Australian Government
Department of Agriculture, Water and the Environment

Okra from India: biosecurity import requirements draft report

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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

Stakeholder submissions on draft reports

This draft report has been issued to give all interested parties an opportunity to comment on relevant technical biosecurity issues, with supporting rationale. A final report will then be produced taking into consideration any comments received.

Submissions should be sent to the Department of Agriculture, Water and the Environment following the conditions specified within the related Biosecurity Advice, which is available at: awe.gov.au/biosecurity-trade/policy/risk-analysis/memos.

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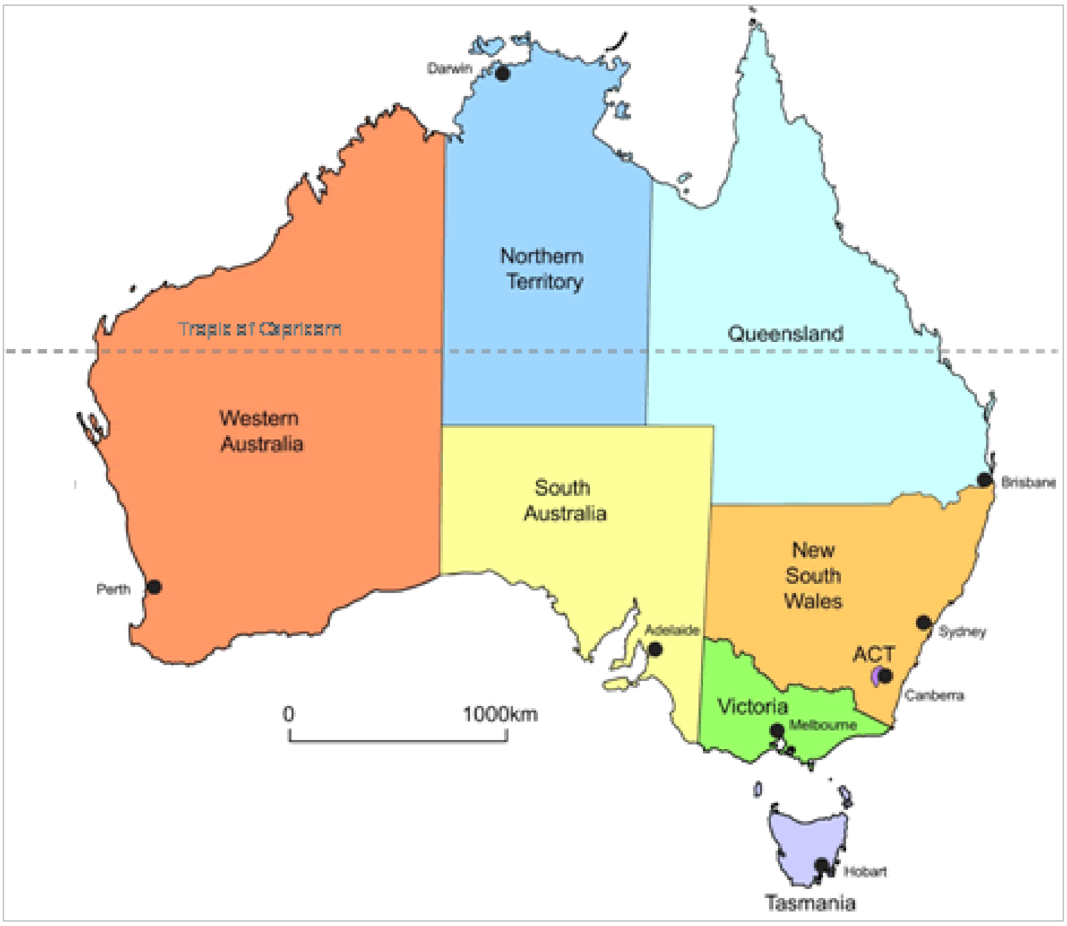

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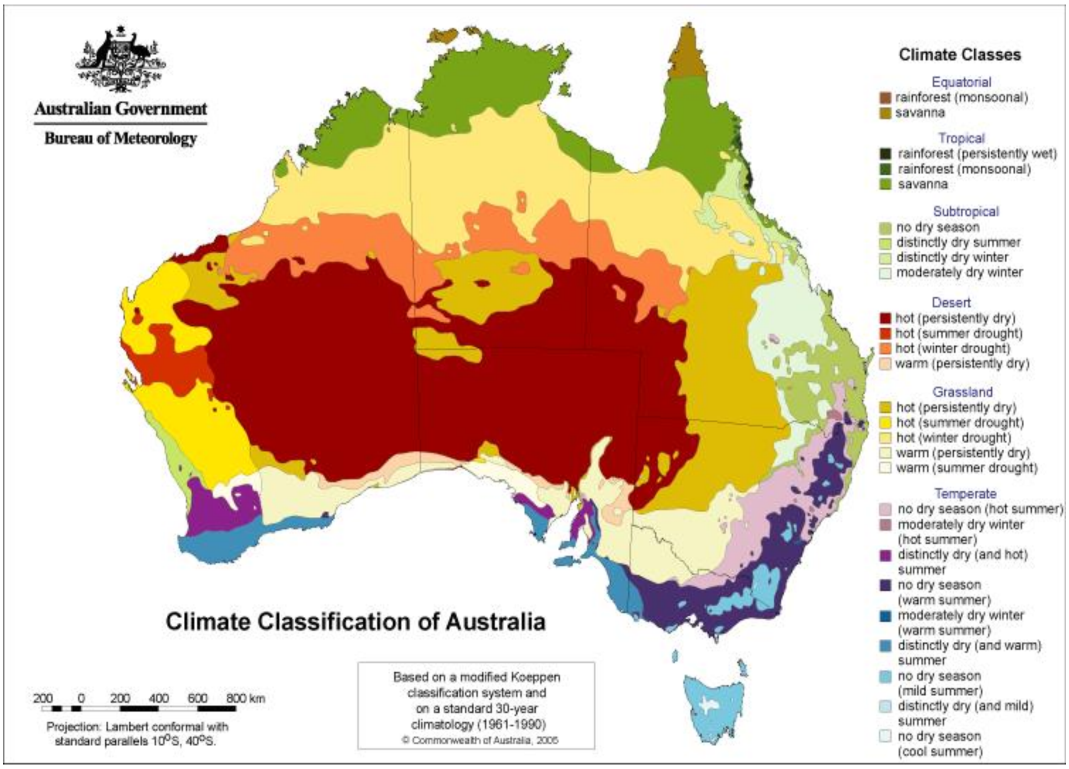

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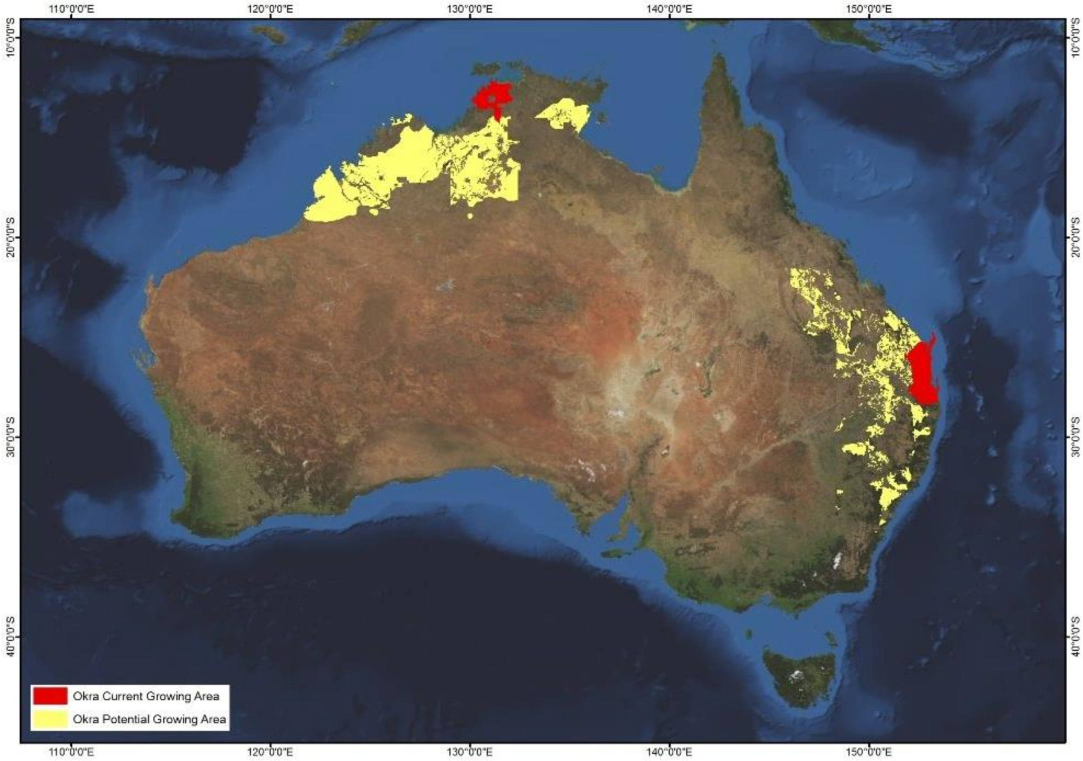


Source: AgriFutures Australia (2017)

Summary

The Australian Government Department of Agriculture, Water and the Environment (the department) has prepared this draft report to assess the proposal by India for market access to Australia for fresh okra fruit (*Abelmoschus esculentus*) for human consumption.

Australia currently permits the importation of fresh okra fruit from Fiji for human consumption, provided Australian biosecurity import conditions are met. Australia does not currently permit the importation of okra fruit from any other country for human consumption.

This draft report proposes that the importation of commercially produced okra fruit to Australia from all commercial production areas of India be permitted, subject to a range of biosecurity requirements.

Included in this draft report are details of plant pests that are of biosecurity concern to Australia and that have potential to be associated with the importation of fresh okra fruit from India. Also included are the risk assessments for the identified quarantine pests and regulated articles, and, where required, proposed risk management measures to reduce the biosecurity risk to an acceptable level, that is, to achieve the appropriate level of protection (ALOP) for Australia.

Ten quarantine pests have been identified in this risk analysis as requiring risk management measures to reduce the biosecurity risk to an acceptable level. These pests are:

- fruit flies: peach fruit fly (*Bactrocera zonata*) and melon fly (*Zeugodacus cucurbitae*)
- mealybugs: papaya mealybug (*Paracoccus marginatus*), Madeira mealybug (*Phenacoccus madeirensis*) and cotton mealybug (*Phenacoccus solenopsis*)
- scale insect: mulberry scale (*Pseudaulacaspis pentagona*)
- thrips: Eurasian flower thrips (*Frankliniella intonsa*) and melon thrips (*Thrips palmi*)
- spider mites: red okra spider mite (*Tetranychus macfarlanei*) and okra mite (*Tetranychus truncatus*).

The 2 quarantine thrips were also assessed as regulated articles for all of Australia, as they are capable of harbouring and spreading emerging orthotospoviruses that are quarantine pests for Australia.

An additional species, chilli thrips (*Scirtothrips dorsalis*), has been assessed as a regulated article for Australia as it is capable of harbouring and spreading emerging orthotospoviruses that are quarantine pests for Australia.

The identified pests are the same, or of the same pest groups, as those associated with other horticultural commodities that have been analysed previously by the department.

Proposed risk management measures take account of regional differences in pest distribution within Australia. Three pests requiring risk management measures, *P. pentagona*, *P. solenopsis* and *T. palmi*, have been identified as regional quarantine pests for Western Australia, and *T. palmi* has been identified as a regional quarantine pest for South Australia. These pests are considered regional quarantine pests as interstate quarantine regulations and enforcement are in place to prevent the introduction and distribution of these pests into the respective jurisdictions.

The department proposes a range of risk management measures, combined with operational systems, to reduce the risks posed by the 11 identified species to achieve the ALOP for Australia. The 11 identified species are 10 quarantine pests, including 2 quarantine thrips that are also regulated articles, and an additional thrips species that is a regulated article. The proposed measures are:

- for fruit flies:
  - pest free areas, pest free places of production or pest free production sites; or
  - fruit treatment (such as irradiation)
- for mealybugs, scale insects, spider mites and thrips:
  - pre-export visual inspection, and, if found, remedial action.

This draft report has been published on the department website to allow interested parties to provide comments and submissions within the specified consultation period.

1 Introduction

1.1 Australia's biosecurity policy framework

Australia's biosecurity policies aim to protect Australia against the risks that may arise from exotic pests entering, establishing and spreading in Australia, thereby threatening Australia's unique flora and fauna, as well as those agricultural industries that are relatively free from serious pests.

