rios et al., 2022). Potential changes in the susceptibility of *H. armigera* and *H. zea* to conventional insecticides and *Bt* cotton technologies could pose a significant threat to agriculture in areas with established populations of these species or their potential hybrids.

[17] *Helicoverpa zea* and *H. armigera* can hybridise (with some reproductive constraints) which could allow events of interspecific gene flow, particularly at high population levels (Rios et al., 2022).

[18] 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.

[20] Synonyms include: *Xanthomonas axonopodis* pv. *malvacearum*; *X. campestris* pv. *malvacearum*.

[21] Exotic races refer to all races of the pathogen other than the 10 known to occur in Australia.

[22] There are at least 32 races of *Xanthomonas citri* subsp. *malvacearum* (Madani et al., 2010).

[23] *Xanthomonas citri* subsp. *malvacearum* can be a symptomless epiphyte.

[24] Races 1, 2, 3, 4, 5, 6, 7, 9, 10 and 18 (the most common race affecting Australian cotton) occur in Australia (Allen & West, 1991). Therefore, the exotic races are considered the races other than races 1, 2, 3, 4, 5, 6, 7, 9, 10 and 18.

[25] *Xanthomonas citri* subsp. *malvacearum* is considered one of the most damaging pathogens affecting cotton (Madani et al., 2010).

[29] *Fusarium oxysporum* f. sp. *vasinfectum* (Fov) may exist in a disease complex with nematodes (e.g. *Meloidogyne incognita*, *Rotylenchulus reniformis*, *Pratylenchus brachyurus* [present in Australia], and *Belonolaimus longicaudatus*) which can result in increased disease severity for some VGCs/races (Dyer et al., 2022; Wagner et al., 2022).

[30] Recently described Fov4 (race 4, VGC 0114) is of great concern in the United States of America because it is highly virulent on both upland (*Gossypium hirsutum*) and Pima (*Gossypium barbadense*) cotton. This VGC does not require nematodes for infection to be severe and kill seedlings (Liu & Wagner, 2022; Wagner et al., 2022).

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[3]	Entry potential	Est.[4] potential	Spread potential	Economic impact	Overall risk
sp. *vasinfectum* (exotic vegetative compatibility groups/races)	vegetative compatibility groups/races)[26]			dispersed via the movement of infected plant materials (including seed, plants, non-host plants), soil/plant debris (e.g. via growing mediums, machinery, equipment etc.), and/or water (e.g. flooding, irrigation), insects and nematodes.[27]	America, South America, Australia, parts of Asia, Europe, and Africa.[28]					
Verticillium dahliae (exotic vegetative compatibility groups/strains)	Verticillium wilt (exotic vegetative compatibility groups/strains)[31]	Very wide host range (over 300 plant species) including cotton.	Roots, stem, leaves, and the whole plant.[32]	The pathogen can be spread with plants, soil, plant debris, irrigation, cultivating machinery and organic amendments over short or long distances. The movement of infected seed	Asia, Europe, North America, Central America, South America, parts of Africa and New	MEDIUM	HIGH[34]	HIGH	HIGH	**HIGH**

[26] There are more than 21 Vegetative Compatibility Groups (VCGs) and two distinct pathotypes of *Fusarium oxysporum* f. sp. *vasinfectum* (Bell et al 2019). There are more than 21 Vegetative Compatibility Groups (VCGs) and two distinct pathotypes of *Fusarium oxysporum* f. sp. *vasinfectum* (Bell et al 2019). Recent and previous surveillance studies show that the Australian isolates/biotypes belong to VCG 01111 and 01112 as well as the 'Mungindi strain' (Le at al 2022; Wang et al., 2006). There are no records of other VCGs/pathotypes in Australia. The exotic vegetative compatibility groups/races exclude the Australian isolates/biotypes VCG 01111, 01112 and 'Mungindi strain'.

[27] Wagner et al. (2022).

[28] Angola, Benin, Central African Republic, Congo (DRC), Côte d'Ivoire, Egypt, Ethiopia, Morocco, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zimbabwe, Afghanistan, Bangladesh, China, India, Indonesia, Iran, Iraq, Israel, Japan, Myanmar, North Korea, Pakistan, Saudi Arabia, South Korea, Taiwan, Turkey, Turkmenistan, Uzbekistan, Vietnam, Yemen, France, Greece, Italy, Netherlands, Romania, Cuba, El Salvador, Guatemala, Haiti, Mexico, Nicaragua, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, Fiji, Argentina, Bolivia, Brazil, Chile, Colombia, Guyana, Paraguay, Peru, Uruguay, Venezuela.

[31] There are five vegetative compatibility groups (VCGs) in *Verticillium dahliae* which are VCG1, VCG2, VCG3, VCG4 and VCG6. VCG1 and VCG2 are further characterised into A and B subgroups, and VCG4 into A, B and AB (Strausbaugh, 1993; Papaioannou & Typas, 2015). There are two main lineages in *V. dahliae* which are clade I with VCGs 1A, 1B, 2A, 4B, as well as 3, and Clade II containing VCGs 2B, 4A, and 6. The following vegetative compatibility groups (VCGs) are present in Australia: VCG1A, VCG2A, VCG4B and VCG6 (Chen et al 2024; Webster et al., 2023). *V. dahliae* isolates that attack cotton are also subdivided into two pathotypes based on the symptoms they induce: defoliating (D) and nondefoliating (ND). 'D' pathotype (e.g. VGC1A) isolates are highly virulent and completely defoliate cotton, whereas 'ND' pathotype isolates are typically less virulent and seldom cause extensive defoliation (Wagner et al., 2021). The *V. dahliae* vegetative compatibility groups (VCGs) that attack cotton are VCG1A, VCG1B, VCG2A, VCG2B, and VCG4B (Wagner et al., 2021). In Australia, VCG1A and VCG2A both can cause significant disease whereas VCG4B is considered mild. VCG1B is a defoliating pathotype, and VCG2B has been reported to cause defoliation symptoms and be highly virulent in Israel and Turkey (Dervis et al., 2008; Göre et al 2014; Korolev et al 2001). This pathogen is highly adaptive and new hosts are regularly being reported so other VGCs could be a risk to cotton. There have been some reports of VCG2B causing damage to cotton and is considered exotic to Australia. VCG2B has been identified from cotton in various countries that include China, Greece, Spain, and Israel (Collado-Romero et al., 2008; Korolev et al., 2000; 2001; 2008; Wagner et al., 2021) as well as Turkey where VCG2B isolates caused partial defoliation symptoms (Dervis et al., 2008)."

[32] *Verticillium dahliae* colonises and proliferates in xylem elements of a plant (typically entering via the roots) which disrupts the transportation of water and dissolved minerals. Characteristic symptoms often involve the leaves (yellowing, wilting, vein clearing, necrosis), vascular bundles (browning), whole plant (dysplasia, stunting, defoliation [depending on pathotype], reductions in yield and/or quality, plant death).

[34] *Verticillium dahliae* can survive in soil for over 10 years as microsclerotia.

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[3]	Entry potential	Est.[4] potential	Spread potential	Economic impact	Overall risk
				or lint is an important pathway for long distance dispersal.	Zealand.[33]					
Viruses										
Cotton leaf curl virus complex (*Begomovirus*)	Cotton leaf curl virus[es] (CLCuV); Cotton leaf curl disease (CLCuD) complex[35],[36]	Important hosts are *Gossypium barbadense* (Gallini cotton), and *Gossypium hirsutum* (upland cotton).[37]	Leaves (thickening and darkening of veins, curling of leaves (mostly upward), development of outgrowths (enations) on the abaxial side of leaves), flowers/bolls (abnormal formation), whole plant (stunting, yield/quality loss).	Movement of infected plant materials[38] and/or vectors[39] (e.g. via plants for planting, cuttings, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not seed-borne.	Egypt, Nigeria, Tanzania, Sudan, Pakistan, India, China, the Philippines, and the United States of America Villegas et al. (2019).[40]	MEDIUM	HIGH	HIGH	EXTREME[41]	**EXTREME**
Cotton leafroll	Cotton leafroll	*Gossypium barbadense*	Affected plant parts	Movement of infected	Benin, Cameroon,	HIGH	HIGH	HIGH	HIGH[47]	**HIGH**

[33] Algeria, Congo (DRC), Egypt, Eswatini, Kenya, Madagascar, Malawi, Morocco, Mozambique, Nigeria, Rwanda, South Africa, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe, Armenia, Azerbaijan, China, Georgia, India, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Pakistan, South Korea, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Malta, Moldova, Montenegro, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Cuba, Mexico, Nicaragua, Trinidad and Tobago, United States of America, New Zealand, Argentina, Brazil, Chile, Colombia, Peru.

[35] There are a number of different cotton leaf curl viruses known to cause CLCuD and their occurrence varies in areas of known distribution. The cotton leaf curl virus or disease complex includes Begomoviruses (e.g. Cotton leaf curl Multan virus (CLCuMuV), Cotton leaf curl Bangalore virus (CLCuBaV), Cotton leaf curl Barasat virus (CLCuBarV); Cotton leaf curl Kokhran virus (CLCuKoV), Cotton leaf curl Gezira virus (CLCuGeV) and Cotton leaf curl Alabad virus (CLCuAlV)) as well as a range of betasatellite and alphasatellite molecules.

[36] Viruses reported in cotton include: Begomovirus (including Cotton leaf curl Alabad virus, Cotton leaf curl Bangalore virus, Cotton leaf curl Barasat virus, Cotton leaf, Cotton leaf curl Burewala virus, Cotton leaf curl Gezira virus, Cotton leaf curl Multan virus, Cotton leaf curl Rajasthan virus, Cotton leaf curl Shadadpur virus) and Begomovirus-associated Alphasatellite and Betasatellite (Cotton leaf curl Burewala alphasatellite, Cotton leaf curl Egypt alphasatellite, Cotton leaf curl Lucknow alphasatellite, Cotton leaf curl Multan alphasatellite and Cotton leaf curl Multan betasatellite)(Amrao et al 2010; Chakrabarty et al. 2020; Mubin et al 2022; NCBI 2024; Rahman et al 2017).

[37] Other hosts may include *Abelmoschus esculentus* (okra), *Capsicum annuum* (bell pepper), *Carica papaya* (pawpaw), *Cucumis sativus* (cucumber), *Cucurbita* spp. (gourds), *Cyamopsis tetragonoloba* (guar), *Duranta erecta* (golden dewdrop), *Glycine max* (soybean), *Hibiscus cannabinus* (kenaf), *Hibiscus rosa-sinensis* (China-rose), *Luffa aegyptiaca* (loofah), *Malvaviscus arboreus* (wax mallow), *Momordica charantia* (bitter gourd), *Ricinus communis* (castor bean), *Sida* spp., *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Xanthium strumarium* (common cocklebur).

[38] CLCuD can be graft transmitted but is not mechanically or seed transmitted.

[39] *Bemisia tabaci* (present in Australia).

[40] There is no evidence that any of the viruses associated with Cotton leaf curl disease (CLCuD) complex is present in Australia (APPD 2024; Azhar et al 2011; NCBI 2024; Villegas et al 2019).

[41] Cotton leaf curl disease may result in a 15–70 % reduction in yield (Rahman et al., 2017). Yield loss and severity is particularly pronounced when infection occurs early in the growing season, or in highly susceptible cultivars. Disease complexes involving CLCuD components with other viruses (e.g. *Tomato leaf curl New Delhi virus* (*Begomovirus*)) may result in synergistic interactions that could enhance pathogenicity (Zaidi et al., 2016).

[47] *Cotton leafroll dwarf virus* (*Polerovirus*) can cause significant yield losses, reaching up to 80% in Brazil (Davis et al., 2021; Parkash et al., 2021).

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[3]	Entry potential	Est.[4] potential	Spread potential	Economic impact	Overall risk
dwarf virus (*Polerovirus*)	dwarf virus (CLRDV); Cotton blue disease (CBD) Cotton leafroll dwarf disease (CLRDD)[42] Atypical Cotton Blue Disease (ACBD); Atypical Cotton Leafroll Dwarf Virus (ACLDV)[43]	(Gallini cotton), *Gossypium hirsutum* (upland cotton), *Gossypium mustelinum*, *Gossypium* spp., *Hibiscus sabdariffa* (roselle), *Sida acuta*, *Cicer arietinum* (chickpea). Known symptomless hosts include several plants in the Amaranthaceae and Fabaceae.	and general symptoms may impact the stem (zig-zag growth pattern), leaves (basal bulging of apical leaves, discolouration - deep bluish-green (CBD), red/intense green leaves and petioles [CLRDD], wilting, downward rolling, crinkling and/or deformation), fruit/boll (reduced boll set), whole plant (stunting, reduced cotton/seed yield per plant).[44]	plants and/or vectors[45] (e.g. via plants for planting, hitchhiking, unregulated pathways or natural dispersal) could facilitate local, regional or long distance dispersal. Wind currents during the monsoon wet season could potentially introduce viruliferous, aphids from Timor-Leste into northern Australia.	Chad, Côte d'Ivoire, Sudan, Uzbekistan, India, Thailand, Timor-Leste[46], Brazil, Argentina, United States of America.					

[42] Cotton plants infected with strains of CLRDV in the United States of America showed different symptoms than CBD. Therefore, the disease caused by this virus or strain has been named as Cotton Leafroll Dwarf Disease (CLRDD) (Parkash et al., 2021).
[43] CLRDV strains that can break resistant varieties have been detected in Brazil and Argentina and were responsible for a "new" or "atypical" virus/disease expressions (Agrofoglio et al., 2017).
[44] Disease symptomology can vary substantially depending upon viral strain, location, host/variety, and the developmental stage at the time of infection along with disease progression.
[45] Poleroviruses are transmitted in a circulative, non-propagative manner by aphids. CLRDV is transmitted by the cotton aphid, *Aphis gossypii* (worldwide distribution) which is present in all cotton growing regions of Australia. Not seed or mechanically transmitted.
[46] CLRDV was detected in Timor-Leste in an asymptomatic, domestic *Gossypium barbadense* planting. It remains to be seen if CLRDV from Timor-Leste can cause 'cotton blue disease' in *G. hirsutum* (Davis et al., 2021).

Exotic pests to monitor

Table 2 includes exotic pests and pathogens of cotton, which if present in Australian production regions could cause economic harm to the industry. The Technical Expert Group (TEG) has considered their entry, establishment, spread potential and economic impact. The overall risk is not sufficiently threatening to categorise them as high priority pests, but if they did enter, establish, and spread within Australian production regions they may cause economic harm to the industry.

Table 2. Exotic pests and pathogens to monitor.

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[48]	Entry potential	Est.[49] potential	Spread potential	Economic impact	Overall risk
Invertebrates										
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)										
Calidea spp. including *Calidea dregii* and excluding *Calidea parentum*[50]	Blue bug	*Cajanus cajan* (pigeon pea), *Capsicum* spp. (peppers), *Chenopodium album* (fat hen), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Medicago sativa* (lucerne), *Ricinus communis* (castor bean), *Sorghum bicolor* (sorghum).	Seeds, developing bolls, stains lint.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Africa.	LOW	HIGH	HIGH	HIGH[51]	**MEDIUM**
Lepidoptera (butterflies and moths)										
Thaumatotibia leucotreta (syn. *Cryptophlebia leucotreta*)	False codling moth	Wide host range including avocado, citrus, cotton, macadamia, stone fruit, common bean, sorghum, maize, cowpea, lima bean.	Fruit/pods, ears, panicles, bolls.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products	Widespread in Africa.[52]	LOW	HIGH	HIGH	HIGH[53]	**MEDIUM**

[48] CABI (2022).
[49] Establishment potential.
[50] *Cantao parentum* (White, 1839) (Synonyms: *Callidea parentum*; *Cantao pulcher*) is present in Australia (ABRS 2024; (McDonald & Cassis 1984).
[51] *Calidea* spp. usually enter crops as bolls mature. *Calidea* spp. can damage lint and cause boll drop (Hill, 2008).
[52] 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.
[53] In Uganda, this pest has been reported to cause 20-90 % losses in cotton due to boll damage. Late sown crops were most affected (Byaruhanga, 1977). Damage to cotton bolls facilitates entry of other microorganisms that can rot and destroy the boll.

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[48]	Entry potential	Est.[49] potential	Spread potential	Economic impact	Overall risk
				(e.g. fruit), or hitchhiking are the most likely pathways for long distance spread.						
Pathogens										
Fungi										
Colletotrichum gossypii var. *cephalosporioides*	Ramulosis; Ramulose; Escobilla; Witches' broom[371]	*Gossypium hirsutum* (cotton).	Ramulosis; lesions, necrosis, over-sprouting or witches' broom.	Infected seed and soil/crop residues. Rain splash, wind-assisted rain and irrigation as well as insects can facilitate dispersal.[54]	Brazil, Colombia, Paraguay, Venezuela.	LOW	MEDIUM	MEDIUM	HIGH[55]	**MEDIUM**
Corynespora cassiicola (exotic or cotton infecting strains)[56]	Target spot; Corynespora leaf spot of cotton (exotic or cotton infecting	Wide host range (more than 400 plant species)[57] including cotton, basil, bean, cowpea, cucumber, papaya, soybean, sweetpotato and tomato.	Leaves (primarily), bolls, bracts, petioles, stems.	*Corynespora cassiicola* spores are known to be transmitted via air, soil, rain-splash and seeds. The pathogen overwinters mainly on	North America, South America, Oceania, and most of Asia, Africa and Europe.[58] Cotton infecting isolates have been reported in the	LOW	MEDIUM[59]	MEDIUM	UNKNOWN[60]	**UNKNOWN**

[54] Infected seed and soil/crop residues often provide the initial inoculum for infection of cotton crops. Conidia are primarily dispersed mainly by rain splash, wind-assisted rain, and irrigation as well as insects. *Colletotrichum gossypii* is carried both on- and inside cotton seeds (i.e. seed-borne) which is an important pathway for long distance dispersal.

[55] *Colletotrichum gossypii* var. *cephalosporioides* differs from *C. gossypii* in virulence, aggressiveness, morphology, growth on various synthetic media and ability to grow at less than 30°C (EFSA, 2018).

[56] *Corynespora cassiicola* is present in Australia. *C. cassiicola* has been reported on many hosts in Australia including papaya (*Carica papaya*) and soybean (*Glycine max*). Target spot has not been confirmed on cotton in Australia. It has been reported that *C. cassiicola* isolates from cotton in the United States of America were genetically distinct from isolates collected from other host species which may suggest a degree of host specificity or the evolution of more aggressive strains on specific hosts (Sumabat et al., 2018).

[57] Rondon & Lawrence (2021).

[58] Benin, Cameroon, Congo (DRC, ROC), Côte d'Ivoire, Egypt, Ethiopia, Gabon, Ghana, Guinea, Liberia, Mauritius, Nigeria, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Japan, Laos, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, Vietnam, Yemen, Austria, Bulgaria, Denmark, France, Germany, Hungary, Italy, Netherlands, Norway, Romania, Russia, Ukraine, United Kingdom, Antigua and Barbuda, Barbados, Belize, British Virgin Islands, Canada, Costa Rica, Cuba, Dominica, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, American Samoa, Australia, Federated States of Micronesia, Fiji, Guam, New Zealand, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Vanuatu, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Venezuela.

[59] A subtropical to tropical climate is generally considered conducive for infection and the development of target spot on a susceptible host. Symptoms and disease development can vary according to the host as well as temperature optima, humidity and leaf wetness. Generally, warmer temperatures (e.g. 20-30°C) along with high relative humidity (≥80 %) and leaf wetness duration tends to promote sporulation and disease development (Sharma, 2017; Rondon & Lawrence, 2021).

[60] Damage and yield loss from *Corynespora cassiicola* can vary according to the host/cultivar, developmental stage (e.g. canopy closure timing) and environmental factors (e.g. weather, microclimate) (Bowen

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution [48]	Entry potential	Est. [49] potential	Spread potential	Economic impact	Overall risk
	strains)			seed, soil or infected plant debris.	United States of America, Brazil and China.[57] [381]					
Phymatotrichopsis omnivora (syn. *Phymatotrichum omnivorum*)	Texas root rot; Cotton root rot	Very wide host range [61] including *Gossypium* spp. (cotton).	Root system, stem, leaves, whole plant (wilting, plant death). [62]	The movement of soil/plant debris [63] via natural or human-mediated pathways (e.g. contaminated machinery, equipment, footwear, growing mediums, animals etc.) could facilitate dispersal.	Libya, Mexico, United States of America (Arizona, Arkansas, California, Louisiana, Nevada, New Mexico, Oklahoma, Texas, Utah), Venezuela.	MEDIUM	MEDIUM [64]	MEDIUM [64]	HIGH	**MEDIUM**
Puccinia cacabata (syn. *Puccinia stakmanii*)	Southwestern cotton rust; Cotton rust	Hosts are primarily within Poaceae and Malvaceae including *Gossypium* spp. (cotton). [65]	Lower leaf surfaces, bracts, stems, bolls, whole plant. [66]	Dispersal is likely via spores (wind-assisted) from hosts and/or hitchhiking (e.g. clothing, equipment,	Bahamas, Dominican Republic, Guatemala, Mexico, United States of America, Argentina, Bolivia, Brazil.	LOW	MEDIUM	HIGH	HIGH [67]	**MEDIUM**

et al., 2018). Yield loss due to target spot on an apparently susceptible cotton cultivar was estimated to be as high as 448 kg lint/ha in the United States of America when comparing non-fungicide-treated plots against full-season fungicide-treated cotton (Bowen et al., 2018). A multi-site study conducted over several years found that a single fungicide application at target spot onset would provide a 4 to 6 % yield gain when compared with no treatment (Bowen et al., 2018). The economic impact of *Corynespora cassiicola* could be considered HIGH in areas and/or circumstances that support disease development and proliferation.

[61] The entire host range is not clear. More than 2,000 dicotyledonous plant species from a range of families have been reported as hosts of *Phymatotrichopsis omnivora*. Major cultivated hosts include *Medicago sativa (alfalfa), Malus domestica (apple), Prunus persica (peach) and Vitis vinifera (grapevine) (EFSA, 2019). Other hosts include Abelmoschus esculentus (okra), Arachis hypogaea (peanut), Beta vulgaris var. saccharifera (sugarbeet), Carya illinoinensis (pecan), Ficus carica (common fig), Glycine max (soybean), Juglans regia (walnut), Petroselinum crispum (parsley), Phaseolus spp. (beans), Pistacia vera (pistachio), Populus spp. (poplars; aspens; cottonwoods), Prunus dulcis (almond), Pyrus communis (European pear), Robinia pseudoacacia (black locust), Salix spp. (willows), Ulmus spp. (elms).*

[62] Symptoms and affected plant parts may include the root system (decay, discoloration of xylem elements), lower stem (discoloration of xylem elements), leaves (yellowing or bronzing of the leaves, wilting, desiccation), whole plant (wilting, plant death). Symptoms are usually obvious until flowering.

[63] Sclerotia are often the primary inoculum source for the initiation of disease in suitable hosts. They also serve as over-seasoning propagules that enable the persistence of *Phymatotrichopsis omnivora* for many years (e.g. up to 12 years) in the soil (EFSA, 2019).

[64] *Phymatotrichopsis omnivora* is often associated with alkaline, calcareous soils with an optimal pH for growth and survival between 7.2–8.0 (EFSA, 2019).

[65] *Bouteloua aristidoides (needle grama), Bouteloua barbata (six-weeks grama), Bouteloua barbata var. rothrockii (Rothrock grama), Bouteloua eriopoda (black grama), Bouteloua hirsuta (hairy grama), Chloris spp. (fingergrasses), Chloris ciliata (fringed chloris), Gossypium spp. (cotton), Gossypium barbadense (Gallini cotton), Gossypium herbaceum (Levant cotton), Gossypium hirsutum (upland cotton), Gossypium thurberi (Arizona wild cotton).*

[66] Symptoms and affected plant parts may include lower leaf surfaces, stem (infection, breakage), bracts, green bolls (lesions), bolls (dwarfing and premature opening in severe infections), whole plant (defoliation in severe infections, yield loss, reduction in quality).

[67] *Puccinia cacabata* has reportedly caused losses in individual fields of up to 75 % within the United States of America and up to 100 % within Mexico (Kirkpatrick & Rothrock, 2001).

Scientific name	Common name	Host(s)	Plant part(s) affected	Dispersal	Distribution[48]	Entry potential	Est.[49] potential	Spread potential	Economic impact	Overall risk
				animals) over short and long distances.						
Virus										
Cotton anthocyanosis virus (*Polerovirus*)	Cotton anthocyanosis virus (CAV); Vermelhao disease; Reddening disease	*Abelmoschus esculentus* (okra), *Gossypium barbadense* (Gallini cotton), *Gossypium hirsutum* (upland cotton), *Hibiscus cannabinus* (kenaf).[68]	Leaves/stems (chlorosis - red to purple [except for veins], progressing from older to newer/developing leaves; older leaves may be shed); whole plant (yield loss).	Movement of infected plants and/or vectors[69] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not known to be seed-borne.	Brazil.	LOW	HIGH	HIGH	HIGH[70]	**MEDIUM**

[68] Suspected reservoirs are ratooned cotton, kenaf, okra, and several malvaceous weeds. Inoculum probably over-seasons in reservoirs.
[69] Poleroviruses are transmitted in a circulative, non-propagative manner by aphids (e.g. *Aphis gossypii* – present in Australia) (Kirkpatrick & Rothrock, 2001).
[70] All commercial cotton varieties are susceptible and losses up to 35 % have been reported. The severity of the disease is greater when infection occurs at early plant growth stages. Plants infected later in the season may experience up to 10 % yield reduction (CABI, 2022). Disease incidence can range from 5 to 100 % (Kirkpatrick & Rothrock, 2001).

Other pests of biosecurity significance

Introduction

This section identifies other pests of biosecurity significance for the Australian cotton industry. By identifying pests which are either currently under quarantine arrangements or which cotton producers 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 other pests of biosecurity significance will also assist in the implementation of effective grower and community awareness campaigns, targeted biosecurity education and training programs for producers, surveillance coordinators, diagnosticians and development of pest-specific mitigation activities.

Threat identification

In order to be considered as a pest of biosecurity significance, the pests included in Table *3* should be economically important to the cotton industry and at least one of the following:

- currently under quarantine arrangements or 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 in an effort to prioritise investment but did not undergo a formal pest risk assessment.

Table 3. Other pests and pathogens of biosecurity significance.

Scientific name	Common name	Host(s)	Affected plant part(s)	Distribution in Australia[71]	Comments
Invertebrates					
Acari (mites)					
Tetranychus evansi	Red spider mite	Mostly Solanaceae (e.g., glossy night shade (*Solanum americanum*), and tomato (*S. lycopersicum*), eggplant (*S. melongena*), black nightshade (*S. nigrum*), potato (*S. tuberosum*)). *T. evansi* can also affect cotton, roses, beans and other plants.	Above ground plant parts. Feeding damage from *T. evansi* often causes speckling of leaves. In severe cases, feeding causes whitening or yellowing of leaves which then desiccate, and eventually fall off. Plant damage progresses quickly which can result in yield loss and plant death.	New South Wales, Queensland, Victoria.[72]	*Tetranychus evansi* is present at some locations in Sydney and Brisbane. The mite has not been reported in any commercial production areas.[72]
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)					
Cantao parentum[73]	Blue bug	*Cajanus cajan* (pigeon pea), *Capsicum* spp. (peppers), *Chenopodium album* (fat hen), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Medicago sativa* (lucerne), *Ricinus communis* (castor bean), *Sorghum bicolor* (sorghum).	Seeds, developing bolls, stains lint.	Present in Australia (ABRS 2024; (McDonald & Cassis 1984).	
Paracoccus marginatus	Papaya mealybug	Very wide host range (families: 58; genera: 189)[74, 75] including *Gossypium* spp. (cotton)[76] such as *Gossypium hirsutum* (upland cotton).[77]	Stems, branches, leaves (foliage), fruit, whole plant. Excretion of honeydew can promote the growth of sooty mould.[78]	Present in Australia (QLD and NT), and considered a Quarantine Pest (Regional, official control). It is	

[71] CABI (2022); APPD (2023).
[72] This pest has been detected in some areas of New South Wales, Queensland and Victoria (ABRS 2024; APPD 2024; IPPC 2017).
[73] Synonyms include *Callidea parentum*; *Cantao pulcher*.
[74] García Morales et al. (2016).
[75] *Paracoccus marginatus* shows a preference for plants from Amaranthaceae, Apocynaceae, Asteraceae, Euphorbiaceae, Fabaceae, Malvaceae and Solanaceae with a strong preference for papaya (*Carica papaya*: Caricaceae) (EFSA, 2023).
[76] Sakthivel et al. (2012).
[77] Jothi et al. (2011); Dhobi et al. (2014); Nagrare et al. (2016); Gama et al. (2020); Nagrare et al. (2022).
[78] *Paracoccus marginatus* feeds on the lower surfaces of foliage, forming a dense mat of waxy secretions. Leaves may distort, crinkle, fail to expand and or wither. Shoots may become bushy and stunted with

Scientific name	Common name	Host(s)	Affected plant part(s)	Distribution in Australia[71]	Comments
				regulated as a Declared Organism (Prohibited) (s. 12) by Western Australia.	
Phenacoccus solenopsis	Solenopsis mealybug; Cotton mealybug	Very wide host range (families: 66; genera: 225)[79] including *Gossypium* spp. (cotton).	Feeding damage can include yellowing of leaves, stunting, distorted growth, defoliation, yield loss and even plant death. Damage may be worse in areas where crop plants are stressed. Honeydew excretions on leaves promote the growth of sooty mould fungi which can inhibit photosynthesis and plant growth.	*P. solenopsis* has been detected in northern New South Wales[80], Northern Territory, Queensland and Western Australia.	*P. solenopsis* is considered a serious cotton pest that is potentially endemic in all areas where cotton is grown within Australia.[80]
Lepidoptera (butterflies and moths)					
Pectinophora gossypiella	Pink bollworm	Hosts are primarily within Malvaceae including *Gossypium* spp. (cotton)[81].	*P. gossypiella* larvae can cause failure of buds to open, fruit shedding, lint damage and seed loss. Larvae burrow within a boll which can cut and stain the lint. Damaged bolls are vulnerable to infection by boll rot fungi, particularly in conditions with high humidity. Damage can result in	*Pectinophora gossypiella* (pink bollworm) is present in Australia (e.g. NT, Qld, WA). *P. gossypiella* was initially detected in Queensland but is thought to occur primarily	A biosecurity risk management plan has been developed for the transportation of cotton modules from Western Australia and the Northern Territory to southern Queensland for ginning (Cotton Australia (2022b)[83]. Strains/biotypes with resistance to Bacillus thuringiensis cotton have been reported in the

dieback of branches. Infested leaves and young fruits can drop or become deformed. Severely infested plants can die. Contaminated fruit and ornamental plants become unmarketable. Paracoccus marginatus excretes honeydew which promotes the growth of sooty moulds. Photosynthesis and gas exchange can be impaired which results in reduced vigour and yield.

[79] García Morales et al. (2016).

[80] Sequeira et al. (2022).

[81] Hosts include *Abelmoschus esculentus* (okra), *Abutilon* spp. (Indian mallow), *Abutilon abutiloides* (shrubby Indian mallow), *Abutilon amplum*, *Abutilon hirtum* (hairy Indian mallow), *Abutilon incanum* (hoary abutilon), *Abutilon indicum* (Indian lantern flower), *Abutilon otocarpum* (desert lantern), *Abutilon trisulcatum* (anglestem Indian mallow), *Acacia wrightii* (Wright acacia), *Alcea rosea* (hollyhock), *Althaea* spp., *Cienfuegosia drummondii* (yellow flymallow), *Croton capitatus* (woolly croton), *Croton texensis* (skunkweed), *Gleditsia triacanthos* (honey locust), *Gossypium* spp. (cotton), *Gossypium arboreum* (tree cotton), *Gossypium australe* (Australian desert rose), *Gossypium barbadense* (Gallini cotton), *Gossypium herbaceum* (Levant cotton), *Gossypium hirsutum* (upland cotton), *Gossypium thurberi* (Arizona wild cotton), *Hibiscus* spp. (rosemallows), *Hibiscus aculeatus* (comfortroot), *Hibiscus bifurcatus*, *Hibiscus cannabinus* (kenaf), *Hibiscus dasycalyx* (Neches River rosemallow), *Hibiscus dongolensis*, *Hibiscus martianus* (syn. *Hibiscus cardiophyllus*) (heart-leaf hibiscus), *Hibiscus micranthus* (tiny flower hibiscus), *Hibiscus moscheutos* subsp. *lasiocarpos* (woolly rosemallow), *Hibiscus moscheutos* subsp. *moscheutos* (swamp rosemallow), *Hibiscus mutabilis* (cottonrose), *Hibiscus panduriformis* (yellow hibiscus), *Hibiscus phoeniceus* (dwarf hibiscus), *Hibiscus rosa-sinensis* (China-rose), *Hibiscus sabdariffa* (roselle), *Hibiscus striatus* subsp. *lambertianus* (striped rosemallow), *Hibiscus syriacus* (shrubby Althaea), *Hibiscus trilobus* (three-lobe rosemallow), *Ipomoea carnea* subsp. *fistulosa* (bush morning glory), *Kosteletzkya althaeifolia*, *Kosteletzkya tubiflora*, *Malachra capitata* (Brazil jute), *Malva parviflora* (small-flowered mallow; pink cheeseweed), *Malva sylvestris* (common mallow), *Malvastrum coromandelianum* (prickly malvastrum), *Malvaviscus arboreus* (wax mallow), *Malvaviscus arboreus* var. *drummondii* (Turk's cap), *Medicago sativa* (lucerne), *Montezuma speciosissima*, *Prosopis juliflora* (mesquite), *Pseudabutilon virgatum*, *Ricinus communis* (castor bean), *Sesbania punicea* (red sesbania), *Sida cordifolia* (heartleaf sida), *Sida spinosa* (teaweed), *Thespesia populnea* (portia tree).

[83] Local dispersal of P. gossypiella is possible through the flight of adults. Long distance dispersal is possible through introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking.

Scientific name	Common name	Host(s)	Affected plant part(s)	Distribution in Australia[71]	Comments
			severe yield and quality losses.	in Western Australia and the Northern Territory.[82]	USA, China, India and Pakistan (Tabashnik and Carrière 2019; Wan et al 2012)[84]. As per current ISPM guidelines and without further information about the strains/biotypes present in Australia, it is unlikely any other biotypes could be assessed as quarantine pests below the species level.
Pathogens					
Bacteria					
Xanthomonas citri subsp. *malvacearum*[85]	Cotton bacterial blight; Angular leaf spot	Cotton.	Leaves, stem and bolls.	*X. citri* subsp. *malvacearum*[86] has been found in New South Wales, Northern Territory, Queensland, Victoria and Western Australia.	Notifiable plant disease.
Fungi					
Corynespora cassiicola	Target spot	Wide host range (more than 400 plant species)[87] including cotton, basil, bean, cowpea, cucumber, papaya, soybean, sweetpotato and tomato.	Leaves (primarily), bolls, bracts, petioles, stems.	*C. cassiicola* has been found in New South Wales, Northern Territory, Queensland, Victoria and Western Australia.	*C. cassiicola* has been reported on many hosts in Australia including papaya (*Carica papaya*) and soybean (*Glycine max*). Target spot has not been confirmed on cotton in Australia. Cotton infecting isolates have been reported in the United States of America, Brazil and China.[87]
Fusarium oxysporum f. sp.	Fov; Fusarium	Cotton.	Roots, stem, leaves, whole plant.	*F. oxysporum* f. sp. *vasinfectum* is detected in	Notifiable plant disease.

[82] Matheson et al. (2023).

[84] Transgenic Bt (*Bacillus thuringiensis*) cotton that produces insecticidal proteins has been grown in Australia since 1996 and has been successfully in controlling *Pectinophora gossypiella* (Matheson et al. 2023). However, there have been reports of strains/biotypes of *Pectinophora gossypiella* developing resistance to Bt cotton in the USA, China and India and Pakistan (Tabashnik and Carrière 2019; Wan et al 2012). The USA and China have successfully controlled *Pectinophora gossypiella* resistance to Bt cotton by adopting resistance management strategies (Tabashnik and Carrière 2019). In Australia the cotton industry uses resistance management strategies to manage insect resistance in both conventional and Bt cotton (Baker and Tann 2014; Grundy et al 2023). Therefore, these insect resistance management strategies should be able to manage the risks associated with resistant strains/biotypes of *Pectinophora gossypiella*.

[85] Synonyms include: *X. axonopodis* pv. *malvacearum*; *X. campestris* pv. *malvacearum*.

[86] There are at least 32 races of *Xanthomonas citri* subsp. *malvacearum* (Chavhan et al 2021; Kumar et al 2018; Madani et al., 2010). Races 1, 2, 3, 4, 5, 6, 7, 9, 10 and 18 have been reported to occur in Australia (Alippi & Hayward 1987; Allen & West 1991) and are Non-Quarantine Pests.

[87] Rondon & Lawrence (2021).

Scientific name	Common name	Host(s)	Affected plant part(s)	Distribution in Australia[71]	Comments
vasinfectum	wilt[88]			cotton growing regions of New South Wales and Queensland.[89]	
Verticillium dahliae	Verticillium wilt[90]	Very wide host range (over 300 plant species) including cotton.	Roots, stem, leaves, and the whole plant.[91]	*V. dahliae* has been found on cotton in New South Wales and Queensland.	Notifiable plant disease. *Verticillium dahliae* VCG 1A is a Declared Pest, Prohibited - s12 in Western Australia. This state has measures to prevent *Verticillium dahliae* VCG 1A from entering which are consistent with the definition of Official Control as per ISPM 5 (FAO 2023). Therefore, DAFF considers that *Verticillium dahliae* VCG 1A is under Regional Official Control. *Verticillium dahliae* VCG2A, VCG4B and VCG6 are Non-Quarantine Pests.
Nematodes					
Belonolaimus longicaudatus	Sting nematode	Wide host range[92] including *Gossypium hirsutum* (upland cotton).	Root system (reduced root system, stubby side branches, terminal galling,	Present in NSW and WA (ABRS 2024; Nobbs 2003).	

[88] There are more than 21 Vegetative Compatibility Groups (VCGs) and two distinct pathotypes of *Fusarium oxysporum* f. sp. *vasinfectum* (Bell et al 2019). There are more than 21 Vegetative Compatibility Groups (VCGs) and two distinct pathotypes of *Fusarium oxysporum* f. sp. *vasinfectum* (Bell et al 2019). Recent and previous surveillance studies show that the Australian isolates/biotypes belong to VCG 01111 and 01112 as well as the 'Mungindi strain' (Le at al 2022; Wang et al., 2006). There are no records of other VCGs/pathotypes in Australia. The exotic vegetative compatibility groups/races exclude the Australian isolates/biotypes VCG 01111, 01112 and 'Mungindi strain'.

[89] Le et al. (2022).

[90] There are five vegetative compatibility groups (VCGs) in *Verticillium dahliae* which are VCG1, VCG2, VCG3, VCG4 and VCG6. VCG1 and VCG2 are further characterised into A and B subgroups, and VCG4 into A, B and AB (Strausbaugh, 1993; Papaioannou & Typas, 2015). There are two main lineages in *V. dahliae* which are clade I with VCGs 1A, 1B, 2A, 4B, as well as 3, and Clade II containing VCGs 2B, 4A, and 6. The following vegetative compatibility groups (VCGs) are present in Australia: VCG1A, VCG2A, VCG4B and VCG6 (Webster et al., 2023). *V. dahliae* isolates that attack cotton are also subdivided into two pathotypes based on the symptoms they induce: defoliating (D) and nondefoliating (ND). 'D' pathotype (e.g. VGC1A) isolates are highly virulent and completely defoliate cotton, whereas 'ND' pathotype isolates are typically less virulent and seldom cause extensive defoliation (Wagner et al., 2021). The *V. dahliae* vegetative compatibility groups (VCGs) that attack cotton are VCG1A, VCG1B, VCG2A, VCG2B, and VCG4B (Wagner et al., 2021). In Australia, VCG1A and VCG2A both can cause significant disease whereas VCG4B is considered mild. VCG1B is a defoliating pathotype, and VCG2B has been reported to cause defoliation symptoms and be highly virulent in Israel and Turkey (Dervis et al., 2008; Göre et al 2014; Korolev et al 2001). This pathogen is highly adaptive and new hosts are regularly being reported so other VGCs could be a risk to cotton. There have been some reports of VCG2B causing damage to cotton and is considered exotic to Australia. VCG2B has been identified from cotton in various countries that include China, Greece, Spain, and Israel (Collado-Romero et al., 2008; Korolev et al., 2000; 2001; 2008; Wagner et al., 2021) as well as Turkey where VCG2B isolates caused partial defoliation symptoms (Dervis et al., 2008).

[91] *Verticillium dahliae* colonises and proliferates in xylem elements of a plant (typically entering via the roots) which disrupts the transportation of water and dissolved minerals. Characteristic symptoms often involve the leaves (yellowing, wilting, vein clearing, necrosis), vascular bundles (browning), whole plant (dysplasia, stunting, defoliation [depending on pathotype], reductions in yield and/or quality, plant death).

[92] *Abelmoschus esculentus* (okra), *Acer* spp. (maples), *Acer pseudoplatanus* (sycamore), *Agrostis stolonifera* (creeping bentgrass), *Agrostis stolonifera var. palustris* (bent grass), *Allium cepa* (onion), *Apium*

Scientific name	Common name	Host(s)	Affected plant part(s)	Distribution in Australia[71]	Comments
			lesions); leaves (chlorosis, wilting); whole plant (stunting, plant death).		
Rotylenchulus reniformis	Reniform nematode	Wide host range (more than 300 species)[93] including cotton, pineapple, papaya, cowpea, soybean, tomato, sweetpotato, lettuce, okra, and squash.	Roots may display reduced growth. Leaves may display chlorosis and/or wilting. Plants may show patchy growth and/or stunting.	Northern Territory, Queensland and northern regions of Western Australia.[93]	*R. reniformis* has a limited distribution in Australia. It has been found in central Queensland on cotton. Long-distance spread to new farms or regions can occur with infected plant materials or when soil is moved on footwear, equipment and vehicles. Effective farm biosecurity practices can reduce the possibility that the nematode will be introduced into new cotton growing areas.[93]
Rotylenchulus parvus	-	Wide host range including cotton, papaya, beetroot, cucumber, barley, maize, grape, sugarcane, other grasses.	Roots.	*R. parvus* occurs in Queensland.	*R. parvus* is common on sugarcane and other grasses throughout Queensland growing areas. *R. parvus* has been found on cotton but trails suggest it is not a favourable host.[93, 94]
Viruses					
Abutilon mosaic virus (*Begomovirus*)	Abutilon mosaic virus; Malvaceous chlorosis virus	Malvaceae including *Abutilon* spp. and cotton.	Leaves.	Queensland.[95]	*Abutilon mosaic virus* has been recorded in Australia.[95] Not considered a significant virus of cotton overseas.

graveolens (celery), *Arachis hypogaea* (peanut), *Baccharis halimifolia* (groundsel-bush), *Beta vulgaris* (beetroot), *Brassica* spp., *Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea var. botrytis* (cauliflower), *Brassica oleracea var. capitata* (cabbage), *Brassica rapa subsp. oleifera* (turnip rape), *Capsicum annuum* (bell pepper), *Casuarina equisetifolia* (casuarina), *Chrysanthemum* spp. (daisy), *Citrullus lanatus* (watermelon), *Citrus sinensis* (sweet orange), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cynodon dactylon* (Bermuda grass), *Daucus carota* (carrot), *Desmodium tortuosum* (Florida beggarweed), *Digitaria decumbens* (pangolagrass), *Digitaria sanguinalis* (large crabgrass), *Diospyros kaki* (persimmon), *Eremochloa ophiuroides* (centipedegrass), *Festuca arundinacea* (tall fescue), *Fragaria* spp. (strawberry), *Glycine max* (soybean), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Hordeum vulgare* (barley), *Ilex* spp. (holly), *Ipomoea batatas* (sweetpotato), *Ipomoea purpurea* (tall morning glory), *Lactuca sativa* (lettuce), *Liquidambar styraciflua* (sweet gum), *Lolium multiflorum* (Italian ryegrass), *Mentha spicata* (spear mint), *Ocimum basilicum* (basil), *Oxalis* spp. (wood sorrels), *Paspalum notatum* (bahia grass), *Pennisetum glaucum* (pearl millet), *Pennisetum purpureum* (elephant grass), *Phaseolus vulgaris* (common bean), *Pinus palustris* (longleaf pine), *Pinus taeda* (loblolly pine), *Pisum sativum* (pea), *Pittosporum tobira* (Japanese pittosporum), *Poaceae* (grasses), *Rumex crispus* (curled dock), *Saccharum officinarum* (sugarcane), *Schinus terebinthifolius* (Brazilian pepper tree), *Secale cereale* (rye), *Sesbania exaltata* (coffeebean), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Sorghum sudanense* (Sudan grass), *Stenotaphrum secundatum* (buffalo grass), *Trifolium* spp. (clovers), *Triticum aestivum* (wheat), *turfgrasses, Ulmus parvifolia* (lacebark elm), *Vaccinium corymbosum* (blueberry), *Vigna unguiculata* (cowpea), *Vitis rotundifolia* (muscadine grape), *Zea mays* (maize), *Zoysia* spp.

[93] Stirling (2023).

[94] CABI (2022).

[95] van Brunschot et al. (2013).

IMPLEMENTING BIOSECURITY FOR THE AUSTRALIAN COTTON INDUSTRY 2023-2028

Following the pest prioritisation and analysis of preparedness through the Cotton Technical Expert Group and the Cotton Biosecurity Implementation Group's biosecurity planning process, an implementation plan that sets out shared biosecurity goals and objectives has been developed. The Biosecurity Implementation Plan was developed to act as a guide for biosecurity activities for the cotton industry, governments, and other stakeholders for 2023-2028. It is intended that the plan is monitored and reviewed regularly.

Biosecurity Implementation Plan

The Biosecurity Implementation Plan (Table *4*) 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 cotton industry, Cotton Australia, Cotton Research Development Corporation (CRDC), PHA, government and other stakeholders.

The key priority areas of the Biosecurity Implementation Plan align with the key priority areas of the National Biosecurity Strategy 2022-2032.[96] 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 across the biosecurity system, with the intention of creating effective and productive biosecurity partnerships.

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

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

Table 4. Cotton industry Biosecurity Implementation Plan.

Biosecurity Strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Priority rank[97]	Implementation[98]
1. Preparedness and Response	1.1 Maintain and update a Biosecurity Incident Standard Operating Procedure (BISOP) designed to guide the cotton industry and government in the event of an exotic pest/pathogen incursion.	Cotton industry BISOP which identifies and documents corporate knowledge, organisational procedures, and roles/responsibilities for responding to a biosecurity incident/incursion.	The BISOP will provide industry and government with operational guidance when responding to a biosecurity incursion/response.	Cotton Australia, CRDC, PHA.	A BISOP for the cotton industry has been developed.	Ongoing	Medium	Medium term
	1.2 Participate in future simulation exercises that test the preparedness and response of the biosecurity system to exotic pest incursions.	Simulation exercises – aim for the delivery of two simulation exercises throughout the life of the biosecurity plan.	Participating industries and governments are better prepared to respond to a pest incursion.	Cotton Australia, CRDC, Commonwealth, State and Territory governments, PHA.	Cotton Australia has participated in previous simulation exercises (e.g., Exercise Blueprint) which focused on Cotton blue disease (*Cotton leafroll dwarf virus*).	2023-2028	High	Long term
	1.3 Review the processes used in accessing new chemistry for exotic pests and determine the opportunity to improve processes (i.e., timeliness and effectiveness).	An analysis of current processes to access chemistry in the event of an exotic pest incursion.	Industry better prepared to access new chemistry in the event of an exotic pest incursion.	Cotton Australia, CRDC, APVMA, collaborating industries.	Cotton Australia and CRDC work to access new chemistry when appropriate.	2024-2025	Medium	Short term
	1.4 During the Biosecurity Plan review process, monitor the availability of chemistry and permits.	Annual review of available chemistry for exotic pests.	Increased knowledge and awareness of available chemistry for exotic pests.	Cotton Australia, CRDC, APVMA, collaborating industries, crop protection companies.		2023-2024	Medium	Medium term

[97] Low; Medium; or High priority.
[98] Expected term for implementation: Short term = <2 years; Medium term = 2-5 years; or Long term = >5 years.

Biosecurity Strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Priority rank[97]	Implementation[98]
	1.5 Maintain 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.	Cotton Australia, CRDC, collaborating industries, SPHD (Subcommittee on Plant Health Diagnostics), State and Territory governments.		2023-2028	High	Long term
	1.6 Develop a list of assays available for important cotton pests and pathogens.	Assay location database.	Knowledge of location and access to assays for cotton pests and pathogens.	CRDC, State and Territory governments.		2024-2025	Medium	Short term
	1.7 Maintain oversight of relevant biosecurity legislation and regulations in all states/territories.	Regular legislation and regulation updates.	Any specific state/territory or discordant requirements identified. Increase industry awareness of legislation and regulations impacting their businesses.	Cotton Australia, CRDC.	Through the Cotton BMP and CottonInfo, growers are aware of legislative responsibilities and industry regulations.	2023-2028	Low	Long term
	1.8 Ensure the Owner Reimbursement Costs (ORC) framework and cost calculations are current and appropriate.	Current ORC framework and cost structure.	ORC framework and costs structures remain relevant to key industry sectors.	Cotton Australia, PHA.	ORC framework is currently in place.	2023-2025	High	Medium term
	1.9 Ensure industry liaison training is provided to relevant cotton industry representatives, Cotton Australia staff and relevant State and Territory government staff.	Specific liaison training developed and delivered for the Cotton industry.	Trained industry representatives with awareness and knowledge of roles and responsibilities in biosecurity responses.	Cotton Australia, PHA, State and Territory governments.	Industry liaison training is often presented on a regional multi-industry basis.	2024-2026	Medium	Short term

Biosecurity Strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Priority rank[97]	Implementation[98]
2. Capacity and Capability	2.1 Form and maintain a Cotton Industry Biosecurity Reference Panel.	A Biosecurity Reference Panel is formed and meets regularly.	The cotton industry maintains its focus on exotic pests and diseases and appropriate preparedness activities.	Cotton Australia, CRDC, Commonwealth, State and Territory governments, PHA.	Biosecurity is addressed through industry groups and programs.	2023	Medium	Short term
	2.2 Encourage the development and maintenance of international networks of biosecurity specialists who can contribute to growth of knowledge and skills within the Australian cotton industry.	Biosecurity network for cotton researchers and industry representatives.	Improved preparedness to manage both established and exotic pests.	Cotton Australia, CRDC.	Existing networks exist, although recent travel restrictions have impacted on activities.	2023-2028	Low	Long term
	2.3 Maintain a suite of training programs and modules for all sectors of the industry (e.g., EPPRD training for Board directors, Industry Liaison training for industry staff).	Appropriate training programs and modules targeting each industry sector.	Industry training programs delivering biosecurity aware staff and industry personnel with the capability to contribute to improved biosecurity preparedness and response.	Cotton Australia, PHA, CRDC, State and Territory governments.	A range of training modules already exist through CottonInfo, Cotton BMP, and PHA (including BOLT). A CRDC sponsored Hemiptera identification workshop was conducted in 2023 to improve brown marmorated stink bug (*Halyomorpha halys*) identification capability at Narrabri, New South Wales.	2023-2028	High	Medium term
	2.4 Assess the diagnostic capability and capacity available to industry and government (baseline and surge capacity) and develop strategies to address any critical gaps.	A diagnostic capacity report.	Industry will have a sound understanding of diagnostic capacity and capability and may develop actions to pre-emptively address constraints.	Cotton Australia, CRDC, Commonwealth, State and Territory governments, PHA.		2024-2026	Medium	Medium term

Biosecurity Strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Priority rank[97]	Implementation[98]
	2.5 Develop a flow chart illustrating the biosecurity network to build awareness though industry and government.	Flow chart of the cotton biosecurity network.	Greater awareness of people and processes relevant to cotton industry biosecurity.	PHA, Cotton Australia, CRDC, Commonwealth, State and Territory govts, PHA.		2023-2028	Medium	Long term
	2.6 Maintain collaborative arrangements with state and territory government research staff, universities, and other research bodies.	A cotton research network.	The cotton industry has access to skilled and experienced research staff.	CRDC, Cotton Australia, State and Territory governments, CSIRO, Universities.	Effective collaboration occurs through industry, governments and universities.	2023-2028	High	Long term
	2.7 Support addressing gaps in biosecurity preparedness by collaborating with other industries, governments, and other stakeholders.	Collaborative biosecurity network.	Improved biosecurity preparedness by industry and government.	PBRI, CRDC, Cotton Australia, State and Territory governments.	The Plant Biosecurity Research Initiative (PBRI) manages multi-industry biosecurity research.	2023-2028	Medium	Long term
3. Communication and Engagement	3.1 Maintain a database which holds current contact information for cotton growers and key industry stakeholders.	Cotton industry database.	Cotton growers and key stakeholders can be contacted efficiently.	Cotton Australia, Cotton Seed Distributers (CSD).	Cotton Seed Distributers (CSD) maintains an industry database.	2023-2028	High	Long term
	3.2 Cotton Australia delivers an effective industry communications program with multiple delivery methods which has the capacity to deliver biosecurity relevant information.	An effective cotton industry communications program.	The cotton industry is well informed on the range of biosecurity issues impacting on industry and business.	Cotton Australia, CRDC, State and Territory governments.	CottonInfo extension activities, network, and materials. Cotton BMP program.	2023-2028	High	Long term
	3.3 Promote, disseminate, and demonstrate benefits of biosecurity to industry within and across each component of the supply chain.	A biosecurity aware industry.	All sectors of the industry are aware of the importance of biosecurity.	Cotton Australia, CRDC, PHA, State and Territory governments.		2023-2028	High	Long term

Biosecurity Strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Priority rank[97]	Implementation[98]
	3.4 Prepare articles on biosecurity and key pests (exotic and established) for publication in industry journals and websites.	Biosecurity relevant material.	Industry stakeholders are informed on pests, current management practices and research activities.	Cotton Australia, State and Territory governments, PHA.	Information and articles published in multiple formats.	2023-2028	Medium	Long term
4. Innovation, Research, Development and Extension	4.1 Review and prioritise cotton biosecurity RD&E annually and identify opportunities for collaboration and cross-sectoral investment.	A cotton biosecurity RD&E program that addresses key issues challenging the industry.	Effective RD&E implemented to address industry biosecurity issues.	Cotton Australia CRDC, PBRI.	CRDC currently manages RD&E. Clever Cotton is CRDC's Strategic RD&E Plan for 2023-28.[99]	2023-2028	Medium	Long term
	4.2 Investigate innovative technologies for rapid in-field diagnosis of key pests and pathogens.	New diagnostic tools and methods.	More rapid diagnosis of pests and pathogens will assist growers implement the most suitable eradication or management program.	Cotton Australia, CRDC, State and Territory governments.	Plant Biosecurity Research Initiative (PBRI)	2023-2028	Medium	Long term
	4.3 Determine what surveillance programs, diagnostics and management options are available for both high priority and emerging plant pests.	Identified programs, protocols and management options.	Improved systems for early detection, efficient diagnosis and management of exotic pests.	Cotton Australia, CRDC, PHA, State and Territory governments.	The preparedness status table within the biosecurity plan includes current information on surveillance programs and diagnostic protocols.	2024-2026	Medium	Long term
	4.4 The cotton industry monitors investment and delivery of biosecurity preparedness and response readiness.	Resource availability matches resource need.	The cotton industry maintains the ability to fund appropriate biosecurity preparedness activities.	Cotton Australia, CRDC, State and Territory governments.		2023-2028	Medium	Long term

[99] Clever Cotton sets out CRDC's vision for a sophisticated, prosperous and sustainable Australian cotton industry that is strongly connected to its value chain.

Biosecurity Strategy	Action	Output	Outcome	Potential partners	Current activities	Timeframe	Priority rank[97]	Implementation[98]
5. Collaboration and Partnerships	5.1 Continue to maintain networks among both researchers and regulators in Commonwealth, State and Territory governments.	A biosecurity network.	Greater input into future decision making that may impact on the industry.	Cotton Australia, CRDC, State and Territory governments.	A biosecurity extension network exists, facilitated through PBRI.	2023-2028	Medium	Long term
	5.2 Facilitate and maintain an international network of cotton technical specialists who can contribute to the further development of knowledge and skills within the Australian cotton industry.	A cotton pest and disease network.	Improved capability and capacity to manage both established and exotic pests.	Cotton Australia, CRDC.	Cotton Inc. is a not-for-profit USA company providing the resources and research needed to help companies develop and market superior, innovative, and profitable cotton products.	2023-2028	Medium	Long term
	5.3 Increase communication and collaboration with northern jurisdictions and DAFF NAQS to improve early detection of exotic pests.	Cotton pest surveillance targets.	Increased early detection of important cotton pests.	Cotton Australia, CRDC, State and Territory governments, DAFF NAQS.	As cotton production increases in northern Australia, networks are developing.	2024-2026	Medium	Long term
	5.4 Engage in initiatives to improve preparedness and response to cross sectoral pests and pathogens.	Cross sectoral research and preparedness activities.	Shared investment into RD&E.	Cotton Australia, CRDC, PBRI, PHA.	PBRI facilitates cross sectoral research involving plant based RDCs.	2023-2028	Medium	Long term

Cotton industry: Biosecurity preparedness

The following table (Table *5*) has been populated with the High Priority Pests (HPP) of the cotton industry. This table identifies the current preparedness documents that are available, and activities that are currently being undertaken. This allows industry, governments and RD&E agencies to better prepare for these HPPs and align future activities as listed in the Biosecurity Implementation Plan.

Table 5. Documents and activities for High Priority Pests of the cotton industry.

Scientific name	Common name	National Diagnostic Protocol [100]	Surveillance programs	Fact sheets [101]	Contingency plan [101]	EPPRD category [102]	National Priority Pest [103]	Potential collaborators [104]
Invertebrates								
Coleoptera (beetles and weevils)								
Anthonomus grandis	Boll weevil	Not developed	Not covered by a pest specific surveillance program	Yes – PHA [105]	Yes – CRDC/DAFF (DAWE) (2021) [106]	3	Not listed	
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)								
Amrasca biguttula	Indian cotton jassid; Indian green jassid; Cotton leafhopper	Not developed	NAQS – Pest and disease surveys	Yes – PHA [107]	Not developed	Not listed	Not listed	
Lygus hesperus	Western plant bug	Not developed	Not covered by a pest specific surveillance program	Yes – PHA [108] NSW DPI [109]	Not developed	4	Not listed	Vegetables

[100] National Diagnostic Protocols are available from https://www.plantbiosecuritydiagnostics.net.au/resources/
[101] Copies of these documents are available from https://www.planthealthaustralia.com.au/resource/resource-centre/
[102] Based on categorisation from the EPPRD at the time of endorsement; see https://www.planthealthaustralia.com.au/response-arrangements/emergency-plant-pest-response-deed-epprd/
[103] National Priority Plant Pests (2019) - DAFF (agriculture.gov.au)
[104] Industries listed in this column identify these pests within their biosecurity plans as a High Priority Pest.
[105] Fact sheet available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Cotton-boll-weevil-FS.pdf
[106] Contingency plan available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/02/Boll_weevil_CP_FullDraft_2021.pdf
[107] Fact sheets available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Indian-green-jassid-FS.pdf
[108] Fact sheet available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/02/Tarnished-and-Western-plant-bugs-FS.pdf
[109] Fact sheet available from https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/western-plantbug

Scientific name	Common name	National Diagnostic Protocol [100]	Surveillance programs	Fact sheets [101]	Contingency plan [101]	EPPRD category [102]	National Priority Pest [103]	Potential collaborators [104]
Lygus lineolaris	Tarnished plant bug	Not developed	Not covered by a pest specific surveillance program	Yes – PHA [110]	Yes – Nursery & Garden Industry (PHA) (2011) [111]	Not listed	Not listed	Berries, Production nurseries
Lepidoptera (butterflies and moths)								
Helicoverpa zea	American cotton bollworm; Corn earworm	Not developed	Not covered by a pest specific surveillance program	Not developed	Yes – Grains Industry (PHA) (2009) [112]	Not listed	Not listed	
Pathogens								
Bacteria								
Xanthomonas citri subsp. *malvacearum* (exotic and hypervirulent races)	Cotton bacterial blight	Draft	NSW – Diseases of cotton QLD – Endemic and exotic diseases of cotton	Yes – PHA [113]	Not developed	3	Not listed	
Fungi								
Fusarium oxysporum f. sp. *vasinfectum* (exotic vegetative compatibility groups/races)	Fusarium wilt	Not developed	NSW – Diseases of cotton QLD – Endemic and exotic diseases of cotton NT – Area of freedom surveys	Yes – PHA [114], CottonInfo [115, 116]	Not developed	Not listed	Not listed	
Verticillium dahliae (exotic vegetative compatibility	Verticillium wilt	Draft	NSW – Diseases of cotton QLD – Endemic and exotic	Yes – PHA [117] CottonInfo [116, 118]	Not developed	3	Not listed	Olives, Almonds, Chestnuts, Pecans,

[110] Fact sheets available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/02/Tarnished-plant-bug-FS.pdf
[111] Contingency plan available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/02/Tarnished-plant-bug-CP-2011.pdf
[112] Contingency plan available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Corn-earworm-CP-2009.pdf
[113] Fact sheet available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Bacterial-blight-FS.pdf
[114] Fact sheet available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Fusarium-wilt-FS.pdf and https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Tarnished-plant-bug-Fusarium-wilt-Technical-FS.pdf
[115] Fact sheet available from https://cottoninfo.com.au/publications/disease-idm-fusarium-wilt
[116] Fact sheet available from https://cottoninfo.com.au/sites/default/files/documents/Be%20wilt%20aware.pdf
[117] Fact sheet available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/02/Verticillium-wilt-FS.pdf
[118] Fact sheet available from https://www.cottoninfo.com.au/sites/default/files/documents/Vert%20update%20%28long%29%20-%20August%202016%20v3.pdf

Scientific name	Common name	National Diagnostic Protocol [100]	Surveillance programs	Fact sheets [101]	Contingency plan [101]	EPPRD category [102]	National Priority Pest [103]	Potential collaborators [104]
groups/strains)			diseases of cotton NT – Area of freedom surveys					Pistachios, Walnuts
Virus								
Cotton leaf curl virus complex (*Begomovirus*)	Cotton leaf curl virus[es] (CLCuV); Cotton leaf curl disease (CLCuD) complex.	Draft	NSW – Diseases of cotton QLD – Endemic and exotic diseases of cotton	Yes - PHA [119] NSW DPI [120]	Yes – Draft: QDAF (2013)	3	NPPP 40	
Cotton leafroll dwarf virus (*Polerovirus*)	Cotton leafroll dwarf virus (CLRDV); Cotton blue disease (CBD); Cotton leafroll dwarf disease (CLRDD); Atypical Cotton Blue Disease (ACBD); Atypical Cotton Leafroll Dwarf Virus (ACLDV).	Draft	NAQS – Pest and disease surveys NSW – Diseases of cotton QLD – Endemic and exotic diseases of cotton	Yes – PHA [121], NSW DPI [122]	Yes – Draft: QDAF (2018)	Not listed	Not listed	

[119] Fact sheets available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Apple-maggot-Cotton-leaf-curl-disease-FS.pdf
[120] Fact sheet available from https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/cotton-leaf-curl
[121] Fact sheet available from https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Cotton-blue-disease-Technical-FS.pdf and https://www.planthealthaustralia.com.au/wp-content/uploads/2024/01/Cotton-blue-disease-FS.pdf
[122] Fact sheet available from https://www.dpi.nsw.gov.au/biosecurity/plant/insect-pests-and-plant-diseases/cotton-blue

Biosecurity plan development and review

With the assistance of Cotton Research and Development Corporation (CRDC), a Technical Expert Group (TEG) and a Biosecurity Implementation Group (BIG) were formed to assist in the development of the *Biosecurity Plan for the Australian Cotton Industry* (the Biosecurity Plan) (Table 6). These groups were coordinated by Plant Health Australia (PHA) and included representatives from CA, CRDC, CSIRO, and state and territory agriculture agencies.

Key roles of the Technical Expert Group included:

- identifying and documenting key threats to the Australian cotton industry,
- consider the potential entry, establishment, spread and economic impact of each exotic pest,
- confirming the High Priority Pest (HPP) list.

Key roles of the Biosecurity Implementation Group 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 plan for future biosecurity related work to be conducted over the life of this biosecurity plan.

Table 6. Members of the Technical Expert Group (TEG) and Biosecurity Implementation Group (BIG).

Name	Organisation	Area(s) of expertise	Member of TEG	Member of BIG
Sally Ceeney	Cotton Australia	Research Direction and Stewardship	✓	✓
Susan Maas	CRDC	R&D Manager	✓	✓
Simone Heimoana	CSIRO	Research Scientist/Project Leader	✓	✓
Wee Tek Tay	CSIRO	Principal Research Scientist (Pest Genomics)	✓	✓
Cherie Gambley	DAF QLD	Senior Plant Pathologist	✓	
Christine Horlock	DAF QLD	Principal Scientist (Plant Health)	✓	✓
Linda Smith	DAF QLD	Senior Plant Pathologist	✓	✓
Murray Sharman	DAF QLD	Principal Plant Pathologist (Virology)	✓	✓
Paul Grundy	DAF QLD	Principal Research Scientist (Entomology/Farming Systems)	✓	✓
Sharna Holman	DAF QLD	Development Extension Officer	✓	✓
Stan Bellgard	DITT NT	Principal Plant Pathologist	✓	✓
Thilini Ekanayake	DITT NT	Senior Research Entomologist	✓	
Harshitsinh Vala	NAQS	Research Scientist/Plant Pathologist	✓	
Duy Le	NSW DPI	Cotton Pathologist	✓	
Lisa Bird	NSW DPI	Research Scientist	✓	✓
Toni Chapman	NSW DPI	Senior Research Scientist (Molecular Bacteriology)	✓	✓
David Cousins	WA DPIRD	Plant Biosecurity		✓
Elsie Kinnaird	WA DPIRD	Entomologist	✓	
Helen Spafford	WA DPIRD	Research Scientist/Biosecurity Preparedness		✓
Margaret Uloth	WA DPIRD	Research Officer	✓	✓

Name	Organisation	Area(s) of expertise	Member of TEG	Member of BIG
Andrew Vossen	PHA	Plant Biosecurity	✓	✓
Luke McKee	PHA	Plant Biosecurity		✓
Jess Lehmann	PHA	Plant Biosecurity	✓	
Maggie Mwathi-Nyarko	PHA	Plant Biosecurity	✓	
Trevor Dunmall	PHA	Plant Biosecurity	✓	✓

Review processes

With the support of the relevant industry bodies and PHA, this plan should be reviewed on a regular 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 a Cotton Biosecurity Reference Panel 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 biosecurity activities within the implementation plan could feed directly into industry RD&E investment plans 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

Development 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 cotton 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 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 EPP incursions, and assists in the response to EPP incursions, particularly those identified as key threats.

Identification of exotic high priority pests assists 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 and weeds 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 and weeds, 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 and weeds for the industry.

Exotic pests of the Australian cotton industry

Threat identification

Information on exotic pest threats to the Australian cotton 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[123] and 11 [Food and Agriculture Organization of the United Nations.[124] A summary of the pest risk analysis protocol followed in this biosecurity plan is shown in Table *7*.

[123] FAO (2007).
[124] FAO (2004).

While there are similarities in the ranking system used in this document and the Biosecurity Import Risk Analysis (BIRA)[125] 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[126] (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 considers 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 considers the impacts on the Australian cotton 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 impacts (Table *8*) differs in comparison to that used in the BIRA process.

Table 7. 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 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].

[125] https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/bira-guidelines-2016.pdf
[126] Now the Department of Agriculture, Fisheries and Forestry (DAFF).

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) present a list of potential plant pest threats to the Australian cotton 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 consider 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 cotton industry), and therefore this rating may differ between biosecurity plans.

Description of terms used in pest risk tables

The descriptions below relate to terms used throughout the Plan, and in particular Table 1, Table 2, Table 14, and Table 15.

Table 8. 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 under International Plant Protection Convention (IPPC) standards[127] and Commonwealth and state/territory legislation.

Many pre-emptive practices can be adopted to reduce the risk of exotic pest movement for the industry (Figure *3*). 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. 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.

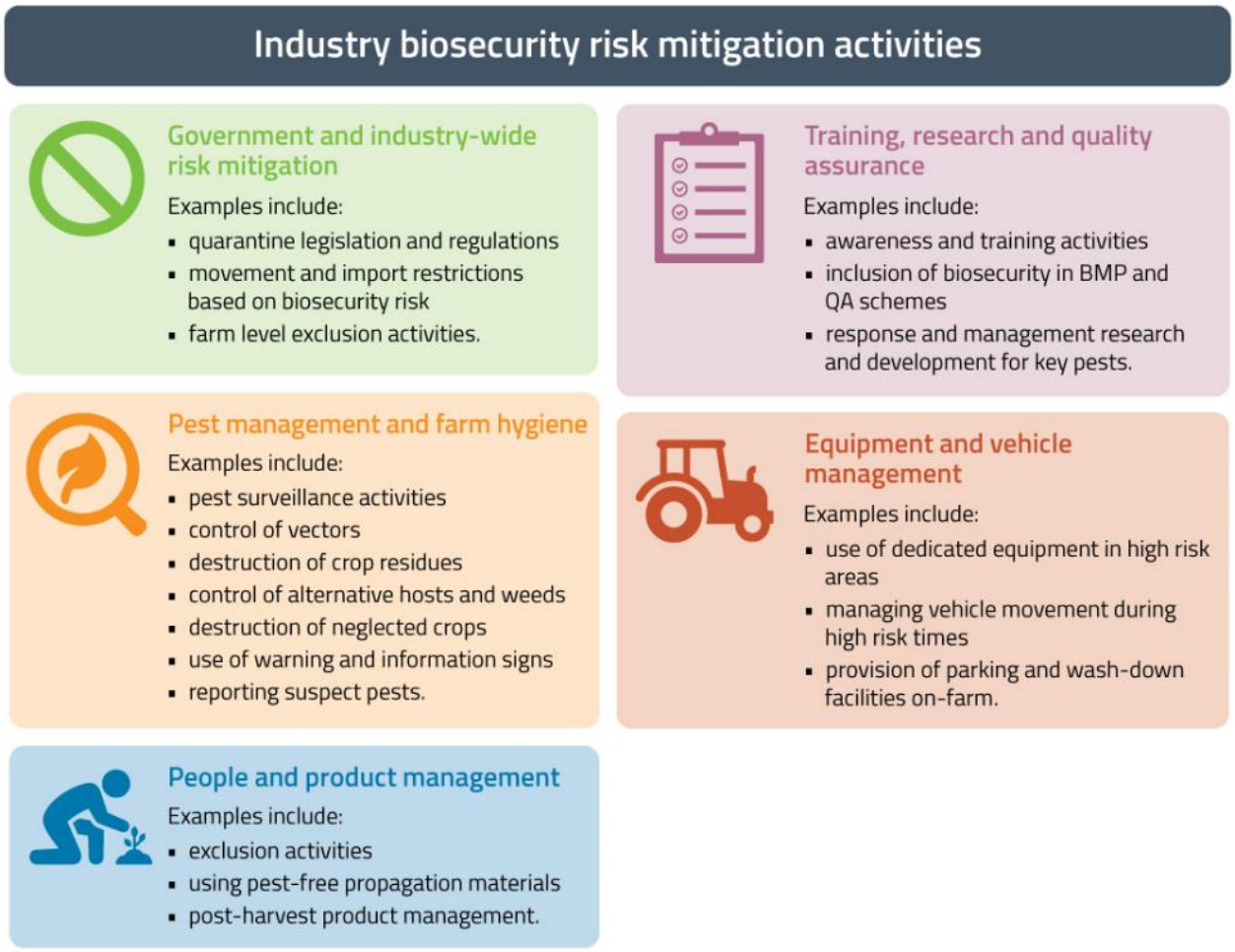

Figure 3. Examples of biosecurity risk mitigation activities.

[127] 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 farm 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. In particular, 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[128] 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, 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[129] 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).[130] NAQS surveillance programs relevant to the cotton industry are listed in Table *9*.

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,
- communication, training and extension strategies with industry,

[128] https://www.wto.org/english/tratop_e/sps_e/spsund_e.htm
[129] FAO (2018).
[130] https://www.agriculture.gov.au/biosecurity-trade/policy/australia/naqs

- 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 cotton industry (exotic or those under official control in a region or state/territory) are shown in Table 9.

Table 9. Official surveillance programs that target pests of the cotton industry (as of 2021).[131]

Surveillance program name	Target host(s)	Target pest(s)[132]	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 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 – pest and disease surveys	Tropical horticultural, environmental and agricultural species.	At least 123 priority exotic pests, diseases and weeds including; *Adoretus sinicus*, ***Amrasca biguttula*** (***Amrasca devastans***), *Helopeltis* spp., *Hypomeces* sp., ***Cotton leafroll dwarf virus*** (*Polerovirus*).	General and specific
Within New South Wales			
Diseases of cotton	Cotton.	Exotic strains of bacterial blight (***Xanthomonas campestris***), **cotton blue disease** (Luteovirus), **cotton leaf curl virus** (*Begomovirus*), Texas root rot (*Phymatotrichum omnivorum*), exotic strains of Verticillium wilt (***Verticillium dahliae***), exotic strains of Fusarium wilt (***Fusarium oxysporum* f. sp. *vasinfectum***).	Specific
Fall Armyworm	Maize, other summer grain crops.	Fall armyworm (*Spodoptera frugiperda*).	Specific
Khapra beetle	Grain processing facilities.	*Trogoderma granarium*.	Specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple	Multiple including brown marmorated stink bug (*Halyomorpha halys*), exotic mites (including *Brevipalpus* spp., *Aceria* spp.)	General and specific

[131] https://www.planthealthaustralia.com.au/wp-content/uploads/2021/08/2020-National-Plant-Biosecurity-Status-Report.pdf
[132] HPPs identified using bold font.

Surveillance program name	Target host(s)	Target pest(s) [132]	Type of surveillance
Within the Northern Territory			
Plant Pest Diagnostic Service – Broadacre cropping	Broadacre crops.	All pests and pathogens that can affect broadacre crops.	General
Within Queensland			
Endemic and exotic diseases of cotton	Cotton.	Exotic strains of bacterial blight (***Xanthomonas campestris***), **cotton leaf curl virus** (Begomovirus), **cotton leafroll dwarf virus** (Polerovirus), Texas root rot (*Phymatotrichum omnivorum*), exotic strains of Verticillium wilt (***Verticillium dahliae***), exotic strains Fusarium wilt (***Fusarium oxysporum* f. sp. *vasinfectum***) and all other exotic viruses.	Specific
Endemic and exotic grains virus surveys	Grains and cotton.	Various viruses, especially aphid transmitted *Polerovirus* complex.	Specific
Fall Armyworm Response Project monitoring	Multiple.	Fall armyworm (*Spodoptera frugiperda*).	General and specific
Grain bulk handling companies	Stored grains.	Endemic and exotic stored grain pests (including *Trogoderma granarium*).	General
Plant Pest Diagnostic Service – Broadacre cropping	Broadacre field crops.	All pathogens that can affect broadacre crops (cotton, grains, pastures).	General
Post-Entry Quarantine inspections	Broadacre field crops (e.g. cotton, sorghum, maize, peanuts).	All pathogens that affect broadacre field crops.	General
Silverleaf whitefly resistance monitoring	Cotton.	Silverleaf whitefly (*Bemisia tabaci* B-type).	Specific
Within South Australia			
Grains Farm Biosecurity Program	In-crop and stored grains.	Various, including Khapra beetle (*Trogoderma granarium*).	General and specific
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Multiple including brown mamorated stink bug (*Halyomorpha halys*)	General and specific
Within Tasmania			
National Plant Health Surveillance Program – multi pest surveillance	Multiple.	Brown marmorated stink bug (*Halyomorpha halys*).	Specific
Silverleaf whitefly surveillance	Nursery stock.	Silver leaf whitefly (*Bemisia tabaci*).	Specific
Warehouse beetle and Khapra beetle trapping surveillance	Stored grains, grain processors and animal feed outlets.	Khapra beetle (*Trogoderma granarium*).	Specific
Within Victoria			
Crop Safe Program	In-field grains.	Khapra beetle (*Trogoderma granarium*).	General
Grains Farm Biosecurity Program	In-crop and stored grains.	Khapra beetle (*Trogoderma granarium*).	Specific

Surveillance program name	Target host(s)	Target pest(s) [132]	Type of surveillance
MyPestGuide e-surveillance	All hosts, general surveillance.	All plant pests.	General and specific
National Plant Health Surveillance Program – Multi pest surveillance	Multiple.	Brown marmorated stink bug (*Halyomorpha halys*).	Specific
Urban Plant Health Network	Multiple plant hosts in periurban landscape, including community gardens.	Various, including brown marmorated stink bug (*Halyomorpha halys*).	General
Within Western Australia			
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
Grains Farm Biosecurity Program	In-crop and stored grains.	Khapra beetle (*Trogoderma granarium*).	Specific
MyCrop e-surveillance	Broadacre crops, general surveillance.	All plant pests.	General and specific
MyPestGuide e-surveillance	All hosts, general surveillance.	All plant pests.	General and specific
National Plant Health Surveillance Program – Multi pest surveillance	Pome and citrus crops.	Multiple including brown marmorated stink bug (*Halyomorpha halys*).	Specific
Pantry Blitz	Stored grain products.	Khapra beetle (*Trogoderma granarium*).	General
PestFacts e-surveillance	Broadacre crops.	All plant pests.	General
Sentinel stored products merchants	Stored grain products.	Khapra beetle (*Trogoderma granarium*).	General and specific

Farm level pest monitoring

Farm 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 *4*.