The risk analysis process is an important part of Australia's biosecurity policy development. It enables the Australian Government to formally consider the level of biosecurity risk that may be associated with proposals to import goods into Australia. If the biosecurity risks do not achieve the appropriate level of protection (ALOP) for Australia, risk management measures are proposed to reduce the risks to an acceptable level. If the risks cannot be reduced to an acceptable level, the goods will not be imported into Australia until suitable measures are identified or developed.

Successive Australian governments have maintained a stringent, but not a zero risk, approach to the management of biosecurity risks. This approach is expressed in terms of the ALOP for Australia, which is defined in the *Biosecurity Act 2015* as providing a high level of protection aimed at reducing risk to a very low level, but not to zero.

Australia's risk analyses are undertaken by the Department of Agriculture, Water and the Environment using technical and scientific experts in relevant fields and involve consultation with stakeholders at various stages during the process.

Risk analyses may take the form of a biosecurity import risk analysis (BIRA) or a review of biosecurity import requirements (such as scientific review of existing policy and import conditions, pest-specific assessments, weed risk assessments, biological control agent assessments or scientific advice).

Further information about Australia's biosecurity framework is provided in the Biosecurity Import Risk Analysis Guidelines 2016, located on the Department of Agriculture, Water and the Environment at awe.gov.au/biosecurity-trade/policy/risk-analysis/guidelines.

1.2 This risk analysis

1.2.1 Background

The Indian Government Department of Agriculture and Farmers Welfare formally requested market access to Australia for fresh okra fruit for human consumption in a submission received in February 2017. This submission provided information on the pests associated with okra in India, including the plant parts affected. Information was also provided on the standard commercial production practices for okra in India.

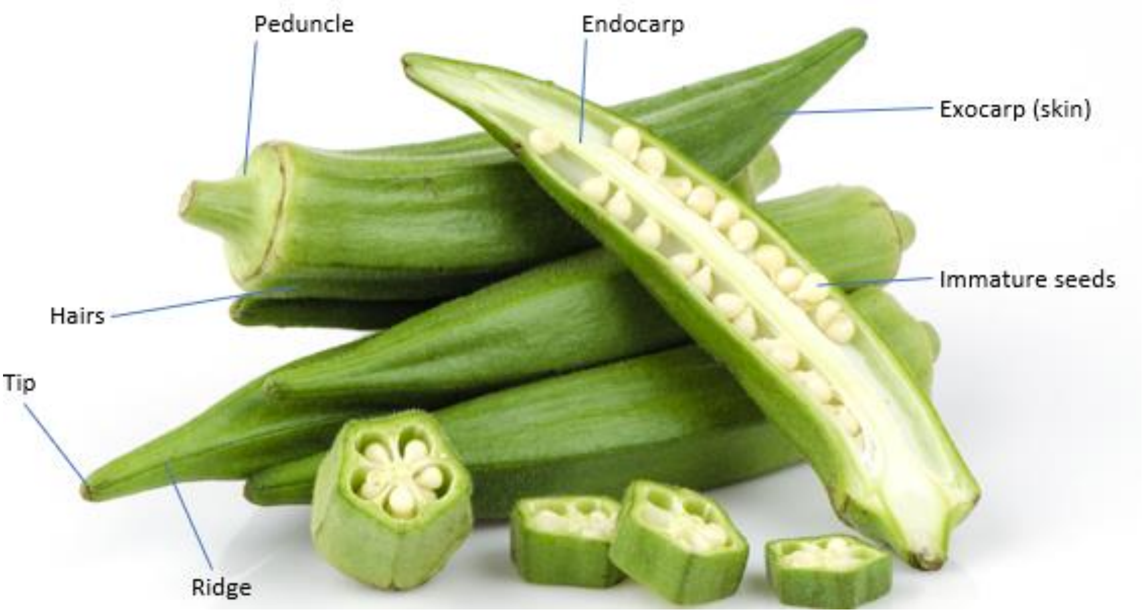
On 21 February 2021, the department notified stakeholders of the decision to progress a request for market access for okra from India as a review of biosecurity import requirements. This analysis is conducted in accordance with the *Biosecurity Act 2015*.

1.2.2 Scope

The scope of this risk analysis is to consider the biosecurity risk that may be associated with the pathway of imported fresh okra fruit (*Abelmoschus esculentus*) from India, produced using standard commercial production practices as described in Chapter 2, for human consumption in Australia.

In this risk analysis, fresh okra fruit is defined as the entire fresh fruit including the skin, flesh, seed and a small portion of peduncle (Figure 1.1) (hereafter referred to as okra). This risk analysis covers all cultivars of commercially produced okra from all production regions in India.

Figure 1.1 Morphology of okra fruit



Source: Ross (2021)

1.2.3 Existing policy

International policy

Okra fruit for human consumption has not been previously assessed for import into Australia. However, historical, established import conditions exist for okra from Fiji. Australia has import policies for the following horticultural commodities from India: pomegranates (DAWE 2020), table grapes (DAWR 2016) and mangoes (Biosecurity Australia 2011).

The biosecurity import conditions for these commodity pathways can be found in the Biosecurity Import Conditions (BICON) system on the department website at bicon.agriculture.gov.au/BiconWeb4.0.

A preliminary assessment has identified that the potential pests of biosecurity concern for okra from India are the same, or of the same pest groups, as those associated with other horticultural commodities that have been assessed previously by the department, and for which risk management measures are established.

The department has reviewed all the pests and pest groups previously identified in existing policies and, where relevant, the information in those assessments has been considered in this risk analysis. The department has also reviewed the latest scientific literature and other information to ensure that the previous assessments are still valid.

The biosecurity risk posed by thrips and the orthotospoviruses they transmit was previously assessed for all countries in the *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (thrips Group PRA) (DAWR 2017).

The biosecurity risk posed by mealybugs and the viruses they transmit was previously assessed for all countries in the *Final group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports* (mealybugs Group PRA) (DAWR 2019).

The biosecurity risk posed by soft and hard scale insects was previously assessed for all countries in the *Final group pest risk analysis for soft and hard scale insects on fresh fruit, vegetable, cut-flower and foliage imports* (scales Group PRA) (DAWE 2021).

These Group policies are applicable to okra from India. The department has determined that the information in these Group policies can be adopted for the species under consideration in this risk analysis.

Domestic arrangements

The Australian Government is responsible for regulating the movement of goods such as plants and plant products into and out of Australia. The state and territory governments are responsible for plant health controls within their individual jurisdiction. Legislation relating to resource management or plant health may be used by state and territory government agencies to control interstate movement of plants and their products. After imported plants and plant products have been cleared by Australian Government biosecurity officers, they may be subject to interstate movement regulations/arrangements. It is the importer's responsibility to identify and ensure compliance with all requirements.

1.2.4 Contaminating pests

In addition to the pests of okra from India that are assessed in this risk analysis, other organisms may arrive with the imported commodity. These organisms may include pests considered not to be associated with the fruit pathway, pests of other crops, or predators and parasitoids of arthropods. The department considers these organisms to be contaminating pests ('contaminants') that could pose sanitary (to human or animal life or health) or phytosanitary (to plant life or health) risks. These risks are identified and addressed using existing operational procedures that require an inspection of all consignments during processing and preparation for export. Consignments will also undergo another inspection on arrival in Australia. The department will investigate whether any pest identified through import verification processes may be of biosecurity concern to Australia and may thus require remedial action.

1.2.5 Consultation

On 21 February 2021, the department notified stakeholders, in Biosecurity Advice 2021-P02, of the commencement of a review of biosecurity import requirements to assess a proposal by India for market access to Australia for okra for human consumption.

Prior to, and following the announcement of this decision, the department engaged with the Australian okra industry.

The department has also consulted with the government of India and Australian state and territory governments during the preparation of this report.

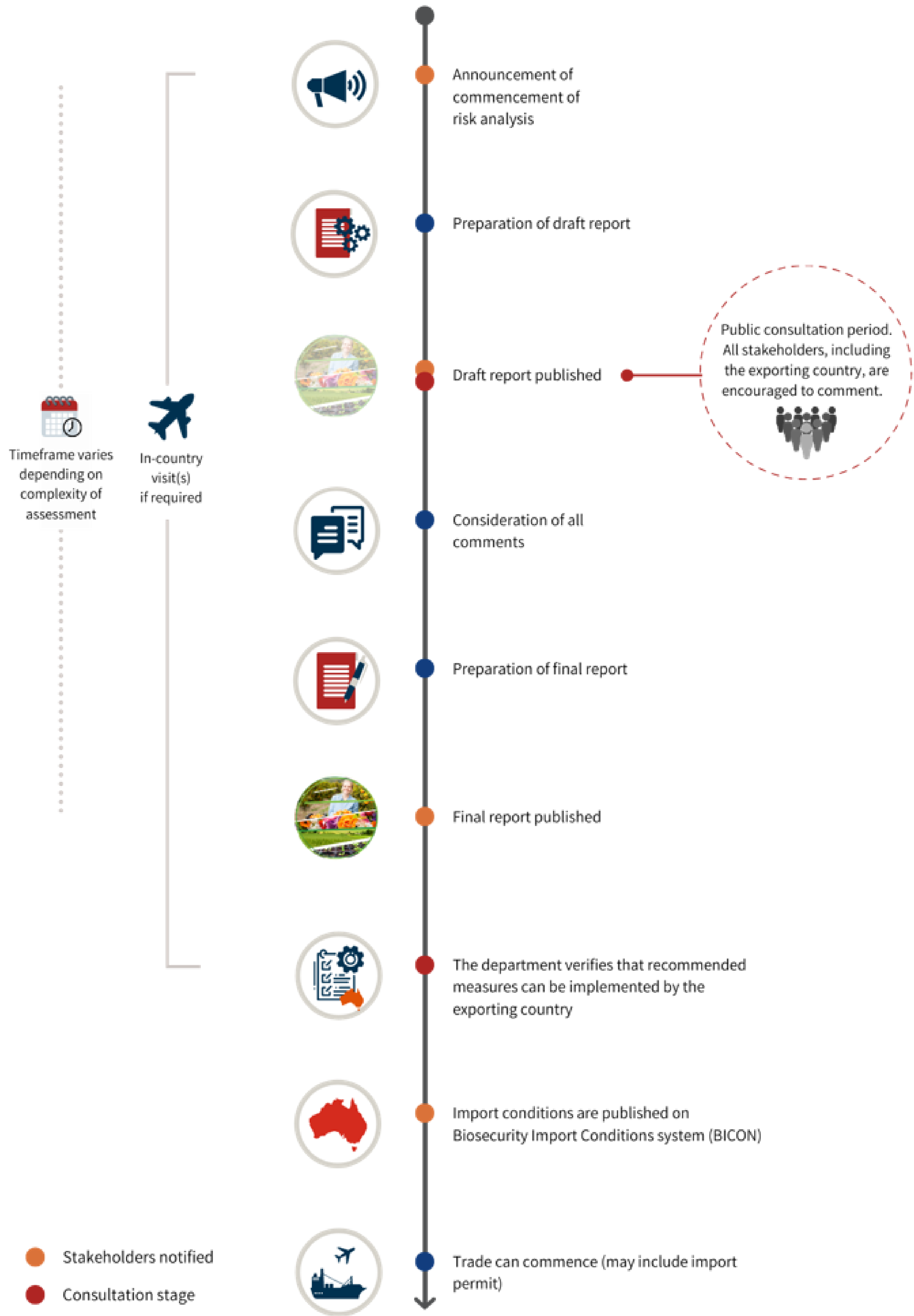
1.2.6 Overview of this pest risk analysis

A pest risk analysis (PRA) is 'the process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it' (FAO 2021b). A pest is 'any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products' (FAO 2021b). This definition is also applied in the *Biosecurity Act 2015*.

The department conducted this PRA in accordance with Australia's method for pest risk analysis (Appendix A), which is consistent with the International Standards for Phytosanitary Measures (ISPMs), including ISPM 2: *Framework for pest risk analysis* (FAO 2021a) and ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2021e), and the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) (WTO 1995).

A summary of the process used by the department to conduct a risk analysis is provided in Figure 1.2.

Figure 1.2 Process flow diagram for conducting a risk analysis



The PRA was conducted in the following 3 consecutive stages:

1) Initiation—identification of:
   - the pathway being assessed in the risk analysis
   - the pest(s) that have potential to be associated with the pathway and are of biosecurity concern and should be considered for analysis in relation to the identified PRA area.
2) Pest risk assessment—this was conducted in 2 sequential steps:

   2a. Pest categorisation: examination of each pest identified in stage 1 to determine whether they are a quarantine pest and require further pest risk assessment.