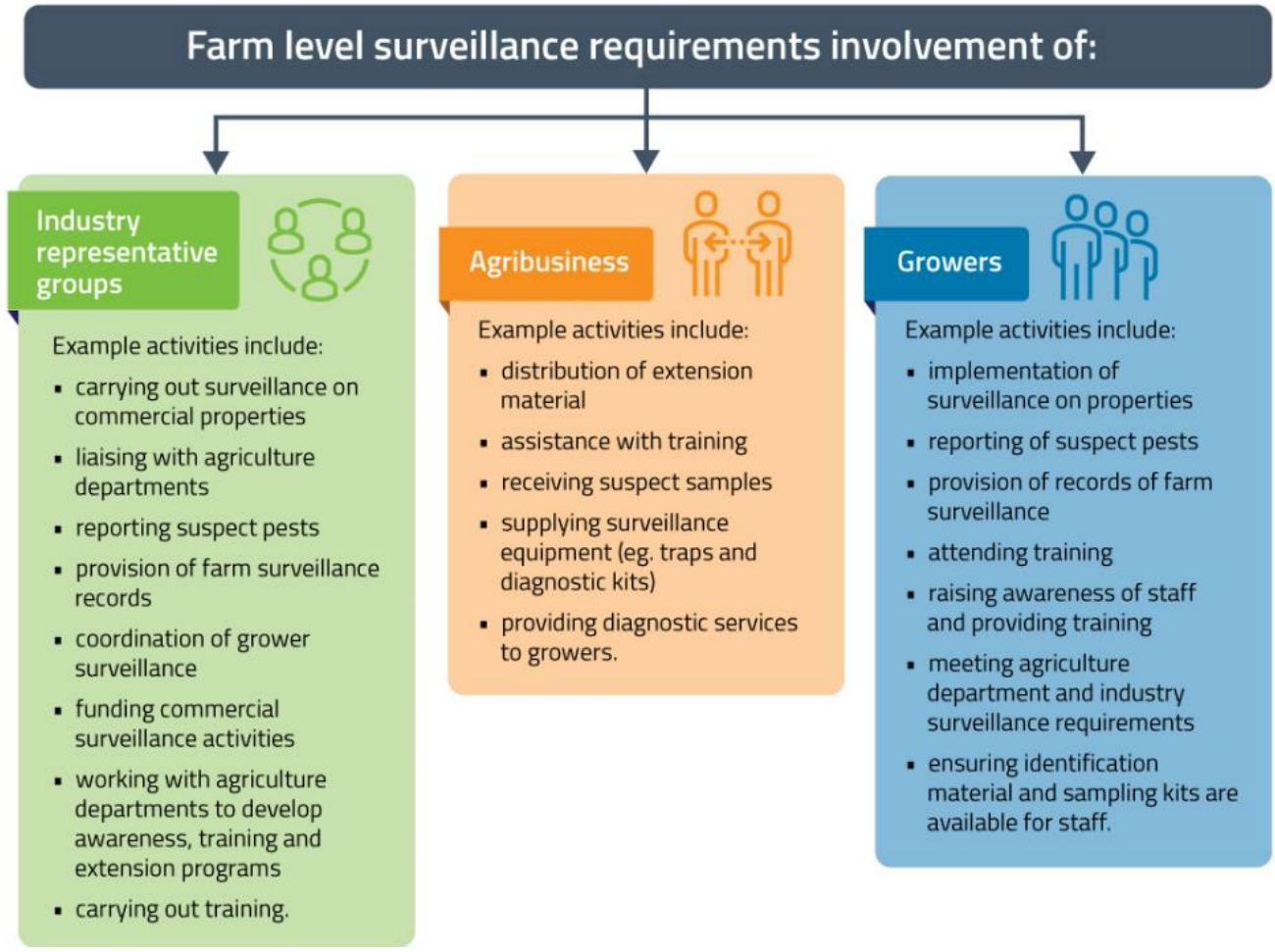

Figure 4. Examples of farm level surveillance activities.

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 https://www.planthealthaustralia.com.au/training/biosecurity-online-training-bolt/.

For more information on the National EPP Training program, refer to https://www.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.

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 cotton 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 cotton 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 *10* contain information on pests across most plant industries, including the cotton industry.

Table 10. Sources of information on High Priority Pests for the cotton industry.

Source	Website
CABI – Crop Protection Compendium	cabi.org/cpc/
Department of Agriculture, Fisheries and Forestry (DAFF)	agriculture.gov.au
Department of Energy, Environment and Climate Action, Victoria (DEECA Vic)	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, Western Australia (DPIRD WA)	https://www.agric.wa.gov.au/biosecurity-quarantine/biosecurity/plant-biosecurity
European and Mediterranean Plant Protection Organization (EPPO)	eppo.int/DATABASES/pqr/pqr.htm
Farm Biosecurity	https://www.farmbiosecurity.com.au/crops/cotton/cotton-pests/
Global Biodiversity Information Facility (GBIF)	https://www.gbif.org/
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/
Department of Agriculture and Fisheries, Queensland (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

Cotton On-farm 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 cotton on-farm 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 farm's biosecurity risk management. Many of these measures can be adopted in a way that suits a given farm 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 Cotton Australia.

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 13. 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 cotton 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 5). Over time, as more resources are produced for individual pests of the cotton industry they will be included in this document and made available through the PHA website[133]. 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 that are listed in the TSTs (Table 14; Table 15).

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 *5* for a list of current fact sheets available for cotton growers.

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[134] and be endorsed by the National Management Group[135] prior to implementation.

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 cotton HPP's see Table 5.

[133] https://www.planthealthaustralia.com.au/resource/
[134] https://www.planthealthaustralia.com.au/biosecurity/incursion-management/plantplan/
[135] https://www.directory.gov.au/portfolios/agriculture-water-and-environment/department-agriculture-water-and-environment/national-management-group

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)[136] are diagnostic protocols for the unambiguous taxonomic identification of a pest in a manner consistent with ISPM No. 27 – Diagnostic Protocols for Regulated Pests.[137] 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).[138] NDPs are peer reviewed and verified before being endorsed by Plant Health Committee (PHC).[139]

Endorsed NDPs are available on the National Plant Biosecurity Diagnostic Network (NPBDN)[140] website together with additional information regarding their development and endorsement.

For diagnostic information on fruit flies, refer to the Australian Handbook for the Identification of Fruit Flies[141].

National Surveillance Protocols

National surveillance protocols (NSPs)[142] are the first point of reference for developing surveillance plans. A surveillance protocol is a technical reference guide for conducting surveillance on a specific plant pest or group of plant pests. It includes information on surveillance methodology, pest biology, taxonomy, identification, and sample processing.

NSPs will be used for all national surveillance programs and their use is also encouraged for all other relevant surveillance activities conducted by governments and industry in Australia. Published NSPs are reviewed by the National Surveillance Protocol working group (NSPWG) and endorsed by the Subcommittee on National Plant Health Surveillance (SNPHS)[143]. Endorsed NSPs are available on the Plant Surveillance Network Australasia-Pacific (PSNAP)[144] website together with additional information regarding their development and endorsement.

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 Table (Table *4*). 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.

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[136] https://www.plantbiosecuritydiagnostics.net.au/initiatives/national-diagnostic-protocols/
[137] FAO (2006).
[138] https://www.plantbiosecuritydiagnostics.net.au/work/subcommittee-on-plant-health-diagnostics/
[139] https://www.agriculture.gov.au/agriculture-land/plant/health/committees/phc
[140] https://www.plantbiosecuritydiagnostics.net.au/
[141] https://www.fruitflyidentification.org.au/identify/handbook/
[142] https://plantsurveillancenetwork.net.au/resources/reference-standards-for-development-and-approval-of-national-surveillance-protocols-for-plant-pests/
[143] https://www.agriculture.gov.au/agriculture-land/plant/health/committees/snphs
[144] https://plantsurveillancenetwork.net.au/resources/

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 cotton 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 cotton industry they will be included in the list and made available through the PHA website.

The Emergency Plant Pest Response Deed

A fundamental component of the Australian plant biosecurity system is the EPPRD[145], which is an agreement between the Australian government, the state/territory governments, 38 plant industries (including Cotton 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 https://www.planthealthaustralia.com.au/resource/.

[145] https://www.planthealthaustralia.com.au/response-arrangements/emergency-plant-pest-response-deed-epprd/

Australian Cotton Industry: 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.[146]

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.[147]

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.[146]

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 (Table 11). 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 11. Response funding allocation between Government and Industry for an EPP.

EPP category	Government funding	Industry funding
Category 1	100%	0%
Category 2	80%	20%
Category 3	50%	50%
Category 4	20%	80%

[146] https://www.planthealthaustralia.com.au/response-arrangements/emergency-plant-pest-response-deed-epprd/
[147] https://www.planthealthaustralia.com.au/response-arrangements/plantplan/

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.

Cotton EPPs categorised to date

EPPs relevant to the Australian cotton industry that are categorised and listed within Schedule 13 of the EPPRD are listed below in Table 12.

Table 12. Formal categories for pests of the Australian cotton industry as listed in Schedule 13 of the EPPRD (as of May 2024[148]). HPPs listed in bold.

EPP category	Scientific name	Common name
3	***Anthonomus grandis***	**Boll weevil**
3	***Begomovirus* Cotton leaf curl virus**	**Cotton leaf curl disease**
2	*Halyomorpha halys*	Brown marmorated stink bug
4	***Lygus hesperus***	**Western plant bug; Western tarnished plant bug**
2	*Phymatotrichopsis omnivora*	Texas root rot
2	*Thaumatotibia leucotreta*	False codling moth
2	*Trogoderma granarium*	Khapra beetle
3	***Verticillium dahliae***	**Verticillium wilt (defoliating strain)**
3	***Xanthomonas axonopodis* pv. *malvacearum***	**Bacterial blight; Angular leaf spot**

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) (Figure 5).[149] All signatories affected by the EPP (both government and industry) are then notified immediately, and a Consultative Committee on Emergency Plant Pests (CCEPP)[150] meeting is convened. 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.

[148] https://www.planthealthaustralia.com.au/response-arrangements/emergency-plant-pest-response-deed-epprd/
[149] https://www.agriculture.gov.au/agriculture-land/plant/health/acppo
[150] https://www.agriculture.gov.au/agriculture-land/plant/health/committees/ccepp

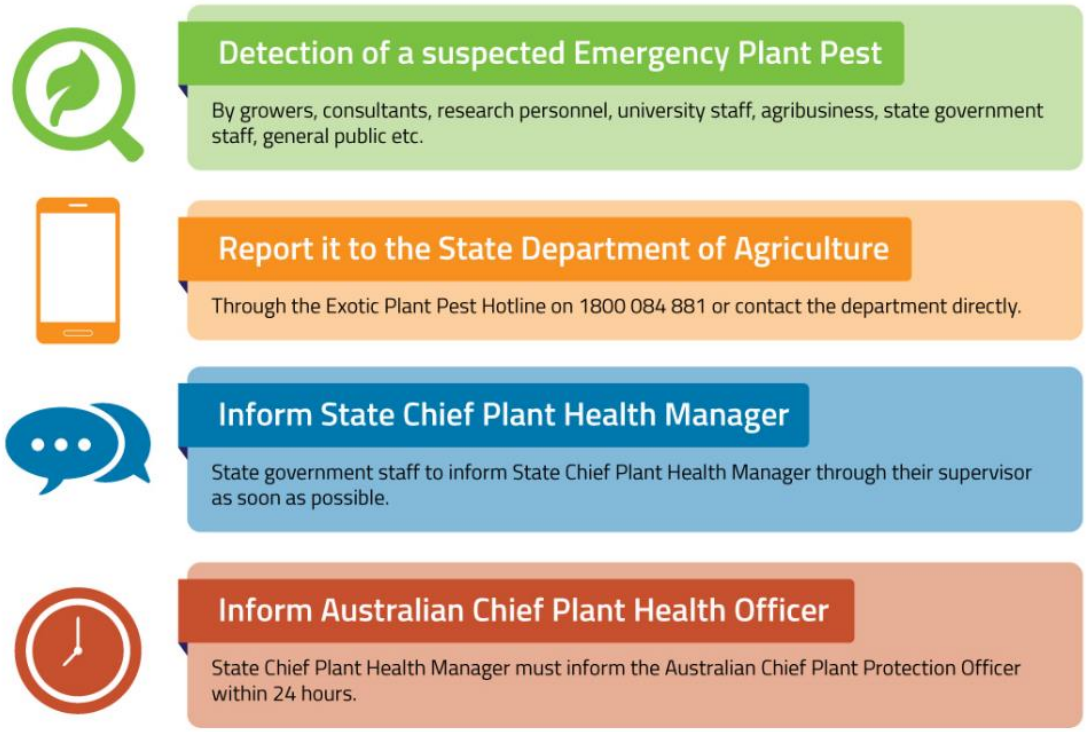

Figure 5. Reporting of suspect EPPs and notification process.

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 Cotton Australia. 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.

If the EPP is deemed ineradicable, a decision is made on another course of action, namely containment or long-term management. In 2016, a Transition to Management (T2M) phase was incorporated into the EPPRD following approval by all EPPRD Parties. T2M may only be initiated if a response plan has been approved and started and it has been agreed that eradication is not possible. Its aim is to provide a formalised structure for transitioning a response under the EPPRD from the eradication of an EPP under an approved Response Plan to management of the EPP outside of the EPPRD processes. T2M is not an automatic process as the parties to the response have to agree it is needed and what activities will be included. Its aims to provide a mechanism to enable the affected industry to transition to ongoing management of the pest.

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.

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 https://www.planthealthaustralia.com.au/response-arrangements/.

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 cotton 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 https://www.planthealthaustralia.com.au/response-arrangements/emergency-plant-pest-response-deed-epprd/owner-reimbursement-costs/.

Industry specific response procedures

Industry communication

Cotton Australia is the peak industry body for the Australian cotton industry and a signatory to the EPPRD. Cotton Australia 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. Cotton Australia will have responsibility for relevant industry communication and media relations (see PLANTPLAN[151] for information on approved communications during an incursion). The contacts nominated for the CCEPP and the NMG by Cotton Australia 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 cotton is of high importance. Each state/territory may have biosecurity legislation in place to control the importation of cotton plant materials 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 for Domestic Quarantine and Market Access (SDQMA).

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 cotton plants and related material can be obtained by contacting your local state or territory agriculture department directly (information is included in Table *13*) or can be accessed through the SMART website[152] 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.

[151] https://www.planthealthaustralia.com.au/response-arrangements/plantplan/
[152] https://interstatequarantine.org.au/

Table 13. Contact details and information sources.

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity Manuals	Emergency Plant Pest Hotline
National					1800 084 881
Cotton Australia	https://cottonaustralia.com.au/ E: talktous@cotton.org.au	(02) 9669 5222	Head office Suite 4.01 247 Coward Street Mascot NSW 2020 Australia	Farm Biosecurity Manual for the Cotton Industry	
Cotton Research Development Corporation	www.crdc.com.au E: crdc@crdc.com.au	(02) 6792 4088	2 Lloyd Street Narrabri NSW 2390 Australia PO Box 282 Narrabri NSW 2390 Australia		
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	

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity Manuals	Emergency Plant Pest Hotline
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 Control Orders https://www.dpi.nsw.gov.au/biosecurity/managing-biosecurity/legislation	Operates 08:30 – 16:30 Monday to Friday. After hours answering machine service with messages followed up the next business day.
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

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity Manuals	Emergency Plant Pest Hotline
Biosecurity SA-Plant Health	https://pir.sa.gov.au/biosecurity/plant_health E. pirsa.planthealth@sa.gov.au E. pirsa.planthealthmarketaccess@sa.gov.au	(08) 8207 7820 1300 666 010 (Fruit fly & Quarantine) (08) 8207 7814 (Market Access and Interstate Certification Assurance)	33 Flemington Street Glenside SA 5065		
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		
Tasmania					1800 084 881
Biosecurity Tasmania, a part of the Department of Natural Resources and the Environment Tasmania (NRE)	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

Organisation	Website/Email	Phone	Address	Legislation/Biosecurity Manuals	Emergency Plant Pest Hotline
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 La Trobe University Bundoora Vic 3083	*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 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 (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.

On-farm exclusion activities

A significant risk of spreading pests onto farms 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 farm 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 business, industry, government, and the community.

One major way this can be achieved is through management of industry biosecurity at the farm level using exclusion practices. Further detail on potential strategies is included in the Biosecurity section (page 56). The cotton 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: COTTON INDUSTRY BIOSECURITY

Introduction

Cotton Australia recognises the need for the cotton industry to work with the federal, state and territory governments to help reduce the potential for incursions of emergency plant pests that could adversely impact on production, domestic and international trade and the regional economy and environment.

The cotton industry is committed to ensuring effective responses to pest incursions are possible to minimise costs to growers, the industry, other plant industries, government parties and the wider community.

The cotton industry through Cotton Australia is working with Plant Health Australia (PHA) to develop a comprehensive national approach to managing biosecurity risks in the cotton industry. Valuable assistance is received from researchers and staff from CSIRO, NSW Department of Primary Industries (NSW DPI), Queensland Department of Agriculture and Fisheries (DAF), Biosecurity Queensland, Cotton Research and Development Corporation (CRDC), Cotton Seed Distributors (CSD), the Australian Government Department of Agriculture and Water Resources and, a number of Universities.

Commitments under the Emergency Plant Pest Response Deed

Cotton Industry Biosecurity Plan

The National Cotton Industry Biosecurity Plan, consistent with PHA's National Industry Biosecurity Planning Guidelines, was launched in November 2006 and reviewed in February 2010 (Version 2). In March 2015, CRDC funding was provided to Plant Health Australia Ltd to conduct a major review of the plan, which has been released as the Cotton Industry Biosecurity Plan Version 3.0 and is available on the Cotton Australia website.

The biosecurity plan identifies and prioritises the cotton industries biosecurity risks and provides a framework for risk mitigation and preparedness activities. The awareness section identifies a range of existing industry processes, fact sheets and other sources of information for the identified 15 High Priority Pests (HPPs) that can be used to promote biosecurity awareness throughout the industry. The cotton Industry Biosecurity Group meets annually to maintain currency of issues, review pest threats, identify biosecurity research and preparedness gaps, and provide oversight of industry implementation and adoption of biosecurity strategies as identified in the BP.

Pest categorisation

Cotton Australia will, as far as it is within its power to do so, ensure that appropriate industry technical experts will be available to participate in future meetings of the Categorisation Group to consider either pest categorisation or funding weight calculations for Emergency Plant Pests with multi-industry impacts. Cotton Australia has participated in all relevant categorisation group meetings. Currently, seven cotton industry identified Emergency Plant Pests have been categorised and are listed in Schedule 13 of the Emergency Plant Pest Response Deed.

National decision-making processes

Cotton Australia will endeavour to ensure that senior and qualified industry delegates are available at short notice to participate in meetings of the Consultative Committee on Emergency Plant Pests or the National Management Group and to take up roles in Local Pest Control Centres or the State Pest Control Headquarters in the event of an incursion. Cotton Australia will also endeavour to ensure that all delegates participate in relevant competency and non-competency based training, which is being delivered through Plant Health Australia's Emergency Plant Pest Preparedness Training Program.

Owner Reimbursement Costs

In association with Plant Health Australia, Cotton Australia developed the cotton Owner Reimbursement Cost (ORC) framework. This framework has been endorsed by the Cotton Australia Board, the PHA Board and Relevant Parties to the Emergency Plant Pest Response Deed (EPPRD) and is available on the PHA website.

On-farm biosecurity

Best management practice program

The cotton Best Management Practices program (*my*BMP) is the core platform for delivery of best practice across the Australian Cotton Industry. The *my*BMP program includes a farm biosecurity module which was originally modelled on the '*Farm Biosecurity Manual for the Cotton Industry*'.

This module is designed to assist growers in protecting their farm from the introduction of endemic and exotic pests, and to help minimise the spread of pest species throughout the industry. Practices to create awareness of biosecurity risks and the process for reporting a suspected incursion are also outlined.

Revisions reflect the responsibilites growers have under changed bioseceurity legislation (including General Biosecurity Obligation and General Biosecurity Duty). The module provides linkages to resources available on other websites including the AHA/PHA Farm Biosecurity website, and website for the industry's CottonInfo extension team. Further to this, links have been added to guide growers to Northern Territory and Western Australia biosecurity resources in recognition of the developing industry in Northern Australia.

Training

A biosecurity scenario training workshop was conducted in August 2019. Exercise Blueprint used a fictional detection of cotton blue disease on a cotton farm near Dalby, Queensland, in a range of discussions and activities to find out how the cotton industry would respond to an incursion of this exotic pest. The main aims of the exercise were to identify how the industry would be engaged in a response and how the communication channels industry would use to ensure the right messages would reach their stakeholders.

Attendees came from a wide range of cotton industry sectors including Cotton Australia, CottonInfo, Cotton Research Development Corporations (CRDC), growers, agronomists, gin operators, researchers, extension officers, the Australian Government (Department of Agriculture), Queensland Department of Agriculture and Fisheries and NSW Department of Primary Industries. SRA participated as observers. The exercise was funded by CRDC to improve the biosecurity preparedness of the cotton industry.

Extension

The Australian Cotton Industry's CottonInfo team play a key role in the development and delivery of research extension resources. The CottonInfo team includes a Biosecurity Tech Lead to help coordinate industry biosecurity extension. A number of extension activities have been delivered to industry to raise awareness and promote the adoption of on-farm biosecurity practices.

These include:

- Updating 'Come Clean. Go Clean' wash-down best management practice protocols to incorporate agricultural detergents and decontaminants, with plans in place to develop a Northern Australia fact sheet to support clean movement in and out of new regions.
- CottonInfo e-newsletters and CRDC Spotlight magazine articles about on-farm hygiene and biosecurity.
- A new on-farm biosecurity campaign 'Be a good mate, Stop it at the gate', which aims to ensure biosecurity is part of day-to-day conversations on Australian cotton farms.

- 'Be a good mate, Stop it at the gate' on-farm biosecurity campaign promotion at the 2018 Australian Cotton Conference.

- Seven short videos highlighting how growers, researchers and agronomists are implementing on-farm biosecurity practices. These videos have collectively been viewed over 1,000 times.

Recommendations for best biosecurity practice, including details of cotton HPPs is published annually in the CottonInfo *Cotton Pest Management Guide*, which is delivered to every cotton grower and pest control advisor. A recent survey of growers found that 83 per cent of respondents attributed some assistance in improving insects, weeds, diseases, resistance & biosecurity practices to CottonInfo. This has translated to improved practice with 44 per cent of cotton growers currently have a farm biosecurity plan (identifying hazards and an action plan) with a further 19 per cent currently developing a plan.

Research and development

Enhanced cotton biosecurity R&D capacity

Cotton Australia is the [PIRD Act 1989] representative organisation for the cotton industry to the Cotton Research and Development Corporation (CRDC) and as such, has a strong role in advising industry priorities for the Corporation's R&D budget. Cotton Australia is committed to supporting proposed projects that enhance our industry's biosecurity expertise and response preparedness.

CRDC, along with other plant-based RDCs, have continued their partnership with Plant Health Australia, and the Department of Agriculture in the Plant Biosecurity Research Initiative (PBRI). The aim of this collaboration is to coordinate biosecurity research and increase collaboration. This is demonstrated in high number of collaborative projects above.

Capacity to respond to exotic pests is supported through the inclusion of biosecurity milestones for researchers monitoring and research of endemic pests and diseases. Biosecurity research and diagnostic capacity for cotton have also been leveraged through a number of scientific exchanges. For example, in early 2019 CRDC, through partnership with US CottonInc, supported cotton pathologist, Linda Smith (QDAF) and virologist, Murray Sharman to travel to the US to participate in meetings following the confirmation of an incursion of Cotton leaf roll dwarf virus (also HPP for Australia). CRDC will also be providing support for a student from US to conduct disease research in Australia.

Recent enhancement of biosecurity capacity, capability and preparedness have been delivered by a variety of research projects which notably includes:

- CRDC is a participant in a collaborative project, *Digital technologies for dynamic management of disease, stress and yield* led by Wine Australia, with funding from the Australian Government, Department of Agriculture and Water Resources as part of its Rural R&D for Profit programme. The project includes developing a molecular tool for quantifying Australian strains of *Verticillium dahliae* in soil and developing improved disease management recommendations from improved analysis of historical and current disease surveys. These surveys also provide proof of absence for HPP exotic diseases.

- CRDC is a participant in a collaborative project *Improving Plant Pest Management Through Cross Industry Deployment of Smart Sensor, Diagnostic and Forecasting* led by Horticulture Innovation Australia, with funding from the Australian Government, Department of Agriculture and Water Resources as part of its Rural R&D for Profit programme. This project should deliver an advanced plant pest surveillance network which will monitor and report on endemic and exotic threats to major primary production industries, including grains, cotton, horticulture, wine and forestry.

- Through the CRDC funded project with QDAF, '*Surveillance and studies for endemic and exotic virus diseases of cotton*' the industry has forged stronger connectivity between the cotton industry and surveillance activities in northern Australia by Northern Australian Quarantine Strategy (NAQS, Department of Agriculture, Fisheries and Forestry). This has led to greater understanding about the diversity of cotton leaf roll virus particularly in near neighbour regions such as Timor Leste and the risk

to Australian cotton in terms of resistance breaking strains. This project is also responsible for viral surveys for major cotton growing regions.

- A University of Queensland PhD, *Biology of Amarathus hybridus, A. mitchelli, and A. powelii: emerging weeds of cotton systems*, seeks to understand endemic Amaranthus in cotton regions, in preparation for an incursion of Palmer amaranth, a biosecurity threat because of its resistance to multiple herbicide mode of action groups and significant impact on cotton farming systems in the US.

- CRDC has partnered with Horticulture Innovation Australia on a University of Queensland lead project *Novel topical vegetable and cotton virus protection with BioClay*. This project aims to minimise the economic impact of pest infestation on vegetables and on cotton through the development of an innovative topical protection medium, BioClay. The high-tech BioClay spray uses nanotechnology to deliver double-stranded RNA, which is anticipated to prime the plant's own defences, similar to the way a vaccine works, and helping the plant to naturally attack specific crop pests and pathogens. A key target in this project is to investigate how this type of technology could support the cotton industry to minimise the impact of exotic viruses, particularly cotton leaf curl virus. Cotton leaf curl virus is a major threat, as Australian varieties are highly susceptible and the whitefly vector is already widespread.

- The potential emerging cotton industry in Northern Australia is supported through the CRDC supported project *Science leadership for cotton development in Northern Australia*, lead by CSIRO. This project coordinate activities, including extension of past research while providing technical support to new and recent commercial cotton investments in tropical Australia. Through QDAF collaboration the project is also providing assessment and support for crop protection risks unique to Northern systems such as the Cotton leafworm (*Spodoptera litura*)and conducting advice and monitoring to reduce the risk of Northern pests such as pink boll worm establishing in Eastern cotton regions.

Pest surveillance

Numerous pest surveys and crop monitoring activities are undertaken each season by cotton industry and State government researchers. Formal alignment of monitoring protocols for high priority exotic pests by all researchers now enables the collection widespread surveillance data throughout NSW and Queensland annually during routine benchmarking of endemic diseases (NSW DPI and DAF early and late season disease surveys). Viral surveys of major commercial areas and Northern Australia are conducted annually as part of the project '*Surveillance and studies for endemic and exotic virus diseases of cotton*'.

Most cotton growers employ consulting agronomists who generally conduct twice weekly crop inspections for pests. In a survey of these consultants, 40 respondents reported spending significant time (1558 hours) on biosecurity, including cleaning down of vehicles and equipment, investigating/ reporting unusual pest/ plant symptoms and completing training/ farm inductions. The Crop Consultants Association regularly includes biosecurity issues in their annual meetings. In addition to agronomist monitoring, CRDC funded the resistance monitoring programs for Silverleaf whitefly SLW (*Bemisia tabaci*) with Qld DAF, Cotton bollworm (*Helicoverpa armigera)*, aphid and mites (with NSW DPI) provide dual purpose of informing industry of any developing resistance issues, as well as monitoring for unusual resistance profiles and exotic pests.

APPENDIX 2: THREAT SUMMARY TABLES

The information provided in the Threat Summary Table (TST) is an overview of exotic plant pest threats to the cotton industry. More than 170 exotic plant pests and pathogens were identified for the cotton industry (Table 14; Table 15). Summarised information on entry, establishment and spread potentials and economic consequences of establishment are provided where available. Pests under official control[153] or eradication may be included in these tables where appropriate. However, cotton pests that are established but regionalised within Australia are not covered by TSTs but may be assessed in state/territory biosecurity plans. Assessments may change given more detailed research and will be reviewed along with the biosecurity plan.

Full descriptions of the risk rating terms can be found on page 45.

Invertebrates

Table 14. Cotton Threat Summary Table: Invertebrates.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution[154]	Entry potential	Est.[155] potential	Spread potential	Economic impact	Overall risk
Acari (mites)										
Acalitus gossypii	Cotton blister mite	Cotton.	Leaves, stem.	Infested plant material and clothing.	India, Pakistan, Caribbean[156], United States of America (Florida), Brazil, Colombia, Peru, Venezuela.	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**

[153] 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.
[154] CABI (2023).
[155] Establishment potential.
[156] Antigua and Barbuda, Barbados, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, U.S. Virgin Islands.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Amphitetranychus viennensis	Hawthorn spider mite	Wide host range [157] including *Gossypium* spp. (cotton).	Leaves (stippling). Continued feeding leads to general browning or scorching of the leaves and premature leaf fall. At high population levels, shoot terminals can be covered with webbing.	Wind dispersal for localised spread. Movement on infested plant materials, machinery and/or hitchhiking could facilitate long distance dispersal.	Asia, Europe, United Kingdom. [158]	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**
Brevipalpus alii	False spider mite	Cotton.	Leaves.	Infected plant material.	Pakistan.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Raoiella indica	Red palm mite	Wide host range [159] including cotton.	Leaves.	Infested plant material and machinery.	Africa, Asia, Caribbean, United States of	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**

[157] *Acer campestre* (field maple), *Acer pseudoplatanus* (sycamore), *Amelanchier canadensis* (thicket serviceberry), *Arachis hypogaea* (peanut), *Chaenomeles* spp. (flowering quinces), *Corylus avellana* (hazel), *Crataegus azarolus, Crataegus monogyna* (hawthorn), *Cydonia oblonga* (quince), *Deutzia* spp., *Ficus carica* (common fig), *Fragaria* spp. (strawberry), *Gossypium* spp. (cotton), *Malus* spp. (ornamental species apple), *Malus domestica* (apple), *Malus sylvestris* (crab-apple tree), *Malus toringo* (toringo crab-apple), *Mespilus* spp. (medlar), *Papaver somniferum* (opium poppy), *Plumeria* spp. (frangipani), *Prunus* spp. (stone fruit), *Prunus avium* (sweet cherry), *Prunus campanulata* (Taiwan cherry), *Prunus cerasifera* (myrobalan plum), *Prunus cerasus* (sour cherry), *Prunus divaricata, Prunus domestica* (plum), *Prunus dulcis* (almond), *Prunus mume* (Japanese apricot tree), *Prunus persica* (peach), *Prunus pseudocerasus* (Chinese fruiting cherry), *Prunus salicina* (Japanese plum), *Prunus serotina* (black cherry), *Prunus spinosa* (blackthorn), *Prunus yedoensis, Pyrus* spp. (pears), *Pyrus communis* (European pear), *Pyrus pyrifolia* (Oriental pear tree), *Quercus mongolica* (Mongolian oak), *Quercus mongolica subsp. mongolica, Ribes rubrum* (red currant), *Rosa* spp. (roses), *Rubus hirtus, Rubus idaeus* (raspberry), *Solanum americanum, Solanum dulcamara* (bittersweet nightshade), *Sorbus* spp. (rowan), *Sorbus aucuparia* (mountain ash), *Tilia* spp. (limes), *Tilia platyphyllos* (large-leaved lime), *Ulmus minor* (European field elm).

[158] Azerbaijan, China, Georgia, Iran, Japan, North Korea, Pakistan, South Korea, Syria, Taiwan, Turkey, Uzbekistan, Austria, Bulgaria, France, Germany, Hungary, Italy (Sicily), Lithuania, Moldova, Netherlands, Poland, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Ukraine, United Kingdom.

[159] *Acanthophoenix rubra, Acer* spp. (maples), *Acoelorrhaphe wrightii* (Everglades palm), *Adonidia arecina, Adonidia merrillii* (Christmas palm), *Aiphanes* spp., *Aiphanes minima, Alpinia purpurata* (red ginger), *Alpinia vittata, Alpinia zerumbet* (shell ginger), *Archontophoenix alexandrae, Areca* spp., *Areca catechu* (betelnut palm), *Arenga australasica, Arenga engleri, Arenga microcarpa, Arenga pinnata* (sugar palm), *Arenga tremula, Arenga undulatifolia, Bactris* spp., *Bactris plumeriana, Beccariophoenix madagascariensis, Bismarckia nobilis, Brahea armata, Butia capitata* (coquinho-azedo), *Calathea arundinacea* (variegated calatea), *Calathea lutea* (calathea), *Caryota mitis, Caryota urens* (fishtail palm), *Chamaedorea* spp., *Coccothrinax argentata, Coccothrinax miraguama, Cocos* spp., *Cocos nucifera* (coconut), *Corypha umbraculifera, Curcuma longa* (turmeric), *Cycas* spp., *Cyrtostachys renda, Dictyosperma album, Dypsis decaryi* (triangle palm), *Dypsis lutescens* (yellow butterfly palm), *Elaeis guineensis* (African oil palm), *Elaeodendron transvaalense, Etlingera elatior* (torch ginger), *Eucalyptus deglupta* (kamarere), *Eugenia uniflora* (Surinam cherry), *Gaussia princeps, Heliconia* spp., *Heliconia bihai* (macaw flower), *Heliconia caribaea, Heliconia caribaea x bihai, Heliconia chartacea, Heliconia episcopalis, Heliconia latispatha, Heliconia marginata, Heliconia psittacorum, Heliconia rostrata, Heterospathe elata var. palauensis, Heterospathe elmeri, Heterospathe intermedia, Heterospathe negrosensis, Hyophorbe indica, Latania lontaroides, Licuala grandis, Licuala spinosa, Livistona australis, Livistona carinensis, Livistona chinensis* (Chinese fan palm), *Livistona fulva, Livistona mariae, Livistona mariae subsp. rigida, Livistona muelleri, Microcycas calocoma, Musa* spp. (banana), *Musa acuminata* (wild banana), *Musa balbisiana, Musa corniculata, Musa ornata* (flowering banana), *Musa troglodytarum, Musa uranoscopos, Musa x paradisiaca* (plantain), *Neoveitchia storckii, Ocimum basilicum* (basil), *Pandanus utilis, Phaseolus* spp. (beans), *Phoenix* spp. (date palm), *Phoenix canariensis* (Canary Island date palm), *Phoenix dactylifera* (date-palm), *Phoenix reclinata* (senegal date palm), *Phoenix roebelenii, Phoenix rupicola, Pritchardia pacifica, Pritchardia vuylstekeana, Pseudophoenix vinifera, Ptychosperma elegans* (solitaire palm), *Ptychosperma macarthurii* (Macarthur palm), *Ravenala madagascariensis, Renealmia alpinia, Renealmia aurantifera, Rhapis excelsa, Roystonea* spp., *Roystonea borinquena, Roystonea oleracea* (Caribbean royal palm), *Roystonea regia* (Cuban royal palm), *Sabal blackburniana, Sabal mauritiiformis, Saribus rotundifolius, Schippia concolor.*

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
					America (Florida), South America. [160]					
Tetranychus canadensis	Canadian spider mite; Four spotted spider mite	Wide host range including cotton, red clover, common bean, barley, rye, maize, wheat.	Leaves (stippling, bronzing, leaf distortion, premature leaf fall), whole plant (poor growth).	Dispersal occurs via crawling, wind and assisted dispersal (i.e. humans, machinery, equipment). The movement of plant materials (including plants, propagation material, fresh fruits, cut flowers, or bulbs), equipment or machinery are important long-distance pathways.	Canada, United States of America, Hungary, Poland, Serbia.	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**
Tetranychus desertorum	Desert spider mite	Wide host range including cassava (*Manihot esculenta*), cotton (*Gossypium* spp.), common bean (*Phaseolus vulgaris*), cowpea (*Vigna unguiculata*) Parthenium weed (*Parthenium hysterophorus*).	Leaves.	Potential for local movement via crawling or wind-assisted dispersal. Infested plant materials, soil and machinery are the most likely pathways for long distance dispersal.	China, Japan, Greece, Mexico, United States of America (including Hawaii), Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Guadeloupe, Haiti, Martinique, Nicaragua, Paraguay, Peru, Puerto Rico, Venezuela. [161]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Tetranychus truncatus	Cassava spider mite	Wide host range [162] including *Gossypium* spp. (cotton).	Speckling of leaves, leading to large areas	Potential for local movement via crawling or wind-assisted dispersal.	Bangladesh, China, Guam, India, Indonesia, Iran, Japan, Malaysia,	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**

[160] Benin, Egypt, Mauritius, Namibia, Réunion, South Africa, Sudan, Tanzania, Tunisia, India, Indonesia, 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 (Florida), Brazil, Colombia, Ecuador, Guyana, Paraguay, Venezuela.

[161] Beard (2018); Migeon and Dorkeld (2023).

[162] *Abelmoschus esculentus* (okra), *Achyranthes aspera* (devil's horsewhip), *Amaranthus* spp. (amaranth), *Amaranthus tricolour* (edible amaranth), *Amaranthus viridis* (slender amaranth), *Arachis hypogaea* (peanut), *Benincasa hispida* (wax gourd), *Boehmeria nivea* (ramie), *Brassica oleracea var. capitata* (cabbage), *Brassica rapa subsp. chinensis* (Chinese cabbage), *Capsicum annuum* (bell pepper), *Carica papaya* (pawpaw), *Cassia fruticosa, Cayratia japonica* (Sorrel vine), *Ceiba pentandra* (kapok), *Celosia argentea* (celosia), *Citrullus lanatus* (watermelon), *Codiaeum variegatum* (garden croton), *Cucumis* spp. (melons, cucumbers, gerkins), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita moschata* (pumpkin), *Daucus carota* (carrot), *Elaeis guineensis* (African oil palm), *Ficus carica* (common fig), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Gossypium herbaceum* (Levant cotton), *Gossypium hirsutum* (upland cotton), *Helianthus* spp. (sunflower), *Helianthus annuus* (sunflower), *Impatiens balsamina* (garden balsam), *Ipomoea aquatica* (swamp morning-glory), *Ipomoea batatas* (sweetpotato), *Ipomoea nil* (white edge morning-glory), *Ipomoea triloba* (three-lobe morning glory), *Livistona chinensis* (Chinese fan

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
			of yellowing and bronzing of foliage.	Infested plant materials, soil and machinery are the most likely pathways for long distance dispersal.	Myanmar, Philippines, South Korea, Taiwan, Thailand, Vietnam. [163]					
Tetranychus turkestani	Strawberry spider mite	Wide host range [164] including *Gossypium* spp. (cotton).	Leaves (yellowish-white spots become reddish brown patches over time and chlorophyll content is reduced. Damaged leaves begin to roll.); whole plant (reduced cotton yield and quality). [165]	Potential for local movement via crawling or wind-assisted dispersal. Infested plant materials, soil and machinery are the most likely pathways for long distance dispersal.	Africa, Asia, Europe, Central America, North America, and New Zealand. [166]	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**
Tetranychus yusti	Red spider mite	Wide host range [167] including *Gossypium* sp. (cotton).	Above ground plant parts.	Potential for local movement via crawling or wind-assisted dispersal.	Nigeria, Cape Verde Islands, Greece, Mexico, United States of	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**

palm), *Manihot* spp., *Manihot esculenta* (cassava), *Melia* spp., *Melia azedarach* (Chinaberry), *Mentha* spp. (mints), *Momordica charantia* (bitter gourd), *Morus* (mulberry tree), *Morus alba* (white mulberry), *Phaseolus* spp. (beans), *Phaseolus vulgaris* (common bean), *Portulaca oleracea* (purslane), *Prunus* spp. (stone fruit), *Ricinus communis* (castor bean), *Rosa* spp. (roses), *Ruellia* spp., *Setaria italica* (foxtail millet), *Solanum americanum, Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum torvum* (turkey berry), *Spathiphyllum cannifolium, Styphnolobium japonicum* (pagoda tree), *Trichosanthes* spp., *Trichosanthes cucumerina* (snake gourd), *Vigna* spp. (cowpea), *Vigna radiata* (mung bean), *Vigna unguiculata* (cowpea), *Vigna unguiculata subsp. sesquipedalis* (asparagus bean), *Zea mays* (maize), *Ziziphus jujuba* (common jujube), *Ziziphus mauritiana* (jujube).

[163] Migeon and Dorkeld (2023).

[164] *Acer pseudoplatanus* (sycamore), *Achillea millefolium* (yarrow), *Althaea officinalis* (Marsh-mallow), *Amaranthus retroflexus* (redroot pigweed), *Ambrosia artemisiifolia* (common ragweed), *Apium graveolens* (celery), *Arctium lappa* (burdock), *Atriplex patula* (common orache), *Betula pubescens* (Downy birch), *Brassica oleracea* (cabbages, cauliflowers), *Calystegia sepium* (great bindweed), *Capsicum* spp. (peppers), *Chamomilla recutita* (common chamomile), *Cirsium arvense* (creeping thistle), *Citrullus lanatus* (watermelon), *Citrus* spp., *Clematis vitalba* (old man's beard), *Convolvulus arvensis* (bindweed), *Coriandrum sativum* (coriander), *Corylus avellana* (hazel), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita pepo* (marrow), *Cynodon dactylon* (Bermuda grass), *Daucus carota* (carrot), *Euphorbia helioscopia* (sun spurge), *Euphorbia pulcherrima* (poinsettia), *Fragaria vesca* (wild strawberry), *Fraxinus ornus* (flowering ash), *Gladiolus hybrids* (sword lily), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Hordeum murinum* (mouse barley), *Lamium purpureum* (purple deadnettel), *Lepidium draba* (hoary cress), *Malus domestica* (apple), *Malus sylvestris* (crab-apple tree), *Malva alcea, Malva sylvestris* (common mallow), *Medicago lupulina* (black medic), *Nerium oleander* (oleander), *Pastinaca sativa* (parsnip), *Phaseolus vulgaris* (common bean), *Pisum sativum* (pea), *Potentilla argentea, Prunus avium* (sweet cherry), *Prunus cerasifera* (myrobalan plum), *Prunus dulcis* (almond), *Prunus persica* (peach), *Pyrus communis* (European pear), *Ranunculus aconitifolius, Rosa* spp. (roses), *Rubus fruticosus* (blackberry), *Rubus hirtus, Rubus idaeus* (raspberry), *Rubus parviflorus* (thimbleberry), *Salvia nemorosa, Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Tilia tomentosa* (silver lime), *Ulmus glabra* (mountain elm), *Ulmus minor* (European field elm), *Vicia faba* (faba bean), *Zea mays* (maize).

[165] Li et al. (2014).

[166] South Africa, China, India, Japan, Pakistan, Azerbaijan, Bulgaria, Croatia, France, Germany, Greece, Hungary, Iran, Iraq, Israel, Kazakhstan, Kuwait, Morocco, Netherlands, Poland, Portugal, Russia, Serbia, Kosovo, Montenegro, Spain (including Canary Is.), Switzerland, Syria, Tajikistan, Tunisia, Turkey, Ukraine, Uzbekistan, Yugoslavia (former), Costa Rica, Guadeloupe, Mexico, United States of America, New Zealand (CABI, 2022; Migeon and Dorkeld, 2023).

[167] *Abelmoschus esculentus, Amaranthus gangeticus, Arachis hypogaea, Baltimora recta, Buettneria aculeata, Cajanus cajan, Caladium hortulanum, Calendula officinalis, Camellia* sp., *Cassia* sp., *Centrosema*

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				Infested plant materials, soil and machinery are the most likely pathways for long distance dispersal.	America, Brazil, Colombia, Ecuador, El Salvador, Guadeloupe, Honduras, Martinique, Venezuela, Thailand, Cook Islands, French Polynesia.					
Coleoptera (beetles and weevils)										
Adoretus sinicus	Chinese rose beetle	Wide host range [168] including *Gossypium* spp. (cotton).	Above ground plant parts (adults), roots (larvae).	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most likely pathways for long distance dispersal.	China, Hong Kong, India, Indonesia, Macau, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, Vietnam, United States of America (Hawaii), American Samoa, Federated States of Micronesia, Guam, Northern Mariana Islands, Palau.	LOW	MEDIUM	MEDIUM	UNKNOWN	**UNKNOWN**
Alcidodes dentipes	Striped sweet	*Arachis hypogaea*	Stems (external and	Crawling and flying allows	Africa. [169]	LOW	MEDIUM	MEDIUM	UNKNOWN	**UNKNOWN**

pubescens, Clitoria ternatea, Colocasia sp.*, Cucumis* sp.*, Cynodon dactylon, Echinochola colonum, Eleusine indica, Fragaria* sp.*, Glycine max, Gossypium* sp.*, Helianthus annuus, Hordeum vulgare, Ipomoea batatas, Macroptilium atropurpureum, Manihot esculenta, Melilotus alba, Lathyrus odoratus, Lolium temulentum, Lonicera* sp.*, Medeola carolinensis, Musa cavendishii, Musa* sp.*, Panicum miliaceum, Passiflora* sp.*, Phaseolus* sp.*, Phaseolus vulgaris, Pisum sativum, Plumeria* sp.*, Pueraria phaseoloides, Richardia scabra, Rosa* sp.*, Sida rhombifolia, Sonchus oleraceus, Solanum* sp.*, Syngonium* sp.*, Tagetes* sp.*, Trifolium repens, Triticum sativum, Vigna unguiculata, Xanthosoma sagittifolium, Zea mays* (Seeman & Beard, 2005).

[168] *Abelmoschus esculentus* (okra)*, Abutilon menziesii, Acacia* spp. (wattles)*, Acalypha* spp. (Copperleaf)*, Acalypha wilkesiana, Alocasia* spp.*, Arachis hypogaea* (peanut)*, Artocarpus heterophyllus* (jackfruit)*, Asparagus officinalis* (asparagus)*, Bauhinia* spp. (camel's foot)*, Berrya cordifolia, Brassica oleracea* (cabbages, cauliflowers)*, Brassica rapa subsp. chinensis* (Chinese cabbage)*, Cajanus cajan* (pigeon pea)*, Camellia sinensis* (tea)*, Canna* spp.*, Carya* spp. (hickories)*, Castanea crenata* (Japanese chestnut)*, Coccoloba uvifera* (sea grape)*, Colocasia esculenta* (taro)*, Colubrina oppositifolia, Combretum* spp.*, Combretum indicum* (Rangoon creeper)*, Commelina communis* (common dayflower)*, Cucumis sativus* (cucumber)*, Dimocarpus longan* (longan tree)*, Diospyros kaki* (persimmon)*, Fragaria* spp. (strawberry)*, Glycine max* (soybean)*, Gossypium* spp. (cotton)*, Hedychium* spp.*, Heliconia* spp.*, Hibiscadelphus distans, Hibiscus* spp. (rosemallows)*, Hibiscus tiliaceus* (coast cottonwood)*, Ipomoea batatas* (sweetpotato)*, Juglans regia* (walnut)*, Ligustrum sinense* (Chinese privet)*, Liquidambar taiwaniana, Macaranga grandifolia, Malus toringo* (toringo crab-apple)*, Melaleuca leucadendra* (long-leaved paperbark)*, Morus alba* (white mulberry)*, Musa x paradisiaca* (plantain)*, Paederia foetida* (skunkvine)*, Perilla frutescens, Phaseolus vulgaris* (common bean)*, Plumbago auriculata* (cape leadwort)*, Quercus aliena* (oriental white oak)*, Quercus mongolica* (Mongolian oak)*, Ricinus communis* (castor bean)*, Robinia pseudoacacia* (black locust)*, Rosa* spp. (roses)*, Rubus* spp. (blackberry, raspberry)*, Saccharum officinarum* (sugarcane)*, Salacca zalacca, Sapium sebiferum* (Chinese tallow tree)*, Solanum melongena* (aubergine)*, Syzygium samarangense* (water apple)*, Terminalia* spp.*, Theobroma cacao* (cocoa)*, Vitis* spp. (grape)*, Vitis vinifera* (grapevine)*, Ximenia* spp.*, Zea mays* (maize)*, Zingiber officinale* (ginger).

[169] Benin, Cameroon, Central African Republic, Congo (DRC), Côte d'Ivoire, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mozambique, Nigeria, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
	potato weevil	(peanut), *Gossypium* spp. (cotton), *Ipomoea batatas* (sweetpotato), *Phaseolus vulgaris* (common bean).	internal feeding), whole plant (wilting, dieback).	for local dispersal. Introduction of infested plant materials, soil, packing materials or hitchhiking are the most likely pathways for long distance dispersal.						
Amorphoidea lata	Cotton flower weevil	*Gossypium* spp. (cotton).	Flowers, anthers, petals.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Indonesia, Philippines.	MEDIUM	MEDIUM	MEDIUM	MEDIUM [170]	**LOW**
Anthonomus grandis	Boll weevil	Wide host range [171] including *Gossypium* spp. (cotton) such as *Gossypium barbadense* (Gallini cotton), and *Gossypium hirsutum* (upland cotton).	Floral bud, boll.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Widespread in North America, Central America and South America. [172]	MEDIUM	HIGH [173]	HIGH	HIGH [174]	**HIGH**
Anthonomus vestitus	Peruvian boll weevil	*Abutilon* spp. (Indian mallow), *Alcea rosea* (hollyhock), *Althaea* spp., *Gossypium* spp. (cotton), *Hibiscus* spp. (rosemallows), *Hibiscus rosa-sinensis* (China-	Floral bud, boll.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Ecuador, Peru.	LOW	MEDIUM	MEDIUM	MEDIUM	**LOW**

[170] Described by Rustico and Jose (1993) as being a significant pest to cotton in the Philippines.

[171] *Abutilon* spp. (Indian mallow), *Cienfuegosia* spp., *Eragrostis curvula* (weeping lovegrass), *Gossypium* spp. (cotton), *Gossypium barbadense* (Gallini cotton), *Gossypium hirsutum* (upland cotton), *Hampea nutricia, Hibiscus* spp. (rosemallows), *Hibiscus syriacus* (shrubby Althaea), *Opuntia lindheimeri* (Lindheimer prickly pear), *Poaceae* (grasses), *Prosopis glandulosa* (honey mesquite), *Thespesia populnea* (portia tree).

[172] Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Martinique, Mexico, Nicaragua, Saint Kitts and Nevis, United States of America (Arkansas, Kansas, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Tennessee, Texas), Argentina, Brazil, Colombia, Paraguay, Venezuela.

[173] Based on this species distribution in the United States of America, Australian cotton growing areas would be suitable for the establishment of Anthonomus grandis. Cotton volunteers present in Australian growing regions could facilitate establishment and have been a problem in the United States of America. Native Malvaceae may act as hosts which has been observed overseas.

[174] *Anthonomus grandis* would have large impact on the industry through direct and significant yield loss (EFSA, 2017), and additional chemical control costs.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		rose), *Thespesia* spp.								
Apion soleatum	Cotton stem weevil	*Gossypium* spp. (cotton).	Stems.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Malawi, Mozambique, South Africa, Tanzania.	LOW	MEDIUM	MEDIUM	MEDIUM [175]	**LOW**
Conoderus falli	Southern potato wireworm	*Arachis hypogaea* (peanut), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Ipomoea batatas* (sweetpotato), *Nicotiana tabacum* (tobacco), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Vigna unguiculata* (cowpea), *Zea mays* (maize).	Germinating seed, roots, tubers, underground stems of seedlings.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or soil and hitchhiking are the most likely pathways for long distance dispersal.	Asia (Georgia), United States of America (California, Florida, Georgia, South Carolina).	LOW	MEDIUM	MEDIUM	UNKNOWN	**UNKNOWN**
Conoderus rudis	-	*Arachis hypogaea* (peanut), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Ipomoea batatas* (sweetpotato), *Nicotiana tabacum* (tobacco), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Vigna unguiculata* (cowpea), *Zea mays* (maize).	Germinating seed, roots, tubers, underground stems of seedlings.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most likely pathways for long distance dispersal.	Asia (Georgia), United States of America (Florida, Georgia).	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Cyrtozemia dispar	-	*Arachis hypogaea* (peanut), *Cyamopsis tetragonoloba* (guar),	Leaves.	Crawling and flying allows for local dispersal. Introduction of infested	India.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[175] A potentially serious pest of cotton in South Africa (Bennett & Nel, 1990).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		Glycine max (soybean), *Gossypium* spp. (cotton), *Pisum sativum* (pea), *Sesamum indicum* (sesame), *Vigna radiata* (mung bean), *Withania somnifera* (poisonous gooseberry).		plant materials, soil, packing material or hitchhiking are the most likely pathways for long distance dispersal.						
Diabrotica speciosa	Cucurbit beetle	Wide host range [176] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Leaves, stems, inflorescences, fruit, roots.	Crawling and flying (wind assisted) allows for local dispersal. Introduction of infested plant materials (i.e. plants, pods or seed), soil or hitchhiking are the most likely pathways for long distance dispersal.	Costa Rica, Panama, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru, Uruguay, Venezuela.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Euetheola humilis (syn. *Euetheola rugiceps*) [177]	Sugarcane beetle	*Gossypium* spp. (cotton), *Ipomoea batatas* (sweetpotato), *Oryza sativa* (rice), *Saccharum officinarum*	Roots, stems.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most	United States of America (southeast), Mexico, Panama, Venezuela, Brazil.	VERY LOW	MEDIUM	MEDIUM	UNKNOWN	**UNKNOWN**

[176] *Abelmoschus esculentus* (okra), *Allium ampeloprasum* (wild leek), *Allium cepa* (onion), *Allium fistulosum* (Welsh onion), *Allium sativum* (garlic), *Alternanthera philoxeroides* (alligator weed), *Amaranthus hybridus* (smooth pigweed), *Amaranthus quitensis, Apium graveolens* (celery), *Arachis hypogaea* (peanut), *Artemisia absinthium* (Wormwood), *Artemisia dracunculus* (tarragon), *Asparagus officinalis* (asparagus), *Asparagus setaceus* (asparagus fern), *Avena* spp. (oats), *Avena barbata* (slender oat), *Avena sativa* (oats), *Baccharis articulata, Beta vulgaris* (beetroot), *Brassica* spp., *Brassica napus, Brassica oleracea* (cabbages, cauliflowers), *Brassica rapa subsp. chinensis* (Chinese cabbage), *Bromus catharticus* (prairiegrass), *Brugmansia suaveolens* (white angel's trumpet), *Camellia sinensis* (tea), *Capsicum annuum* (bell pepper), *Capsicum frutescens* (chilli), *Capsicum* spp., *Carica papaya* (pawpaw), *Cayaponia* spp., *Cayaponia bonariensis, Cayaponia citrullifolia, Cayaponia podantha, Chamomilla recutita* (common chamomile), *Chenopodium album* (fat hen), *Chenopodium quinoa* (quinoa), *Chrysanthemum* spp. (daisy), *Cichorium endivia* (endives), *Cichorium intybus* (chicory), *Citrullus lanatus* (watermelon), *Citrus* spp., *Coriandrum sativum* (coriander), *Cucumis* spp. (melons, cucuimbers, gerkins), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita andreana, Cucurbita maxima* (giant pumpkin), *Cucurbita moschata* (pumpkin), *Cucurbita pepo* (marrow), *Cucurbitella asperata, Cynara cardunculus* (cardoon), *Cynara cardunculus var. scolymus* (globe artichoke), *Cynodon dactylon* (Bermuda grass), *Cyphomandra betacea* (tree tomato), *Dahlia pinnata* (garden dahlia), *Datura ferox* (fierce thornapple), *Daucus carota* (carrot), *Fragaria vesca* (wild strawberry), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Helianthus tuberosus* (Jerusalem artichoke), *Hibiscus rosa-sinensis* (China-rose), *Ilex paraguariensis* (mate), *Ipomoea batatas* (sweetpotato), *Ipomoea cairica* (five-fingered morning glory), *Ipomoea purpurea* (tall morning glory), *Lactuca sativa* (lettuce), *Lagenaria siceraria* (bottle gourd), *Lavandula angustifolia* (lavender), *Lepidium didymum* (lesser swine-cress), *Lilium maculatum, Linum usitatissimum* (flax), *Lolium perenne* (perennial ryegrass), *Luffa aegyptiaca* (loofah), *Malva* spp. (mallow), *Medicago sativa* (lucerne), *Melilotus albus* (honey clover), *Mentha arvensis* (corn mint), *Mentha suaveolens, Morrenia odorata, Musa* spp. (banana), *Nasturtium officinale* (watercress), *Nicotiana tabacum* (tobacco), *Ocimum basilicum* (basil), *Origanum vulgare* (oregano), *Oryza sativa* (rice), *Passiflora caerulea* (blue passionflower), *Petroselinum crispum* (parsley), *Phaseolus* spp. (beans), *Phaseolus coccineus* (runner bean), *Phaseolus lunatus* (lima bean), *Phaseolus vulgaris* (common bean), *Physalis viscosa* (sticky physalis), *Pimpinella anisum* (aniseed), *Pisum sativum* (pea), *Prunus domestica* (plum), *Prunus persica* (peach), *Raphanus sativus* (radish), *Rosa* spp. (roses), *Sechium edule* (chayote), *Sicyos polyacanthos, Solanum bonariense, Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum sisymbriifolium* (sticky nightshade).

[177] Billeisen and Brandenburg (2014).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		(sugarcane), *Zea mays* (maize), turfgrasses.		likely pathways for long distance dispersal.						
Hypomeces squamosus	Gold dust weevil; Green weevil	Wide host range [178] including *Gossypium* spp. (cotton).	Above ground (adult), below ground (larvae).	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Brunei, Cambodia, China, Hong Kong, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Taiwan, Thailand, Vietnam.	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**
Lepropus lateralis	-	*Cajanus cajan* (pigeon pea), *Gossypium* spp. (cotton), *Mangifera indica* (mango).	Leaves.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil, packing material or hitchhiking are the most likely pathways for long distance dispersal.	Bangladesh, India.	VERY LOW	LOW	MEDIUM	UNKNOWN	**UNKNOWN**
Litostylus strangulatus	-	*Cajanus cajan* (pigeon pea), *Capsicum annuum* (bell pepper), *Gossypium* spp. (cotton), *Psidium guajava* (guava).	Leaves.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil, packing material or hitchhiking are the most likely pathways for long distance dispersal.	Dominica, Montserrat, Saint Vincent & the Grenadines.	VERY LOW	LOW	LOW	UNKNOWN	**UNKNOWN**
Menoetius curvipes	-	*Beta vulgaris* var. *saccharifera* (sugarbeet), *Cajanus*	Leaves.	Crawling and flying allows for local dispersal. Introduction of infested	British Virgin Islands, Puerto Rico, US Virgin Islands.	VERY LOW	MEDIUM	MEDIUM	LOW	**NEGLIGIBLE**

[178] *Acacia auriculiformis* (northern black wattle), *Acacia mangium* (brown salwood), *Artocarpus heterophyllus* (jackfruit), *Azadirachta excelsa, Azadirachta indica* (neem tree), *Bauhinia* spp. (camel's foot), *Bombax ceiba* (silk cotton tree), *Cassia fistula* (Indian laburnum), *Casuarina equisetifolia* (casuarina), *Ceiba pentandra* (kapok), *Citrus* spp., *Corymbia torelliana* (cadaga), *Eucalyptus camaldulensis* (red gum), *Eucalyptus grandis* (saligna gum), *Eugenia* spp., *Falcataria moluccana* (batai wood), *Flindersia brayleana, Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Hevea brasiliensis* (rubber), *Hibiscus* spp. (rosemallows), *Ipomoea batatas* (sweetpotato), *Ipomoea purpurea* (tall morning glory), *Lagerstroemia speciosa* (pride of India), *Mangifera indica* (mango), *Manilkara zapota* (sapodilla), *Morus alba* (white mulberry), *Neolamarckia cadamba* (common bur-flower tree), *Neolamarckia cadamba* (common bur-flower tree), *Nephelium lappaceum* (rambutan), *Nicotiana tabacum* (tobacco), *Oryza sativa* (rice), *Palaquium gutta* (gutta percha tree), *Persea americana* (avocado), *Persea bombycina, Pterocarpus indicus* (red sandalwood), *Saccharum officinarum* (sugarcane), *Tectona grandis* (teak), *Theobroma cacao* (cocoa), *Vernicia montana* (Chinese wood oil tree), *Vigna unguiculata* (cowpea), *Zea mays* (maize).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		cajan (pigeon pea), *Citrus* spp., *Gossypium* spp. (cotton), *Phaseolus* spp. (beans), *Ricinus communis* (castor bean).		plant materials, stored products and packing materials are the most likely pathways for long distance dispersal.						
Mesoplatys ochroptera	Sesbania beetle; Leaf beetle	*Aeschynomene* spp. (jointvetch), *Cajanus cajan* (pigeon pea), *Erythrina abyssinica* (red hot poker tree), *Gossypium hirsutum* (upland cotton), *Leucaena leucocephala* (leucaena), *Senna siamea* (yellow cassia), *Sesbania formosa*, *Sesbania macrantha*, *Sesbania sesban* (sesban).	Leaves.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most likely pathways for long distance dispersal.	Africa.	VERY LOW	LOW	LOW	UNKNOWN	**UNKNOWN**
Mylabris pustulata	Blister beetle; Arhap blister beetle; Banded blister beetle	*Abelmoschus moschatus* (musk mallow), *Cajanus cajan* (pigeon pea), *Gossypium* spp. (cotton), *Pennisetum glaucum* (pearl millet), *Sesamum indicum* (sesame), *Vigna mungo* (black gram), *Zea mays* (maize).	Flowers.	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most likely pathways for long distance dispersal.	Bangladesh, India, Indonesia, Pakistan, Sri Lanka.	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**
Myllocerus discolor	Grey weevil	Wide host range [179] including *Gossypium* spp. (cotton).	Above ground (adult), below ground (larvae).	Crawling and flying allows for local dispersal. Introduction of infested plant materials or hitchhiking are the most	Bangladesh, India.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[179] *Anacardium occidentale* (cashew nut), *Capsicum annuum* (bell pepper), *Citrus* spp., *Citrus sinensis* (sweet orange), *Corchorus capsularis* (white jute), *Corchorus olitorius* (jute), *Gossypium* spp. (cotton), *Litchi chinensis* (lichi), *Mangifera indica* (mango), *Pennisetum glaucum* (pearl millet), *Phyllanthus emblica* (Indian gooseberry).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				likely pathways for long distance dispersal.						
Pachnoda interrupta	Chafer beetle	Wide host range [180] including *Gossypium* spp. (cotton).	Roots, inflorescences (i.e. cotton), seed.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most likely pathways for long distance dispersal.	Burundi, Cameroon, Ethiopia, Mali, Nigeria, Senegal, Somalia, Sudan.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Percolaspis cf. *ornata*	-	Soybean, maize, cotton, cocoa.	Stems of seedlings, foliage. [181]	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most likely pathways for long distance dispersal.	Brazil.	VERY LOW	LOW	LOW	UNKNOWN	**UNKNOWN**
Pharaxonotha kirschii	Mexican grain beetle	Stored products including cotton, maize, wheat.	Stored seed.	Crawling and flying allows for local dispersal. Introduction of infested grain (eggs, larvae or adults) is the most likely pathways for long distance dispersal.	North America, Central America, South America, Europe, Asia (excluding China).	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**
Phyllophaga spp. (exotic species)	White grubs; May beetles (exotic species)	Wide host range including cotton, grains, acacia, etc.	Below ground, seedlings.	Crawling and flying allows for local dispersal. Introduction of infested plant materials, soil or hitchhiking are the most likely pathways for long distance dispersal. These taxa are attracted to lights	South Africa, Sudan, Bangladesh, China, India, Indonesia, Japan, North Korea, Philippines, South Korea, Sri Lanka, North America, Canada, Costa Rica, Cuba, El Salvador,	LOW	HIGH	MEDIUM	LOW [183]	**VERY LOW**

[180] *Abelmoschus esculentus* (okra), *Balanites aegyptiaca* (simple-thorned torchwood), *Cinnamomum burmanni* (padang cassia), *Cucumis sativus* (cucumber), *Gossypium* spp. (cotton), *Helianthus* spp. (sunflower), *Lawsonia inermis* (Egyptian privet), *Mangifera indica* (mango), *Oryza sativa* (rice), *Pennisetum glaucum* (pearl millet), *Psidium guajava* (guava), *Rosa* spp. (roses), *Sorghum bicolor* (sorghum), *Zea mays* (maize).

[181] de Oliveira and Frizzas (2021).

[183] Species-specific information of *Phyllophaga* spp. on cotton is limited.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				and may be attracted to well-lit ports and airports.	Guatemala, Honduras, Mexico, Nicaragua, Panama, United States of America, New Zealand, Ecuador. [182]					
Sinoxylon conigerum	Conifer auger beetle	Wide host range [184] including *Gossypium* spp. (cotton).	Stems, whole plant.	Crawling and flying allows for local dispersal. Infested wood packaging materials, plants (stems, twigs) and hitchhiking are the most likely pathway for long distance introduction.	Kenya, Liberia, Madagascar, Malawi, Mauritius, Réunion, Seychelles, Somalia, Tanzania, Togo, Asia, China, Hong Kong, India, Indonesia, Israel, Japan, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Italy, Spain, Barbados, Belize, Costa Rica, Haiti, United States of America (Florida, Hawaii), American Samoa, Niue, Brazil, Venezuela.	HIGH [185]	MEDIUM	MEDIUM	LOW	**VERY LOW**
Sphenoptera gossypii	Cotton stem borer	*Gossypium* spp. (cotton).	Stems, internal feeding.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products (e.g. fruit), hitchhiking are the most likely pathways for long distance spread.	Sudan, Bangladesh, India, Sri Lanka.	LOW	MEDIUM	MEDIUM	MEDIUM	**LOW**

[182] Some species of this genus already occur in Australia.

[184] *Acacia koaia, Albizia amara, Bambusa* spp. (bamboo), *Bombax ceiba* (silk cotton tree), *Cajanus cajan* (pigeon pea), *Ceratonia siliqua* (carob), *Delonix regia* (flamboyant), *Derris elliptica* (tuba root), *Derris scandens, Erythrina variegata* (Indian coral tree), *Ficus altissima, Gossypium* spp. (cotton), *Grewia tiliifolia, Haldina cordifolia* (heart-leaf adina), *Hevea brasiliensis* (rubber), *Holoptelea integrifolia, Hura crepitans* (sand box), *Lagerstroemia microcarpa, Mangifera indica* (mango), *Manihot esculenta* (cassava), *Myroxylon balsamum* (Peru balsam), *Persea americana* (avocado), *Shorea robusta* (sal), *Tectona grandis* (teak), *Tephrosia candida* (white tephrosia), *Terminalia bellirica* (beleric myrobalan), *Terminalia macrocarpa*.

[185] *Sinoxylon conigerum* has been intercepted at the Australian border.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Trogoderma granarium	Khapra beetle	Wide range of stored products [186] including *Gossypium* spp. (cotton).	Stored seed.	Crawling and movement of stored products or materials allows for local dispersal. Introduction of infested stored products and packing materials are the most likely pathways for long distance dispersal.	Widespread in Africa, Asia, and parts of Europe. [187]	HIGH [188]	MEDIUM	MEDIUM	VERY LOW [189]	**NEGLIGIBLE**
Diptera (flies and midges)										
Acrosticta apicalis	Otidid fly	Peanut, cotton, aubergine, sweetpotato.	Above ground plant parts.	Flying allows for local dispersal. Introduction of infested plant materials (e.g. plants, cut flowers), soil, or hitchhiking are the most likely pathways for long distance dispersal.	Barbados, Saint Kitts and Nevis.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Contarinia gossypii	Cotton bud midge [190]	Cotton.	Floral structures: malformation of flower buds and 'squares', damage to androecium, premature drop of floral structures, secondary infections.	Flying allows for local dispersal. Introduction of infested plant materials (e.g. plants, cut flowers), soil, or hitchhiking are the most likely pathways for long distance dispersal.	Colombia, U.S. Virgin Islands, Antigua, Montserrat, Barbados. [191]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Dasineura gossypii	Cotton flower bud midge [192]	Cotton.	Floral structures: damage to anthers,	Flying allows for local dispersal. Introduction of	India. [191]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[186] *Arachis hypogaea* (peanut), *Cicer arietinum* (chickpea), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Hordeum vulgare* (barley), *Oryza sativa* (rice), *Panicum miliaceum* (millet), *Pennisetum glaucum* (pearl millet), *Phaseolus vulgaris* (common bean), *Sesamum indicum* (sesame), *Sorghum* spp., *Sorghum bicolor* (sorghum), *stored products* (dried stored products), *Triticum* spp. (wheat), *Triticum aestivum* (wheat), *Vicia faba* (faba bean), *Vigna unguiculata* (cowpea), *Zea mays* (maize), *Zingiber officinale* (ginger).

[187] Algeria, Burkina Faso, Egypt, Libya, Madagascar, Mali, Mauritania, Morocco, Niger, Nigeria, Senegal, Somalia, Sudan, Tunisia, Zanzibar Island, Zambia, Zimbabwe, Afghanistan, Bangladesh, India, Iran, Iraq, Israel, Lebanon, Myanmar, Pakistan, Qatar, Saudi Arabia, South Korea, Sri Lanka, Syria, Turkey, Yemen, Albania, Cyprus, Greece, Italy (Sardinia), Norway, Union of Soviet Socialist Republics (former).

[188] *Trogoderma granarium* could enter as a contaminant of grain or other materials from overseas.

[189] Potential impacts would likely only be on cotton seed and not cotton lint.

[190] Jiménez and Ramírez (1984).

[191] Gagné and Jaschhof (2021).

[192] Chakraborty et al. (2015).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
			staminal column and outer wall of style which leads to deformation, floral desiccation, and secondary infection/decay. [193]	infested plant materials (e.g. plants, cut flowers), soil, or hitchhiking are the most likely pathways for long distance dispersal.						
Euxesta eluta	Corn silk flies	*Capsicum* spp. (peppers), *Gossypium* spp. (cotton), *Saccharum officinarum* (sugarcane), *Zea mays* (maize).	Larvae attack the silks and consume the contents of kernels along the ear of maize (damage primarily occurs at the tip).	Flying allows for local dispersal. Introduction of infested plant materials (e.g. plants, produce), soil, or hitchhiking are the most likely pathways for long distance dispersal.	Antigua and Barbuda, Jamaica, Saint Kitts and Nevis, Brazil (Minas Gerais), Chile, Ecuador, Argentina. [194]	LOW	MEDIUM	MEDIUM	LOW [195]	**VERY LOW**
Hemiptera (stink bugs, aphids, mealybugs, scale, whiteflies and hoppers)										
Acyrthosiphon gossypii	Aphid	Cotton. Also affects legumes and plants in the Zygophyllaceae family.	Leaves, bolls.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Greece, Portugal, Spain, Turkey, central Asia [196], Iraq, Yemen, China (Xinjiang), South Korea.	MEDIUM	LOW [197]	LOW	LOW [198]	**NEGLIGIBLE**

[193] Barbar et al. (2016).
[194] Gallardo et al. (2017).
[195] The primary host of economic importance is maize.
[196] Pest of cotton in central Asia (Gao et al., 2013).
[197] Tends to be a cooler season species (Gao et al., 2013) and tends to decline in seasons or areas with higher temperatures.
[198] Current management practices for cotton aphid (*Aphis gossypii*) may manage this species.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Adelphocoris lineolatus	Lucerne bug	Wide host range [199] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Sap sucking [200]: Stems, leaves, fruit, seed.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Widespread in Asia, Europe, and North America. [201]	LOW	HIGH	HIGH	LOW	**VERY LOW**
Adelphocoris suturalis	-	*Gossypium* spp. (cotton). Other plant hosts include fruit trees (e.g. *Vitis vinifera*, *V. labrusca*, *Ziziphus jujuba*), alfalfa, vegetable crops (e.g. *Phaseolus vulgaris*, *Daucus carota*) and weeds. [202]	Sap sucking: Cotton flower buds and developing plant parts, leading to abnormal growth, wilting and/or premature abscission.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	China.	LOW	HIGH	HIGH	MEDIUM[202]	**LOW**
Amrasca biguttula (syn. *Amrasca devastans*, *Amrasca*	Indian cotton jassid; Indian green jassid; Okra	Wide host range [203] including *Gossypium* spp. (cotton).	Above ground plant parts: Feeding can damage leaves (hopper burn) and	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of	Ghana, Afghanistan, Bangladesh, China, India, Indonesia, Iraq, Japan, Laos, Myanmar,	HIGH	HIGH	HIGH	HIGH	**HIGH**

[199] *Actinidia kolomikta* (kolomiktavine), *Amaranthus* spp. (amaranth), *Ambrosia artemisiifolia* (common ragweed), *Artemisia dracunculus* (tarragon), *Asparagus officinalis* (asparagus), *Beta vulgaris* (beetroot), *Brassica napus* (canola), *Conyza canadensis* (Canadian fleabane), *Cucumis sativus* (cucumber), *Eremurus* spp. (foxtail lilies), *Fragaria ananassa* (strawberry), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Lactuca* spp. (lettuce), *Lotus corniculatus* (bird's-foot trefoil), *Lupinus* spp. (lupins), *Malus* spp. (ornamental species apple), *Medicago* spp. (medic), *Medicago sativa* (lucerne), *Melilotus* spp. (melilots), *Morus* (mulberrytree), *Nicotiana tabacum* (tobacco), *Onobrychis viciifolia* (sainfoin), *Oxytropis* spp., *Papaver* spp. (poppies), *Phaseolus vulgaris* (common bean), *Pisum sativum* (pea), *Prunus armeniaca* (apricot), *Prunus persica* (peach), *Pyrus* spp. (pears), *Rubus* spp. (blackberry, raspberry), *Rubus idaeus* (raspberry), *Securigera varia* (crown vetch), *Sesamum indicum* (sesame), *Sesbania grandiflora* (sesbania), *Solanum laciniatum* (kangaroo apple), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Trifolium* spp. (clovers), *Trifolium incarnatum* (Crimson clover), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *Triticum* spp. (wheat), *Vicia sativa* (common vetch).

[200] Vector of some potato viruses.

[201] Azerbaijan, China, Iran, Japan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Uzbekistan, Albania, Andorra, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Moldova, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, United States of America.

[202] Tian et al. (2015).

[203] *Abelmoschus esculentus* (okra), *Amaranthus* spp. (amaranth), *Arachis hypogaea* (peanut), *Beta vulgaris var. saccharifera* (sugarbeet), *Cajanus cajan* (pigeon pea), *Calendula* spp. (marigolds), *Cassia* spp. (sennas), *Chloris gayana* (Rhodes grass), *Corchorus* spp. (jutes), *Crotalaria juncea* (sunn hemp), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Guizotia abyssinica* (niger), *Helianthus annuus* (sunflower), *Hibiscus cannabinus* (kenaf), *Hibiscus sabdariffa* (roselle), *Morus alba* (white mulberry), *Phaseolus vulgaris* (common bean), *Raphanus sativus* (radish), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Sorghum bicolor* (sorghum), *Vigna radiata* (mung bean), *Vigna unguiculata* (cowpea), *Zea mays* (maize).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
biguttula, *Empoasca devastans*)	leafhopper; Cotton leafhopper		cause stunted growth. Feeding can also cause honeydew and secondary pathogens to develop on the lint.	infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Nepal, Pakistan, Philippines, Taiwan, Thailand, Vietnam, Christmas Island, Guam.					
Aphis fabae	Black bean aphid	Very wide host range [204] including *Gossypium* spp. (cotton).	Above ground plant parts. Vector of numerous plant viruses.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Widespread in Africa, Asia, Europe, North America, and South America. [205]	MEDIUM	HIGH [206]	HIGH	VERY LOW [207]	**VERY LOW**

[204] *Allium* spp., *Amaranthus* spp. (amaranth), *Amaranthus retroflexus* (redroot pigweed), *Apium graveolens* (celery), *Arctium lappa* (burdock), *Asparagus officinalis* (asparagus), *Berberis vulgaris* (European barberry), *Beta* spp., *Beta vulgaris* (beetroot), *Brassica* spp., *Cajanus cajan* (pigeon pea), *Capsicum annuum* (bell pepper), *Capsicum* spp., *Carduus* spp., *Chenopodium album* (fat hen), *Chenopodium quinoa* (quinoa), *Cirsium* spp., *Citrus* spp., *Citrus deliciosa* (mediterranean mandarin), *Citrus sinensis* (sweet orange), *Cotoneaster* spp., *Crataegus phaenopyrum* (washington thorn), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita maxima* (giant pumpkin), *Cuscuta lupuliformis, Cynara cardunculus var. scolymus* (globe artichoke), *Euonymus europaeus, Euonymus japonicus* (Japanese spindle tree), *Foeniculum vulgare* (fennel), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Helichrysum* spp., *Hosta* spp., *Lactuca sativa* (lettuce), *Lonicera* spp., *Lupinus luteus* (yellow lupin), *Lupinus* spp., *Momordica* spp., *Oxytropis albiflorus, Papaver somniferum* (opium poppy), *Pastinaca sativa* (parsnip), *Phaseolus coccineus* (runner bean), *Phaseolus vulgaris* (common bean), *Philadelphus coronarius* (mock orange), *Pisum sativum* (pea), *Pulsatilla grandis* (greater pasque flower), *Rheum officinale* (Chinese rhubarb), *Rosa* spp., *Rumex* spp. (dock), *Sambucus* spp., *Sinapis alba* (white mustard), *Solanum* spp. (nightshade), *Solanum lycopersicum* (tomato), *Solanum nigrum* (black nightshade), *Solanum tuberosum* (potato), *Spinacia oleracea* (spinach), *Spiraea, Tanacetum vulgare* (tansy), *Urtica* spp., *Viburnum opulus* (Guelder rose), *Viburnum* spp., *Vicia* spp., *Vicia faba* (faba bean), *Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine), *Zea mays* (maize).