   2b. Further pest risk assessment: evaluation of the likelihood of the introduction (entry and establishment), spread and the magnitude of the potential consequences of the quarantine pest(s). The combination of the likelihoods and consequences gives an overall estimate of the biosecurity risk of the pest, known as the unrestricted risk estimate (URE).
3) Pest risk management—the process of identifying and proposing/recommending required phytosanitary measures to reduce the biosecurity risk to achieve the ALOP for Australia where the URE is determined as not achieving the ALOP for Australia. Restricted risk is estimated with these phytosanitary measure(s) applied.

A phytosanitary measure is 'any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests' (FAO 2021c).

For further information on the:

- method for PRA see: Appendix A
- terms used in this risk analysis see: Glossary, acronyms and abbreviations at the end of this report
- pathway being assessed in this risk analysis see: section 1.2.2
- initiation and pest categorisation see: Appendix B
- pest risk assessments for pests/pest groups identified in Appendix B as requiring further pest risk assessment see: Chapter 3
- risk management measures for pests/pest groups assessed in Chapter 3 as not achieving the ALOP for Australia see: Chapter 4.

1.2.7 Next steps

The department has notified the proposer, the registered stakeholders and the WTO Secretariat about the release of this draft report.

This draft report gives stakeholders an opportunity to comment on the department's review and proposed measures, and to draw attention to any scientific, technical or other gaps in the data, or misinterpretations or errors.

The department will consider submissions received on the draft report and may consult further with stakeholders. The department will revise the report as appropriate and then prepare a final report, taking into account stakeholder comments.

The final report will be published on the department website with a notice advising stakeholders of its release. The department will also notify the proposer, the registered stakeholders and the WTO Secretariat about the release of the final report. Publication of the final report represents the end of the risk analysis process. The biosecurity requirements recommended in the final report will form the basis of the conditions published on BICON, and for any import permits subsequently issued.

Should the final report recommend importation be permitted, India must be able to demonstrate to the department that processes and procedures are in place to implement the agreed risk management measures prior to publication of import conditions on BICON. This will ensure safe trade in fresh okra fruit from India.

2 Commercial production practices for okra in India

This chapter provides information on the pre-harvest, harvest and post-harvest practices considered to be standard practices in India for the production of okra for export. It also outlines the export capability of India.

2.1 Considerations used in estimating unrestricted risk

India provided a technical market access submission to Australia that included information on commercial production practices of okra in India.

The information provided by India has been supplemented with data from published literature and other sources and has been taken into consideration when estimating the unrestricted risks of pests that may be associated with import of this commodity.

In estimating the likelihood of pest introduction, it was considered that the pre-harvest, harvest and post-harvest production practices for okra, as described in this chapter, are implemented by all growers and packing houses for all varieties of okra produced for export. Due to the COVID-19 situation an in-country inspection to India has not yet been undertaken. If deemed necessary, an in-country inspection may be undertaken prior to the commencement of trade.

2.2 Production areas of okra

Okra is commercially grown in almost all parts of India, although the amount produced varies greatly by state. In 2017–18, India produced more than 6 million tonnes of okra, with production highest in Gujarat at 921,720 t, followed by West Bengal at 914,860 t, Bihar at 787,780 t, Madhya Pradesh at 638,340 t and Odisha at 566,880 t (APEDA 2021).

The top 10 okra production states are indicated in Map 4.

2.3 Climate in production areas

India has a wide range of climatic conditions, including high-rainfall tropical areas in the south-west, temperate conditions in the north to north-east, montane-alpine environments in the far north and arid to semi-arid areas in the central-western regions (Beck et al. 2018).

The 4 seasons experienced in India are:

- winter (January to February), with average temperatures of 10°C to 15°C in the northwest and 20°C to 25°C in the southeast
- summer (March to May), also considered the pre-monsoon season with thunderstorms and high temperatures reaching up to 40°C in central India
- rainy (June to September), also considered the southwest summer monsoon season with approximately 75% of India’s annual rainfall
- autumn (October to December), also considered the post-monsoon season/northeast winter monsoon season with the northeast receiving approximately 35% of its annual rainfall (India Meteorological Department 2008; Maps of India 2018).

As a result of the large geographic range of India, different parts of the country experience different ranges of temperature and rainfall even during the same month or season.

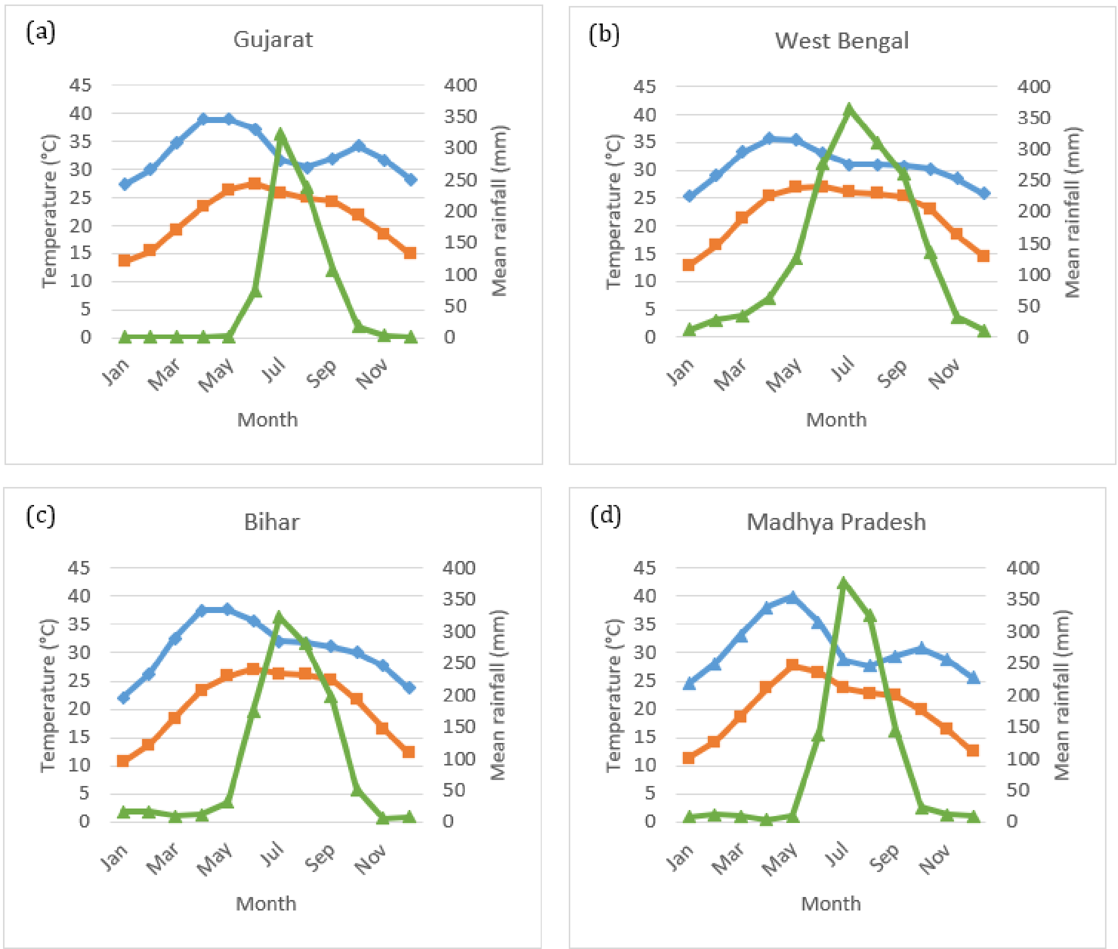
Okra is grown in tropical, sub-tropical and warm temperate regions, with year-round production in the states of Gujarat, Odisha and West Bengal (APEDA 2015). Okra is highly susceptible to low temperatures and frost, failing to germinate at temperatures below 20°C (Reddy 2019a). Temperatures above 42°C slow plant and fruit growth (Dhankhar & Mishra 2005).

Map 4 Top 10 production states of okra in India 2017 to 2018

Source: APEDA (2021); Image adapted from Maps of India (2013); Pikbest (2019)

Figure 2.1 shows mean monthly minimum and maximum temperatures, and mean monthly rainfall in major okra growing states. Most Indian states receive the majority of their rainfall during the monsoon season, although the monsoon season slightly varies in parts of India. Some parts tend to have a more even distribution of rainfall throughout the year.

Figure 2.1 Mean monthly minimum and maximum temperatures and mean monthly rainfall in the main okra production states in India



Mean monthly maximum (-◆-) and minimum temperature (-■-) (°C) and mean monthly rainfall (mm) (-▲-) in India's major okra production states Source: Climate-data.org (2021).

2.4 Pre-harvest

2.4.1 Cultivars

Okra has been cultivated in India for centuries, and many cultivars have been developed to maximise plant growth and yield. Okra has been selectively bred for a range of desired characteristics including number of fruit ridges, extent of hairiness, pigmentation, size of fruit, height of the plant and the degree of branching (Dhankhar & Mishra 2005). Common okra dwarf varieties grow up to 1 m and other varieties grow to about 2–3 m in height.

Okra cultivars are developed by state universities and research stations of the Indian Council of Agricultural Research (ICAR), which evaluate the improved genotypes and identify suitable cultivars for cultivation in the area under their jurisdiction (DBMST & MEF 2011; TNAU-NAIP 2011).

Okra yellow vein mosaic virus (OYVMV) is the most serious disease of okra with in-crop yield losses ranging between 50 to 94% (Karmakar et al. 2017; Mubeen et al. 2021) and managing this disease has played a key role in developing varieties/cultivars. Various plant breeding methods have been used to develop high yielding okra varieties that are resistant to OYVMV. These methods have included plant introduction, single plant selection and pure line selection from local collections, selection from bi-parental crosses, and selection from complex crosses (TNAU-NAIP 2011). Wild *Abelmoschus* species have also been utilised in development of OYVMV-resistant varieties, such as Parbhani Kranti and Punjab Padmini. Pusa Sawani was an OYVMV-resistant variety developed around the mid-1940s through the crop improvement program, replacing many of the heirloom, low yielding local cultivars that became less popular following the release of the new variety. Field tolerance to OYVMV gradually declined in Pusa Sawani during the early 1960s and research on virus resistance intensified across India, resulting in the development of additional high yielding, OYVMV resistant varieties (Chaudhary, Khan & Riaz 2016; TNAU-NAIP 2011). Okra varieties susceptible to OYVMV are still widely grown as the occurrence and severity of vein mosaic virus disease are location and season specific (Kumar et al. 2017).

A brief description of the fruit and yield potential of the widely grown okra varieties developed in India is given in Table 2.1.

Table 2.1 Main commercial okra varieties cultivated in India

Variety	Characteristics
Arka Abhay	Fruit with 5 ridges, of medium length, dark green and without hairs. Field tolerant to *Okra yellow vein mosaic virus* (OYVMV). Average yield potential is 18 t/ha.
Arka Anamika	Fruit with 5–6 ridges, of medium length, dark green and without hairs. Moderately resistant to OYVMV. Average yield potential is 20 t/ha.
Kashi Bhairav	Fruit with 5 ridges, 10–12 cm length at marketable stage and dark green. Resistant to OYVMV and *Okra leaf curl virus* (OLCV) under field conditions. Yield potential is 20–22 t/ha.
Kashi Kranti	Fruit with 5 ridges, 8–10 cm in length at marketable stage and light green. Resistant to OYVMV and OLCV. Yield potential is 12.5–14 t/ha.
Kashi Pragati	Fruit with 5 ridges, 10–12 cm in length at marketable stage, light green and without hairs. Resistant to OYVMV and OLCV. Yield potential is 15–18 t/ha.
Kashi Satdhari	Fruit with 7 ridges, 13–15 cm in length at marketable stage and without hairs. Resistant to OYVMV under field conditions. Yield potential is 11–14 t/ha.
Parbhani Kranti	Fruit with 5 ridges, 10–12 cm in length at marketable stage, dark green, slender and with hairs. Field tolerant to OYVMV. Yield potential is 9–11.5 t/ha.
Punjab 7	Fruit with 5 ridges, of medium length, dark green and without hairs. Resistant to OYVMV. Average potential yield is 11.2 t/ha.
Punjab Padmini	Fruit with 5 ridges, 15–20 cm in length at marketable stage, dark green and without hairs. Yield potential is 10–12 t/ha.
Pusa A-4	Fruit with 5 ridges, 12–15 cm in length at marketable stage, dark green and without hairs. Resistant to OYVMV. Average yield potential is 14 t/ha.
Pusa Mukhamali	Fruit with 5 ridges, 15–20 cm in length at marketable stage, light green and without hairs. Highly susceptible to OYVMV. Yield potential is 8–10 t/ha.
Pusa Sawani	Fruit with 5 ridges, 15–20 cm in length at marketable stage and dark green. Susceptible to OYVMV. Yield potential is 12–15 t/ha.
Varsha Uphar	Fruit with 5 ridges, of medium length, dark green and without hairs. Average yield potential is 9.8 t/ha.

Sources: IIHR (2021); Jindal et al. (2021); Singh (2012); Thind and Mahal (2021); TNAU-NAIP (2011); Vantika Tech (2020); Vidhi (2016)

2.4.2 Cultivation practices

Planting season

The planting seasons in different states of India extend over most of the year due to the wide range of climates. Differences in temperature and rainfall between the summer (March to May) and rainy (June to September) seasons necessitate the use of different varieties of okra and varying agronomic practices during the different seasons (Reddy 2019b; Reddy et al. 2013). While okra is grown throughout the year in India, the climatic patterns prevalent in India often result in 2 main growing seasons, with seed being sown in January for the summer season and the end of May for the rainy season (Government of India 2017a). The coastal states of Gujarat, West Bengal and Odisha have climates conducive to year-round cultivation of okra (APEDA 2015).

Farm preparation and planting

Okra grows best in tilled soil that is free-draining and high in organic matter. Okra generally requires 100 kg/ha nitrogen, 10 kg/ha phosphorus and 60 kg/ha potassium from the soil to produce 10 tonnes of fruit per hectare (Kumar, Ramjan & Das 2019). Applications of fertilisers vary from farm to farm depending upon fertility level. Composted manure at the rate of 20–25 t/ha is also often applied. Half of the nitrogen and all of the phosphorus and potassium required are applied at the time of land preparation (Kumar, Ramjan & Das 2019). The remaining half of the nitrogen is applied in 2 equal doses, one at 4 weeks after sowing and the second at the initiation of flowering and fruiting (Kumar, Ramjan & Das 2019). *Azospirillum* species (nitrogen fixing rhizobacteria) and phosphobacteria (phosphorus-mineralizing bacteria) may be incorporated into the prepared soil to enhance nitrogen and phosphorus uptake (TNAU-NAIP 2011).

During summer, okra seeds are sown at the rate of 18–20 kg/ha, spaced 45 cm between rows and 20 cm between plants. During the rainy season, okra seeds are sown at the rate of 8–10 kg/ha, spaced 60 cm between rows and 30 cm between plants to accommodate the additional vigour of plants grown during this season (Reddy 2019b; TNAU-NAIP 2011). Plastic mulch is often used to keep the soil moist and reduce weed growth. Okra requires large amounts of water, especially during summer. Drip irrigation is the preferred method, although surface irrigation is also frequently used (Job, Singh & Dinmani 2018; Reddy 2019b). Figure 2.2 and Figure 2.3 show examples of okra cropping conditions in India.

Figure 2.2 Okra crop using plastic mulch to preserve water and manage weed growth

Source: Reddy (2019b)

Figure 2.3 Typical okra crop

Source: Reddy (2019b)

2.4.3 Pest management

Okra fields are registered with the respective state agriculture department and crop management is supervised by India's National Plant Protection Organisation (NPPO), the Department of Agriculture and Farmers Welfare (DAFW), Directorate of Plant Protection, Quarantine and Storage (Ministry of Agriculture and Farmers Welfare). Official inspections are undertaken in the place of production at appropriate times during the growing season to check for the presence of pests and diseases in okra crops. Field inspections are jointly conducted by officials from DAFW and the respective state agricultural department (Government of India 2021).

Okra farmers implement a wide range of pest control regimes. Chemical control and cultural practices are commonly applied in an integrated program to reduce pest incidence, and bio-control agents such as *Beauveria bassiana* may also be used (Government of India 2017a; Kedar, Kumerang & Thodsare 2013; Sushil et al. 2020). Government programs are in place that aim to educate farmers in the proper use of control techniques and integrated pest management procedures (Satyagopal et al. 2014). Surveillance of pest and disease hotspots is undertaken periodically by private institutions and by state and federal government officials (Government of India 2017a). Table 2.2 outlines some control methods used for common pests of okra.

Neem cake, a by-product of neem (*Azadirachta indica*) oil production, is often applied to the soil as a pesticide and additional fertiliser, via ploughing at the rate of 100 kg/ha (Sushil et al. 2020). Soil sterilisation may also be undertaken pre-sowing through the application of soil fumigants, such as metham sodium or formaldehyde, or by steaming the soil or through soil solarisation, where transparent plastic is laid over the soil and heat from the sun is used to raise the soil temperature and kill soil-borne organisms (Government of India 2017a; Reddy 2019c). Before sowing, seeds are often soaked in a dilute solution of carbendazim for 6 hours to reduce the incidence of fungal pathogens (Chittora & Singh 2016; Government of India 2017a).

Weeding, thinning and earthing (raised seed bed) are important cultural operations in okra production. It is considered best practice to keep the crop weed-free during the first 20 to 25 days of plant growth (Kumar & Choudhary 2014; Sushil et al. 2020). Pendimethalin herbicide can be applied as a post-sowing and pre-emergence soil surface spray, as part of a good weed management system that integrates cultural, mechanical and biological methods (Chittora & Singh 2016; Kumar & Choudhary 2014). Plastic sheeting may be placed around emerging seedlings, or seeds may be sown directly into slits in plastic mulch to reduce the incidence of weeds (Reddy 2019b).

Crop rotation and isolation from other malvaceous crops are often used in okra cropping to reduce the incidence of serious pests and pathogens. Members of the family Malvaceae are potential hosts of diseases that affect okra and are recommended to be removed from the vicinity of the okra crop (Sushil et al. 2020). Trap crops may also be used for the management of some pests such as *Bemisia tabaci*, the vector of OYVMV, and shoot and fruit borers (Government of India 2017a; Kedar, Kumerang & Thodsare 2013; Sushil et al. 2020).

Farmers inspect their crops weekly and use sticky, pheromone or light traps to monitor for pests such as moths (*Earias* spp., *Helicoverpa* spp., *Spodoptera* spp.), thrips, whiteflies, aphids and jassids/leafhoppers. Localised or regional economic threshold levels have been established for different pests, which enable farmers to apply chemical sprays to their crops to reduce potential damage and yield losses when insect numbers exceed these levels. Fruit that show signs of infestation by fruit borers are collected and destroyed (Sushil et al. 2020).

Table 2.2 Example of pest management techniques for okra in India

Pest/pathogen	Common name	Management method
Earias spp.	Shoot and fruit borer	Collection and destruction of infested fruit; trap crops such as maize or sorghum; crop isolation; sprays of carbaryl, cypermethrin, deltamethrin or malathion in rotational treatment regimes
Helicoverpa armigera	Cotton bollworm	Collection and destruction of infested fruit; trap crops; crop isolation; ploughing; sprays of chlorantraniliprole or azadirachtin
Spodoptera litura	Armyworm	Collection and destruction of infested fruit; ploughing; sprays of chlorantraniliprole
Amrasca biguttula biguttula	Leafhopper/jassid	Inter-cropping of non-hosts; destruction of susceptible hosts and weed reservoirs; biopesticides; sprays of azadirachtin
Bemisia tabaci; Aleurodicus dispersus	Whitefly	Inter-cropping of non-hosts; destruction of susceptible hosts and weed reservoirs; sprays of azadirachtin or imidacloprid; seed treatment with imidacloprid; yellow sticky and delta traps (10 units/ha)
Paracoccus marginatus; Phenacoccus solenopsis	Mealybug	Pruning of infested plant parts; trap crops; biopesticides
Scirtothrips dorsalis; Thrips palmi	Thrips	Crop isolation; destruction of infested plants; sprays of imidacloprid or deltamethrin
Tetranychus spp.	Spider mite	Crop isolation; destruction of infested plants; biopesticides; sprays of dicofol
Pythium aphanidermatum	Damping off	Field sanitation; biopesticides of *Trichoderma* spp.; treatment of seeds with metalaxyl
Yellow vein mosaic virus	Vein clearing/yellow vein mosaic	Managed through whitefly control, destruction of infected plants

Source: Chittora and Singh (2016); Government of India (2017a); Samnotra et al. (2016); Sushil et al. (2020)

2.5 Harvesting and handling procedures

The quality and shelf life of stored okra depends on the care taken during harvest (Dhall, Sharma & Mahajan 2012). Okra fruit are expected to be fresh, vibrant in colour, bear no bruises and snap when bent. Even minor bruising or damage to the fruit can become major sources of deterioration and decomposition after a few days in storage.

Okra fruit are harvested when immature, usually 5 to 6 days after the flower has opened (TNAU-NAIP 2011). Mature okra fruit are fibrous and not suitable for consumption but are used for fibre or seed production. Farmers harvest okra every other day when the fruit has reached the desired size (Reddy 2019b). Harvesting often occurs in the morning when the fruit are cool, beginning 60 to 70 days after sowing and continuing for up to 6 months (Government of India 2017a; TNAU-NAIP 2011; Tuskegee University 2009; Vidhi 2016).

Okra fruit are harvested by hand using cotton gloves to bend the fruit back until the peduncle snaps. Occasionally clippers are used to minimise damage to the fruit and ensure a short peduncle is retained with the fruit (Dhall, Sharma & Mahajan 2012). In the field, fruit are placed in a cloth bag holding about 2–3 kg of fruit at a time. Figure 2.4 shows harvesting of okra.

Figure 2.4 Okra being harvested

Source: Tuskegee University (2009)

2.6 Post-harvest

Harvested fruit are collected into crates and transported to the packing house in insect-proof vehicles. Production site/farm details are verified by inspectors at the packing house prior to fruit being accepted for further processing (Government of India 2021). This enables a system of traceability to ensure that investigations and corrective actions can be undertaken, should that become necessary. Figure 2.5 gives an example of harvested okra.

Figure 2.5 Harvested okra

Source: Infonet (2019)

Packing houses which receive okra intended for export are inspected and certified by the Pack House Inspection Committee constituted by the Agricultural and Processed Food Products Export Development Authority (APEDA). The Pack House Inspection Committee consists of a member of the horticulture division from APEDA head office, a member from the regional APEDA office, a member from the Directorate of Marketing and Inspection, and a member of the state agriculture department (APEDA 2014). To obtain certification, a packing house must meet prescribed standards of quarantine safety, including a separate plant quarantine area for phytosanitary inspection at the point of export (APEDA 2014). The suitability of packing house infrastructure for safe commodity handling and storage, including facilities for pre-cooling and cool storage, are covered by the certification process, and internal quality assurance systems are validated for storage and hygiene practices, and record keeping and traceability (APEDA 2014).

2.6.1 Packing house processes

Okra consignments for export are received from farmers into a primary inspection and holding area where an initial inspection is conducted by DAFW-approved personnel to ensure consignments with symptomatic fruit do not enter the main packing house facility. After primary inspection, okra fruit are placed into 8 kg capacity plastic crates and held under cool storage ready for sorting, grading and packing for export.

Sorting and grading

In the packing house, fruit are sorted and graded in well-lit rooms. Fruit are generally placed on clean stainless steel tables and sorted manually. Fruit that do not meet export requirements are rejected and sent back to the producer.

Sorting and grading areas are supplied with waste bins, which are emptied regularly to avoid secondary infestation, and accumulated waste goes to municipal authorities for disposal. Sticky traps are installed for monitoring/detection of insect pests throughout the packing house and the sorting and grading area is cleaned daily (Government of India 2021). Figure 2.6 shows okra being sorted and graded.

Figure 2.6 Okra being sorted and graded

Source: Government of India (2021)

Packing

After grading, fruit are placed into 5 kg ventilated corrugated fibre board (CFB) boxes lined with a low-density polyethylene (LDPE) or polypropylene (PP) film, which is folded over the top of the fruit and a lid placed onto the box. Fruit for export then progress to phytosanitary inspection or are stored in cool rooms after packing awaiting phytosanitary inspection. Under optimal conditions of 7°C to 10°C and relative humidity of 90 to 95% (Government of India 2017a), okra can be stored for 7 to 10 days (Government of India 2017a). Below 7°C, okra suffers chilling injury causing pitting and darkening of the fruit surface (National Horticulture Board 2019). Figure 2.7 shows packed okra ready to be exported.