[205] Algeria, Burundi, Cameroon, Congo (ROC), 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, Indonesia, 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, Federal Republic of Yugoslavia (former), Denmark, Finland, France (Corsica), Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Montenegro, Netherlands, Norway, Poland, Portugal (Madeira) 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.

[206] Wide host range and ability to establish in a range of climates overseas suggests there is a high probability of establishment in Australia.

[207] Reported on cotton in the United States of America (Stoetzel et al., 1996) but *Aphis fabae* is only considered a minor pest. Australia has good aphid management in place to manage endemic aphids so its impact on cotton is likely to be minimal.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Aphis gossypii (exotic strains)	Cotton aphid	Very broad host range [208] (e.g. at least 200 economically important crops) including cotton.	Sap sucking [209]: Leaves, inflorescence, stems, honeydew on lint.	Crawling and flying (wind assisted) allows for local or regional dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Worldwide. [210]	MEDIUM	HIGH	HIGH	MEDIUM [211]	**MEDIUM**
Apolygus lucorum (syn. *Lygus lucorum*)	Small green plant bug	Wide host range [212] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Sap sucking: Vegetative and reproductive tissues. Feeding causes stunted growth and the abscission or malformation of leaves, flowers, and fruits.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Europe (widespread), China, Japan, South Korea, North America, Africa.	MEDIUM	HIGH	HIGH	MEDIUM [213]	**MEDIUM**
Asterolecanium pustulans	Oleander pit scale; Akee fringed scale	Pigeon pea, akee, coconut, coffee, silky oak, mango, eggplant,	Stems, leaves and branches.	Crawling and flying allows for local dispersal. Introduction (regulated or	Widespread in North America, Central America, Caribbean,	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[208] Other hosts include black gram, canola, common bean, cowpea, maize, mungbean, peanut, soybean, sunflower, papaya, citrus, capsicum, melon, cucumber, pumpkin, carnation, jasmine, lettuce, lychee, macadamia, apple, passionfruit, avocado, tomato, potato, Asteraceae, Myrtaceae, Ranunculaceae and roses.

[209] *Aphis gossypii* can vector more than 50 plant viruses including *Cotton anthocyanosis virus* (*Polerovirus*) and *Cotton leafroll dwarf virus* (*Polerovirus*).

[210] Algeria, Burundi, Cameroon, Republic of the Congo, 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, Europe, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, North America, Bermuda, Bonaire, Saint Eustatius and Saba, Canada, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Chile, Peru, Uruguay.

[211] Exotic strains may have different insecticide resistance profiles, and/or may cause different levels of damage on cotton than strains already in Australia. The economic impact of *Aphis gossypii* (exotic strains) would be considered HIGH with an exotic virus (e.g. *Cotton anthocyanosis virus* (*Polerovirus*) or *Cotton leafroll dwarf virus* (*Polerovirus*)).

[212] *Agastache rugosa* (Korean mint), *Amaranthus hypochondriacus, Artemisia annua, Artemisia argyi, Artemisia scoparia, Camellia sinensis* (tea), *Cannabis sativa* (hemp), *Chamaemelum nobile* (common chamomile), *Corchorus capsularis* (white jute), *Coriandrum sativum* (coriander), *Daucus carota* (carrot), *Dianthus superbus, Fagopyrum esculentum* (buckwheat), *Glebionis coronaria* (crowndaisy), *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Hibiscus cannabinus* (kenaf), *Humulus scandens* (Japanese hop), *Impatiens balsamina* (garden balsam), *Linum usitatissimum* (flax), *Malus domestica* (apple), *Mentha haplocalyx, Nepeta tenuifolia, Ocimum basilicum* (basil), *Oenothera odorata, Persicaria orientalis, Prunus avium* (sweet cherry), *Ricinus communis* (castor bean), *Sorghum bicolor* (sorghum), *Telosma cordata, Vigna radiata* (mung bean).

[213] Significant pest of cotton (and many other crops) in northern China as a result of the widespread adoption of Bt cotton, along with a reduction in broad-spectrum insecticides (Wang et al., 2014; Dong et al., 2020).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		cocoa, cotton.		unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	South America. Also present in Egypt, São Tomé and Príncipe, China, India, Taiwan, Turkey, Cyprus, United Kingdom. [214]					
Asymmetrasca decedens	-	Wide host range [215] including *Gossypium* spp. (cotton).	Sap sucking [216]: Stem, leaves.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Egypt, India, Iran, Israel, Lebanon, Turkey, Greece, Italy, Portugal, Spain.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Bagrada hilaris	Bagrada bug	Wide host range (over 70 plant species in 23 families) including cotton, sunflower, cruciferous and leguminous crops and horticulture, weeds (e.g. sow thistle, bindweed) as well as Poaceae including sorghum, millet, wheat.	Feeding damage produces circular or star-shaped chlorotic pots or lesions on leaves that become necrotic. Leaves can be misshapen and infested plants may become distorted. Leaves can shrivel and dry. Seedlings and young plants can	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Widespread in Africa and parts of Asia. Also in Italy, Malta, Mexico, United States of America (Arizona, California, Hawaii, Minnesota, Nevada, New Mexico, Texas, Utah), and Chile. [218]	MEDIUM	HIGH	HIGH	LOW [219]	**LOW**

[214] Egypt, São Tomé and Príncipe, China, India, Taiwan, Turkey, Cyprus, United Kingdom, Anguilla, Antigua and Barbuda, Bahamas, Barbados, Bermuda, Costa Rica, Cuba, Curaçao, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Haiti, Honduras, Jamaica, 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, Brazil, Colombia, Ecuador, Guyana, Peru, Venezuela.

[215] *Alnus glutinosa* (European alder), *Capsicum* spp. (peppers), *Citrus deliciosa* (mediterranean mandarin), *Citrus limon* (lemon), *Citrus reticulata* (mandarin), *Citrus sinensis* (sweet orange), *Cucurbita* spp. (pumpkin), *Gossypium* spp. (cotton), *Malus domestica* (apple), *Medicago sativa* (lucerne), *Morus* spp. (mulberrytree), *Prunus* spp. (stone fruit), *Prunus armeniaca* (apricot), *Prunus domestica* (plum), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Punica granatum* (pomegranate), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine).

[216] *Asymmetrasca decedens* is a natural vector of phytoplasmas which include '*Candidatus* Phytoplasma phoenicium' (16SrIX) and '*Candidatus* Phytoplasma prunorum' (16SrX-B).

[218] Angola, Botswana, Cabo Verde, Congo (DRC, ROC), Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Senegal, Seychelles, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe, Afghanistan, India, Iran, Iraq, Myanmar, Nepal, Pakistan, Sri Lanka, Yemen, Italy, Malta, Mexico, United States of America (Arizona, California, Hawaii, Minnesota, Nevada, New Mexico, Texas, Utah), Chile.

[219] The primary hosts of *Bagrada hilaris* are mostly within the Brassicaceae (EFSA, 2022).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
			be killed. [217]							
Bemisia tabaci (exotic biotypes)	Silverleaf whitefly (exotic biotypes) [220]	Broad host range including cotton, vegetables, and ornamentals.	Leaves, honeydew on lint.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Worldwide. [221]	MEDIUM	HIGH	HIGH	MEDIUM [222]	**MEDIUM**
Calidea spp. including *Calidea dregii* and excluding *Calidea parentum* [223]	Blue bug	*Cajanus cajan* (pigeon pea), *Capsicum* spp. (peppers), *Chenopodium album* (fat hen), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Medicago sativa* (lucerne), *Ricinus communis* (castor bean), *Sorghum bicolor* (sorghum).	Seeds, developing bolls, stains lint.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Africa.	LOW	HIGH	HIGH	HIGH [224]	**MEDIUM**

[217] EFSA (2022).

[220] *Bemisia tabaci* is a cryptic species complex. Exotic biotypes of *Bermisia tabaci* are considered exotic to Australia. The MEAM 1, Asia II and "Australia" biotypes/species are recognised in Australia (Kanakala & Ghanim, 2019; Kunz et al., 2019 pre-print; Fang et al., 2022).

[221] Algeria, Angola, Benin, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC, ROC), 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.

[222] Exotic *Bemisia tabaci* biotypes or populations may have different insecticide resistance profiles or cause differing levels of damage on cotton than biotypes already in Australia (Fang et al., 2022). *Bemisia tabaci* can have a significant impact on lint yield when plants are heavily infested (Naranjo et al., 1996). The economic impact of *B. tabaci* (exotic strains) would be considered EXTREME with an exotic virus (e.g. Cotton leaf curl virus complex (*Begomovirus*)).

[223] *Cantao parentum* (White, 1839) (Synonyms: *Callidea parentum*; *Cantao pulcher*) is present in Australia (ABRS 2024; (McDonald & Cassis 1984).

[224] *Calidea* spp. usually enter crops as bolls mature. *Calidea* spp. can damage lint and cause boll drop (Hill, 2008).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Campylomma angustior	-	Sorghum, cotton.	Sap sucking: Above ground plant parts.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Mali, Nigeria.	VERY LOW	LOW	LOW	LOW	**NEGLIGIBLE**
Chinavia hilaris	Green stink bug	Wide host range [225] including *Gossypium* spp. (cotton).	Bolls, developing seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Pakistan, Canada, United States of America.	MEDIUM	MEDIUM	MEDIUM	MEDIUM [226]	**LOW**
Chionaspis minor	Small snow scale	*Cajanus cajan* (pigeon pea), *Gossypium* spp. (cotton), *Solanum melongena* (aubergine).	Sap sucking: Leaves and/or stems.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Antigua and Barbuda, Barbados, Cayman Islands, Dominican Republic, Grenada, Haiti, Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, United States of	LOW	LOW	LOW	LOW	**NEGLIGIBLE**

[225] *Abelmoschus esculentus* (okra), *Acer* spp. (maples), *Acer negundo* (box elder), *Althaea* spp. (hollyhocks), *Asparagus officinalis* (asparagus), *Brassica oleracea var. capitata* (cabbage), *Catalpa* spp., *Cephalanthus occidentalis* (common buttonbush), *Cercis canadensis* (eastern redbud), *Citrus sinensis* (sweet orange), *Cornus* spp. (dogwood), *Corylus avellana* (hazel), *Crataegus* spp. (hawthorns), *Datura stramonium* (jimsonweed), *Desmodium* spp. (tick clovers), *Fragaria ananassa* (strawberry), *Fraxinus* spp. (ashes), *Glycine max* (soybean), *Glytsia triacanthos* (honey locust), *Gossypium* spp. (cotton), *Ilex aquifolium* (holly), *Juglans nigra* (black walnut), *Lonicera* spp. (honeysuckles), *Malus domestica* (apple), *Medicago sativa* (lucerne), *Mimosa* spp. (sensitive plants), *Morus alba* (white mulberry), *Phaseolus* spp. (beans), *Phaseolus lunatus* (lima bean), *Pisum sativum* (pea), *Platycladus orientalis* (Chinese arborvitae), *Prunus armeniaca* (apricot), *Prunus avium* (sweet cherry), *Prunus domestica* (plum), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Prunus serotina* (black cherry), *Pyrus communis* (European pear), *Rhamnus cathartica* (buckthorn), *Rhus* spp. (sumach), *Robinia pseudoacacia* (black locust), *Rubus idaeus* (raspberry), *Sambucus* spp. (elderberry), *Sambucus canadensis* (American black elderberry), *Securigera varia* (crown vetch), *Sesbania punicea* (red sesbania), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solidago* spp. (goldenrod), *Syringa vulgaris* (lilac), *Tilia heterophylla* (white basswood), *Trifolium* spp. (clovers), *Ulmus rubra* (slippery elm), *Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine), *Wisteria* spp., *Zea mays* (maize).

[226] Found to cause damage to transgenic cotton in the USA (Greene & Turnipseed, 1996). Important pest of cotton in the more northern cotton regions in the United States of America such as Tennessee. It would likely be a pest on cotton in Australia if it became established. However, the natural suite of predators and parasites that already contribute to control of other bug pests, such as *Nezara viridula* would probably also help control this pest. The cropping systems and environment in Australia is not very conducive to the build-up of big populations, except perhaps in more diverse cropping areas (e.g. Darling Downs, Griffith, Upper Namoi). Effective insecticide options are available.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
					America, Brazil, Guyana.					
Cicadulina chinai	-	Barley, maize, wheat, finger millet, sugarcane, rice, cotton.	Sap sucking [227]: Stem, leaves.	Crawling, jumping and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Kenya, Egypt, India.	LOW	LOW	LOW	UNKNOWN	**UNKNOWN**
Clavigralla tomentosicollis	African podbug	Wide host range [228] including *Gossypium hirsutum* (upland cotton).	Sap sucking: Pods and seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials (e.g. plants, products) or hitchhiking are the most likely pathways for long distance spread.	Africa. [229]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Corythucha gossypii	Cotton lacebug	Wide host range [230] including *Gossypium* (cotton).	Sap sucking: Above ground plant parts.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	United States of America (Florida, Hawaii), Central America, Caribbean, South America (northern).	MEDIUM	MEDIUM	MEDIUM	LOW	**VERY LOW**

[227] Some *Cicudulina* species are known vectors of important plant viruses.
[228] Anacardium occidentale (cashew nut), Cajanus cajan (pigeon pea), Cicer arietinum (chickpea), Glycine max (soyabean), Gossypium hirsutum (upland cotton), Ipomoea batatas (sweetpotato), Lablab purpureus (hyacinth bean), Mangifera indica (mango), Phaseolus vulgaris (common bean), Spinacia oleracea (spinach), Tephrosia (hoary-pea), Vigna unguiculata (cowpea).
[229] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Republic of the Congo, Côte d'Ivoire, Gambia, Ghana, Kenya, Madagascar, Malawi, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe.
[230] *Abelmoschus esculentus* (okra), *Annona* spp., *Araceae* (arums), *Arachis hypogaea* (peanut), *Cajanus cajan* (pigeon pea), *Capsicum annuum* (bell pepper), *Carica papaya* (pawpaw), *Manihot esculenta* (cassava), *Musa* spp. (banana), *Phaseolus* spp. (beans), *Ricinus communis* (castor bean), *Saccharum officinarum* (sugarcane), *Solanum melongena* (aubergine).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Creontiades pallidus	Boll shedder bug; Bud shredder bug [231]	Wide host range [232] including *Gossypium* (cotton).	Sap sucking [233]: Above ground plant parts	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Widespread in Africa, Asia, and Europe. [234]	MEDIUM	MEDIUM	MEDIUM	MEDIUM [235]	**LOW**
Creontiades signatus	Verde plant bug	Cotton, weeds.	Bolls.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	North America, Central America. [236]	LOW	MEDIUM	HIGH	LOW [237]	**VERY LOW**
Dysdercus spp. (African species) [238]	Cotton stainer; Red cotton bug; Red cotton stainer	Wide host range including *Gossypium* spp. (cotton).	Bolls, lint [239], seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Africa (e.g. Benin, Botswana, Burkina Faso, Cote d'Ivoire, Cameroon, Congo, Gabon, Guinea, Kenya, Madagascar, Mozambique, Namibia, Nigeria, Sierra Leone, South Africa, Uganda,	LOW	HIGH	HIGH	MEDIUM [240]	**LOW**

[231] There are a number of *Creontiades* species in Australia (McColl et al., 2010).
[232] *Cajanus cajan* (pigeon pea), *Capsicum* spp. (peppers), *Chenopodium album* (fat hen), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Medicago sativa* (lucerne), *Ricinus communis* (castor bean), *Sorghum bicolor* (sorghum).
[233] Transmits cotton boll rot (several fungi and bacteria including *Fusarium*, *Diplodia* and *Alternaria* species).
[234] McColl et al. (2010).
[235] Cotton can usually compensate for early losses of squares (Schaefer & Panizzi, 2000).
[236] Pest of cotton in the Rio Grande area of the United States of America near the Texas-Mexico border where it utilises a range of weed hosts.
[237] Damage is similar to *Creontiades dilutus* (already present in Australia). Current mirid management practices will likely manage this pest.
[238] African species include *Dysdercus ruber*, *Dysdercus superstitiosus*. Other potential taxa include *D. voelkeri*, *D. nigrofasciatus*, *D. haemorrhoidalis*, *D. cardinalis*, *D. orientalis*, *D. intermedius*, *D. melanoderes*, and *D. pretiosus*.
[239] These bugs feed on bolls and stain the cotton lint a yellow-brown colour.
[240] Damage is expected to be similar to American *Dysdercus* species. There are *Dysdercus* species that occur in Australia.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
					Zimbabwe).					
Dysdercus spp. (American species) [241]	Cotton stainer; Red cotton bug; Red cotton stainer	Wide host range including *Gossypium* spp. (cotton).	Bolls, lint,[239] seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	North America, Caribbean, Central America, South America.	LOW	HIGH	HIGH	MEDIUM [242]	**LOW**
Dysdercus spp. (Asian species) [243]	Cotton stainer; Red cotton bug; Red cotton stainer	Wide host range including *Gossypium* spp. (cotton).	Bolls, lint, seeds[244].	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	India, Pakistan, China, Southeast Asia, Papua New Guinea.	LOW	HIGH	HIGH	MEDIUM [244]	**LOW**
Edessa meditabunda	Green and brown stink bug	Wide host range [245] including *Gossypium* spp. (cotton).	Above ground plant parts.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, soil (eggs) or hitchhiking are the most likely pathways for long distance spread.	Antigua and Barbuda, Barbados, Cuba, Grenada, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Argentina, Brazil, Colombia, French Guiana, Guyana,	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[241] American species include *Dysdercus albofasciatus*, *D. andreae*, *D. bimaculatus, D. concinnus*, *D. flavolimbatus*, *D. honestus* (*incertae sedis*), *D. imitator*, *D. lunulatus*, *D. maurus* (*incertae sedis*) (Silva et al., 2021), *D. mimus*, *D. obliquus*, *D. obscuratus*, *D. peruvianus*, *D. ruficeps* and *D. suturellus*.

[242] *D. suturellus* is considered the most damaging of the American species. There are *Dysdercus* species that occur in Australia.

[243] Species include *Dysdercus evanescens*, *D. fuscomaculatus*, *D. koenigii*, *D. philippinus*, *D. poecilus*.

[244] *Dysdercus koenigii* is becoming a serious pest of cotton crops in Pakistan and India. It feeds on emerging cotton bolls, mature cotton seeds but also transmits cotton staining fungi (e.g. *Eremothecium gossypii*; syn. *Nematospora gossypii*) (Karar et al., 2021). There are *Dysdercus* species that occur in Australia.

[245] *Abelmoschus esculentus* (okra), *Beta vulgaris* (beetroot), *Cajanus cajan* (pigeon pea), *Capsicum annuum* (bell pepper), *Cichorium intybus* (chicory), *Citrus* spp., *Crotalaria spectabilis* (showy rattlepod), *Datura stramonium* (jimsonweed), *Desmodium* spp. (tick clovers), *Glycine* spp., *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Lactuca sativa* (lettuce), *Linum usitatissimum* (flax), *Lolium multiflorum* ssp. *gaudini, Lupinus albus* (white lupine), *Lupinus luteus* (yellow lupin), *Manihot esculenta* (cassava), *Medicago sativa* (lucerne), *Nicotiana tabacum* (tobacco), *Phaseolus* spp. (beans), *Pisum sativum* (pea), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Theobroma cacao* (cocoa), *Vigna umbellata* (rice bean), *Zea mays* (maize).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
					Paraguay, Suriname, Uruguay.					
Empoasca dolichi	-	Cowpea, peanut, cotton.	Sap sucking: Above ground plant parts.	Crawling, jumping and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Nigeria, Zambia.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Euschistus heros	Neotropical brown stink bug [246]	Wide host range [247] including *Gossypium hirsutum* (upland cotton).	Sap sucking: Leaves, pods, seeds.	Crawling and flying allows for a limited amount of local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Argentina, Brazil, Paraguay.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Euschistus servus	Brown stink bug	*Carya illinoinensis* (pecan), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Prunus persica* (peach), *Zea mays* (maize).	Sap sucking: Leaves, pods, seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Pakistan, Canada, Mexico, United States of America.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Halyomorpha halys	Brown marmorated stink bugs	Wide host range with over 100 species reported as hosts including cotton,	Bolls. [248]	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of	Widespread in Asia, Europe, and North America. Also reported in Algeria, Morocco,	HIGH	HIGH	HIGH	MEDIUM	**MEDIUM**

[246] The status of *Euschistus heros* is changing from a secondary to a primary pest in Brazilian soybean crops (Soares et al., 2018). In Brazilian populations of *E. heros*, Soares et al. (2018) suggests that an increase of population densities in soybean fields, a shorter quiescence period, a larger host range (i.e. damage in cotton crops) and pesticide tolerance/resistance have been frequently reported.
[247] *Amaranthus retroflexus* (redroot pigweed), *Cajanus cajan* (pigeon pea), *Coffea* spp. (coffee), *Conyza bonariensis* (hairy fleabane), *Euphorbia heterophylla* (wild poinsettia), *Glycine max* (soybean), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Lablab purpureus* (hyacinth bean), *Ligustrum lucidum* (broad-leaf privet), *Mangifera indica* (mango), *Mucuna pruriens* (velvet bean), *Phaseolus vulgaris* (common bean), *Vassobia breviflora, Zea mays* (maize).
[248] *Halyomorpha halys* is spreading into the cotton belt of the United States of America, and *H. halys* is reported to attack large bolls in preference to small bolls (Kamminga et al., 2014).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		sweetcorn, soybeans, vegetables and fruit trees.		infested plant materials or hitchhiking are the most likely pathways for long distance spread.	and Chile. [249]					
Hebata decipiens (syn. *Empoasca decipiens*)	Leafhopper cotton	Wide host range [250] including *Gossypium* spp. (cotton).	Sap sucking [251]: Above ground plant parts.	Crawling, jumping and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Widespread in Europe, and central Asia. Also occurs in the Middle East and northern Africa. [252]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Hebata fabalis (syn. *Empoasca fabalis*)	-	Common bean, jack bean, lima bean, jute, pigeon pea, potato, sweetpotato, maize, cotton. [253]	Sap sucking: Above ground plant parts.	Crawling, jumping and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Argentina, Brazil, Colombia, Peru, Puerto Rico, Caribbean, United States of America (southeast and Hawaii), Madeira Island (Portugal), Canary Islands (Spain). [254]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Hebata motti (syn.	-	Wide host range [255]	Sap sucking: Above	Crawling, jumping and/or	Burma, China, India,	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

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

[250] *Abelmoschus esculentus* (okra), *Beta vulgaris var. saccharifera* (sugarbeet), *Capsicum annuum* (bell pepper), *Capsicum frutescens* (chilli), *Carum carvi* (caraway), *Citrus deliciosa* (mediterranean mandarin), *Citrus limon* (lemon), *Citrus reticulata* (mandarin), *Citrus sinensis* (sweet orange), *Coriandrum sativum* (coriander), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita* (pumpkin), *Cucurbita pepo* (marrow), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Hibiscus sabdariffa* (roselle), *Hordeum vulgare* (barley), *Medicago sativa* (lucerne), *Morus* (mulberrytree), *Origanum majorana* (sweet marjoram), *Ranunculus asiaticus* (garden crowfoot), *Sesamum indicum* (sesame), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Vitis vinifera* (grapevine).

[251] *Hebata decipiens* can vector a range of phytoplasmas.

[252] Ethiopia, Germany, Italy, Kyrgyzstan, Russia (western), Turkey, United Kingdom, Afghanistan, Austria, Bosnia and Herzegovina, Bulgaria, Cyprus, Czechia, Denmark, Egypt, France, Georgia, Greece, Hungary, India, Iran, Iraq, Ireland, Israel, Jordan, Kazakhstan, Latvia, Lebanon, Libya, Lithuania, Moldova, Moravia, Morocco, Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, Tadzhikistan, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan.

[253] Dmitriev (2018); Aguin-Pombo and Freitas (2020).

[254] Aguin-Pombo and Freitas (2020).

[255] *Acacia nilotica, Arachis hypogaea* (peanut), *Capsicum annum, Chenopodium* sp., *Cyamopsis tetragonoloba* (cluster bean; guar), *Gossypium* sp. (cotton), *Linum usitatissimum* (linseed/flax), *Lycopersicum*

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Empoasca motti)		including *Gossypium* sp. (cotton).	ground plant parts.	flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Myanmar, Nepal, Pakistan, Sri Lanka.					
Helopeltis schoutedeni	Cotton helopeltis; Cacao-mosquito	*Anacardium occidentale* (cashew nut), *Bixa orellana* (annatto), *Camellia sinensis* (tea), *Capsicum annuum* (bell pepper), *Capsicum frutescens* (chilli), *Gossypium* spp. (cotton), *Mangifera indica* (mango), *Ricinus communis* (castor bean), *Vigna unguiculata* (cowpea).	Sap sucking: Leaves, stems, pods/fruits. Affected leaves often curl and become deformed, lesions develop, and dieback of young shoots is common. Damage on pods appears as dark, circular lesions, which usually harden as scars on the husk.	Crawling and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Angola, Burundi, Cameroon, Central African Republic, Chad, Congo (DRC), Côte d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Liberia, Malawi, Mali, Mozambique, Nigeria, Rwanda, São Tomé and Príncipe, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zimbabwe.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Jacobiasca lybica	Cotton jassid	*Cajanus cajan* (pigeon pea), *Citrus sinensis* (sweet orange), *Gossypium* spp. (cotton), *Hibiscus sabdariffa* (roselle), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine).	Sap sucking: Leaves, leaf sheaths.	Crawling, jumping and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Algeria, Central African Republic, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Kenya, Libya, Mauritius, Morocco, Mozambique, Nigeria, Senegal, Somalia, South Africa, Sudan, Tanzania, Tunisia, Uganda, India, Iran, Israel, Lebanon, Saudi Arabia, Turkey, Yemen, Albania, Greece, Italy, Portugal, Spain, Argentina.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

esculentum, Milletia auriculata, Nicotiana tabacum, Pisum sativum (field pea)*, Psidium guajava* (guava)*, Ricinus communis* (castor)*, Sesbania sesban, Solanum melongena, Solanum tuberosum* (potato)*, Trifolium alexandrinum, Vigna mungo* (blackgram)*, Vigna radiata* (mungbean)*, Vigna unguiculata* (cowpea).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Jacobiella spp. including *Jacobiella facialis*	Cotton leaf hopper	Cotton and a range of other species including *Solanum melongena* (aubergine).	Sap sucking: Leaves, leaf sheaths.	Crawling, jumping and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials,[256] or hitchhiking are the most likely pathways for long distance spread.	Namibia, Nigeria, Senegal, Togo, South Africa.	LOW	MEDIUM	MEDIUM	MEDIUM[257]	**LOW**
Leptoglossus zonatus	-	Wide host range[258] including *Gossypium hirsutum* (upland cotton).	Sap sucking: Leaves, stems, flowers, fruit.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials (e.g. plants, fruit, products) or hitchhiking are the most likely pathways for long distance spread.	United States of America (southern and western), Mexico, Central America, South America (northern half).	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Lygus elisus (syn. *Lygus nigrosignatus*)	Lucerne plant bug; Pale legume bug	Wide host range including cotton. Other hosts include *Brassica juncea* var. *juncea* (Indian mustard), *Brassica napus* (canola), *Capsella bursa-pastoris* (shepherd's purse), *Daucus carota* (carrot), *Lupinus albus* (white lupine), *Medicago sativa* (lucerne), *Mentha piperita* (peppermint),	Squares, bolls.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Canada, United States of America, Mexico.	MEDIUM	HIGH	HIGH	MEDIUM[259]	**MEDIUM**

[256] Eggs can be hidden in plant materials.

[257] Controlled with Thiamethoxam seed treatments in Namibia, and Karate® EC was found to be effective against *Jacobiella facialis* on cotton in South Africa (Malinga & Laing, 2021).

[258] *Carya illinoinensis* (pecan), *Citrus aurantiifolia* (lime), *Citrus sinensis* (sweet orange), *Cucumis melo* (melon), *Cucurbita* spp. (gourds), *Gossypium hirsutum* (upland cotton), *Jatropha curcas* (jatropha), *Juglans regia* (walnut), *Persea americana* (avocado), *Pistacia vera* (pistachio), *Prunus amygdalus* (almond), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Sorghum bicolor* (sorghum), *Zea mays* (maize).

[259] *Lygus elisus* is generally observed less frequently than *L. hesperus* and *L. lineolaris,* and subsequently considered less damaging.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		other vegetable crops, fruit trees and weeds.								
Lygus hesperus	Western plant bug	Wide host range (over 100 hosts) including *Daucus carota* (carrot), *Gossypium hirsutum* (upland cotton), *Medicago sativa* (lucerne), *Solanum lycopersicum* (tomato).	Squares, bolls.[260]	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Canada, United States of America, Mexico.	MEDIUM[261]	HIGH	HIGH	HIGH[262]	**HIGH**
Lygus lineolaris	Tarnished plant bug	Wide host range[263] (over 700 species)[264] including *Gossypium hirsutum* (upland cotton).	Squares, bolls.[260]	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Georgia (Asia), Romania, Bermuda, Canada, El Salvador, Guatemala, Honduras, Mexico, United States of America.	MEDIUM	HIGH	HIGH	HIGH[265]	**HIGH**
Lygus pratensis	Tarnished	Wide host range[266] including *Gossypium*	Leaves, squares, bolls. Plants may become	Crawling and flying allows for local dispersal.	Widespread in Europe, north Africa, the Middle	LOW	HIGH	HIGH	MEDIUM[268]	**LOW**

[260] Lygus bugs can threaten a cotton crop from earliest squaring, through cut-out and final boll set. If many squares drop, the plant may redirect its resources into vegetative growth. Feeding can cause damage to squares and reproductive structures. Lygus bugs may pierce the walls of young bolls to feed on seeds which may fail to develop. Lint around the injured seeds is often stained yellow and may not mature normally.

[261] Eggs could be laid in plant material.

[262] Significant pest of cotton overseas which reduces lint quality and yield.

[263] Other hosts include *Amaranthus cruentus* (red amaranth), *Anethum graveolens* (dill), *Apium graveolens* (celery), *Apium graveolens var. dulce* (celery), *Asparagus officinalis* (asparagus), *Aster* spp., *Aster pilosus* (white heath aster), *Bellis perennis* (common daisy), *Beta vulgaris* (beetroot), *Brassica napus var. napus* (rape), *Brassica oleracea var. botrytis* (cauliflower), *Brassica oleracea var. capitata* (cabbage), *Calendula officinalis* (pot marigold), *Cosmos* spp., *Cucumis sativus* (cucumber), *Dahlia hybrids*, *Daucus carota* (carrot), *Erigeron* spp. (fleabanes), *Fragaria ananassa* (strawberry), *Gladiolus hybrids* (sword lily), *Glycine max* (soybean), *Gossypium hirsutum* (upland cotton), *Helianthus* spp. (sunflower), *Lespedeza juncea var. sericea* (Perennial lespedeza), *Malus* spp. (ornamental species apple), *Medicago sativa* (lucerne), *Papaver nudicaule* (Iceland poppy), *Phaseolus lunatus* (lima bean), *Phaseolus vulgaris* (common bean), *Pinus echinata* (shortleaf pine), *Populus* spp. (poplars; aspens; cottonwoods), *Prunus persica* (peach), *Pyrus communis* (European pear), *Rheum hybridum* (rhubarb), *Rubus* spp. (blackberry, raspberry), *Salvia officinalis* (common sage), *Sinapis alba* (white mustard), *Solanum tuberosum* (potato), *Tragopogon porrifolius* (oysterplant), *Trifolium incarnatum* (Crimson clover), *Verbena* spp. (vervain), *Vicia sativa* (common vetch), *Zea mays subsp. mays* (sweetcorn), *Zinnia elegans* (zinnia).

[264] George et al. (2021).

[265] Significant pest of cotton overseas which reduces lint quality and yield (George et al., 2021).

[266] Other hosts include *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Medicago sativa* (lucerne), *Pistacia vera* (pistachio), *Prunus persica* (peach), *Pyrus communis* (European pear), *Raphanus sativus* (radish), *Solanum tuberosum* (potato), *Zea mays* (maize).

[268] *Lygus pratensis* occasionally reach outbreak levels which can result in significant loss of crop quality and yield. Insecticide-based approaches are typically used to suppress *L. pratensis* population levels and safeguard cotton yields (Zhang et al., 2020). In China, *L. pratensis* population levels have increased in recent years after wide-scale adoption of Bt (*Bacillus thuringiensis*) cotton (Zhang et al., 2020).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
	plant bug	spp. (cotton).	stunted.[267]	Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	East, Turkey, central Asia, northern India, Nepal, Russia (e.g. Siberia) and parts of China.[267]					
Lygus rugulipennis	European tarnished plant bug; Bishop bug	Polyphagous (over 400 plant species)[269] including *Gossypium* spp. (cotton).[270]	Sap sucking: Leaves, stems, buds, flowers, pods and seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Europe (widespread), United Kingdom, Russia, Iran, Turkey, Japan, Canada	LOW	HIGH	HIGH	UNKNOWN	**UNKNOWN**
Melanoliarus maidis (syn. *Oliarus maidis*)		Maize, sugarcane, cotton, grasses.	Sap sucking: Leaves, stems.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Caribbean.	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	**UNKNOWN**
Murgantia histrionica	Harlequin bug	Wide host range[271] including *Gossypium* spp. (cotton).	Sap sucking: Leaves, flowers.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or	Bermuda, Mexico, United States of America.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[267] Zhang et al. (2020); CABI (2022).
[269] van Tol et al. (2022).
[270] Other hosts include *Ambrosia artemisiifolia* (common ragweed), *Chenopodium quinoa* (quinoa), *Cucumis sativus* (cucumber), *Fragaria ananassa* (strawberry), *Glycine max* (soybean), *Lactuca sativa* (lettuce), *Medicago sativa* (lucerne), *Solanum melongena* (aubergine), *Triticum aestivum* (wheat).
[271] *Abelmoschus esculentus* (okra), *Ambrosia* spp. (ragweed), *Ambrosia psilostachya* (perennial ragweed), *Asparagus officinalis* (asparagus), *Beta vulgaris* (beetroot), *Brassica nigra* (black mustard), *Brassica oleracea var. botrytis* (cauliflower), *Brassica oleracea var. capitata* (cabbage), *Brassica oleracea var. gemmifera* (Brussels sprouts), *Brassica oleracea var. italica* (broccoli), *Brassica oleracea var. viridis* (collards), *Brassica rapa subsp. chinensis* (Chinese cabbage), *Brassica rapa subsp. pekinensis*, *Brassica napus var. napus* (canola), *Capsella bursa-pastoris* (shepherd's purse), *Chenopodium album* (fat hen), *Chrysanthemum* spp. (daisy), *Cucurbita pepo* (marrow), *Eriobotrya japonica* (loquat), *Gossypium* spp. (cotton), *Lactuca sativa* (lettuce), *Lepidium sativum* (garden cress), *Nasturtium officinale* (watercress), *Phaseolus vulgaris* (common bean), *Prunus avium* (sweet cherry), *Prunus domestica* (plum), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Raphanus sativus* (radish), *Rosa* spp. (roses), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Vitis vinifera* (grapevine), *Yucca elata* (soap tree), *Zea mays* (maize).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				hitchhiking are the most likely pathways for long distance spread.						
Oxycarenus hyalinipennis	Cotton seed bug	Wide host range [272] including *Gossypium* spp. (cotton) such as *Gossypium barbadense* (Gallini cotton), and *Gossypium hirsutum* (upland cotton).	Sap sucking: *Oxycarenus hyalinipennis* will suck fluids from leaves, stems, and flowers for moisture, but feeds on seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Widespread in Africa, Asia, Europe, Caribbean and South America. [273]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Oxycarenus laetus	Dusky cotton stainer; Indian dusky cotton bug	*Gossypium* spp. (cotton), *Hibiscus rosa-sinensis* (China-rose), *Thespesia populnea* (portia tree).	Bolls, seeds.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Bangladesh, China, India, Myanmar, Pakistan, Thailand.	LOW	MEDIUM	MEDIUM	LOW [274]	**VERY LOW**
Pangaeus bilineatus	Burrowing bug	Peanut, cotton [275], peppers, strawberry, spinach,	Sap sucking: Roots/tubers, ground	Crawling and flying allows for local dispersal. Introduction (regulated or	United States of America, Guatemala.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[272] *Abelmoschus esculentus* (okra), *Abelmoschus moschatus* (musk mallow), *Abutilon* spp. (Indian mallow), *Abutilon fruticosum, Abutilon grandifolium* (hairy Indian mallow), *Abutilon incanum* (hoary abutilon), *Abutilon indicum* (Indian lantern flower), *Abutilon pictum, Acacia nilotica* (gum arabic tree), *Alcea rosea* (Hollyhock), *Allium cepa* (onion), *Althaea* spp. (hollyhocks), *Anacardium occidentale* (cashew nut), *Bambusa vulgaris* (common bamboo), *Brachychiton populneus, Brassica* spp., *Cajanus cajan* (pigeon pea), *Calotropis* spp., *Capsicum annuum* (bell pepper), *Chamaemelum nobile* (common chamomile), *Citrus aurantiifolia* (lime), *Citrus limetta* (sweet lemon tree), *Cola* spp., *Cuscuta campestris* (field dodder), *Dalbergia sissoo, Daucus carota* (carrot), *Diospyros* spp. (malabar ebony), *Dombeya* spp., *Ficus benjamina* (weeping fig), *Ficus carica* (common fig), *Gossypium* spp. (cotton), *Gossypium barbadense* (Gallini cotton), *Gossypium hirsutum* (upland cotton), *Grewia asiatica* (phalsa), *Herissantia crispa, Hibiscus* spp. (rosemallows), *Hibiscus cannabinus* (kenaf), *Hibiscus mutabilis* (cottonrose), *Hibiscus sabdariffa* (roselle), *Hibiscus syriacus* (shrubby Althaea), *Hibiscus trionum* (Venice mallow), *Jasminum officinale, Malva* spp. (mallow), *Malva parviflora* (small-flowered mallow; pink cheeseweed), *Malva sylvestris* (common mallow), *Mangifera indica* (mango), *Moringa oleifera* (horse radish tree), *Morus nigra* (black mulberry), *Nerium oleander* (oleander), *Ornithogalum thyrsoides, Pavonia* spp., *Pavonia spinifex, Pennisetum glaucum* (pearl millet), *Persea americana* (avocado), *Phoenix dactylifera* (date-palm), *Phymosia umbellata, Prunus* spp. (stone fruit), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Rhododendron austrinum, Sida* spp., *Sida rhombifolia, Solanum americanum, Solanum melongena* (aubergine), *Sphaeralcea miniata, Sterculia* spp., *Syzygium cumini* (black plum), *Trifolium alexandrinum* (Berseem clover), *Triticum* spp. (wheat), *Triumfetta* spp., *Vigna unguiculata* (cowpea), *Zea mays* (maize), *Ziziphus mauritiana* (jujube).