Figure 2.7 Packed okra for export

Source: Government of India (2021)

2.6.2 Phytosanitary inspection

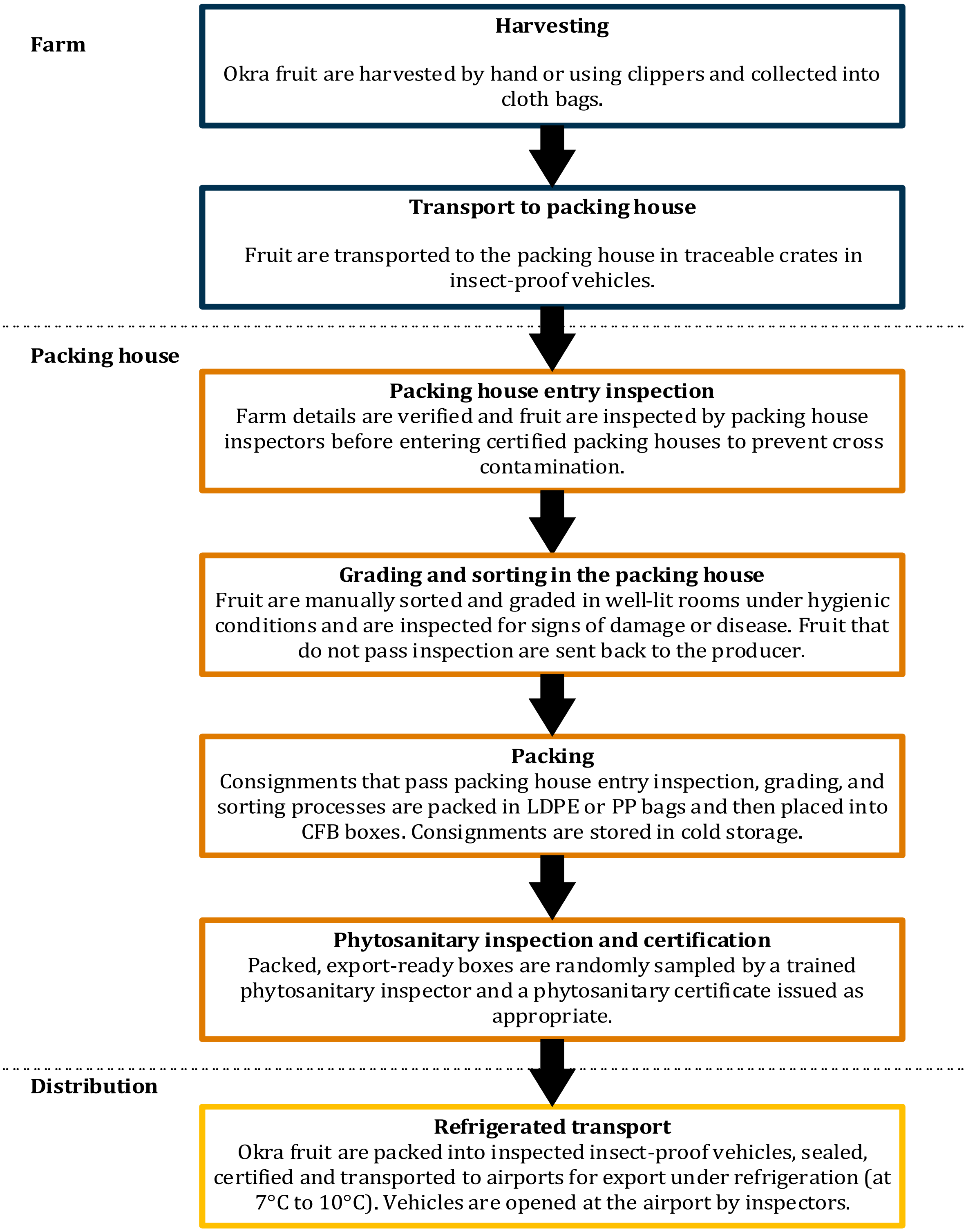
Prior to export, randomly selected samples from each consignment are inspected at the packing house by DAFW-approved personnel, as described in section 4.2.6. If the consignment is found to be free of pests and meets the requirements of the importing country, it is issued with a phytosanitary certificate. CFB boxes are then suitably labelled as having passed plant quarantine inspection and placed in packing house cold storage awaiting transport to cold storage facilities located at the airport (Government of India 2021).

2.6.3 Transport

Okra that are ready for export are loaded into refrigerated vehicles. All refrigerated vehicles used for the transport of okra export consignments are verified as suitable for carriage following inspection by an NPPO inspector. Following loading at the packing house, the vehicle load is sealed and verified. The vehicle seal is verified following arrival at the airport and the seal is removed by a plant quarantine inspector ready for final transfer to an aircraft (Government of India 2021). A temperature of 7°C to 10°C and relative humidity of 90 to 95% is maintained during transit (National Horticulture Board 2019). Aircraft are the only viable transportation option due to the short shelf life of okra (7 to 10 days).

A summary of the operational steps for okra grown in India for export is provided in Figure 2.8.

Figure 2.8 Summary of operational steps for okra grown in India for export



2.7 Export capability

2.7.1 Production statistics

India is the largest producer of okra in the world, producing 6,075,900 t during the 2017–18 growing season. A summary of okra production for major okra producing Indian states is provided in Table 2.3.

Table 2.3 Okra production in major okra producing states of India (2017-18 growing season)

State	Yield (tonnes)
Gujarat	921,720
West Bengal	914,860
Bihar	787,780
Madhya Pradesh	638,340
Odisha	566,880
Chhattisgarh	323,340
Uttar Pradesh	307,290
Haryana	233,960
Andhra Pradesh	205,910
Telangana	167,260

Source: APEDA (2021)

2.7.2 Export statistics

The precise quantity of okra exported from India is unknown, as exported okra is included in the category of 'mixed vegetables' for statistical purposes. The value of exported mixed vegetables during the period of 2011–12 amounted to 3,153,856,000 rupees (approximately A$57,000,000) (Government of India 2017a). Major importing countries for mixed vegetables from India are the United Arab Emirates, Nepal, the United Kingdom, Qatar and Bangladesh (APEDA 2021).

2.7.3 Export season

The broad climatic range of India and the suitable growing conditions in both summer and monsoon seasons enable harvesting of okra throughout the year. The coastal states of West Bengal, Gujarat and Odisha experience prime okra growing and harvesting conditions year-round (APEDA 2015). Conditions in other states only permit okra to be harvested during specific periods (see Table 2.4).

Table 2.4 Peak okra growing periods in major okra producing states

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gujarat	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round
West Bengal	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round
Bihar			Lean	Lean	Peak	Peak	Lean	Lean	Lean	Lean		
Madhya Pradesh	Peak	Peak/Lean	Lean									
Odisha	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round	Year-round
Chhattisgarh	Peak	Peak/Lean	Lean									Lean
Uttar Pradesh			Lean	Peak	Peak	Lean	Lean (part)	Lean	Peak	Peak/Lean	Lean	
Haryana			Lean	Peak	Lean							
Andhra Pradesh			Lean	Peak	Peak	Peak	Lean	Lean	Peak	Peak	Lean	Lean
Telangana			Lean	Peak	Peak	Peak	Lean	Lean	Peak	Peak	Lean	Lean

Peak (■), lean (■), and year-round (■) growing seasons in major okra producing states. Adapted from: APEDA (2015)

3 Pest risk assessments for quarantine pests

3.1 Summary of outcomes of pest initiation and categorisation

The initiation process (Appendix B) identified 219 pests as being associated with okra in India.

Of these 219 pests, the pest categorisation process (Appendix B) identified:

- 110 pests as already present in Australia and not under official control, and therefore not requiring further assessment
- 98 pests as not having potential to enter on the commercially produced fresh okra fruit from India pathway, and therefore not requiring further assessment

The remaining 11 pests were assessed as having potential to establish, spread and cause consequences in Australia, and therefore as requiring further pest risk assessment.

3.2 Pests requiring further pest risk assessment

The 11 pests, associated with commercially produced okra for export from India, identified as requiring further pest risk assessment, are listed in Table 3.1. Of these 11 pests:

- 10 are quarantine pests and 1 is a regulated article for Australia as it can vector emerging quarantine orthotospoviruses
- 2 of the 10 quarantine pests are also regulated articles for Australia as they can vector emerging quarantine orthotospoviruses
- 3 of the quarantine pests are regional quarantine pests as, whilst they have been recorded in some regions of Australia, interstate quarantine regulations are in place and enforced.

Table 3.1 Quarantine pests and regulated articles associated with okra from India, and requiring further pest risk assessment

Pest/pest group	Scientific name	Common name	Policy status/region
Fruit flies [Diptera: Tephritidae]	*Bactrocera zonata*	Peach fruit fly	EP
	Zeugodacus cucurbitae	Melon fly	EP
Mealybugs [Hemiptera: Pseudococcidae]	*Paracoccus marginatus*	Papaya mealybug	GP
	Phenacoccus madeirensis	Madeira mealybug	GP
	Phenacoccus solenopsis	Cotton mealybug	GP, WA
Scale insects [Hemiptera: Diaspididae]	*Pseudaulacaspis pentagona*	Mulberry scale	GP, WA
Thrips [Thysanoptera: Thripidae]	*Frankliniella intonsa* **a**	Eurasian flower thrips	GP
	Scirtothrips dorsalis	Chilli thrips	GP, RA
	Thrips palmi **a**	Melon thrips	GP, SA, WA
Mites [Acariformes: Tetranychidae]	*Tetranychus macfarlanei*	Okra spider mite	
	Tetranychus truncatus	Okra mite	

a: Thrips species that is also identified as a regulated article for Australia as it can vector emerging quarantine orthotospoviruses. **EP:** Species has been assessed previously and import policy already exists. **GP:** Species has been assessed previously in a Group PRA, and the Group PRA has been applied. **RA:** Regulated article. **WA:** Regional quarantine pest for Western Australia. **SA:** Regional quarantine pest for South Australia.

3.3 Overview of pest risk assessment

This chapter assesses, for each of the pests or pest groups identified in Table 3.1, the likelihoods of entry, establishment and spread, and the magnitude of the associated potential consequences these species may cause if they were to enter, establish and spread in Australia.

All of the pests or pest groups in Table 3.1 have been assessed previously by the department. Where appropriate, the outcomes of the previous assessments for these pests have been adopted for this risk analysis, unless new information is available that suggests the risk would be different. The acronym 'EP' is used to identify species assessed previously and for which import policy already exists. The process relating to the adoption of outcomes from previous assessments is outlined in Appendix A in section A2.6.

The biosecurity risk posed by thrips and the orthotospoviruses they transmit was previously assessed for all countries in the thrips Group PRA, which has been applied to this assessment of okra from India.

The biosecurity risk posed by mealybugs and the viruses they transmit was previously assessed for all countries in the mealybugs Group PRA, which has been applied to this assessment of okra from India.

The biosecurity risk posed by soft and hard scale insects was previously assessed for all countries in the scales Group PRA, which has been applied to this assessment of okra from India.

The acronym 'GP' is used to identify species assessed previously in a Group PRA and for which a Group PRA was applied. The application of the Group PRAs to this risk analysis is outlined in Appendix A in section A2.7. A summary of the assessment from the Group PRAs is presented for the relevant pests and/or regulated thrips in this chapter for convenience.

A summary of the likelihood, consequence and URE ratings obtained in each pest risk assessment is provided in Table 3.8. An overview of the decision process at the initiation, pest categorisation and pest risk assessment stages of this PRA is presented diagrammatically in Figure 3.1.

3.4 Peach fruit fly and melon fly

Bactrocera zonata (EP) and *Zeugodacus cucurbitae* (EP)

Bactrocera zonata (peach fruit fly) and *Zeugodacus cucurbitae* (melon fly) belong to the Tephritidae family, a group of fruit flies considered to be among the most damaging pests of horticultural crops. These fruit fly species have not been reported in Australia and therefore are quarantine pests for all of Australia.

These pest species (*B. zonata* and *Z. cucurbitae*) have been grouped together in this assessment as they have common biological characteristics and are considered to pose similar risks. In this assessment, the term 'fruit flies' is used to refer to these 2 species. The scientific name is used when the information is about a specific species.

On the basis of phylogenetic relationship analysis, melon fly (*B. cucurbitae*) has been proposed to be placed in the genus *Zeugodacus* (De Meyer et al. 2015; Virgilio et al. 2015). Current and past literature refers to melon fly under both the former (*B. cucurbitae*) and current (*Z. cucurbitae*) scientific names. This document refers to melon fly as *Z. cucurbitae*.

Bactrocera zonata and *Z. cucurbitae* are reported to be present across India (EPPO 2021).

Tephritid fruit flies have 4 life stages: egg, larva, pupa and adult. Over the course of an adult female's lifetime, *Z. cucurbitae* can lay up to 1,000 eggs and *B. zonata* can lay up to 550 eggs (Gerson & Applebaum 2014; Weems, Heppner & Fasulo 2018). Adult flies oviposit eggs below the fruit skin and hatched larvae feed within the fruit (Fletcher 1989). Upon maturity, fruit fly larvae drop to the ground and pupate in the soil, forming a tan/dark brown puparium (Christenson & Foote 1960; Weems, Heppner & Fasulo 2018). Adult fruit flies can survive for more than a year and produce several generations annually, dependent on diet and temperature (Christenson & Foote 1960; Weems, Heppner & Fasulo 2018). Fruit flies are primarily dispersed by transfer of infested fruit. However, adult flies of some species have a strong capacity for independent flight (Fletcher 1989; Qureshi et al. 1974).

Bactrocera zonata has been assessed previously in the existing policies for pomegranates from India (DAWE 2020a) and mangoes from Indonesia, Thailand and Vietnam (DAWR 2015). *Zeugodacus cucurbitae* has been assessed previously in existing policies (as *B. cucurbitae* and *Z. cucurbitae*) in jujubes from China (Department of Agriculture 2020), lychees from Taiwan and Vietnam (DAFF 2013), and longans and lychees from China and Thailand (DAFF 2004). In those policies, the UREs for *B. zonata* and *Z. cucurbitae* were assessed as not achieving the ALOP for Australia and specific risk management measures were required.

The current assessment of these fruit flies builds on the previous assessments. However, there may be differences in commercial production practices, climatic conditions, fruit biology, and pest prevalence between the previously assessed commodity/country pathways and okra from India. These differences make it necessary to reassess the likelihood that these fruit flies will be imported into Australia with okra from India.

Previous assessments for *B. zonata* and *Z. cucurbitae* in the existing policies rated the likelihood of distribution as High. Okra fruit from India are expected to be distributed in Australia in a similar way to the commodities considered in previous assessments. Okra fruit are expected to be imported from India year-round, and to be distributed to various destinations in Australia for sale. They may be distributed through large fresh produce wholesale markets and then to supermarkets or other sellers, or directly to smaller retailers and then to consumers. Most fruit waste would be generally disposed of via municipal waste facilities, but a small quantity may be discarded in the environment. Any fruit flies present on discarded okra may disperse to new hosts, as adult fruit flies are highly mobile and could fly to nearby host plants. *Bactrocera zonata* and *Z. cucurbitae* have wide host ranges and there will likely be hosts present year-round in Australia. Therefore, the time of year when importation occurs will not affect the likelihood of distribution for this pest. On this basis, the same rating of High for the likelihood of distribution for fruit flies in previous assessments is adopted for the okra from India pathway.

The likelihoods of establishment and spread of *B. zonata* and *Z. cucurbitae* in Australia from the okra from India pathway have also been assessed as similar to those of the previous assessments of High and High, respectively. Those likelihoods relate specifically to events that occur in Australia and are essentially independent of the import pathway. The consequences of entry, establishment and spread for *B. zonata* and *Z. cucurbitae* in Australia are also independent of the import pathway and have been assessed as being similar to the previous assessments of High. The existing ratings for the likelihoods of establishment and spread, and the rating for the overall consequences for *B. zonata* and *Z. cucurbitae* in previous assessments, have been adopted for the okra from India pathway.

In addition, the department has reviewed relevant literature—for example, Boontop et al. (2017); De Meyer et al. (2015); Follett et al. (2019); Hicks et al. (2019); Kim and Kim (2018); Mkiga and Mwatawala (2015); Zingore et al. (2020). No new information has been identified that would significantly change the risk ratings for distribution, establishment, spread or consequences, as set out for *B. zonata* and *Z. cucurbitae* in the existing policies.

The risk scenario of biosecurity concern considered here is the potential presence of eggs or larvae of the assessed fruit flies within imported okra.

3.4.1 Likelihood of entry

The likelihood of entry is considered in 2 parts: the likelihood of importation and the likelihood of distribution, which consider pre-border and post-border issues, respectively.

Likelihood of importation

The likelihood that *B. zonata* and *Z. cucurbitae* will arrive in Australia in a viable state with the importation of okra from India is assessed as **Very Low**.

The likelihood of importation is assessed as Very Low because, while *B. zonata* and *Z. cucurbitae* are prevalent in India and okra is reported to be a host for both species, there are no reports of field-grown okra being infested by these fruit fly species in India. The limited literature available on infestation of okra by *B. zonata* and *Z. cucurbitae* suggests that okra is not a preferred host for these fruit flies. However, fruit flies may infest okra fruit, and early stages of infestation may not show visible symptoms. Immature stages of fruit flies may be unable to develop at cold temperatures during storage and transport. Upon reaching favourable temperatures while on sale in retail outlets and markets, fruit flies may complete development in the fruit.

The following information provides supporting evidence for this assessment.

Bactrocera zonata and *Z. cucurbitae* are present in India, however, okra may not be a preferred host.

- *Bactrocera zonata* and *Z. cucurbitae* are present in India, and India produces okra throughout the year (EPPO 2021; Government of India 2017a).
- Okra has been reported to be a viable host for *B. zonata* and *Z. cucurbitae*, although fruit fly infestation of okra in the field has never been reported in India and is rarely reported in other countries (El-Gendy 2017; Kumagai, Tsuchiya & Katsumata 1996; Syed, Ghani & Murtaza 1970; Wong et al. 1989).
- A laboratory experiment investigating host preferences of *B. zonata* reported that 90% fewer pupae developed in okra compared to mango, and that pupae recovered from okra weighed 17% less than those from mango (El-Gendy 2017).
- Another study in Pakistan found that *B. zonata* attacked okra in the field only to a negligible extent when its regular hosts were scarce, indicating that okra may not be a preferred host (Syed, Ghani & Murtaza 1970).
- Another study in the Mariana Islands rearing *Z. cucurbitae* from field-collected fruit reported low levels of infestation of okra fruit among a small number of fruiting vegetables studied (Wong et al. 1989).
- A no-choice laboratory assay found that *Z. cucurbitae* did not oviposit into intact, undamaged okra fruit (Kumagai, Tsuchiya & Katsumata 1996).
- Okra grows best in temperatures of 22°C to 35°C (Government of India 2017a), which are favourable temperatures for the development of fruit flies. Therefore, it is possible that fruit flies could infest okra in India prior to harvest.
- There are no reports available on what stage(s) of okra fruit (e.g. immature, mature and/or hardened) is able to be infested by these fruit flies, considering okra is harvested when fruit are immature.

Fruit fly eggs and early instar larvae, if present in okra, are likely to remain undetected during harvest and post-harvest processes. As information specific to okra is not available, information presented below is based on literature relating to other host fruit.

- Adult female flies of *B. zonata* and *Z. cucurbitae* pierce the skin of fruit and oviposit 4 to 8 eggs in a single location, sometimes with no visible symptoms on the fruit surface (Christenson & Foote 1960; El-Gendy 2017).
- Upon hatching, the larvae begin feeding inside the fruit, maturing through three instars before dropping to the ground and forming a pupa (Fletcher 1989; Gerson & Applebaum 2014; Weems, Heppner & Fasulo 2018).
- Fruit that have been infested may show signs of decomposition or have visible holes caused by mature larvae exiting the fruit (Plant Health Australia 2013). However, infested fruit containing eggs or immature larvae may remain undetected due to the lack of visible symptoms.

Fruit fly eggs and larvae may remain viable during cold transport and storage.

- The development time of fruit flies is inversely dependent on temperature, with development time increasing at lower ambient temperature (Duyck, Sterlin & Quilici 2004; Fletcher 1989; Mkiga & Mwatawala 2015).
- Fruit flies take 6 to 7 days at 25°C to pupate when reared on a range of media including natural hosts and artificial diets (Duyck, Sterlin & Quilici 2004; Mkiga & Mwatawala 2015).

- The lower developmental thresholds for *B. zonata* and *Z. cucurbitae* larvae are 12.6°C and 13.4°C, respectively (Duyck, Sterlin & Quilici 2004; Mkiga & Mwatawala 2015).
- Harvested okra fruit are proposed to be stored and transported at 7°C to 10°C (Government of India 2017a), indicating that fruit flies may not be able to develop during storage and transport. However, upon reaching temperatures capable of supporting development, such as in retail settings, the larvae may be able to continue and complete development.

For the reasons outlined, the likelihood that *B. zonata* and *Z. cucurbitae* will arrive in Australia in a viable state with the importation of okra from India is assessed as Very Low.

Likelihood of distribution

The likelihood that the assessed fruit flies will be distributed within Australia in a viable state as a result of the processing, sale or disposal of okra from India, and subsequently transfer to a susceptible part of a host, is likely to be similar to *B. zonata* and *Z. cucurbitae* on previously assessed pathways. The same rating of **High** for the likelihood of distribution for these fruit flies in previous assessments is adopted for okra from India.

Overall likelihood of entry

The overall likelihood of entry is determined as **Very Low** by combining the re-assessed likelihood of importation of Very Low with the adopted likelihood of distribution of High, using the matrix of rules in Table A.2.

3.4.2 Likelihoods of establishment and spread

The likelihoods of establishment and spread for the assessed fruit flies are independent of the import pathway and are considered similar to those in previously assessed pathways.

Based on the existing import policies for these fruit flies, the likelihoods of establishment and spread are assessed as **High** and **High**, respectively.

3.4.3 Overall likelihood of entry, establishment and spread

The overall likelihood of entry, establishment and spread is determined by combining the individual likelihoods of entry, of establishment and of spread using the matrix of rules in Table A.2.

The overall likelihood that fruit flies will enter Australia as a result of trade in okra from India, be distributed in a viable state to a susceptible part of a host, establish in Australia and subsequently spread within Australia is assessed as **Very Low**.

3.4.4 Consequences

The potential consequences of the entry, establishment and spread of the assessed fruit flies in Australia are similar to those in the previously assessed pathways. The overall consequences in the previous assessments were assessed as High. The overall consequences for the assessed fruit flies on the okra from India pathway are also assessed as **High**.

3.4.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the likelihoods of entry, establishment and spread with the outcome of overall consequences. Likelihoods and consequences are combined using the risk estimation matrix in Table A.4.

Unrestricted risk estimate for *B. zonata* and *Z. cucurbitae*	
Overall likelihood of entry, establishment and spread	Very Low
Consequences	High
Unrestricted risk	**Low**

The URE for *B. zonata* and *Z. cucurbitae* on the okra from India pathway is assessed as **Low**, which does not achieve the ALOP for Australia. Therefore, specific risk management measures are required for these fruit flies on the okra from India pathway.

3.5 Papaya mealybug, Madeira mealybug and cotton mealybug

***Paracoccus marginatus* (GP), *Phenacoccus madeirensis* (GP) and *Phenacoccus solenopsis* (GP, WA)**

Two mealybug species on the okra from India pathway, *Paracoccus marginatus* (papaya mealybug) and *Phenacoccus madeirensis* (Madeira mealybug), were identified as quarantine pests for Australia. One mealybug species, *Phenacoccus solenopsis* (cotton mealybug), was identified as a quarantine pest of regional concern for Australia. *Phenacoccus solenopsis* is not present in Western Australia and is a regional quarantine pest for that state.

The indicative likelihood of entry for all mealybug species is assessed in the mealybugs Group PRA as Moderate (DAWR 2019). *Phenacoccus marginatus*, *P. madeirensis* and *P. solenopsis* are reported from India and have been associated with okra (Ben-Dov 1994; Kedar, Kumerang & Thodsare 2013; Sahito & Abro 2012; Sakthivel et al. 2012; Shylesha & Joshi 2012). Standard packing house processes and transportation are not expected to eliminate these mealybugs from the pathway. After assessment of relevant pathway-specific factors (sections A2.6 and A2.7) for okra from India, likelihoods of entry of Moderate were verified as appropriate for these mealybug species on this pathway (Table 3.2).

Table 3.2 Quarantine mealybug species for okra from India

Pest	In mealybugs Group PRA	Quarantine pest	On okra pathway	Likelihood of entry
Paracoccus marginatus	Yes	Yes	Yes	Moderate
Phenacoccus madeirensis	Yes	Yes	Yes	Moderate
Phenacoccus solenopsis	Yes	Yes (WA)	Yes	Moderate

WA: Regional quarantine pest for Western Australia.

A summary of the risk assessment for quarantine mealybugs is presented in Table 3.3 for convenience.

Table 3.3 Risk estimates for quarantine mealybugs

Risk component	Rating for quarantine mealybugs
Likelihood of entry (importation x distribution)	Moderate (High x Moderate)
Likelihood of establishment	High
Likelihood of spread	High
Overall likelihood of entry, establishment and spread	Moderate
Consequences	Low
Unrestricted risk	**Low**

As assessed in the mealybugs Group PRA, the indicative URE for mealybugs is Low (Table 3.3), which does not achieve the ALOP for Australia. This indicative URE is considered to be applicable for all quarantine mealybugs on the okra from India pathway. Therefore, specific risk management measures are required for the quarantine mealybugs on this pathway.