[273] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Congo (DRC, ROC), Côte d'Ivoire, Egypt, Eritrea, Eswatini, Ethiopia, Ghana, Guinea, Kenya, Libya, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zimbabwe, Bangladesh, Cambodia, China, India, Iran, Iraq, Israel, Laos, Myanmar, Pakistan, Philippines, Saudi Arabia, Sri Lanka, Syria, Thailand, Turkey, Vietnam, Yemen, Austria, Cyprus, France, Germany, Greece, Hungary, Italy, Malta, Portugal, Russia, Serbia, Spain, Bahamas, Puerto Rico, Turks and Caicos Islands, U.S. Virgin Islands, Argentina, Bolivia, Brazil, Paraguay.

[274] *Oxycarenus laetus* can cause staining to lint, and reduced seed weight, oil content and germination (Srinivas, 2004; Khan et al., 2014).

[275] *Pangaeus bilineatus* is primarily considered a pest of peanut but has also been reported to feed on cotton (i.e. *Gossipium hirsutum*) seedlings (Aigner et al., 2021).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		Spartina, *Desmodium*, oak, peach, and pear.	pods.	unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.						
Paurocephala gossypii	Cotton psyllid	Cotton.	Leaves, stem/stalks. [276] Secretion of honeydew.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials (e.g. eggs laid inside plant materials) or hitchhiking are the most likely pathways for long distance spread.	Africa.	LOW	MEDIUM [277]	MEDIUM	LOW	**VERY LOW**
Phenacoccus gossypii	Mexican mealybug	*Gossypium* spp. (cotton), *Manihot esculenta* (cassava), ornamentals.	Sup sucking: wilting, deformation, stunting.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	India, Italy, Spain, Bahamas, Bermuda, Cuba, Mexico, Puerto Rico, United States of America (including Hawaii, southern states), Brazil, Colombia, French Guiana, Paraguay, Peru.	MEDIUM	HIGH	HIGH	LOW	**LOW**
Pseudatomoscelis seriatus (syn. *Psallus seriatus*)	Cotton fleahopper	Wide host range (over 160 hosts) [278] including cotton, lucerne, common bean, soybean, sunflower, watermelon.	Terminals and young fruit.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	United States of America (Arizona, Florida, Georgia, South Carolina, North Carolina, Texas, Oklahoma, Arkansas, Mississippi, Louisiana, Alabama). [278]	LOW	MEDIUM	MEDIUM	LOW [279]	**VERY LOW**

[276] Infestations may be accompanied by a disorder called 'psyllose' which is thought to be caused by a phytoplasma or 'mycoplasma-like organism' which may result in intense reddening of the leaves, followed by defoliation and complete yield loss (Bateman, 1989). Further research is required to assess the vector status of *Paurocephala gossypii*.

[277] Current distribution suggests *Paurocephala gossypii* is most likely to establish in tropical areas.

[278] Barman et al. (2013).

[279] Yield losses of 12 % to 34 % on cotton have been previously attributed to *Pseudatomoscelis seriatus* in the United States of America (Schwartz, 1983). Impacts to cotton from *P. seriatus* are regionally variable (Williams, 2011). Cotton fleahoppers tend to prefer and perform better on native weed hosts than cotton (Barman et al., 2013).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Rhinacloa forticornis	Brown cotton mirid	Pigeon pea, cotton.	Sap sucking: Above ground plant parts.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	United States of America (including Hawaii), Mexico, Central America, Caribbean, South America (Colombia, Venezuela).	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Scaphytopius albifrons	Leafhopper	Cotton	Above ground plant parts. [280]	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	North America.	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	**UNKNOWN**
Spilostethus pandurus	Seed bug; Milkweed bug	Wide host range [281] including cotton. [282]	Sap sucking: Leaves, stems, pods, seeds.	Crawling and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long distance spread.	Morocco, India, Iran, Israel, Egypt, Lebanon, Cyprus, France, Italy, Portugal.	LOW	HIGH	HIGH	LOW	**VERY LOW**
Spissistilus festinus	Three-cornered alfalfa hopper	Wide host range [283] including peanut, soybean, cotton, lucerne, alfalfa, vegetables, grapevine, cowpea, sunflower,	Sap sucking: Stem (small, brown, chlorotic lesions on stems which can form corky calluses), leaves (become dry and defoliate in severe	Crawling and/or flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials, or hitchhiking are the most likely pathways for long	Canada, United States of America, Central America.	LOW	MEDIUM	MEDIUM	UNKNOWN	**UNKNOWN**

[280] Vector of *Cotton yellow vein virus* (Unclassified).

[281] *Alhagi pseudalhagi* (Camel-thorn), *Arachis hypogaea* (peanut), *Chenopodium album* (fat hen), *Elymus repens* (quackgrass), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Medicago sativa* (lucerne), *Nerium oleander* (oleander), *Pennisetum glaucum* (pearl millet), *Pistacia vera* (pistachio), *Saccharum officinarum* (sugarcane), *Sesamum indicum* (sesame), *Sorghum bicolor* (sorghum), *Triticum aestivum* (wheat), *Zea mays* (maize).

[282] Awad et al. (2013).

[283] Plant species in the Fabaceae are the most favourable for *Spissistilus festinus* development and reproduction (UF, 2022).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		vetch.	infestations). Plants become wilted with reduced vigour. Stems can break at the callus. Sooty mould can develop on honeydew.	distance spread.						
Trialeurodes abutilonea	Banded wing whitefly	Wide host range including cotton, capsicum, lettuce, cassava and various ornamental plants.	Leaves, honeydew on lint.	Crawling and flying allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plant materials or hitchhiking are the most likely pathways for long distance spread.	Cuba, Dominican Republic, Jamaica, Mexico, Puerto Rico, Trinidad and Tobago, United States of America, South America.	MEDIUM	HIGH	HIGH	MEDIUM	**MEDIUM**
Trialeurodes ricini	Castor bean whitefly	Polyphagous [284] including *Gossypium hirsutum* (upland cotton).	Leaves.	Adults are weak flyers but can disperse naturally. The movement of infested plants or fruits can lead to long-distance spread.	Africa and Asia. [285]	MEDIUM	HIGH	HIGH	MEDIUM	**MEDIUM**
Lepidoptera (butterflies and moths)										
Alabama argillacea	Cotton leaf worm	*Abelmoschus esculentus* (okra), *Cajanus cajan* (pigeon pea),	Leaves, branches, buds, fruit/bolls	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated	Widespread in Central America, the Caribbean, and South America [286].	LOW	HIGH	HIGH	LOW [287]	**VERY LOW**

[284] Other hosts include *Annona glabra* (pond apple), *Arbutus* spp., *Aristolochia bracteata* (wormkiller), *Bauhinia* spp. (camel's foot), *Begonia* spp., *Boscia senegalensis, Breynia* spp., *Breynia rhamnoides, Calopogonium* spp., *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* spp. (spurges), *Euphorbia heterophylla* (wild poinsettia), *Euphorbia hirta* (garden spurge), *Gardenia erubescens, Gardenia jovis-tonantis, Gardenia ternifolia, Gossypium hirsutum* (upland 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* spp., *Phyllanthus acidus* (star gooseberry), *Phyllanthus amarus* (jamaicaweed), *Piper umbellatum, Psidium* spp., *Psidium guajava* (guava), *Ricinus communis* (castor bean), *Rosa* spp. (roses), *Sesamum* spp. (sesame), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Sonchus oleraceus* (common sowthistle), *Telfairia* spp., *Ziziphus mauritiana* (jujube).

[285] Central African Republic, Chad, Democratic Republic of the Congo, 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 (Canary Islands).

[286] Antigua and Barbuda, Bahamas, Barbados, Canada, Cuba, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Jamaica, Mexico, Montserrat, Nicaragua, 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, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Venezuela.

[287] *Alabama argillacea* has been considered a significant pest of cotton in Brazil with concerns for insecticide resistance within populations (Silva et al., 2011). Agricultural and management practices in North America appear to have mitigated the impact to cotton from *A. argillacea*. Overall risk to Australian cotton is considered VERY LOW for Bt cotton, but LOW for conventional cotton.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		Gossypium spp. (cotton), *Thespesia populnea* (portia tree), *Hampea* spp.	(larvae).	pathways) of infested plants, or hitchhiking are the most likely pathways for long distance spread.	Rare to non-existent in North America.					
Amsacta moorei	Tiger moth	Wide host range [288] including *Gossypium* spp. (cotton).	Leaves (skeletonisation).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Senegal, China, India, Pakistan, Sri Lanka	LOW	HIGH	HIGH	MEDIUM	**LOW**
Anticarsia gemmatalis	Soybean caterpillar	Hosts are predominantly within the Fabaceae [289] but also includes cotton. [290]	Growing points, leaves, stems, whole plant.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Canada (Quebec), Cuba, Honduras, Mexico, Puerto Rico, United States of America, Argentina, Brazil, Chile, Colombia, Ecuador.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Autographa gamma	Silver-Y moth	Wide host range (over 200 species) [291] including lucerne, chickpea, linseed (flax),	Leaves, petioles (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested	Widespread in Asia, Europe and north Africa. [293]	LOW	HIGH	MEDIUM	LOW	**VERY LOW**

[288] *Achyranthes aspera* (devil's horsewhip), *Arachis hypogaea* (peanut), *Boehmeria nivea* (ramie), *Boerhavia diffusa* (red spiderling), *Cajanus cajan* (pigeon pea), *Carthamus tinctorius* (safflower), *Citrullus colocynthis* (colocynth), *Citrullus lanatus* (watermelon), *Crotalaria juncea* (sunn hemp), *Cucumis* spp. (melons, cucumbers, gherkins), *Cyamopsis tetragonoloba* (guar), *Cynodon dactylon* (Bermuda grass), *Cyperus rotundus* (purple nutsedge), *Eclipta prostrata* (eclipta), *Eleusine coracana* (finger millet), *Euphorbia hirta* (garden spurge), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Pennisetum glaucum* (pearl millet), *Ricinus communis* (castor bean), *Sesamum indicum* (sesame), *Sorghum bicolor* (sorghum), *Trianthema portulacastrum* (horse purslane), *Tribulus terrestris* (puncture vine), *Urochloa ramosa* (browntop millet), *Vigna aconitifolia* (moth bean), *Vigna mungo* (black gram), *Vigna radiata* (mung bean), *Vigna unguiculata* (cowpea), *Zea mays* (maize).

[289] *Arachis hypogaea* (peanut), *Cajanus cajan* (pigeon pea), *Canavalia gladiata* (sword bean), *Glycine max* (soybean), *Indigofera hirsuta* (hairy indigo), *Lablab purpureus* (hyacinth bean), *Macroptilium lathyroides* (syn. Phaseolus lathyroides (phasey bean)), *Medicago lupulina* (black medick), *Medicago sativa* (lucerne), *Mucuna pruriens* (velvet bean), *Phaseolus* spp. (beans), *Phaseolus vulgaris* (common bean), *Pueraria montana var. lobata* (kudzu), *Sesbania exaltata* (coffeebean (USA)), *Trifolium repens* (white clover), *Vicia angustifolia* (Narrowleaf vetch), *Vigna umbellata* (rice bean), *Vigna unguiculata* (cowpea).

[290] UF (2020).

[291] Sullivan and Molet (2007).

[293] Algeria, Egypt, Ethiopia, Libya, Morocco, Azerbaijan, China, India, Iran, Iraq, Israel, Japan (Hokkaido), Kazakhstan, North Korea, Saudi Arabia, Syria, Turkey, Uzbekistan, Albania, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Faroe Islands, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Moldova, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Serbia, Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		maize, cotton, cowpea, common bean, field pea, soybean, sunflower, wheat.		plants, plant products (e.g. vegetables, cut flowers) [292], or hitchhiking are the most likely pathways for long distance spread.						
Bucculatrix thurberiella	American cotton leaf perforator	*Gossypium* spp. (cotton).	Leaves.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, or hitchhiking are the most likely pathways for long distance spread.	United States of America (Arizona, California, New Mexico, Texas, western Louisiana), Mexico, Central America, Colombia, Venezuela, Paraguay, Peru, Brazil. [294]	LOW	HIGH	HIGH	LOW [295]	**VERY LOW**
Chrysodeixis includens	Soybean looper	Wide host range [296] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Leaves, flowers, pods, fruit (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or	Bermuda, Canada, Costa Rica, Cuba, Honduras, Nicaragua, Puerto Rico, United States of America,	LOW	HIGH	MEDIUM	LOW	**VERY LOW**

[292] Venette et al. (2003).

[294] Smith and Flint (1977).

[295] Economic impact would likely be higher for conventional cotton. In the past, *Bucculatrix thurberiella* has caused significant defoliation to cotton, particularly when the cultural practice of growing 'stub cotton' was used which facilitated the build-up of economically significant *B. thurberiella* populations (Smith & Flint, 1977).

[296] *Abelmoschus esculentus* (okra), *Allium sativum* (garlic), *Amaranthus* spp. (amaranth), *Amaranthus deflexus* (perennial pigweed), *Amaranthus hybridus* (smooth pigweed), *Amaranthus spinosus* (spiny amaranth), *Ananas comosus* (pineapple), *Apium graveolens* (celery), *Arachis hypogaea* (peanut), *Asparagus officinalis* (asparagus), *Aster* spp., *Begonia* spp., *Bidens pilosa* (blackjack), *Brassica napus var. oleifera, Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea var. italica* (broccoli), *Brassica oleracea var. viridis* (collards), *Cajanus cajan* (pigeon pea), *Calendula officinalis* (Pot marigold), *Capsicum annuum* (bell pepper), *Celosia argentea* (celosia), *Chenopodium album* (fat hen), *Chrysanthemum* spp. (daisy), *Citrullus lanatus* (watermelon), *Crotalaria spectabilis* (showy rattlepod), *Cucumis sativus* (cucumber), *Cyamopsis tetragonoloba* (guar), *Cyphomandra betacea* (tree tomato), *Daucus carota* (carrot), *Dianthus caryophyllus* (carnation), *Eruca vesicaria* (purple-vein rocket), *Eryngium foetidum, Eupatorium* spp., *Euphorbia pulcherrima* (poinsettia), *Fevillea cordifolia, Geranium* spp. (cranesbill), *Gerbera jamesonii* (African daisy), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Hibiscus rosa-sinensis* (China-rose), *Hydrangea* spp. (hydrangeas), *Impatiens walleriana* (busy lizzy), *Ipomoea batatas* (sweetpotato), *Ixora coccinea* (flame-of-the-woods), *Lactuca sativa* (lettuce), *Lantana* spp., *Lepidium virginicum* (Virginian peppercress), *Lolium perenne* (perennial ryegrass), *Manihot esculenta* (cassava), *Matthiola incana* (stock), *Medicago sativa* (lucerne), *Mentha* spp. (mints), *Mentha arvensis var. piperascens* (Japanese mint), *Mentha spicata* (spear mint), *Nasturtium officinale* (watercress), *Nicotiana rustica* (wild tobacco), *Nicotiana tabacum* (tobacco), *Passiflora edulis* (passionfruit), *Peperomia obtusifolia* (pepper-face), *Persea americana* (avocado), *Phaseolus* spp. (beans), *Phaseolus lunatus* (lima bean), *Phaseolus vulgaris* (common bean), *Philodendron* spp., *Phyllanthus urinaria* (leafflower), *Physalis* spp. (groundcherry), *Pisum sativum* (pea), *Portulaca grandiflora* (rose moss), *Portulaca oleracea* (purslane), *Pueraria montana var. lobata* (kudzu), *Rumex* spp. (dock), *Rumex crispus* (curled dock), *Saccharum officinarum* (sugarcane), *Saintpaulia ionantha* (African violet), *Schefflera actinophylla* (umbrella tree), *Senecio bicolor* (dusty miller), *Sida rhombifolia, Solanum* spp. (nightshade), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Solidago* spp. (goldenrod), *Sonchus* spp. (sowthistle), *Sonchus oleraceus* (common sowthistle), *Sorghum bicolor* (sorghum), *Stictocardia tiliifolia* (spottedheart), *Triticum aestivum* (wheat), *Urera baccifera, Verbena* spp. (vervain), *Vicia faba* (faba bean), *Vigna unguiculata* (cowpea), *Xanthium strumarium* (common cocklebur), *Zea mays* (maize).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				hitchhiking are the most likely pathways for long distance spread.	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Peru.					
Cryptoblabes gnidiella	Citrus pyralid	Wide host range [297] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Above ground plant parts (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products (e.g. fruit), or hitchhiking are the most likely pathways for long distance spread.	Egypt, Liberia, Morocco, Nigeria, Sierra Leone, South Africa, Zimbabwe, India, Israel, Lebanon, Malaysia, Pakistan, Thailand, Turkey, Austria, Cyprus, France, Greece, Italy, Malta, Portugal, Spain, Ukraine, Bermuda, United States of America (Hawaii), New Zealand, Brazil, Uruguay.	MEDIUM	MEDIUM	HIGH	LOW	**VERY LOW**
Dichagyris herculea (syn. *Ochropleura herculea*)	Climbing cut worm	*Zea mays* (maize), wheat, chickpea, safflower, finger millet, chillies, tobacco, cotton, castor, onion, eggplant.	Foliage (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	India.	VERY LOW	MEDIUM	MEDIUM	LOW	**NEGLIGIBLE**
Diparopsis watersi (syn. *Diparopsis castanea*)	Sudan boll worm	*Gossypium* spp. (cotton).	Bolls.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated	Widespread in	LOW	HIGH	HIGH	LOW [299]	**VERY**

[297] *Actinidia* spp., *Allium sativum* (garlic), *Annona muricata* (soursop), *Averrhoa* spp., *Citrus limon* (lemon), *Citrus reticulata* (mandarin), *Citrus sinensis* (sweet orange), *Citrus x paradisi* (grapefruit), *Coffea* spp. (coffee), *Diospyros kaki* (persimmon), *Eriobotrya japonica* (loquat), *Fatsia japonica* (Japanese aralia), *Feijoa* (fejoia), *Ficus* spp., *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Khaya senegalensis* (dry zone mahogany), *Malus* spp. (ornamental species apple), *Mangifera indica* (mango), *Mespilus* (medlar), *Morella faya* (firetree), *Morus alba* (white mulberry), *Nephelium lappaceum* (rambutan), *Nerium oleander* (oleander), *Oryza sativa* (rice), *Osmanthus* spp., *Paspalum dilatatum* (dallisgrass), *Pennisetum* spp. (feather grass), *Persea americana* (avocado), *Phaseolus* spp. (beans), *Philodendron* spp., *Pinus pinea* (stone pine), *Prunus* spp. (stone fruit), *Punica granatum* (pomegranate), *Pyrus* spp. (pears), *Quercus* spp. (oaks), *Ricinus communis* (castor bean), *Saccharum officinarum* (sugarcane), *Schinus terebinthifolius* (Brazilian pepper tree), *Solanum melongena* (aubergine), *Sorghum bicolor* (sorghum), *Swietenia* (mahogany), *Vitis vinifera* (grapevine), *Zea mays* (maize).

[299] Economic impact is considered LOW for Bt cotton, but potentially HIGH for conventional cotton varieties.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				pathways) of infested plants, or hitchhiking are the most likely pathways for long distance spread.	Africa. [298]					**LOW** [300]
Earias biplaga	Spiny bollworm	Hosts [301] predominantly within Malvaceae including *Gossypium* spp. (cotton).	Bolls, stems, enclosed areas.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Widespread in Africa [302]	LOW	HIGH	HIGH	LOW [303]	**VERY LOW** [304]
Earias cupreoviridis	Cotton green moth	*Abelmoschus esculentus* (okra), *Abelmoschus moschatus* (musk mallow), *Corchorus* spp. (jutes), *Corchorus capsularis* (white jute), *Gossypium* spp. (cotton), *Hibiscus cannabinus* (kenaf).	Bolls, stems, enclosed areas.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Located in parts of Africa and Asia. [305]	LOW	HIGH	HIGH	LOW [303]	**VERY LOW** [304]
Elasmopalpus lignosellus	Lesser corn stalk borer	Wide host range including wheat, oat, rye, peanut, pigeon pea,	Larvae initially feed on leaves and pods, moving to lower	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated	Barbados, Bermuda, Costa Rica, Cuba, El Salvador, Guatemala,	LOW	HIGH	HIGH	LOW	**VERY LOW**

[298] Benin, Botswana, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Eritrea, Eswatini, Ethiopia, Ghana, Malawi, Mali, Mozambique, Nigeria, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Zambia, Zimbabwe.

[300] Overall risk is VERY LOW for Bt cotton, but up to MEDIUM for conventional cotton varieties.

[301] *Abelmoschus esculentus* (okra), *Abutilon* spp. (Indian mallow), *Abutilon indicum* (Indian lantern flower), *Alcea rosea* (hollyhock), *Ceiba pentandra* (kapok), *Cienfuegosia* spp., *Gossypium* spp. (cotton), *Hibiscus* spp. (rosemallows), *Hibiscus cannabinus* (kenaf), *Hibiscus rosa-sinensis* (China-rose), *Hibiscus sabdariffa* (roselle), *Sida* spp., *Theobroma cacao* (cocoa), *Urena lobata* (caesar weed), *Vernonia* spp., *Waltheria indica*.

[302] Angola, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Congo (DRC), Côte d'Ivoire, Egypt, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, São Tomé and Príncipe, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe, Israel.

[303] Economic impact is considered LOW for Bt cotton, but potentially HIGH for conventional cotton varieties.

[304] Overall risk is VERY LOW for Bt cotton, but up to MEDIUM for conventional cotton varieties.

[305] Central African Republic, Congo (DRC), Ethiopia, Kenya, Madagascar, Mauritius, Niger, Nigeria, Sudan, Tanzania, Uganda, China, India (Karnataka), Israel, Pakistan, South Korea, Vietnam.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		soybean, common bean, cotton [306], rice, sugarcane, cowpea, wheat, maize, sorghum, linseed (flax).	stems and roots causing wilting, stunting and sometimes plant death.	pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Jamaica, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, Virgin Islands, United States of America, Argentina, Bolivia, Brazil, Chile, Colombia, French Guiana, Guyana, Paraguay, Peru, Uruguay, Venezuela.					
Estigmene acrea	Salt marsh caterpillar	Vegetables and field crops including lucerne, cotton, soybean, common bean, field pea, maize, canola, sugar beet and clover.	Leaves (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, United States of America, Colombia.	LOW	MEDIUM	MEDIUM	LOW [307]	**VERY LOW**
Feltia subterranea	Granulate cutworm	Wide host range [308] including *Gossypium* spp. (cotton).	Larvae damage seedlings by cutting off the stem at the soil surface. On older plants, larvae feed on foliage, and fruit (externally, or internally).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Barbados, Bermuda, Cuba, Dominica, Dominican Republic, Honduras, Jamaica, Mexico, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, United States of America, Chile, Venezuela, Costa Rica, Panama, Colombia, Brazil, Uruguay.	LOW	HIGH	HIGH	LOW	**VERY LOW**

[306] EFSA (2021).

[307] *Estigmene acrea* is an occasional pest of cotton in the United States of America (Kerns & Kesey, 2009). *Bt* cotton is very resistant to feeding by neonate and fourth-instar saltmarsh caterpillars (Kerns & Kesey, 2009).

[308] *Allium* spp., *Beta vulgaris var. saccharifera* (sugarbeet), *Capsicum annuum* (bell pepper), *Daucus carota* (carrot), *Gossypium* spp. (cotton), *Manihot esculenta* (cassava), *Nicotiana tabacum* (tobacco), *Phaseolus* spp. (beans), *Saccharum officinarum* (sugarcane), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Spinacia oleracea* (spinach), *Zea mays* (maize).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Helicoverpa armigera (exotic and Bt tolerant strains/biotypes)	Cotton bollworm; African boll worm	Wide host range including cotton, maize, chickpea, lucerne, soybean, peanuts.	Above ground plant parts.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, hitchhiking or natural dispersal may facilitate long distance spread.	Widespread in Asia, Africa, Europe, Oceania, and South America. [309]	MEDIUM	HIGH	HIGH	MEDIUM [310]	**MEDIUM**
Helicoverpa zea	American cotton bollworm [311]; Corn earworm	Wide host range including cotton, pigeon pea, capsicum, soybean, sunflower, common bean, tomato, sorghum, maize, peanut, chickpea, millet, cowpea.	Above ground plant parts.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance dispersal.	Widespread in North America, Central America, the Caribbean, and South America. [312]	MEDIUM	HIGH	HIGH	HIGH [313]	**HIGH**
Heliothis peltigera	Bordered straw	Various including safflower, cotton,	Leaves, bracts, flowers/florets	Flying (adults) allows for local dispersal. Introduction	Algeria, Chad, Egypt, Eritrea, Gambia, Libya,	MEDIUM	MEDIUM	MEDIUM	MEDIUM	**LOW**

[309] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC, ROC), Democratic Republic of the, Côte d'Ivoire, Egypt, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Morocco, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, Saint Helena, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe, Afghanistan, Armenia, Azerbaijan, Bangladesh, Bhutan, Brunei, Cambodia, China, Cocos Islands, Georgia, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Laos, Lebanon, Malaysia, Myanmar, Nepal, North Korea, Pakistan, Philippines, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Vietnam, Yemen, Europe, Albania, Austria, Belgium, Bulgaria, Cyprus, Federal Republic of Yugoslavia (former), Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Malta, Moldova, Montenegro, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, Puerto Rico, American Samoa, Federated States of Micronesia, Fiji, Guam, Kiribati, Marshall Islands, New Caledonia, New Zealand, Norfolk Island, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Argentina, Brazil, Paraguay, Peru, Uruguay.

[310] Stable but higher than expected levels of resistance in *Helicoverpa armigera* remains a concern to cotton production in Australia. Resistance to Bollgard II is typically managed through restricting planting windows, pupae busting and planting refuge crops. The introduction of Bollgard III (Cry1Ac, Cry2Ab and Vip3A) has provided a more robust resistance management tool for Australian cotton growers due to the different modes of action (i.e. not cross-resistant). Field populations are also resistant to numerous insecticide groups (Joußen et al., 2012; Mahon et al., 2012; Qi et al., 2021; Windus et al., 2021). Subsequently, ongoing monitoring and management of Bt and insecticide resistance is required. The introduction of exotic strains, particularly with Bt and/or insecticide resistance could pose a significant threat to cotton production in Australia and the ongoing management of *Helicoverpa armigera* and other lepidopteran pests.

[311] *Helicoverpa zea* and *H. armigera* can hybridise (with some reproductive constraints) which could allow events of interspecific gene flow, particularly at high population levels (Rios et al., 2022).

[312] 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.

[313] *Helicoverpa zea* (and *H. armigera*) has also shown reduced susceptibility to groups of insecticides including carbamates, organophosphates, pyrethroids, and *Bacillus thuringiensis* proteins (e.g. Cry1A, Cry2A) (da Silva et al., 2020; Rios et al., 2022). Potential changes in the susceptibility of *H. armigera* and *H. zea* to conventional insecticides and *Bt* cotton technologies could pose a significant threat to agriculture in areas with established populations of these species or their potential hybrids.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		sunflower, soybean, maize, chickpea, peanut, cowpea, lentil, linseed (flax), sorghum, wheat.	(larvae).	(regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Mauritania, Morocco, Niger, Somalia, Tunisia, India, Iran, Israel, Lebanon, Syria, Turkey, Bulgaria, France, Italy, Greece, Russia, China, Laos.					
Heliothis virescens (syn. *Helicoverpa viriscens*)	Tomato budworm	Wide host range including cotton, chickpea, maize, sunflower, flax, common beans, pigeon pea, tobacco, tomato, sweetpotato, peanuts, soybean, field pea, sorghum, common vetch.	Bolls, squares.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Widespread in North America, Central America, the Caribbean, and South America. [314]	MEDIUM	HIGH	HIGH	MEDIUM [315]	**MEDIUM**
Heliothis viriplaca	Flax budworm	*Cicer arietinum* (chickpea), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Lens culinaris* subsp. *culinaris* (lentil), *Medicago sativa* (lucerne), *Phaseolus vulgaris* (common bean), *Zea mays* (maize).	Above ground plant parts (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Europe (widespread), United Kingdom, North Africa, Syria, Israel, Tajikistan, Turkey, Uzbekistan, India, Myanmar, Russia, China, Japan, Korea.	LOW	LOW	LOW	LOW	**NEGLIGIBLE**
Loxostege sticticalis	Beet webworm	Wide host range including peanut, faba bean, wheat, maize, sunflower, soybean, canola, cotton, onion, beets, cucumber, carrot,	Foliage, tender stems, growing points (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most	China, Kazakhstan, Mongolia, Tajikistan, Turkmenistan, Bulgaria, Italy, Lithuania, Netherlands, Romania, Russia, Serbia, Ukraine,	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[314] Antigua and Barbuda, Bahamas, Barbados, Bermuda, Canada, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, 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, French Guiana, Guyana, Paraguay, Peru, Uruguay, Venezuela.

[315] *Heliothis virescens* is purportedly susceptible to *Bt* cotton (Adamczyk Jr. & Hubbard, 2006). Conventional cotton may experience more damage if *Heliothis virescens* established in Australia.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		linseed (flax), lucerne, potato, field pea, oat, sorghum.		likely pathways for long distance spread.	Canada, United States of America.					
Mussidia nigrivenella	Cob borer	Wide host range [316] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Cobs, bolls, pods, seed/grain, stored grain (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Benin, Cameroon, Congo (DRC, ROC), Côte d'Ivoire, Ghana, Kenya, Mali, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Tanzania, Togo.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Orgyia leucostigma	White-marked tussock moth	Wide host range [317] including *Gossypium herbaceum* (Levant cotton).	Foliage (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested	Canada, United States of America.	LOW	HIGH	HIGH	LOW	**VERY LOW**

[316] *Adansonia digitata* (baobab), *Bauhinia thonningii* (wild bauhinia), *Canavalia* spp. (jackbean), *Canavalia ensiformis* (jack bean), *Cola acuminata* (cola), *Cola cordifolia, Detarium microcarpum, Gardenia sokotensis, Gardenia ternifolia, Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Mucuna* spp. (velvet beans), *Mucuna pruriens* (velvet bean), *Musa* spp. (banana), *Parkia biglobosa* (néré), *Phaseolus lunatus* (lima bean), *Physostigma venenosum, Psophocarpus tetragonolobus* (winged bean), *Sesbania herbacea, Tamarindus indica* (tamarind), *Tephrosia candida* (white tephrosia), *Theobroma cacao* (cocoa), *Vigna unguiculata* (cowpea), *Vitellaria paradoxa* (shea tree), *Ximenia americana* (hog plum), *Zea mays* (maize).

[317] *Abies balsamea* (balsam fir), *Acer negundo* (box elder), *Acer platanoides* (Norway maple), *Acer rubrum* (red maple), *Acer saccharinum* (silver maple), *Acer saccharum* (sugar maple), *Aesculus flava* (yellow buckeye), *Aesculus glabra* (Texas buckeye), *Aesculus hippocastanum* (horse chestnut), *Ailanthus altissima* (tree-of-heaven), *Albizia julibrissin* (silk tree), *Alnus serrulata, Amelanchier canadensis* (thicket serviceberry), *Asimina triloba* (Pawpaw-apple), *Berberis canadensis* (American barberry), *Berberis vulgaris* (European barberry), *Betula lenta* (sweet birch), *Betula nigra* (river birch), *Betula papyrifera* (paper birch), *Betula pubescens* (Downy birch), *Buxus sempervirens* (common boxwood), *Campsis radicans* (trumpetcreeper), *Carpinus caroliniana* (American hornbeam), *Carya illinoinensis* (pecan), *Castanea dentata* (American chestnut), *Castanea pumila* (Allegheny chinquapin), *Catalpa bignonioides* (Southern catalpa), *Catalpa speciosa* (hardy catalpa), *Celtis occidentalis* (hackberry), *Cephalanthus occidentalis* (common buttonbush), *Cercis canadensis* (eastern redbud), *Chamaecyparis thyoides* (Atlantic white cedar), *Chenopodium album* (fat hen), *Chionanthus virginicus* (white fringe tree), *Cornus alternifolia* (pagoda dogwood), *Cornus florida* (Flowering dogwood), *Corylus americana* (American hazel), *Cotinus coggygria* (fustet), *Crataegus crus-galli* (Cockspur hawthorn), *Cydonia oblonga* (quince), *Diospyros kaki* (persimmon), *Diospyros virginiana* (common persimmon), *Euonymus atropurpureus* (purple spindle), *Fagus grandifolia* (American beech), *Ficus carica* (common fig), *Fraxinus americana* (white ash), *Fraxinus excelsior* (ash), *Geranium maculatum* (spotted geranium), *Gleditsia triacanthos* (honey locust), *Gordonia lasianthus, Gossypium herbaceum* (Levant cotton), *Gymnocladus dioicus* (Kentucky coffeetree), *Hamamelis virginiana* (Virginian witch-hazel), *Hibiscus syriacus* (shrubby Althaea), *Hibiscus trionum* (Venice mallow), *Humulus lupulus* (hop), *Ilex opaca* (American holly), *Ipomoea purpurea* (tall morning glory), *Iris* spp. (irises), *Jasminum* spp. (jasmine), *Juglans cinerea* (butternut), *Juglans nigra* (black walnut), *Juglans regia* (walnut), *Juniperus virginiana* (eastern redcedar), *Larix decidua* (common larch), *Larix laricina* (American larch), *Ligustrum vulgare* (common privet), *Liquidambar styraciflua* (Sweet gum), *Liriodendron tulipifera* (tuliptree), *Lonicera japonica* (Japanese honeysuckle), *Maclura pomifera* (osage orange), *Magnolia virginiana* (sweet bay), *Malus domestica* (apple), *Malva* spp. (mallow), *Morus rubra* (red mulberrytree), *Myrica pensylvanica* (northern bayberry), *Nyssa sylvatica* (tupelo), *Ostrya virginiana* (American hophornbeam), *Oxydendrum arboreum* (sourwood), *Parthenocissus quinquefolia* (Virginia creeper), *Paulownia tomentosa* (paulownia), *Picea glauca* (white spruce), *Pinus strobus* (eastern white pine), *Plantago* spp. (Plantain), *Platanus occidentalis* (sycamore), *Poa pratensis* (smooth meadow-grass), *Populus alba* (silver-leaf poplar), *Populus balsamifera* (balm of Gilead), *Populus deltoides* (poplar), *Populus fremontii* (Fremont cottonwood), *Populus nigra* (black poplar), *Populus tremuloides* (trembling aspen), *Prunus americana* (American plum), *Prunus armeniaca* (apricot), *Prunus avium* (sweet cherry), *Prunus cerasus* (sour cherry), *Prunus domestica* (plum), *Prunus ilicifolia* (holly-leaved cherry), *Prunus persica* (peach), *Prunus salicina* (Japanese plum), *Prunus virginiana* (common chokecherrytree), *Pyracantha coccinea* (scarlet firethorn), *Pyrus communis* (European pear), *Quercus alba* (white oak), *Quercus coccinea* (scarlet oak), *Quercus laurifolia* (Laurel oak), *Quercus montana* (basket oak), *Quercus nigra* (water oak), *Quercus phellos* (Willow oak), *Quercus rubra* (northern red oak).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				plants, plant products, or hitchhiking are the most likely pathways for long distance spread.						
Ostrinia nubilalis	European maize borer	Wide host range [318] including *Gossypium* spp. (cotton).	Above ground plant parts.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Widespread in Europe, north Africa and North America. [319]	MEDIUM	MEDIUM	HIGH	LOW [320]	**LOW**
Pardoxia graellsii (syn. *Acontia graellsii*)	Yellow drab	*Althaea officinalis*, *Lavatera olbia* and *Gossypium* spp.	Leaves.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	France, Spain, Turkey, Iraq, China, India, Myanmar, Cape Verde, the Comoros, Ethiopia, Ghana, Réunion, Madagascar, Malawi, Mauritania, Mauritius, Nigeria, Saudi Arabia, Sierra Leone, South Africa, Gambia, Yemen, Zimbabwe.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Platynota stultana	Omnivorous	Wide host range [321]	Leaves,	Flying (adults) allows for	Spain, Mexico, United	LOW	HIGH	HIGH	MEDIUM	**LOW**

[318] *Amaranthus* spp. (amaranth), *Amaranthus retroflexus* (redroot pigweed), *Arctium minus* (common burdock), *Artemisia vulgaris* (mugwort), *Avena sativa* (oats), *Capsicum* spp. (peppers), *Capsicum annuum* (bell pepper), *Chrysanthemum* spp. (daisy), *Cynara cardunculus var. scolymus* (globe artichoke), *Datura stramonium* (jimsonweed), *Echinochloa crus-galli* (barnyard grass), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Hordeum vulgare* (barley), *Humulus lupulus* (hop), *Malus domestica* (apple), *Pennisetum glaucum* (pearl millet), *Phaseolus vulgaris* (common bean), *Poaceae* (grasses), *Populus* spp. (poplars, aspens, cottonwoods), *Prunus persica* (peach), *Setaria italica* (foxtail millet), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Sorghum bicolor* (sorghum), *Sorghum halepense* (Johnson grass), *Triticum aestivum* (wheat), *Xanthium* spp. (cocklebur), *Zea mays* (maize), *Zea mays subsp. mays* (sweetcorn).

[319] Algeria, Egypt, Libya, Morocco, Tunisia, China, Georgia, Iran, Israel, Lebanon, Syria, Turkey, Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia (western), Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom (England), Canada, United States of America.

[320] Mostly a pest of maize but also affects other hosts such as cotton. Pest of cotton in North Carolina but *Ostrinia nubilalis* tends to be controlled by Bt insecticidal proteins.

[321] *Actinidia arguta* (tara vine), *Albizia* spp., *Amaranthus* spp. (amaranth), *Ambrosia* spp. (ragweed), *Annona cherimola* (cherimoya), *Apium graveolens* (celery), *Arachis* spp., *Aster* spp., *Beta vulgaris* (beetroot),

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
	leafroller	including *Gossypium* spp. (cotton).	flowers/inflorescence, fruit (larvae).	local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products or hitchhiking are the most likely pathways for long distance spread.	States of America.					
Spodoptera cosmioides	Black armyworm [322]	Wide host range (40 different plant families; ~126 species) [323] including cotton, soybean, grains, rice, pineapple, onion, tomato.	Leaves (defoliation), reproductive tissues/fruit (feeding injury). When stressed (e.g. lack of food), *Spodoptera cosmioides* consumes apical parts of branches, bores into stem tissues, and can attack plant roots that are near the soil surface.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products or hitchhiking are the most likely pathways for long distance spread.	South America.	LOW	HIGH	HIGH	MEDIUM	**LOW**

Capsicum annuum (bell pepper), *Chenopodium album* (fat hen), *Chrysanthemum* spp. (daisy), *Citharexylum spinosum*, *Citrus* spp., *Citrus limon* (lemon), *Citrus maxima* (pummelo), *Citrus reticulata* (mandarin), *Citrus sinensis* (sweet orange), *Cotoneaster* spp., *Cyclamen* spp., *Dianthus caryophyllus* (carnation), *Ebenaceae*, *Eucalyptus* spp., *Gardenia* spp., *Ginkgo* spp., *Glycine max* (soybean), *Gossypium* spp. (cotton), *Juglans regia* (walnut), *Juniperus* spp. (junipers), *Malus* spp. (ornamental species apple), *Malva* spp. (mallow), *Medicago sativa* (lucerne), *Mentha* spp. (mints), *Pelargonium* spp. (pelargoniums), *Persea americana* (avocado), *Phaseolus* spp. (beans), *Pinus* sp. (pine), *Poaceae* (grasses), *Portulaca grandiflora* (rose moss), *Prunus persica* (peach), *Punica granatum* (pomegranate), *Pyrus* spp. (pears), *Ribes* spp. (currants), *Rosa* spp. (roses), *Rubus* spp. (blackberry, raspberry), *Senecio* spp. (groundsel), *Solanum lycopersicum* (tomato), *Sorghum bicolor* (sorghum), *Taxus* spp. (yew), *Theaceae*, *Trifolium* spp. (clovers), *Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine), *Zea mays* (maize).