This risk assessment, which is based on the mealybugs Group PRA, applies to all quarantine mealybugs on the okra from India pathway, irrespective of their specific identification in this document. This process is further described in section A2.7.

3.6 Mulberry scale

***Pseudaulacaspis pentagona* (GP, WA)**

One scale insect species, *Pseudaulacaspis pentagona* was identified on the okra from India pathway as a quarantine pest of regional concern for Australia. *Pseudaulacaspis pentagona* is not present in Western Australia and is a regional quarantine pest for that state.

The indicative likelihood of entry for this scale species is assessed in the scales Group PRA as Moderate (DAWR 2019). *Pseudaulacaspis pentagona* is reported from India and is associated with okra (MAF 1999; McKenzie 1956; Morales-Rodrigues & McKenna 2019; Nakahara 1982). Standard packing house processes and transportation are not expected to eliminate this scale from the okra from India pathway. After assessment of relevant pathway-specific factors (sections A2.6 and A2.7) for okra from India, the likelihood of entry of Moderate was verified as appropriate for *P. pentagona* on this pathway.

A summary of the risk assessment for quarantine scales is presented in Table 3.4 for convenience.

Table 3.4 Risk estimates for quarantine scale insects

Risk component	Rating for quarantine scales
Likelihood of entry (importation x distribution)	Moderate (High x Moderate)
Likelihood of establishment	High
Likelihood of spread	High
Overall likelihood of entry, establishment and spread	Moderate
Consequences	Low
Unrestricted risk	**Low**

As assessed in the scale insects Group PRA, the indicative URE for scale insects is Low (Table 3.4), which does not achieve the ALOP for Australia. This indicative URE is considered to be applicable for the quarantine scale insects on the okra from India pathway. Therefore, specific risk management measures are required for the quarantine scale insect pests on this pathway.

This risk assessment, which is based on the scale insects Group PRA, applies to all quarantine scale insects on the okra from India pathway, irrespective of their specific identification in this document. This process is further described in section A2.7.

3.7 Eurasian flower thrips, chilli thrips and melon thrips

***Frankliniella intonsa* (GP), *Scirtothrips dorsalis* (GP, RA) and *Thrips palmi* (GP, SA, WA)**

Three thrips species were identified on the okra from India pathway as quarantine pests and/or regulated articles for Australia: *Frankliniella intonsa, Scirtothrips dorsalis* and *Thrips palmi* (Table 3.5).

Frankliniella intonsa has not been recorded from Australia and is a quarantine pest for all of Australia.

Thrips palmi is not present in South Australia and is assessed as a regional quarantine pest for that state. *Thrips palmi* is present but not widely distributed in Western Australia and is assessed as a regional quarantine pest for all areas of Western Australia outside the Ord River Irrigation Area (Shire of Wyndham-East Kimberley).

Scirtothrips dorsalis is present in Australia and is not under official control and, therefore, is not a quarantine pest for Australia.

Frankliniella intonsa, S. dorsalis and *T. palmi* are identified as regulated articles because they are capable of harbouring and spreading (vectoring) emerging orthotospoviruses that are quarantine pests for Australia, as detailed in the thrips Group PRA (DAWR 2017).

A regulated article is defined by the IPPC as 'any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved' (FAO 2021c). For simplicity, thrips identified as a regulated article are also referred to as 'regulated thrips'.

The indicative likelihood of entry for all quarantine and regulated thrips is assessed in the thrips Group PRA as Moderate (DAWR 2017). *Frankliniella intonsa*, *S. dorsalis* and *T. palmi* are reported from India and are associated with okra (CABI 2022; Capinera 2020; Government of India 2017a, b; Toyota 1972). Standard packing house processes and transportation are not expected to eliminate these thrips from the pathway. After assessment of relevant pathway-specific factors (sections A2.6 and A2.7) for okra from India, the likelihood of entry of Moderate, as assessed in the thrips Group PRA, was verified as appropriate for these thrips species on the okra from India pathway (Table 3.5).

Table 3.5 Quarantine and regulated thrips species for okra from India

Pest	In thrips Group PRA	Quarantine pest	Regulated thrips	On okra pathway	Likelihood of entry
Frankliniella intonsa	Yes	Yes	Yes	Yes	Moderate
Thrips palmi	Yes	Yes (SA, WA)	Yes	Yes	Moderate
Scirtothrips dorsalis	Yes	No	Yes	Yes	Moderate

SA: Regional quarantine pest for South Australia. **WA**: Regional quarantine pest for Western Australia.

A summary of the risk assessment for quarantine thrips is presented in Table 3.6 for convenience.

Table 3.6 Risk estimates for quarantine thrips

Risk component	Rating for quarantine thrips
Likelihood of entry (importation x distribution)	Moderate (High x Moderate)
Likelihood of establishment	High
Likelihood of spread	High
Overall likelihood of entry, establishment and spread	Moderate
Consequences	Low
Unrestricted risk	**Low**

As assessed in the thrips Group PRA, the indicative URE for thrips is Low (Table 3.6), which does not achieve the ALOP for Australia. This indicative URE is considered to be applicable for the quarantine thrips species present on the okra from India pathway. Therefore, specific risk management measures are required for the quarantine thrips on this pathway.

As the regulated thrips *F. intonsa*, *S. dorsalis* and *T. palmi* can vector orthotospoviruses that are quarantine pests for Australia, a summary of the risk assessment for quarantine orthotospoviruses transmitted by thrips is presented in Table 3.7.

Table 3.7 Risk estimates for emerging quarantine orthotospoviruses vectored by regulated thrips

Risk component	Rating for emerging quarantine orthotospoviruses (a)
Likelihood of entry (importation x distribution)	Low (Moderate x Moderate)
Likelihood of establishment	Moderate
Likelihood of spread	High
Overall likelihood of entry, establishment and spread	Low
Consequences	Moderate
Unrestricted risk	**Low**

a: Risk estimates for orthotospoviruses adopted from the thrips Group PRA (DAWR 2017).

As assessed in the thrips Group PRA, the URE for emerging quarantine orthotospoviruses transmitted by regulated thrips is Low (Table 3.7), which does not achieve the ALOP for Australia.

This URE is considered to be applicable for the emerging orthotospoviruses known to be vectored by the thrips species present on the okra from India pathway. Therefore, specific risk management measures are required for the regulated thrips to mitigate the risks posed by emerging quarantine orthotospoviruses.

This risk assessment, which is based on the thrips Group PRA, applies to all phytophagous quarantine thrips and regulated thrips on the okra from India pathway, irrespective of their specific identification in this document. This process is further described in section A2.7.

3.8 Okra spider mite and okra mite

***Tetranychus macfarlanei* (EP) and *Tetranychus truncatus* (EP)**

Tetranychus macfarlanei and *Tetranychus truncatus* belong to the family Tetranychidae, which comprises more than 1,200 described species in 6 tribes and 71 genera (Bolland, Gutierrez & Flechtmann 1998; Seeman & Beard 2011). *Tetranychus* is one of the largest genera of the Tetranychidae, representing more than 100 known species, and considered one of the most economically important genera of mites (Seeman & Beard 2011; Walter 2006).

The spider mite species, *T. macfarlanei* and *T. truncatus*, have not been reported in Australia and therefore are quarantine pests for all of Australia. These species have been grouped together in this assessment as they have common biological characteristics and are considered to pose similar risks. In this assessment, the term 'spider mites' is used to refer to both species. The scientific name is used when the information relates to specific species.

Tetranychus macfarlanei has been reported from India, Bangladesh, Madagascar, Mauritius and the Canary Islands (Bolland, Gutierrez & Flechtmann 1998; Jeppson, Keifer & Baker 1975; Ullah et al. 2012; Vacante 2016). *Tetranychus truncatus* is widely distributed in Southeast Asia, including India (Bachhar et al. 2019; Srinivasan et al. 2012) and Indonesia, and extends to Japan and Korea in the east, and to Iran in the west (Bolland, Gutierrez & Flechtmann 1998; Vacante 2016).

Tetranychid mites have 5 distinct life stages: egg, larva, protonymph, deutonymph and adult. At the end of the active larval stage there is a quiescent phase called nymphochrysalis, and at the completion of each nymphal stage, the quiescent phases are deutochrysalis and teliochrysalis (Sakunwarin, Chandrapatya & Baker 2003). After the teleiochrysalis quiescent phase, the deutonymph moults into the adult stage.

Spider mites typically colonise the under-surface of leaves. Eggs are laid on the under-surface of leaves and on the silk webbing produced during their feeding activity (Sarma 2010). Larvae are highly mobile, compared to the more sedentary nymphal stages, and crawl for some time immediately after hatching before settling to feed on the cell contents of leaves (Colt et al. 2001). When larvae are fully developed, they cease to feed and enter the nymphochrysalis quiescent phases (Jadhav, Bhosale & Barkade 2017). Larval and nymphal development stages, and the quiescent phases are short in duration.

The development time, fecundity and longevity of *T. macfarlanei* and *T. truncatus* are known to vary with temperature, humidity and host plant type (Islam et al. 2017; Latha et al. 2019). Over the course of a female spider mite's lifespan, up to 65 eggs are laid (Borkar, Kolhe & Undirwade 2020; Latha et al. 2019; Sakunwarin, Chandrapatya & Baker 2003). The optimal temperature ranges for development are 28°C to 35°C and 24°C to 31°C for *T. macfarlanei* and *T. truncatus*, respectively (Borkar, Kolhe & Undirwade 2020; Latha et al. 2019). Development time shortens in tetranychid mites as temperatures increase, but longevity and fecundity are sharply reduced once temperatures increase beyond optimal ranges (Lin et al. 2020; Sarma 2010; Ullah et al. 2012). Under optimal conditions, the lifespan of male and female spider mites ranges from 11 to 19 days and 12 to 26 days, respectively (Borkar, Kolhe & Undirwade 2020; Sarma 2010).

Adults of *T. macfarlanei* and *T. truncatus* reproduce sexually and parthenogenetically (Jadhav, Bhosale & Barkade 2017; Sakunwarin, Chandrapatya & Baker 2003). Similar to most *Tetranychus* species, unfertilised females produce only male offspring (Helle & Pijnacker 1985).

Spider mite feeding on leaf cell contents results in characteristic speckled appearance of leaves, with gradual coalescence of chlorotic spots producing a pronounced yellowish hue and bronzing of leaves (Seeman & Beard 2011). The feeding activity of spider mites result in reduced ability of the plant to photosynthesise and reduced vitality and fruit setting (Jeppson, Keifer & Baker 1975; Sarma 2010; Ullah et al. 2012).

Tetranychus macfarlanei and *T. truncatus* have not been previously assessed by the department. However, a pest group of *Tetranychid* mites has previously been assessed by the department and import policies for *Tetranychid* mites already exist. *Tetranychus canadensis*, *T. mcdanieli*, *T. pacificus* and *T. turkestani* have been assessed in the final import risk analysis report for stone fruit from California, Idaho, Oregon and Washington (stone fruit from the USA) (Biosecurity Australia 2010).

Tetranychus macfarlanei and *T. truncatus* have similar biological characteristics to 2 of those spider mite species - *T. pacificus* and *T. turkestani* - including:

- highly polyphagous habits, and wide distribution across subtropical climatic areas in countries where they are endemic. *Tetranychus macfarlanei* and *T. truncatus* also occur in tropical zones in countries where they are present.
- distribution of *T. truncatus* can extend to temperate regions because females can overwinter in those climates, a characteristic shared by *T. pacificus* and *T. turkestani* (Seeman & Beard 2011; Chen, Zhou & Li 1996). *Tetranychus macfarlanei* has no known diapause capacity at low temperatures and hence temperate regions are unsuitable for the development of this species (Ullah et al. 2012). However, *T. macfarlanei* has established in highly diverse subtropical and tropical climates. Australia has a variety of climate conditions, including tropical, sub-tropical and temperate climates that would facilitate the survival and development of these *Tetranychus* species.

On the basis of these similarities, outcomes of previous risk assessments for *T. pacificus* and *T. turkestani* on stone fruit from the USA (Biosecurity Australia 2010) have been reviewed in this risk assessment for *T. macfarlanei* and *T. truncatus* on okra from India. Where the risk profile is assessed as comparable to those previously assessed situations, outcomes of previous risk assessments have been adopted in this assessment. For each of the risk components, the comparisons and bases for adopting previous assessments for spider mites on stone fruit from the USA, or further assessing the risk for spider mites on okra from India, are outlined below.