[322] Silva et al. (2017); Freitas et al. (2019); Araujo and Carlos (2020); Machado et al. (2020); Rabelo et al. (2020).

[323] Freitas et al. (2019).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
Spodoptera eridania	Southern armyworm	Wide host range [324] including *Gossypium* spp. (cotton) such as *Gossypium herbaceum* (Levant cotton), and *Gossypium hirsutum* (upland cotton).	Leaves, fruit.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long distance spread.	Widespread in North America, Central America, the Caribbean, South America and parts of Africa and Asia. [325]	LOW	HIGH	HIGH	MEDIUM [326]	**LOW**
Spodoptera frugiperda (exotic strains)	Fall army worm (FAW)	Wide host range (i.e. over 350 host plants) including cotton, peanut, soybean, lucerne, cereals.	Leaves, bolls, squares, flowers.	Flying (adults) allows for local dispersal. Natural dispersal could occur through northern Australia. Introduction (regulated or	Widespread in Africa, Asia, Oceania, North America, Central America, the Caribbean,	LOW	HIGH	HIGH	MEDIUM [328]	**LOW**

[324] *Abelmoschus esculentus* (okra), *Achyranthes aspera* (devil's horsewhip), *Alcea rosea* (hollyhock), *Allium cepa* (onion), *Allium fistulosum* (Welsh onion), *Allium sativum* (garlic), *Alpinia purpurata* (red ginger), *Amaranthus* spp. (amaranth), *Amaranthus deflexus* (perennial pigweed), *Amaranthus hybridus* (smooth pigweed), *Amaranthus quitensis*, *Amaranthus retroflexus* (redroot pigweed), *Amaranthus spinosus* (spiny amaranth), *Amaranthus viridis* (slender amaranth), *Antirrhinum majus* (snapdragon), *Apium graveolens* (celery), *Arachis hypogaea* (peanut), *Artemisia absinthium* (wormwood), *Asparagus officinalis* (asparagus), *Beta* spp., *Beta vulgaris* (beetroot), *Beta vulgaris var. cicla*, *Bidens pilosa* (blackjack), *Brassica napus var. oleifera*, *Brassica nigra* (black mustard), *Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea var. capitata* (cabbage), *Brassica oleracea var. viridis* (collards), *Camellia japonica* (camellia), *Capsicum annuum* (bell pepper), *Carica papaya* (pawpaw), *Cecropia peltata* (trumpet tree), *Centrosema pubescens* (centro), *Chenopodium quinoa* (quinoa), *Chrysanthemum morifolium* (chrysanthemum), *Cicer arietinum* (chickpea), *Citharexylum fruticosum*, *Citrullus lanatus* (watermelon), *Citrus* spp., *Citrus limon* (lemon), *Citrus sinensis* (sweet orange), *Coffea arabica* (arabica coffee), *Commelina diffusa* (spreading dayflower), *Conyza bonariensis* (hairy fleabane), *Conyza canadensis* (Canadian fleabane), *Coriandrum sativum* (coriander), *Crotalaria spectabilis* (showy rattlepod), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita maxima* (giant pumpkin), *Cynodon nlemfuensis* (African Bermuda-grass), *Daucus carota* (carrot), *Dianthus* spp. (carnation), *Dianthus caryophyllus* (carnation), *Digitaria* (crabgrass), *Digitaria ischaemum*, *Digitaria sanguinalis* (large crabgrass), *Dioscorea* spp. (yam), *Dioscorea batatas* (Chinese yam), *Eclipta prostrata* (eclipta), *Eucalyptus* spp., *Fragaria vesca* (wild strawberry), *Geranium* (cranesbill), *Gerbera jamesonii* (African daisy), *Gladiolus hybrids* (sword lily), *Glycine max* (soybean), *Gonzalagunia spicata*, *Gossypium* spp. (cotton), *Gossypium herbaceum* (Levant cotton), *Gossypium hirsutum* (upland cotton), *Hamelia patens*, *Helianthus* spp. (sunflower), *Helianthus annuus* (sunflower), *Hibiscus cannabinus* (kenaf), *Hibiscus rosa-sinensis* (China-rose), *Impatiens walleriana* (busy lizzy), *Ipomoea batatas* (sweetpotato), *Ipomoea purpurea* (tall morning glory), *Lactuca sativa* (lettuce), *Lagerstroemia indica* (Indian crape myrtle), *Laportea aestuans*, *Lavandula angustifolia* (lavender), *Leucaena leucocephala* (leucaena), *Linum usitatissimum* (flax), *Lolium perenne* (perennial ryegrass), *Lonicera japonica* (Japanese honeysuckle), *Ludwigia* spp. (waterprimrose), *Malus domestica* (apple), *Malva parviflora* (small-flowered mallow; pink cheeseweed), *Manihot esculenta* (cassava), *Medicago sativa* (lucerne), *Melinis minutiflora* (molasses grass), *Melissa officinalis* (Lemon balm), *Mentha* spp. (mints), *Mentha arvensis* (corn mint), *Mentha arvensis var. piperascens* (Japanese mint), *Mentha piperita* (peppermint), *Mentha spicata* (spear mint), *Mimosa pudica* (sensitive plant), *Mimosa scabrella*, *Morus alba* (white mulberry), *Mucuna pruriens* (velvet bean), *Musa* spp. (banana), *Nasturtium officinale* (watercress), *Nerium oleander* (oleander), *Neurolaena lobata*, *Nicotiana alata* (sweet-scented tobacco), *Nicotiana tabacum* (tobacco).

[325] Benin, Cameroon, Gabon, Nigeria, India, 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.

[326] Southern armyworm larvae have lower susceptibility to Cry1Ac and Cry1F than to Cry2A Bt toxins which is consistent with data reported for other armyworms such as S. exigua, S. cosmioides, S. frugiperda (Rabelo et al., 2020).

[328] Whole genome analyses of invasive Fall Army Worm (FAW) populations from various African nations, India, China, Southeast Asia, and Australia suggests that a high proportion of FAW individuals are hybrids of the C- and R-strains. Bt and insecticide resistance profiles between FAW populations within Australia appear to differ. Novel resistance traits (i.e. local or exotic) in populations of FAW could create new resistance and management challenges. Movements of FAW into new or established ranges could lead to as yet unknown and complex gene flow patterns that could significantly hinder the development of suitable pest and resistance management strategies for this global pest complex (Tay et al., 2022 - pre-print).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
				unregulated pathways) of infested plants, plant products or hitchhiking are the most likely pathways for long distance spread.	and South America. [327]					
Spodoptera latifascia	Lateral lined armyworm; Velvet armyworm [329]	Wide host range [330] including *Gossypium* spp. (cotton).	Above ground plant parts (larvae).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products or hitchhiking are the most likely pathways for long distance spread.	Antigua and Barbuda, Barbados, Belize, Cayman Islands, Cuba, Dominica, Honduras, Jamaica, Mexico, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Argentina, Brazil, Ecuador, French Guiana, Guyana, Venezuela, United States of America.	LOW	HIGH	HIGH	LOW	**VERY LOW**
Spodoptera littoralis	Cotton leafworm	Wide host range including peanuts, soybean, sunflower, common bean, lucerne, field pea, faba bean, mung bean, maize, wheat, sorghum, black	Larvae feed on leaves, buds, fruit, seeds, and stems (occasionally).	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products, or hitchhiking are the most likely pathways for long	Widespread in Africa, central and southern Asia and parts of	LOW	HIGH	HIGH	MEDIUM [332]	**LOW**

[327] Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo (DRC, ROC), Côte d'Ivoire, Egypt, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe, Bangladesh, Bhutan, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Israel, Japan, Jordan, Laos, Macau, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Saudi Arabia, South Korea, Sri Lanka, Syria, Thailand, United Arab Emirates, Vietnam, Yemen, Cyprus, Spain, Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Canada, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, 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, New Caledonia, New Zealand, Norfolk Island, Papua New Guinea, Solomon Islands, Timor-Leste, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.

[329] UF (2016).

[330] *Arachis hypogaea* (peanut), *Avena sativa* (oats), *Capsicum annuum* (bell pepper), *Daucus carota* (carrot), *Eucalyptus* spp., *Glycine max* (soybean), *Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Hordeum vulgare* (barley), *Ipomoea batatas* (sweetpotato), *Lolium perenne* (perennial ryegrass), *Nicotiana tabacum* (tobacco), *Phaseolus* spp. (beans), *Secale cereale* (rye), *Solanum lycopersicum* (tomato), *Sorghum bicolor* (sorghum), *Triticum aestivum* (wheat), *Zea mays* (maize).

[332] Britz et al. (2020).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		gram, cowpea, and cotton.		distance spread.	Europe. [331]					
Thaumatotibia leucotreta (syn. *Cryptophlebia leucotreta*)	False codling moth	Wide host range including avocado, citrus, cotton, macadamia, stone fruit, common bean, sorghum, maize, cowpea, lima bean.	Fruit/pods, ears, panicles, bolls.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants, plant products (e.g. fruit), or hitchhiking are the most likely pathways for long distance spread.	Widespread in Africa. [333]	LOW	HIGH	HIGH	HIGH [334]	**MEDIUM**
Trichoplusia ni	Cabbage semi looper	Wide host range (over 160 species) including cotton, crucifers, beans, and various vegetable crops. Cultivated crucifers are preferred hosts.	Leaves.	Flying (adults) allows for local dispersal. Introduction (regulated or unregulated pathways) of infested plants or hitchhiking are the most likely pathways for long distance spread.	North America, Central America, the Caribbean, South America, Asia, Africa and Europe. [335]	MEDIUM	HIGH	HIGH	LOW	**LOW**
Orthoptera (grasshoppers, locusts, crickets and katydids)										
Anacridium aegyptium	Red-spined tree locust	Wide host range including *Gossypium* spp. (cotton), *Prosopis juliflora* (mesquite),	Leaves, grains.	Capable of flight which facilitates local/regional dispersal. Gregarious phases and swarming may	Europe (particularly southern/Mediterranean region), United Kingdom, Africa,	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[331] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo (DRC, ROC), 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, India, Iran, Iraq, Israel, Jordan, Lebanon, Oman, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen, Cyprus, France, Greece, Italy, Malta, Portugal, Spain.

[333] 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.

[334] In Uganda, this pest has been reported to cause 20-90 % losses in cotton due to boll damage. Late sown crops were most affected (Byaruhanga, 1977). Damage to cotton bolls facilitates entry of other microorganisms that can rot and destroy the boll.

[335] Algeria, Cabo Verde, Democratic Republic of the Congo, 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, Federal Republic of Yugoslavia (former), 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.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		Triticum aestivum (wheat), *Vitis vinifera* (grapevine).		occur. Contaminated soil (egg pods) or hitchhiking on international transport may facilitate spread.	Middle East, and Central Asia.					
Chondracris rosea	Citrus locust; Cotton locust	Wide host range [336] including *Gossypium* spp. (cotton).	Stem, leaves, growing points.	Capable of flight which facilitates local/regional dispersal. Contaminated soil (egg pods) or hitchhiking on international transport may facilitate spread.	China, Hong Kong, Indonesia, Japan, Laos, Malaysia, Pakistan, Philippines, South Korea, Taiwan, Thailand, Vietnam.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Diabolocatantops axillaris	Devil grasshopper	Wide host range [337] including *Gossypium hirsutum* (upland cotton).	Above ground plant parts.	Capable of flight which facilitates local/regional and migratory dispersal. Contaminated soil (egg pods) or hitchhiking on international transport may facilitate spread.	Angola, Benin, Burkina Faso, Cabo Verde, Cameroon, Comoros, Egypt, Eritrea, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Senegal, Sudan, Tanzania, Iran, Oman, Saudi Arabia, United Arab Emirates, Yemen.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Gryllotalpa	European	Wide host range [338]	Damage to	Crawling and flying	Europe, Russia, central	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[336] Hosts include *Arachis hypogaea* (peanut), *Camellia sinensis* (tea), *Cannabis sativa* (hemp), *Citrus* spp., *Cocos nucifera* (coconut), *Daemonorops margaritae*, *Durio zibethinus* (durian), *Elaeis guineensis* (African oil palm), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Hevea brasiliensis* (rubber), *Ipomoea batatas* (sweetpotato), *Musa* spp. (banana), *Musa textilis* (manila hemp), *Musa x paradisiaca* (plantain), *Nephelium lappaceum* (rambutan), *Oryza sativa* (rice), *Psidium guajava* (guava), *Pueraria montana var. lobata* (kudzu), *Ricinus communis* (castor bean), *Saccharum officinarum* (sugarcane), *Saccharum spontaneum* (wild sugarcane), *Tectona grandis* (teak), *Theobroma cacao* (cocoa), *Vernicia fordii* (tung-oil tree), *Zea mays* (maize).

[337] Hosts include *Abelmoschus esculentus* (okra), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Pennisetum glaucum* (pearl millet), *Phaseolus* spp. (beans), *Pisum sativum* (pea), *Sesamum indicum* (sesame), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Sorghum bicolor* (sorghum).

[338] *Allium* spp., *Althaea officinalis* (marsh-mallow), *Atropa belladonna* (deadly nightshade), *Avena sativa* (oats), *Beta vulgaris* (beetroot), *Brassica oleracea* (cabbages, cauliflowers), *Cannabis sativa* (hemp), *Capsicum* spp. (peppers), *Chamomilla recutita* (common chamomile), *Chrysanthemum* spp. (daisy), *Cucumis sativus* (cucumber), *Cucurbita* spp. (gourds), *Cynodon* spp. (quickgrass), *Daucus carota* (carrot), *Dianthus* spp. (carnation), *Eremochloa ophiuroides* (centipedegrass), *Fragaria ananassa* (strawberry), *Gladiolus* spp. (sword lily), *Gladiolus hybrids* (sword lily), *Glycine max* (soybean), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Hemarthria altissima* (limpograss), *Hordeum* spp. (barleys), *Humulus lupulus* (hop), *Ipomoea batatas* (sweetpotato), *Lactuca* spp. (lettuce), *Malus domestica* (apple), *Mentha piperita* (peppermint), *Nicotiana tabacum* (tobacco), *Panicum* spp. (millets), *Paspalum notatum* (bahia grass), *Phoenix dactylifera* (date-palm), *Prunus* spp. (stone fruit), *Pyrus communis*

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
gryllotalpa	mole cricket	including *Gossypium hirsutum* (upland cotton).	roots/tubers and stems or leaves near the soil surface. Seedlings are particularly susceptible to *Gryllotalpa gryllotalpa* damage.	facilitate local dispersal. Adults are attracted to lights. Contaminated soil and/or hitchhiking on international transport may facilitate spread.	Asia, north Africa, and the United States of America.[339]					
Nomadacris septemfasciata	Red locust	Wide host range including *Citrus* spp., *Coffea* spp. (coffee), *Eleusine coracana* (finger millet), *Gossypium herbaceum* (Levant cotton), *Manihot esculenta* (cassava), *Nicotiana tabacum* (tobacco), *Oryza sativa* (rice), Poaceae (grasses), *Saccharum officinarum* (sugarcane), *Sorghum bicolor* (sorghum), *Zea mays* (maize).	Above ground plant parts (typically leaves and seed heads).	Capable of flight which facilitates local/regional and migratory dispersal. *Nomadacris septemfasciata* can display gregarious and swarming behaviours. Contaminated soil (egg pods) or hitchhiking on international transport may facilitate spread.	Angola, Botswana, Burundi, Cabo Verde, Cameroon, Chad, Comoros, Congo (DRC), Eswatini, Ethiopia, Gabon, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Nigeria, Réunion, Rwanda, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia, Zimbabwe.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Oxya chinensis	Rice grasshopper	*Gossypium* spp. (cotton), *Oryza sativa* (rice), *Panicum miliaceum* (millet), *Phragmites australis* (common reed), *Sorghum bicolor* (sorghum), *Triticum* spp. (wheat), *Zea mays*	Leaves (primarily), stems, ears.	Capable of flight which facilitates local/regional dispersal. Contaminated soil (egg pods) or hitchhiking on international transport may facilitate spread.	Bangladesh, China, Hong Kong, India, Indonesia, Japan, Malaysia, North Korea, Pakistan, South Korea, Thailand, United States of America (Hawaii).	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

(European pear), *Raphanus* spp. (radish), *Rosa* spp. (roses), *Solanum laciniatum* (kangaroo apple), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Stenotaphrum secundatum* (buffalo grass), *Triticum* spp. (wheat), *Tulipa gesneriana, turfgrasses, Vernicia fordii* (tung-oil tree), *Vitis vinifera* (grapevine), *Zea mays* (maize), *Zoysia* spp.

[339] Algeria, Egypt, Armenia, Azerbaijan, Georgia, India, Iran, Kuwait, Turkey, Turkmenistan, Uzbekistan, Albania, Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Moldova, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russia, Slovenia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, United States of America.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		(maize).								
Schistocerca americana	American grasshopper	Wide host range [340] including *Gossypium* spp. (cotton).	Leaves.	Crawling, jumping and flying facilitate local/regional dispersal. Nymphs display gregarious behaviour which reduces with age. Contaminated soil and/or hitchhiking on international transport may facilitate spread.	United States of America, Mexico, the Bahamas.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Zonocerus variegatus	Variegated grasshopper	Wide host range [341] including *Gossypium* spp. (cotton).	Above ground plant parts.	Capable of flight which facilitates local/regional dispersal. Contaminated soil (egg pods) or hitchhiking on international transport may facilitate spread.	Africa. [342]	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Thysanoptera (thrips)										
Caliothrips fasciatus	Californian bean thrips	Wide host range including common bean, field pea, alfalfa, rockmelon, cotton, lettuce, pear, walnut, orange, avocado, citrus, grapes, and weeds such	Leaves, stem, petiole, fruit, whole plant (yield loss, malformation and/or delayed maturity/reduced	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants, plant	Canada, United States of America, Mexico.	MEDIUM	MEDIUM	HIGH [343]	MEDIUM	**LOW**

[340] *Arachis hypogaea* (peanut), *Avena sativa* (oats), *Brassicaceae* (cruciferous crops), *Citrus* spp., *Gossypium* spp. (cotton), *Ipomoea batatas* (sweetpotato), *Oryza sativa* (rice), *Phaseolus* spp. (beans), *Pinus taeda* (loblolly pine), *Poaceae* (grasses), *Saccharum officinarum* (sugarcane), *Secale cereale* (cereal rye), *Zea mays* (maize).

[341] *Abelmoschus esculentus* (okra), *Acalypha wilkesiana, Agelaea obliqua, Allium cepa* (onion), *Amaranthus* spp. (amaranth), *Anacardium occidentale* (cashew nut), *Ananas comosus* (pineapple), *Arachis hypogaea* (peanut), *Asparagus africanus* (ornamental asparagus), *Aspilia africana, Brassicaceae* (cruciferous crops), *Cannabis sativa* (hemp), *Carica papaya* (pawpaw), *Chromolaena odorata* (Siam weed), *Citrus aurantiifolia* (lime), *Citrus limon* (lemon), *Citrus reticulata* (mandarin), *Citrus sinensis* (sweet orange), *Coffea* spp. (coffee), *Colocasia esculenta* (taro), *Cucurbitaceae* (cucurbits), *Daucus carota* (carrot), *Dialium guineense* (velvet tamarind), *Digitaria horizontalis, Dioscorea* spp. (yam), *Elaeis guineensis* (African oil palm), *Ficus exasperata, Gossypium* spp. (cotton), *Helianthus annuus* (sunflower), *Ipomoea batatas* (sweetpotato), *Ipomoea pileata, Lecaniodiscus cupanioides, Mallotus oppositifolius, Mangifera indica* (mango), *Manihot esculenta* (cassava), *Morinda lucida, Musa* spp. (banana), *Nicotiana tabacum* (tobacco), *Pennisetum* spp. (feather grass), *Persea americana* (avocado), *Piper* spp. (pepper), *Plumeria* spp. (frangipani), *Poaceae* (grasses), *Pupalia* spp., *Rauvolfia vomitoria, Reissantia indica, Securinega virosa, Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Tectona grandis* (teak), *Vigna unguiculata* (cowpea), *Zanthoxylum zanthoxyloides, Zea mays* (maize).

[342] Angola, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo (DRC, ROC), Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Malawi, Mali, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Togo.

[343] Thrips can be spread between areas with the movement of plant materials including cut flowers, produce/fruit, and nursery plants.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		as sow thistle.	vigour).	products (e.g. fruit), or soil.						
Caliothrips impurus	African cotton thrips	Wide host range including alfalfa, common bean, hyacinth bean, chickpea, berseem, cotton, peanut, onion.	Seedlings, leaves.	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and plant products.	Africa, India.	LOW	MEDIUM	HIGH[343]	MEDIUM	**LOW**
Frankliniella fusca	Tobacco thrips	Wide host range[344] including *Gossypium* spp. (cotton).	Foliage, flowers, fruit, whole plant (yield loss, malformation and/or delayed maturity/reduced vigour).	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and/or plant products (all life-forms).	Japan, the Netherlands, Canada, Cuba, Martinique, Mexico, Puerto Rico, United States of America.	MEDIUM	MEDIUM	HIGH[343]	MEDIUM	**LOW**
Frankliniella intonsa	Flower thrips	Wide host range[345] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Foliage, flowers, fruit, whole plant (yield loss, malformation and/or delayed maturity/reduced	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely	North America, Europe, Asia, and New	MEDIUM	MEDIUM	HIGH[343]	MEDIUM[347]	**LOW**

[344] *Amaranthus retroflexus* (redroot pigweed), *Ambrosia artemisiifolia* (common ragweed), *Arachis hypogaea* (peanut), *Capsicum annuum* (bell pepper), *Cardamine hirsuta* (hairy bittercress), *Citrullus lanatus* (watermelon), *Conyza canadensis* (Canadian fleabane), *Digitaria sanguinalis* (large crabgrass), *Geranium carolinianum* (Carolina geranium), *Glycine max* (soyabean), *Gnaphalium purpureum, Gossypium* spp. (cotton), *Hippeastrum* spp., *Lactuca serriola* (prickly lettuce), *Lamium amplexicaule* (henbit deadnettle), *Linaria canadensis, Narcissus pseudonarcissus* (wild lent lily), *Nicotiana tabacum* (tobacco), *Persicaria pensylvanica, Plantago lanceolata* (ribwort plantain), *Ranunculus sardous, Raphanus raphanistrum* (wild radish), *Rumex crispus* (curled dock), *Sinapis arvensis* (wild mustard), *Solanum lycopersicum* (tomato), *Sonchus asper* (spiny sow-thistle), *Stellaria media* (common chickweed), *Trifolium repens* (white clover), *Verbesina encelioides* (golden crownbeard), *Vigna unguiculata* (cowpea), *Zea mays* (maize).

[345] *Abelmoschus esculentus* (okra), *Allium cepa* (onion), *Allium fistulosum* (Welsh onion), *Allium roylei, Arachis hypogaea* (peanut), *Asparagus officinalis* (asparagus), *Barbarea vulgaris* (common wintercress), *Brassica* spp., *Calluna vulgaris* (heather), *Capsicum* spp. (peppers), *Capsicum annuum* (bell pepper), *Chamomilla recutita* (common chamomile), *Chenopodium album* (fat hen), *Chrysanthemum indicum* (chrysanthemum), *Chrysanthemum morifolium* (chrysanthemum), *Citrus* spp., *Citrus sinensis* (sweet orange), *Convolvulus arvensis* (bindweed), *Cucumis sativus* (cucumber), *Diospyros kaki* (persimmon), *Epilobium angustifolium* (rosebay willowherb), *Erigeron* (Fleabane), *Fragaria* (strawberry), *Fragaria ananassa* (strawberry), *Fragaria vesca* (wild strawberry), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Hibiscus rosa-sinensis* (China-rose), *Lens culinaris* (lentil), *Lythrum hyssopifolia, Lythrum salicaria* (purple loosestrife), *Malva sylvestris* (common mallow), *Medicago sativa* (lucerne), *Melilotus albus* (honey clover), *Melilotus officinalis* (yellow sweet clover), *Oenothera biennis* (common evening primrose), *Ononis arvensis, Oryza sativa* (rice), *Phalaris brachystachys* (short-spiked canarygrass), *Phaseolus vulgaris* (common bean), *Pisum sativum* (pea), *Polygonum persicaria* (redshank), *Prunus persica* (peach), *Prunus persica var. nucipersica* (nectarine), *Punica granatum* (pomegranate), *Ranunculus* spp. (buttercup), *Rosa* spp. (roses), *Rumex obtusifolius* (broad-leaved dock), *Saccharum* spp., *Solanum carolinense* (horsenettle), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solidago canadensis* (Canadian goldenrod), *Trifolium cherleri, Trifolium pratense* (red clover), *Trifolium tomentosum, Triticum aestivum* (wheat), *Vicia cracca* (Tufted vetch), *Vigna angularis* (adzuki bean), *Zea mays* (maize).

[347] High populations of flower thrips can cause young bolls to drop from the plant (Atakan & Ozgur, 2001).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
			vigour).	infested plants and/or plant products (all life-forms).	Zealand. [346]					
Frankliniella tritici	Eastern flower thrips	Wide host range [348] including *Gossypium* spp. (cotton).	Leaves, flowers, whole plant (yield loss, malformation and/or delayed maturity/reduced vigour).	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and plant products.	Georgia, Iraq, Kazakhstan, Czechia, Russia, Hungary, Poland, Romania, Slovakia, Spain, Ukraine, Canada, Puerto Rico, United States of America, Brazil.	MEDIUM	MEDIUM	HIGH	UNKNOWN	**UNKNOWN**
Haplothrips aculeatus	Grass thrips	Wide host range [349] including *Gossypium* spp. (cotton).	Leaves, flowers, whole plant (yield loss, malformation and/or delayed maturity/reduced vigour).	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and plant products.	Europe, United Kingdom as well as parts of Asia and United States of America. [350]	MEDIUM	MEDIUM	HIGH	UNKNOWN	**UNKNOWN**
Kurtomathrips morrilli	-	Cotton, chrysanthemums, beans, lantana, *Datura* spp., *Malva rotundifolia*,	Leaves.	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance	United States of America (south-western), Hawaii,	LOW	MEDIUM	MEDIUM	LOW [352]	**VERY LOW**

[346] Algeria, Bangladesh, China, Georgia, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Malaysia, Mongolia, Pakistan, Philippines, Qatar, South Korea, Taiwan, Thailand, Turkey, Albania, Austria, Belgium, Bulgaria, Croatia, Czechia, Russia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Greenland, Panama, United States of America, New Zealand.

[348] *Armoracia rusticana* (horseradish), *Asparagus officinalis* (asparagus), *Avena sativa* (oats), *Carthamus tinctorius* (safflower), *Cassia* spp. (sennas), *Chrysanthemum* spp. (daisy), *Daucus carota* (carrot), *Fragaria ananassa* (strawberry), *Glycine max* (soybean), *Gossypium* spp. (cotton), *Medicago sativa* (lucerne), *Prunus avium* (sweet cherry), *Prunus domestica* (plum), *Raphanus raphanistrum* (wild radish), *Rosa* spp. (roses), *Rubus* spp. (blackberry, raspberry), *Secale cereale* (rye), *Sinapis arvensis* (wild mustard), *Solanum lycopersicum* (tomato), *Trifolium* spp. (clovers), *Triticum aestivum* (wheat), *Vigna unguiculata* (cowpea).

[349] *Alopecurus arundinaceus, Avena sativa* (oats), *Brassica oleracea var. alboglabra* (Chinese kale), *Chrysanthemum segetum, Cyperus rotundus* (purple nutsedge), *Daucus carota subsp. sativus, Fragaria ananassa* (strawberry), *Gossypium* spp. (cotton), *Hordeum vulgare* (barley), *Juncus* spp. (rushes), *Lupinus angustifolius* (narrow-leaf lupin), *Lygeum spartum, Oryza sativa* (rice), *Panicum* spp. (millets), *Panicum miliaceum* (millet), *Phalaris brachystachys* (short-spiked canarygrass), *Phragmites australis* (common reed), *Saccharum officinarum* (sugarcane), *Secale cereale* (cereal rye), *Sorghum bicolor* (sorghum), *Sorghum halepense* (Johnson grass), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *Triticale* (×Triticosecale), *Triticum* spp. (wheat), *Triticum aestivum* (wheat), *Typha* spp. (reedmace), *Zea mays* (maize).

[350] Bangladesh, China, Iran, Japan, North Korea, South Korea, Turkey, Vietnam, Belarus, Croatia, Czechia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, United Kingdom, United States of America.

[352] *Kurtomathrips morrilli* is most likely to damage cotton with water stress. *Kurtomathrips morrilli* can be typically be controlled with insecticides (Kerns & Anderson, 2012).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		Wedelia spp., *Wisteria* spp.		dispersal is most likely infested plants and plant products.	Mexico, and Jamaica. [351]					
Neohydatothrips variabilis (syn. *Sericothrips variabilis*)	Soybean thrips	*Glycine max* (soybean), *Gossypium* spp. (cotton), *Phaseolus vulgaris* (common bean), Prunus persica (peach), *Solanum lycopersicum* (tomato), *Vigna unguiculata* (cowpea).	Leaves, flowers.	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and plant products (all life stages).	Canada, United States of America.	LOW	MEDIUM	HIGH	UNKNOWN	**UNKNOWN**
Retithrips syriacus	Black vine thrips	Wide host range [353] including *Gossypium* spp. (cotton).	Foliage, flowers, pods/fruit (malformed), whole plant (yield loss, malformation and/or delayed maturity/reduced vigour).	Adults with functional wings can disperse via wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and/or plant products (all life-forms).	Egypt, Libya, Tunisia, India, Iraq, Israel, Sri Lanka, Guadeloupe, Martinique, Puerto Rico, United States of America, Brazil.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Thrips angusticeps	Field thrips	Wide host range [354] including barley, canola,	Foliage, stem, flowers, pods/fruit,	Adults with functional wings can disperse via	Europe (widespread), United Kingdom, North	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[351] Mound et al. (2016).

[353] *Acacia longifolia* (golden wattle), *Ampelopsis aconitifolia* (monkhood-vine), *Arachis hypogaea* (peanut), *Carica papaya* (pawpaw), *Carya illinoinensis* (pecan), *Castanea* spp. (chestnuts), *Cercis siliquastrum* (Judas tree), *Cocos nucifera* (coconut), *Coffea* spp. (coffee), *Cotinus coggygria* (fustet), *Cotoneaster* spp., *Cydonia oblonga* (quince), *Dimocarpus longan* (longan tree), *Diospyros kaki* (persimmon), *Dodonaea viscosa* (switch sorrel), *Eucalyptus* spp., *Eucalyptus globulus* (Tasmanian blue gum), *Eugenia uniflora* (Surinam cherry), *Feijoa, Ficus* spp., *Fuchsia* spp., *Gossypium* spp. (cotton), *Gossypium arboreum* (tree cotton), *Jatropha curcas* (jatropha), *Juglans regia* (walnut), *Lagerstroemia indica* (Indian crape myrtle), *Lagerstroemia speciosa* (pride of India), *Leucaena* spp., *Leucaena leucocephala* (leucaena), *Lonicera* spp. (honeysuckles), *Malus domestica* (apple), *Mangifera indica* (mango), *Manihot esculenta* (cassava), *Manilkara zapota* (sapodilla), *Melaleuca quinquenervia* (paperbark tree), *Musa* spp. (banana), *Myrtus communis* (myrtle), *Persea americana* (avocado), *Phaseolus vulgaris* (common bean), *Pistacia vera* (pistachio), *Platanus* spp. (planes), *Populus* spp. (poplars; aspens; cottonwoods), *Prunus salicina* (Japanese plum), *Psidium guajava* (guava), *Pyrus communis* (European pear), *Rhus typhina* (staghorn sumac), *Ricinus communis* (castor bean), *Rosa* spp. (roses), *Rosa chinensis* (China rose), *Schinus terebinthifolius* (Brazilian pepper tree), *Syzygium cumini* (black plum), *Syzygium jambos* (rose apple), *Terminalia arjuna* (arjun), *Terminalia catappa* (Singapore almond), *Tinospora sinensis, Vigna unguiculata* (cowpea), *Vitis vinifera* (grapevine).

[354] *Allium cepa* (onion), *Allium porrum* (leek), *Allium sativum* (garlic), *Armoracia rusticana* (horseradish), *Beta vulgaris var. saccharifera* (sugarbeet), *Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea var. capitata* (cabbage), *Brassica oleracea var. italica* (broccoli), *Bromus* spp. (bromegrasses), *Carthamus* spp., *Carum carvi* (caraway), *Chrysanthemum* spp. (daisy), *Citrus aurantium* (sour orange), *Citrus limon* (lemon), *Citrus reticulata* (mandarin), *Citrus sinensis* (sweet orange), *Citrus x paradisi* (grapefruit), *Convolvulus* spp. (morning glory), *Crataegus* spp. (hawthorns), *Dianthus* spp. (carnation), *Dianthus caryophyllus* (carnation), *Euphorbia* spp. (spurges), *Fragaria ananassa* (strawberry), *Gerbera* spp. (Barbeton daisy), *Gossypium* spp. (cotton), *Malus domestica* (apple), *Morus alba* (white mulberry), *Nicotiana tabacum* (tobacco), *Olea europaea, Prunus avium* (sweet cherry), *Prunus domestica* (plum), *Prunus persica* (peach), *Quercus* spp. (oaks), *Raphanus* spp. (radish), *Raphanus sativus* (radish), *Salix* spp. (willows), *Sinapis* spp. (mustard), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Taraxacum* spp. (dandelion), *Trifolium* spp. (clovers), *Typha* spp. (reedmace), *Verbascum* spp., *Vitis vinifera* (grapevine).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [154]	Entry potential	Est. [155] potential	Spread potential	Economic impact	Overall risk
		cereal rye, common bean, cotton (*Gossypium* spp.) faba bean, field pea, lentil, linseed/flax, lupin, oats, soybean, triticale, wheat, lucerne.	seed, whole plant (yield loss, malformation and/or delayed maturity/reduced vigour).	wind-assisted flight. Pathway for long distance dispersal is most likely infested plants and/or plant products (all life-forms).	Africa, Russia, Turkey, Caucasus, Iran and Israel. [355]					

[355] Algeria, Egypt, Libya, Morocco, Tunisia, Azerbaijan, Georgia, Iran, Israel, Turkey, Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Portugal, Romania, Russia, Serbia and Montenegro, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

Pathogens

Table 15. Cotton Threat Summary Table: Pathogens.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
Bacteria (including phytoplasmas)										
Candidatus Phytoplasma asteris	16SrI; Yellow disease phytoplasmas; Cotton little leaf phytoplasma; Indian cotton little leaf phytoplasma	*Candidatus* Phytoplasma asteris has a wide host range. Hosts of cotton little leaf phytoplasma include cotton (*Gossypium hirsutum*) and sponge gourd (*Luffa cylindrica*).	Symptoms vary depending on the host species, stage of infection and phytoplasma isolate or sub-group. Cotton little leaf phytoplasma can reduce the size of leaves by nearly one-third. [358]	The 16SrI group phytoplasmas are not known to be seed-transmissible but are graft transmissible and spread naturally by insect vectors. [359] The movement of infected plants/plant materials and/or vectors could facilitate long distance dispersal.	*Candidatus* Phytoplasma asteris has a wide geographic range. [360] Cotton little leaf phytoplasma is found in India.	LOW (without vector) LOW (with vector)	LOW (without vector) MEDIUM (with vector)	LOW (without vector) MEDIUM (with vector)	LOW (without vector) MEDIUM (with vector)	**NEGLIGIBLE** (without vector) **LOW** (with vector)
Cotton virescence phytoplasma	16SrII (related strains) [361]; Cotton phyllody phytoplasma; Cotton phyllody; Cotton	Gossypium spp. (cotton). *Sida cordifolia*, *S. rhombifolia*, *Mitracarpus scaber*, sesame, dodder, periwinkle	Leaves (reduced size, chlorosis: yellowing, reddening), floral structures (virescence, phyllody, shoot proliferation), whole plant (shortening of	Naturally spread by insect vectors (i.e. *Orosius cellulosus* – potentially in Australia). [362, 363] The movement of infected plants/plant materials and/or vectors could	Burkina Faso, Côte d'Ivoire, Ghana, Mali, India, Pakistan.	LOW	MEDIUM	HIGH	MEDIUM [364]	**LOW**

[356] CABI (2022).
[357] Establishment potential.
[358] Kumar et al. (2010).
[359] *Candidatus* Phytoplasma asteris is typically naturally transmitted by a wide range of phloem-feeding hemipteran insect vectors, such as leafhoppers, planthoppers and psyllids. The vector of cotton little leaf phytoplasma is not yet determined.
[360] Candidatus Phytoplasma asteris: South Africa, China, India, Indonesia, Iran, Japan, Lebanon, Malaysia, Myanmar, Pakistan, South Korea, Sri Lanka, Taiwan, Thailand, Turkey, Belarus, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Poland, Portugal, Romania, Russia, Serbia, Montenegro, Spain, Ukraine, United Kingdom, Bermuda, Canada, Costa Rica, Cuba, Guatemala, Mexico, Saint Vincent and the Grenadines, United States of America, Argentina, Brazil, Colombia, Peru.
[361] The cotton phyllody or virescence phytoplasma are 16SrII (related strains). Cotton phyllody (CoP) phytoplasma has been attributed to the 16SrII-C (Martini et al., 2007; Lee et al., 2010) and 16SrII-F (Makarova et al., 2012) subgroups. 'Cotton virescence pytoplasma' has been attributed to the 16SrII-C subgroup (Marzachì et al., 2009).
[362] Fletcher et al. (2017).
[363] Naturally transmitted by the polyphagous leafhopper, *Orosius cellulosus* (potentially in Australia) as well as dodder (*Cuscuta campestris*). Graft transmissible. Not seed transmissible.
[364] There are reports of 30 % of plants being infected by cotton virescence phytoplasma in parts of Africa (Desmidts et al., 1973).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
	virescence phytoplasma; Cotton flower virescence	(experimentally).	internodes, stunting).	facilitate long distance dispersal.						
Xanthomonas citri subsp. *malvacearum* [365] (exotic and hypervirulent races)	Cotton bacterial blight; Angular leaf spot (exotic [366] and hypervirulent races) [367]	Cotton.	Leaves, stem and bolls.	Locally dispersed via rain-splash. The movement of infected seed and plant materials [368] could facilitate long distance dispersal.	North America, Asia, Africa, Europe, Australia (some races are present in Australia). [369]	MEDIUM	HIGH	HIGH	HIGH [370]	**HIGH**
Fungi										
Colletotrichum gossypii (syn. *Glomerella gossypii*)	Anthracnose of cotton [371]	*Gossypium hirsutum* (cotton), *Gossypium barbadense* (sea island cotton), *Solanum lycopersicum* (tomato).	Seedling damping-off. Leaf, stem, boll (necrosis), whole plant (stunting, yield and quality loss). [372]	Infected seed and soil/crop residues. Rain splash, wind-assisted rain and irrigation as well as insects can facilitate dispersal. [373]	United States of America, Central America, South America, most of Asia, parts of Africa, Bulgaria and Romania. [374, 375]	MEDIUM	MEDIUM	MEDIUM	MEDIUM	**LOW**

[365] syn. *Xanthomonas axonopodis* pv. *malvacearum*; *X. campestris* pv. *malvacearum*.
[366] Exotic races refer to all races of the pathogen other than the 10 known to occur in Australia.
[367] There are at least 32 races of *Xanthomonas citri* subsp. *malvacearum* (Madani et al., 2010).
[368] *Xanthomonas citri* subsp. *malvacearum* can be a symptomless epiphyte.
[369] Races 1, 2, 3, 4, 5, 6, 7, 9, 10 and 18 (the most common race affecting Australian cotton) occur in Australia (Allen & West, 1991). Therefore, the exotic races are considered the races other than races 1, 2, 3, 4, 5, 6, 7, 9, 10 and 18.
[370] *Xanthomonas citri* subsp. *malvacearum* is considered one of the most damaging pathogens affecting cotton (Madani et al., 2010).
[371] The biologically specialised *Colletotrichum gossypii* and *C. gossypii* var. *cephalosporioides* (within the *Colletotrichum gloeosporioides* species complex) require additional sequences to be generated from authentic isolates with known pathogenicity to establish genetic relationships and delineate species and/or variant boundaries (Weir et al., 2012; EFSA, 2018).
[372] Symptoms and affected plant parts may include post-emergence damping-off of seedlings; reddish-brown cortical rot at the base of the hypocotyl, and spotting of the cotyledons. Necrosis on leaves, stems, and boll as well as stunting, resulting in yield and quality losses. It also affects the lint and seeds reducing fibres quality and seed germinability.
[373] Infected seed and soil/crop residues often provide the initial inoculum for infection of cotton crops. Conidia are primarily dispersed mainly by rain splash, wind-assisted rain, and irrigation as well as insects. *Colletotrichum gossypii* is carried both on- and inside cotton seeds (i.e. seed-borne) which is an important pathway for long distance dispersal.
[374] Benin, Central African Republic, Congo (DRC), Côte d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Mozambique, Nigeria, Senegal, Somalia, South Africa, Sudan, Tanzania, Uganda, Zimbabwe, Afghanistan, Armenia, Azerbaijan, Bangladesh, Cambodia, China, Georgia, India, Indonesia, Japan, Myanmar, North Korea, Pakistan, Philippines, South Korea, Sri Lanka, Taiwan, Thailand, Bulgaria, Romania, Barbados, Bermuda, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Puerto Rico, Trinidad and Tobago, United States of America, Guam, Argentina, Brazil, Colombia, Ecuador, Guyana, Paraguay, Uruguay, Venezuela.
[375] Shivas et al. (2016).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
Colletotrichum gossypii var. *cephalosporioides*	Ramulosis; Ramulose; Escobilla; Witches' broom [376]	*Gossypium hirsutum* (cotton).	Ramulosis; lesions, necrosis, over-sprouting/witches' broom.	Infected seed and soil/crop residues. Rain splash, wind-assisted rain and irrigation as well as insects can facilitate dispersal. [377]	Brazil, Colombia, Paraguay, Venezuela.	LOW	MEDIUM	MEDIUM	HIGH [378]	**MEDIUM**
Corynespora cassiicola (exotic or cotton infecting strains) [379, 380]	Target spot; Corynespora leaf spot of cotton (exotic or cotton	Wide host range (more than 400 plant species) [381] including cotton, basil, bean, cowpea, cucumber,	Leaves (primarily), bolls, bracts, petioles, stems.	*Corynespora cassiicola* spores are known to be transmitted via air, soil, rain-splash and seeds. The pathogen	North America, South America, Oceania, and most of Asia, Africa and Europe. [382] Cotton infecting isolates have	LOW	MEDIUM [383]	MEDIUM	UNKNOWN [384]	**UNKNOWN**

[376] The biologically specialised *Colletotrichum gossypii* and *C. gossypii* var. *cephalosporioides* (within the *Colletotrichum gloeosporioides* species complex) require additional sequences to be generated from authentic isolates with known pathogenicity to establish genetic relationships and delineate species and/or variant boundaries (Weir et al., 2012; EFSA, 2018).

[377] Infected seed and soil/crop residues often provide the initial inoculum for infection of cotton crops. Conidia are primarily dispersed mainly by rain splash, wind-assisted rain, and irrigation as well as insects. Colletotrichum gossypii is carried both on- and inside cotton seeds (i.e. seed-borne) which is an important pathway for long distance dispersal.

[378] *Colletotrichum gossypii* var. *cephalosaporioides* differs from *C. gossypii* in virulence, aggressiveness, morphology, growth on various synthetic media and ability to grow at less than 30°C (EFSA, 2018).

[379] *Corynespora cassiicola* is present in Australia. *C. cassiicola* has been reported on many hosts in Australia including papaya (*Carica papaya*) and soybean (*Glycine max*). Target spot has not been confirmed on cotton in Australia. It has been reported that *C. cassiicola* isolates from cotton in the United States of America were genetically distinct from isolates collected from other host species which may suggest a degree of host specificity or the evolution of more aggressive strains on specific hosts (Sumabat et al., 2018).

[380] *Corynespora cassiicola* is widespread in Australia, but it has not been reported on cotton (*Gossypium hirsutum*) (APPD 2024). There is no information about which strains of *Corynespora cassiicola* are present in Australia. Screening to determine which strains are present in Australia would be needed to determine which strains are considered exotic.

[381] Rondon & Lawrence (2021).

[382] Benin, Cameroon, Congo (DRC, ROC), Côte d'Ivoire, Egypt, Ethiopia, Gabon, Ghana, Guinea, Liberia, Mauritius, Nigeria, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Bangladesh, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Japan, Laos, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, Vietnam, Yemen, Austria, Bulgaria, Denmark, France, Germany, Hungary, Italy, Netherlands, Norway, Romania, Russia, Ukraine, United Kingdom, Antigua and Barbuda, Barbados, Belize, British Virgin Islands, Canada, Costa Rica, Cuba, Dominica, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States of America, American Samoa, Australia, Federated States of Micronesia, Fiji, Guam, New Zealand, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Vanuatu, Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Venezuela.

[383] A subtropical to tropical climate is generally considered conducive for infection and the development of target spot on a susceptible host. Symptoms and disease development can vary according to the host as well as temperature optima, humidity and leaf wetness. Generally, warmer temperatures (e.g. 20-30°C) along with high relative humidity (≥80 %) and leaf wetness duration tends to promote sporulation and disease development (Sharma, 2017; Rondon & Lawrence, 2021).

[384] Damage and yield loss from *Corynespora cassiicola* can vary according to the host/cultivar, developmental stage (e.g. canopy closure timing) and environmental factors (e.g. weather, microclimate) (Bowen et al., 2018). Yield loss due to target spot on an apparently susceptible cotton cultivar was estimated to be as high as 448 kg lint/ha in the United States of America when comparing non-fungicide-treated plots against full-season fungicide-treated cotton (Bowen et al., 2018). A multi-site study conducted over several years found that a single fungicide application at target spot onset would provide a 4 to 6 % yield gain when compared with no treatment (Bowen et al., 2018). The economic impact of *Corynespora cassiicola* could be considered HIGH in areas and/or circumstances that support disease development and proliferation.

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
	infecting strains)	papaya, soybean, sweetpotato and tomato.		overwinters mainly on seed, soil or infected plant debris.	been reported in the United States of America, Brazil and China.[381]					
Fusarium oxysporum f. sp. *vasinfectum* (exotic vegetative compatibility groups/races)	Fov; Fusarium wilt (exotic vegetative compatibility groups/races) [385]	Cotton.	Roots, stem, leaves, whole plant.	*Fusarium oxysporum* f. sp. *vasinfectum* could be dispersed via the movement of infected plant materials (including seed, plants, non-host plants), soil/plant debris (e.g. via growing mediums, machinery, equipment etc.), and/or water (e.g. flooding, irrigation), insects and nematodes. [386]	United States of America, Central America, South America, Australia, parts of Asia, Europe, and Africa. [387]	MEDIUM	HIGH	HIGH	HIGH [388, 389]	**HIGH**
Magnaporthiopsis maydis (syn. *Harpophora maydis*, *Cephalosporium maydis*)	Late wilt; slow wilt	*Zea mays* (maize), *Gossypium hirsutum* (upland cotton), *Gossypium barbadense* (Gallini cotton), *Lupinus*	Roots.	*Magnaporthiopsis maydis* can survive and spread via infested soil or crop residues (e.g. wind, machinery), seed-borne inoculum or	Egypt, Kenya, India, Israel, Hungary, Portugal, Spain.	LOW	HIGH	HIGH	LOW [391]	**VERY LOW**

[385] More than 21 Vegetative Compatibility Groups (VCGs) and two distinct pathotypes have been identified (Bell et al., 2017; 2019). The Australian isolates belong to VCG 01111 and 01112 as well as the 'Mungindi strain' (Wang et al., 2006).

[386] Wagner et al. (2022).

[387] Angola, Benin, Central African Republic, Congo (DRC), Côte d'Ivoire, Egypt, Ethiopia, Morocco, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zimbabwe, Afghanistan, Bangladesh, China, India, Indonesia, Iran, Iraq, Israel, Japan, Myanmar, North Korea, Pakistan, Saudi Arabia, South Korea, Taiwan, Turkey, Turkmenistan, Uzbekistan, Vietnam, Yemen, France, Greece, Italy, Netherlands, Romania, Cuba, El Salvador, Guatemala, Haiti, Mexico, Nicaragua, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, Fiji, Argentina, Bolivia, Brazil, Chile, Colombia, Guyana, Paraguay, Peru, Uruguay, Venezuela.

[388] *Fusarium oxysporum* f. sp. *vasinfectum* (Fov) may exist in a disease complex with nematodes (e.g. *Meloidogyne incognita*, *Rotylenchulus reniformis*, *Pratylenchus brachyurus* [present in Australia], and *Belonolaimus longicaudatus*) which can result in increased disease severity for some VGCs/races (Dyer et al., 2022; Wagner et al., 2022).

[389] Recently described Fov4 (race 4, VGC 0114) is of great concern in the United States of America because it is highly virulent on both upland (*Gossypium hirsutum*) and Pima (*Gossypium barbadense*) cotton. This VGC does not require nematodes for infection to be severe and kill seedlings (Liu & Wagner, 2022; Wagner et al., 2022).

[391] *Magnaporthiopsis maydis* is associated with increased production of lateral roots and the appearance of local dark red lesions and shallow cracks on young cotton roots up to 45 days after sowing. The lesions and fungus typically disappear as cotton plants mature and their roots harden. *M. maydis* can cause decreased root biomass in cotton (Dor & Degani, 2019).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
		albus (white lupine), *Setaria viridis* (green foxtail), *Citrullus lanatus* (watermelon). [390]		secondary hosts. The most likely pathway of entry for *M. maydis* is through transport of infected seeds.						
Phymatotrichopsis omnivora (syn. *Phymatotrichum omnivorum*)	Texas root rot; Cotton root rot	Very wide host range [392] including *Gossypium* spp. (cotton).	Root system, stem, leaves, whole plant (wilting, plant death). [393]	The movement of soil/plant debris [394] via natural or human-mediated pathways (e.g. contaminated machinery, equipment, footwear, growing mediums, animals etc.) could facilitate dispersal.	Libya, Mexico, United States of America (Arizona, Arkansas, California, Louisiana, Nevada, New Mexico, Oklahoma, Texas, Utah), Venezuela.	MEDIUM	MEDIUM [395]	MEDIUM [395]	HIGH	**MEDIUM**
Puccinia cacabata (syn. *Puccinia stakmanii*)	Southwestern cotton rust; Cotton rust	Hosts are primarily within Poaceae and Malvaceae including *Gossypium* spp. (cotton). [396]	Lower leaf surfaces, bracts, stems, bolls, whole plant. [397]	Dispersal is likely via spores (wind-assisted) from hosts and/or hitchhiking (e.g. clothing, equipment, animals) over short and	Bahamas, Dominican Republic, Guatemala, Mexico, United States of America, Argentina, Bolivia, Brazil.	LOW	MEDIUM	HIGH	HIGH [398]	**MEDIUM**

[390] Dor and Degani (2019); PPQ (2021).

[392] The entire host range is not clear. More than 2,000 dicotyledonous plant species from a range of families have been reported as hosts of *Phymatotrichopsis omnivora*. Major cultivated hosts include *Medicago sativa* (alfalfa), *Malus domestica* (apple), *Prunus persica* (peach) *and Vitis vinifera* (grapevine) (EFSA, 2019). *Other hosts include Abelmoschus esculentus* (okra), *Arachis hypogaea* (peanut), *Beta vulgaris var. saccharifera* (sugarbeet), *Carya illinoinensis* (pecan), *Ficus carica* (common fig), *Glycine max* (soybean), *Juglans regia* (walnut), *Petroselinum crispum* (parsley), *Phaseolus* spp. (beans), *Pistacia vera* (pistachio), *Populus* spp. (poplars; aspens; cottonwoods), *Prunus dulcis* (almond), *Pyrus communis* (European pear), *Robinia pseudoacacia* (black locust), *Salix* spp. (willows), *Ulmus* spp. (elms).

[393] Symptoms and affected plant parts may include the root system (decay, discoloration of xylem elements), lower stem (discoloration of xylem elements), leaves (yellowing or bronzing of the leaves, wilting, desiccation), whole plant (wilting, plant death). Symptoms are usually obvious until flowering.

[394] Sclerotia are often the primary inoculum source for the initiation of disease in suitable hosts. They also serve as over-seasoning propagules that enable the persistence of *Phymatotrichopsis omnivora* for many years (e.g. up to 12 years) in the soil (EFSA, 2019).

[395] *Phymatotrichopsis omnivora* is often associated with alkaline, calcareous soils with an optimal pH for growth and survival between 7.2–8.0 (EFSA, 2019).

[396] Bouteloua aristidoides (needle grama), Bouteloua barbata (six-weeks grama), Bouteloua barbata var. rothrockii (Rothrock grama), Bouteloua eriopoda (black grama), Bouteloua hirsuta (hairy grama), Chloris spp. (fingergrasses), Chloris ciliata (fringed chloris), Gossypium spp. (cotton), Gossypium barbadense (Gallini cotton), Gossypium herbaceum (Levant cotton), Gossypium hirsutum (upland cotton), Gossypium thurberi (Arizona wild cotton).

[397] Symptoms and affected plant parts may include lower leaf surfaces, stem (infection, breakage), bracts, green bolls (lesions), bolls (dwarfing and premature opening in severe infections), whole plant (defoliation in severe infections, yield loss, reduction in quality).

[398] *Puccinia cacabata* has reportedly caused losses in individual fields of up to 75 % within the United States of America and up to 100 % within Mexico (Kirkpatrick & Rothrock, 2001).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
				long distances.						
Verticillium dahliae (exotic vegetative compatibility groups/strains)	Verticillium wilt (exotic vegetative compatibility groups/strains) [399]	Very wide host range (over 300 plant species) including cotton.	Roots, stem, leaves, and the whole plant. [400]	The pathogen can be spread with plants, soil, plant debris, irrigation, cultivating machinery and organic amendments over short or long distances. The movement of infected seed or lint is an important pathway for long distance dispersal.	Asia, Europe, North America, Central America, South America, parts of Africa and New Zealand. [401]	MEDIUM	HIGH [402]	HIGH	HIGH	**HIGH**
Nematodes										
Hoplolaimus aegypti	Lance nematode	Cotton, maize, soybean.	Root system; leaves (chlorosis); whole plant (mild stunting). [403]	Soil, plant materials; particularly with residual soil, and machinery or equipment could spread this nematode long	Egypt.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[399] There are five vegetative compatibility groups (VCGs) in *Verticillium dahliae* which are VCG1, VCG2, VCG3, VCG4 and VCG6. VCG1 and VCG2 are further characterised into A and B subgroups, and VCG4 into A, B and AB (Strausbaugh, 1993; Papaioannou & Typas, 2015). There are two main lineages in *V. dahliae* which are clade I with VCGs 1A, 1B, 2A, 4B, as well as 3, and Clade II containing VCGs 2B, 4A, and 6. The following vegetative compatibility groups (VCGs) are present in Australia: VCG1A, VCG2A, VCG4B and VCG6 (Webster et al., 2023). *V. dahliae* isolates that attack cotton are also subdivided into two pathotypes based on the symptoms they induce: defoliating (D) and nondefoliating (ND). 'D' pathotype (e.g. VGC1A) isolates are highly virulent and completely defoliate cotton, whereas 'ND' pathotype isolates are typically less virulent and seldom cause extensive defoliation (Wagner et al., 2021). The *V. dahliae* vegetative compatibility groups (VCGs) that attack cotton are VCG1A, VCG1B, VCG2A, VCG2B, and VCG4B (Wagner et al., 2021). In Australia, VCG1A and VCG2A both can cause significant disease whereas VCG4B is considered mild. VCG1B is a defoliating pathotype, and VCG2B has been reported to cause defoliation symptoms and be highly virulent in Israel and Turkey (Dervis et al., 2008; Göre et al 2014; Korolev et al 2001). This pathogen is highly adaptive and new hosts are regularly being reported so other VGCs could be a risk to cotton. There have been some reports of VCG2B causing damage to cotton and is considered exotic to Australia. VCG2B has been identified from cotton in various countries that include China, Greece, Spain, and Israel (Collado-Romero et al., 2008; Korolev et al., 2000; 2001; 2008; Wagner et al., 2021) as well as Turkey where VCG2B isolates caused partial defoliation symptoms (Dervis et al., 2008).

[400] *Verticillium dahliae* colonises and proliferates in xylem elements of a plant (typically entering via the roots) which disrupts the transportation of water and dissolved minerals. Characteristic symptoms often involve the leaves (yellowing, wilting, vein clearing, necrosis), vascular bundles (browning), whole plant (dysplasia, stunting, defoliation [depending on pathotype], reductions in yield and/or quality, plant death).

[401] Algeria, Congo (DRC), Egypt, Eswatini, Kenya, Madagascar, Malawi, Morocco, Mozambique, Nigeria, Rwanda, South Africa, Tanzania, Tunisia, Uganda, Zambia, Zimbabwe, Armenia, Azerbaijan, China, Georgia, India, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kyrgyzstan, Lebanon, Pakistan, South Korea, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan, Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Malta, Moldova, Montenegro, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Canada, Cuba, Mexico, Nicaragua, Trinidad and Tobago, United States of America, New Zealand, Argentina, Brazil, Chile, Colombia, Peru.

[402] *Verticillium dahliae* can survive in soil for over 10 years as microsclerotia.

[403] Kirkpatrick and Rothrock (2001).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
				distances.						
Hoplolaimus columbus	Columbia lance nematode	*Acalypha wilkesiana*, *Glycine max* (soybean), *Gossypium* spp. (cotton) such as *Gossypium barbadense* (Gallini cotton), *Phoenix dactylifera* (date-palm), *Saccharum officinarum* (sugarcane), *Washingtonia filifera* (desert fanpalm).	Root system (lesions, discoloured cortical cells, stunting, altered root growth patterns); leaves (chlorosis); bolls (shedding of squares or small bolls [occasionally]); whole plant (mild stunting).	Soil, plant materials - particularly with residual soil (e.g. turf, contaminated seed etc.), and machinery or equipment could spread this nematode long distances.	Egypt, India, Pakistan, Trinidad and Tobago, United States of America.	LOW	MEDIUM [404]	MEDIUM	LOW	**VERY LOW**
Hoplolaimus indicus	Lance nematode	Wide host range [405] including *Gossypium* spp. (cotton). *Oryza sativa* (rice) is a primary host.	Root system; leaves; whole plant (stunting, reduced yield and/or quality). [406]	Soil, plant materials - particularly with residual soil, and machinery or equipment could spread this nematode long distances.	Ghana, Libya, Bangladesh, China, India, Iran, Nepal, Pakistan.	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**
Hoplolaimus magnistylus	Lance nematode	Host range includes *Glycine max* (soybean), *Gossypium* spp. (cotton) such as	Root system (altered root growth patterns, e.g. taproot stunting, increase in secondary roots near	Soil, plant materials - particularly with residual, and machinery or equipment could spread this nematode long	United States of America (e.g. Arkansas, Mississippi, Illinois, Tennessee).	LOW	MEDIUM	MEDIUM	LOW	**VERY LOW**

[404] Columbia lance nematode is most common in soils that have relatively high sand content.

[405] *Abelmoschus esculentus* (okra), *Anacardium occidentale* (cashew nut), *Arachis hypogaea* (peanut), *Basella* spp., *Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea var. botrytis* (cauliflower), *Brassica oleracea var. capitata* (cabbage), *Brassica rapa* (field mustard), *Cajanus cajan* (pigeon pea), *Calotropis procera* (apple of sodom), *Capsicum annuum* (bell pepper), *Capsicum frutescens* (chilli), *Casuarina* spp. (beefwood), *Chrysanthemum* spp. (daisy), *Citrus* spp., *Citrus jambhiri* (rough lemon), *Cucumis sativus* (cucumber), *Cyamopsis tetragonoloba* (guar), *Cynodon dactylon* (Bermuda grass), *Eleusine coracana* (finger millet), *Gossypium* spp. (cotton), *Ipomoea batatas* (sweetpotato), *Mangifera indica* (mango), *Musa* spp. (banana), *Nerium oleander* (oleander), *Oryza sativa* (rice), *Pennisetum glaucum* (pearl millet), *Phoenix dactylifera* (date-palm), *Pinus roxburghii* (chir pine), *Pisum sativum* (pea), *Poncirus trifoliata* (Trifoliate orange), *Prunus persica* (peach), *Psidium* spp. (guava), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Raphanus sativus* (radish), *Ricinus communis* (castor bean), *Saccharum officinarum* (sugarcane), *Senna siamea* (yellow cassia), *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Solanum tuberosum* (potato), *Sorghum bicolor* (sorghum), *Trifolium alexandrinum* (Berseem clover), *Triticum aestivum* (wheat), *Vigna mungo* (black gram), *Vigna radiata* (mung bean), *Vigna unguiculata* (cowpea), *Zea mays* (maize).

[406] Symptoms and affected plant parts may include the root system (altered root growth patterns, e.g. taproot stunting, increase in secondary roots near surface), leaves (wilting, chlorosis), whole plant (stunting, reduced yield and/or quality).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
		Gossypium hirsutum (upland cotton), *Panicum virgatum*, *Zea mays* (maize).	surface); leaves (wilting, chlorosis); whole plant (stunting, reduced yield and/or quality).	distances.						
Meloidogyne acronea	African cotton root nematode	Wide host range [407] including *Gossypium* spp. (cotton) such as *Gossypium hirsutum* (upland cotton).	Root system (knotting, inconspicuous galls, slight swelling); flowering (delayed flowering); whole plant (stunting, chlorosis, wilting, reduced vigour and yield). [408]	Soil, plant materials and machinery or equipment could spread this nematode long distances.	Africa (e.g. Kenya, Malawi, South Africa). [409]	LOW	MEDIUM [410]	MEDIUM	MEDIUM	**LOW**
Pratylenchus delattrei	Lesion nematode	Cotton [411], sugarcane, pigeon pea, peanut, common bean, maize, weeping lovegrass, Rhodes grass, oats, pearl millet, wheat, tomato.	Root system.	Soil, plants with and/or equipment could spread this nematode long distances.	Madagascar, Cape Verde [412], Sudan, South Africa, Oman, Iran, Pakistan, India, Vietnam, South Korea.	LOW	MEDIUM	HIGH	LOW	**VERY LOW**
Viruses and viroids										
Abutilon mosaic virus (*Begomovirus*)	Abutilon mosaic virus (AbMV);	*Abutilon* spp. and *Abutilon* x *hybridum* (Indian mallow),	Leaves symptomatic (mottled yellow mosaic).	Local and regional dispersal is most likely via the whitefly vector	United States of America (Hawaii), Argentina, Bolivia,	LOW	HIGH	HIGH	LOW	**VERY LOW**

[407] *Arachis hypogaea* (peanut), *Cajanus cajan* (pigeon pea), *Cassia* spp. (sennas), *Chloris gayana* (Rhodes grass), *Croton tiglium* (Purging croton), *Cyamopsis tetragonoloba* (guar), *Eleusine coracana* (finger millet), *Eragrostis* (lovegrasses), *Gossypium* spp. (cotton), *Gossypium hirsutum* (upland cotton), *Helianthus annuus* (sunflower), *Hibiscus sabdariffa* (roselle), *Pennisetum glaucum* (pearl millet), *Phaseolus* spp. (beans), *Phaseolus vulgaris* (common bean), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Sorghum bicolor* (sorghum).

[408] Page and Bridge (1994).

[409] Onkendi et al. (2014).

[410] *Meloidogyne acronea* prefers soils with a high water-holding capacity.

[411] Limited information is available other than *Pratylenchus delattrei* has been reported from cotton in Madagascar (Majd Taheri et al., 2013).

[412] Flis et al. (2018).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
(exotic strains)	Malvaceous chlorosis virus	*Gossypium hirsutum* (upland cotton), *Phaseolus vulgaris* (common bean), *Vigna unguiculata* (cowpea).		(*Bemisia tabaci* - present in Australia). Transport of virus and/or vector (such as through the live plant trade or unregulated pathways) could be pathways for introduction.	Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.					
Chickpea chlorotic dwarf virus (*Mastrevirus*)	Chickpea chlorotic dwarf virus (CpCDV - C & L)	Chickpea, faba bean, field pea, lentil, common bean, pigeon pea, squash, watermelon, okra, cotton (*Gossypium hirsutum*, *G. arboreum*), pepper, tomato, cucumber, spinach, *Acacia* spp., *Dolichos lablab*, *Rhynchosia minima*. [413]	Infected cotton plants show leaf curl disease symptoms. [414]	Movement of infected plants and/or vectors [415] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not known to be seed-borne.	CpCDV (A-S): Burkina Faso, Egypt, Eritrea, Ethiopia, Morocco, Nigeria, South Africa, Sudan, Tunisia, Turkey, India, Iran, Iraq, Oman, Pakistan, Syria, Yemen. Cotton infecting strains are CpCDV-C in India, Pakistan and Sudan as well as CpCDV-L in Pakistan. [416]	LOW	HIGH	HIGH	LOW	**VERY LOW**
Cotton anthocyanosis virus (*Polerovirus*)	Cotton anthocyanosis virus (CAV); Vermelhao disease; Reddening disease	*Abelmoschus esculentus* (okra), *Gossypium barbadense* (Gallini cotton), *Gossypium hirsutum* (upland cotton), *Hibiscus cannabinus*	Leaves/stems (chlorosis - red to purple [except for veins], progressing from older to newer/developing leaves; older leaves may be shed); whole plant (yield loss).	Movement of infected plants and/or vectors [418] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not known to be seed-borne.	Brazil.	LOW	HIGH	HIGH	HIGH [419]	**MEDIUM**

[413] The strains of CpCDV (A-S) display varying geographical distributions and host ranges.
[414] Attributing the presence of CpCDV strains in cotton to disease symptoms requires further clarification, particularly when CpCDV is found along with other viruses (Manzoor et al., 2014).
[415] Specific vectors are not yet identified. Members of the genus *Mastrevirus* are transmitted by leafhoppers (e.g. *Orosius albicinctus*, *Orosius orientalis* - present in Australia, and *Neolimnus aegyptiacus*).
[416] Kanakala and Kuria (2019).
[418] Poleroviruses are transmitted in a circulative, non-propagative manner by aphids (e.g. *Aphis gossypii* – present in Australia) (Kirkpatrick & Rothrock, 2001).
[419] All commercial cotton varieties are susceptible and losses up to 35 % have been reported. The severity of the disease is greater when infection occurs at early plant growth stages. Plants infected later in the season may experience up to 10 % yield reduction (CABI, 2022). Disease incidence can range from 5 to 100 % (Kirkpatrick & Rothrock, 2001).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
		(kenaf). [417]								
Cotton chlorotic spot virus (*Begomovirus*)	Cotton chlorotic spot virus (CCSV; CoChSpV) [420]	Cotton.	Leaves (chlorotic spots, interveinal chlorosis, leaf distortion).	Movement of infected plants and/or vectors [421] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not known to be seed-borne.	Brazil (mid-west and northeast regions). [422]	LOW	HIGH	HIGH	UNKNOWN	**UNKNOWN**
Cotton leaf crumple virus (*Begomovirus*)	Cotton leaf crumple virus (CLCrV); Cotton leaf crumple disease (CLCrD)	*Gossypium* spp. (cotton) such as *Gossypium barbadense* (Gallini cotton) and *Gossypium hirsutum* (upland cotton), zucchini, watermelon, common bean.	Leaves (crumple, discoloration, mosaic [in Guatemala]), flowers (minute outgrowths), bolls (deformed), whole plant (stunting).	Movement of infected plants and/or vectors [423] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not seed-borne.	India, Guatemala, Mexico, United States of America.	LOW	HIGH	HIGH	LOW [424]	**VERY LOW**
Cotton leaf curl virus complex (*Begomovirus*)	Cotton leaf curl virus[es] (CLCuV);	Important hosts are *Gossypium barbadense* (Gallini	Leaves (thickening and darkening of veins, curling of	Movement of infected plant materials [427] and/or vectors [428] (e.g. via plants	Egypt, Nigeria, Tanzania, Sudan, Pakistan, India, China,	MEDIUM	HIGH	HIGH	EXTREME [429]	**EXTREME**

[417] Suspected reservoirs are ratooned cotton, kenaf, okra, and several malvaceous weeds. Inoculum probably over-seasons in reservoirs.
[420] de Almeida et al. (2013).
[421] *Bemisia tabaci* - present in Australia.
[422] Tarazi and Vaslin (2022).
[423] *Bemisia tabaci* - present in Australia.
[424] Cotton leaf crumple virus (CLCrV) can be extremely damaging if cotton seedlings are infected before reaching the age of 10–14 leaf stage. When infection occurs during the rapid foliar growth stages losses ranging from 16-85% have been reported (Brown, 1992). Losses are attributed to reduced boll set, fewer open bolls, and lower seed indices. This disease is often controlled by reducing the whitefly population in the field. Breeders have also identified cotton cultivar Cedix as resistant to CLCrV which was used to develop tolerant cotton lines (Rahman et al., 2017). Despite the potential economic impact of CLCrV, there is generally low incidence in the field (Sharman, 2022 pers. comm.).
[427] CLCuD can be graft transmitted but is not mechanically or seed transmitted.
[428] *Bemisia tabaci* (present in Australia).
[429] Cotton leaf curl disease may result in a 15–70 % reduction in yield (Rahman et al., 2017). Yield loss and severity is particularly pronounced when infection occurs early in the growing season, or in highly susceptible cultivars. Disease complexes involving CLCuD components with other viruses (e.g. *Tomato leaf curl New Delhi virus* (*Begomovirus*)) may result in synergistic interactions that could enhance pathogenicity (Zaidi et al., 2016).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
	Cotton leaf curl disease (CLCuD) complex [425]	cotton), and *Gossypium hirsutum* (upland cotton). [426]	leaves (mostly upward), development of outgrowths (enations) on the abaxial side of leaves), flowers/bolls (abnormal formation), whole plant (stunting, yield/quality loss).	for planting, cuttings, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not seed-borne.	the Philippines, and the United States of America (Villegas et al., 2019).					
Cotton leafroll dwarf virus (*Polerovirus*)	Cotton leafroll dwarf virus (CLRDV); Cotton blue disease (CBD) Cotton leafroll dwarf disease (CLRDD) [430] Atypical Cotton Blue Disease (ACBD); Atypical Cotton Leafroll Dwarf Virus	*Gossypium barbadense* (Gallini cotton), *Gossypium hirsutum* (upland cotton), *Gossypium mustelinum*, *Gossypium* spp., *Hibiscus sabdariffa* (roselle), *Sida acuta*, *Cicer arietinum* (chickpea). Known symptomless hosts include several plants in the	Affected plant parts and general symptoms may impact the stem (zig-zag growth pattern), leaves (basal bulging of apical leaves, discolouration - deep bluish-green [CBD], red/intense green leaves and petioles [CLRDD], wilting, downward	Movement of infected plants and/or vectors [433] (e.g. via plants for planting, hitchhiking, unregulated pathways or natural dispersal) could facilitate local, regional or long distance dispersal. Wind currents during the monsoon wet season could potentially introduce viruliferous, aphids from Timor-Leste into northern Australia.	Benin, Cameroon, Chad, Côte d'Ivoire, Sudan, Uzbekistan, India, Thailand, Timor-Leste [434], Brazil, Argentina, United States of America.	HIGH	HIGH	HIGH	HIGH [435]	**HIGH**

[425] There are a number of different cotton leaf curl viruses known to cause CLCuD and their occurrence varies in areas of known distribution. The cotton leaf curl virus or disease complex includes Begomoviruses (e.g. Cotton leaf curl Multan virus (CLCuMuV), Cotton leaf curl Bangalore virus (CLCuBaV), Cotton leaf curl Barasat virus (CLCuBarV); Cotton leaf curl Kokhran virus (CLCuKoV), Cotton leaf curl Gezira virus (CLCuGeV) and Cotton leaf curl Alabad virus (CLCuAlV)) as well as a range of betasatellite and alphasatellite molecules.

[426] Other hosts may include *Abelmoschus esculentus* (okra), *Capsicum annuum* (bell pepper), *Carica papaya* (pawpaw), *Cucumis sativus* (cucumber), *Cucurbita* spp. (gourds), *Cyamopsis tetragonoloba* (guar), *Duranta erecta* (golden dewdrop), *Glycine max* (soybean), *Hibiscus cannabinus* (kenaf), *Hibiscus rosa-sinensis* (China-rose), *Luffa aegyptiaca* (loofah), *Malvaviscus arboreus* (wax mallow), *Momordica charantia* (bitter gourd), *Ricinus communis* (castor bean), *Sida* spp., *Solanum lycopersicum* (tomato), *Solanum melongena* (aubergine), *Xanthium strumarium* (common cocklebur).

[430] Cotton plants infected with strains of CLRDV in the United States of America showed different symptoms than CBD. Therefore, the disease caused by this virus or strain has been named as Cotton Leafroll Dwarf Disease (CLRDD) (Parkash et al., 2021).

[433] Poleroviruses are transmitted in a circulative, non-propagative manner by aphids. CLRDV is transmitted by the cotton aphid, *Aphis gossypii* (worldwide distribution) which is present in all cotton growing regions of Australia. Not seed or mechanically transmitted.

[434] CLRDV was detected in Timor-leste in an asymptomatic, domestic *Gossypium barbadense* planting. It remains to be seen if CLRDV from Timor-Leste can cause 'cotton blue disease' in *G. hirsutum* (Davis et al., 2021).

[435] *Cotton leafroll dwarf virus* (*Polerovirus*) can cause significant yield losses, reaching up to 80% in Brazil (Davis et al., 2021; Parkash et al., 2021).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
	(ACLDV) [431]	Amaranthaceae and Fabaceae.	rolling, crinkling and/or deformation), fruit/boll (reduced boll set), whole plant (stunting, reduced cotton/seed yield per plant). [432]							
Cotton terminal stunt virus (Unclassified)	Cotton terminal stunt virus; Cotton terminal stunt disease	Cotton.	Leaves (mottling, puckering, twisting); terminal tips (stunting); flowers/squares/bolls (shedding, soft discoloured seed); whole plant (shortening of internodes, xylem discolouration).	Movement of infected plants and/or vectors [436] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not known to be seed-borne.	Mexico, United States of America.	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN [437]	**UNKNOWN**
Cotton yellow mosaic virus (*Begomovirus*) (syn. *African cotton mosaic virus*) [438]	Cotton yellow mosaic virus (CYMV)	Cotton.	Leaves (light yellow mosaic/mottle, deformation); flowers (fewer); bolls (shedding); whole plant (stunting, reduced canopy).	Local and regional dispersal is most likely via the whitefly vector (*Bemisia tabaci* - present in Australia). Transport of virus and/or vector (such as through the live plant trade or unregulated pathways) could be pathways for introduction. Not known	Benin, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Egypt, Ghana, Mali, Nigeria, Sudan, Tanzania, Togo.	LOW	HIGH	HIGH	LOW [439]	**VERY LOW**

[431] CLRDV strains that can break resistant varieties have been detected in Brazil and Argentina and were responsible for a "new" or "atypical" virus/disease expressions (Agrofoglio et al., 2017).
[432] Disease symptomology can vary substantially depending upon viral strain, location, host/variety, and the developmental stage at the time of infection along with disease progression.
[436] Not determined (potentially within Cicadellidae).
[437] Yield loss is suggested to be substantial, although there are no quantitative data on yield loss (Kirkpatrick & Rothrock, 2001). Cotton terminal stunt virus affected 400,000 acres (160,000 ha) in Texas in 1962 (Sleeth et al., 1963). Cotton terminal stunt disease was detected in 90 % of fields in the Rio Grande Valley region with disease incidence of 50 % in some fields (Kirkpatrick & Rothrock, 2001). A limited number of recent reports suggests it is no longer a significant issue in the United States of America.
[438] Alegbejo et al. (2008); Leke et al. (2016).
[439] Cotton yellow mosaic virus seems to occur sporadically in Africa with symptom severity depending on the cotton variety, management practice and environmental conditions (Alegbejo et al., 2008).

Scientific name	Common name	Host(s)	Affected plant part	Dispersal	Distribution [356]	Entry potential	Est. [357] potential	Spread potential	Economic impact	Overall risk
				to be seed-borne.						
Cotton yellow vein virus (Unclassified)	Cotton yellow vein disease; Texas cotton vein-clearing	Cotton.	Leaves (vein clearing, foliar mottling/mosaic, red spotting, chlorosis, distortion), whole plant (stunting).	Movement of infected plants and/or vectors [440] (e.g. via plants for planting, hitchhiking or unregulated pathways) could facilitate local, regional or long distance dispersal. Not known to be seed-borne.	Mexico, United States of America.	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	**UNKNOWN**

[440] Disease symptoms are associated with the presence of the leafhopper, *Scaphytopius albifrons* (not in Australia).

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