There are differences in commercial production practices, climatic conditions, fruit biology and pest prevalence between the previously assessed USA stone fruit pathway and the okra from India pathway. These differences make it necessary to specifically assess the likelihood that the assessed spider mites will be imported into Australia with okra from India.

The assessment of spider mites on stone fruit from the USA (Biosecurity Australia 2010) rated the likelihood of distribution as Moderate. Okra fruit are expected to be distributed in Australia as a result of the processing, sale or disposal of the imported produce in a similar way to stone fruit from the USA. Fruit that are unmarketable are likely to be disposed of as municipal waste, from where it is unlikely that spider mites will be distributed into the environment. From domestic situations, fruit waste disposed of as litter may be deposited into urban or peri-urban situations, as well as areas of natural vegetation. Spider mites on both pathways have a polyphagous habit. They can infest a wide range of agricultural and horticultural crops and hosts that can be found in domestic gardens, as well as in urban environments as amenity plants or weeds. Therefore, the time of year when importation occurs will not affect the likelihood of distribution for these spider mites. On the basis outlined, the likelihood of distribution of Moderate previously assessed for spider mites on the stone fruit from the USA pathway has been adopted for spider mites on the okra fruit from India pathway.

The likelihoods of establishment and spread of spider mites on okra from India will be comparable with spider mites on stone fruit from the USA because these likelihoods relate specifically to events that occur in Australia and are independent of the import pathway. The consequences of entry, establishment and spread of spider mites in Australia are also independent of the import pathway. The existing ratings for the likelihoods of establishment and spread, and the rating for the overall consequences for spider mites on the stone fruit from the USA pathway have been adopted for spider mites on the okra from India pathway.

In addition, the department has reviewed the latest literature—for example, Borkar, Kolhe and Undirwade (2020); Islam et al. (2017); Jadhav, Bhosale and Barkade (2017); Jin et al. (2018); Latha et al. (2019); Satish et al. (2018); Win et al. (2018); Zeity, Srinivasa and Gowda (2017). No new information has been identified that would significantly change the risk ratings for distribution, establishment, spread or consequences as set out in previous assessments for spider mites.

The risk scenario of biosecurity concern considered here is the potential presence of adults, juveniles or eggs of *T. macfarlanei* and *T. truncatus* on okra from India imported into Australia.

3.8.1 Likelihood of entry

The likelihood of entry is considered in 2 parts: the likelihood of importation and the likelihood of distribution, which consider pre-border and post-border issues, respectively.

Likelihood of importation

The likelihood that the assessed spider mites will arrive in Australia in a viable state with the importation of okra from India is assessed as **High**.

The likelihood of importation is assessed as High because *T. macfarlanei* and *T. truncatus* are present in India and the okra plant is known to be a viable host for completion of development. Okra is a perishable fruit that requires careful handling during post-harvest processing to avoid damage to the fruit surface. Therefore, spider mite adults, juveniles or eggs residing on the fruit surface may not be dislodged during postharvest handling. Sorting and grading procedures in packing houses may not detect and remove these development stages as they are small and difficult to observe without a magnification device such as a hand lens. Some adults, nymphs or eggs may survive the low temperatures during storage and transportation of okra. Various spider mite species have been intercepted numerous times on imported fresh produce on arrival in Australia.

The following information provides supporting evidence for this assessment.

Spider mites are present in India and okra is a host.

- *Tetranychus macfarlanei* and *T. truncatus* are reported to be present in India by many authors (Kumar et al. 2013a; Latha et al. 2019; Nandini & Srinivasa 2018; Patel, Patel & Patel 2015; Vacante 2016; Zeity 2015). Okra has been reported to be a viable host for *T. macfarlanei* (Borkar, Kolhe & Undirwade 2020; Gupta & Gupta 1994; Zeity 2015) and *T. truncatus* (Bachhar et al. 2019).
- *Tetranychus macfarlanei* is a highly polyphagous pest that has been reported to cause severe damage to okra crops (Bhanderi 1991; Rajgopal & Srinivasa 2017; Zeity, Srinivasa & Gowda 2017). In India, *T. truncatus* attacks several important economic crop plants, including okra (Bachhar et al. 2019; Mondal, Gowda & Srinivasa 2020).
- Okra grows best at temperatures of 22°C to 35°C, which covers the optimal temperature ranges for development of *T. macfarlanei* (Borkar, Kolhe & Undirwade 2020; Latha et al. 2019; Ullah et al. 2012) and *T. truncatus* (Sakunwarin, Chandrapatya & Baker 2003; Win et al. 2018). All immature stages and adults would likely be present in okra fields during pod development and harvest.

Spider mites are primarily pests of leaves but can also be found on fruit. Spider mite adults, juveniles or eggs present on fruit are unlikely to be completely removed during harvesting and post-harvest processes.

- Damage to host plants is mainly caused by feeding of all developmental stages of mites on leaves (Sakunwarin, Chandrapatya & Baker 2003). Secondary impacts accrue from resultant effects on photosynthetic capabilities of host plants (Colt et al. 2001; Hollingsworth 2008).
- Large colonies of spider mites produce fine webbing around the leaves and flowers in which they feed and move toward the apices of plants where they tend to congregate (Borkar, Kolhe & Undirwade 2020). While principally found on the leaves of host plants, spider mites may also be present on fruit, especially when high mite densities are present on leaves (Satyagopal et al. 2014; Seeman & Beard 2011).
- There is no evidence of spider mites feeding directly on okra fruit. The presence of larval, nymphal or adult stages on okra fruit may be considered incidental, as the mouthparts of spider mites are highly adapted for feeding by puncturing the parenchyma cells of leaves (Zeity 2015).
- Okra is also a perishable fruit that requires careful handling during postharvest processing to avoid damage to the fruit surface. Therefore adults, juveniles or eggs of spider mites on the fruit surface may not be dislodged during postharvest handling.
- Okra fruit provide some points, such as the remnant of the peduncle, and base of ridges and spines/hairs on the surface (often present on heirloom varieties), where spider mites may reside.

Storage and transport conditions are unlikely to kill all life stages of spider mites.

- Okra fruit are stored soon after harvest in cool rooms at 7°C to 10°C and relative humidity of 90 to 95% (National Horticulture Board 2019), and can retain quality under optimal conditions for 7 to 10 days (Government of India 2017a).
- Under favourable conditions, the lifespan of male and female spider mites ranges from 11 to 19 days and 12 to 26 days, respectively (Borkar, Kolhe & Undirwade 2020; Latha et al. 2019; Sarma 2010).
- For *T. macfarlanei*, the lower thermal development threshold is estimated at 12.9°C to 13.0°C (Ullah et al. 2012). Egg development and larval development duration is prolonged at lower temperatures: at 17.5°C, eggs take up to 12.6 days to hatch and larvae take up to 2.4

days before entering nymphochrysalis. At 15°C, the viability of eggs is low and mortality rates of emerging larvae is high (Ullah et al. 2012).

- The lower threshold temperature for development of *T. truncatus* is reported to be 10.9°C (Gotoh, Moriya & Nachman 2015). The duration of egg and larval development is prolonged at lower temperatures: at 20°C, eggs take up to 6.5 days to hatch and larvae take up to 1.8 days before entering the nymphochrysalis quiescent stage. Mortality rates of 40% (mainly egg and larval stages) were observed during development at 20°C (Sakunwarin, Chandrapatya & Baker 2003).
- The larval period is relatively short, up to 2 days (Borkar, Kolhe & Undirwade 2020; Pang et al. 2004; Sakunwarin, Chandrapatya & Baker 2003), and larvae enter the nymphochrysalis quiescent stage in a shorter time as ambient temperatures increase (Ullah et al. 2012; Win et al. 2018). Following their emergence from eggs on the leaves, larvae need to migrate to fruit and are unlikely to survive an extended period of cool conditions during postharvest storage.
- Eggs are not reported to be laid on okra fruit. However, at high population densities, adult females may disperse to the fruit and incidental egg laying may occur. At low temperatures (7°C to 10°C), the viability of eggs is low and the mortality rate of emerging larvae is high (Sakunwarin, Chandrapatya & Baker 2003; Ullah et al. 2012).
- Spider mites are unlikely to develop during storage and transport at 7°C to 10°C (Sakunwarin, Chandrapatya & Baker 2003; Ullah et al. 2012). Okra is a perishable fruit that can be stored for 7 to 10 days under optimal conditions and will be exported by air freight. Some adults, nymphs or eggs may survive the low temperatures during postharvest and transportation of okra.
- Various spider mites species have been intercepted on imported fresh produce on arrival in Australia, including on commodities that require lower storage and transportation temperatures than okra, such as stone fruit (DAFF 2003), indicating that spider mites can survive storage and transportation temperatures.

For the reasons outlined, the likelihood of importation of *T. macfarlanei* and *T. truncatus* on imported okra from India is assessed as High.

Likelihood of distribution

The likelihood that the assessed spider mites will be distributed within Australia in a viable state as a result of the processing, sale or disposal of okra from India and subsequently transfer to a susceptible part of a host, is likely to be similar to the spider mite species previously assessed on the stone fruit from the USA (Biosecurity Australia 2010). The same rating of **Moderate** for the likelihood of distribution for spider mite species in the previous assessment is adopted for the assessed spider mites for okra from India.

Overall likelihood of entry

The overall likelihood of entry is determined as **Moderate** by combining the re-assessed likelihood of importation of High with the adopted likelihood of distribution of Moderate, using the matrix of rules shown in Table A.2.

3.8.2 Likelihoods of establishment and spread

The likelihoods of establishment and spread for *T. macfarlanei* and *T. truncatus* in Australia are independent of the import pathway and are considered to be similar to those in the previous assessment of spider mite species on stone fruit from the USA.

Based on the existing import policy for stone fruit from the USA (Biosecurity Australia 2010), the likelihoods of establishment and spread are assessed as **High** and **High**, respectively.

3.8.3 Overall likelihood of entry, establishment and spread

The overall likelihood of entry, establishment and spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of rules in Table A.2.

The overall likelihood that spider mites will enter Australia as a result of trade in okra fruit from India, be distributed in a viable state to a susceptible part of a host, establish in Australia and subsequently spread within Australia is assessed as **Moderate.**

3.8.4 Consequences

The potential consequences of the entry, establishment and spread of *T. macfarlanei* and *T. truncatus* in Australia are similar to those in the previous assessments of spider mite species for stone fruit from the USA (Biosecurity Australia 2010). The overall consequences in the previous assessments were assessed as Low. The overall consequences for spider mites on the okra from India pathway are also assessed as **Low**.

3.8.5 Unrestricted risk estimate

Unrestricted risk is the result of combining the likelihoods of entry, establishment and spread with the outcome of overall consequences. Likelihoods and consequences are combined using the risk estimation matrix in Table A.4.

Unrestricted risk estimate for *T. macfarlanei* and *T. truncatus*	
Overall likelihood of entry, establishment and spread	Moderate
Consequences	Low
Unrestricted risk	**Low**

The URE for *T. macfarlanei* and *T. truncatus* on the okra from India pathway is assessed as **Low**, which does not achieve the ALOP for Australia. Therefore, specific risk management measures are required for these spider mites on the okra from India pathway.

3.9 Pest risk assessment conclusions

Likelihood ratings and consequences estimate for individual quarantine pests and regulated articles are set out in Table 3.8.

Of the 11 quarantine pests and regulated articles for which a further full pest risk assessment was conducted:

- The UREs for the 10 quarantine pests were assessed as not achieving the ALOP for Australia, and thus specific risk management measures are required for these quarantine pests on this pathway. These pests are:
  - peach fruit fly (*Bactrocera zonata*)
  - melon fly (*Zeugodacus cucurbitae*)
  - papaya mealybug (*Paracoccus marginatus*)
  - Madeira mealybug (*Phenacoccus madeirensis*)
  - cotton mealybug (*Phenacoccus solenopsis*)
  - mulberry scale (*Pseudaulacaspis pentagona*
  - Eurasian flower thrips (*Frankliniella intonsa*)
  - melon thrips (*Thrips palmi*)
  - okra red spider mite (*Tetranychus macfarlanei*)
  - okra mite (*Tetranychus truncatus*).
- Chilli thrips (*Scirtothrips dorsalis*), as well as the 2 quarantine thrips (*F. intonsa* and *T. palmi*), were identified as regulated articles for Australia due to their potential to introduce emerging quarantine orthotospoviruses into Australia. The URE for quarantine orthotospoviruses was assessed in the thrips Group PRA (DAWR 2017a) as not achieving the ALOP for Australia, and thus specific risk management measures are required for these regulated articles on this pathway.

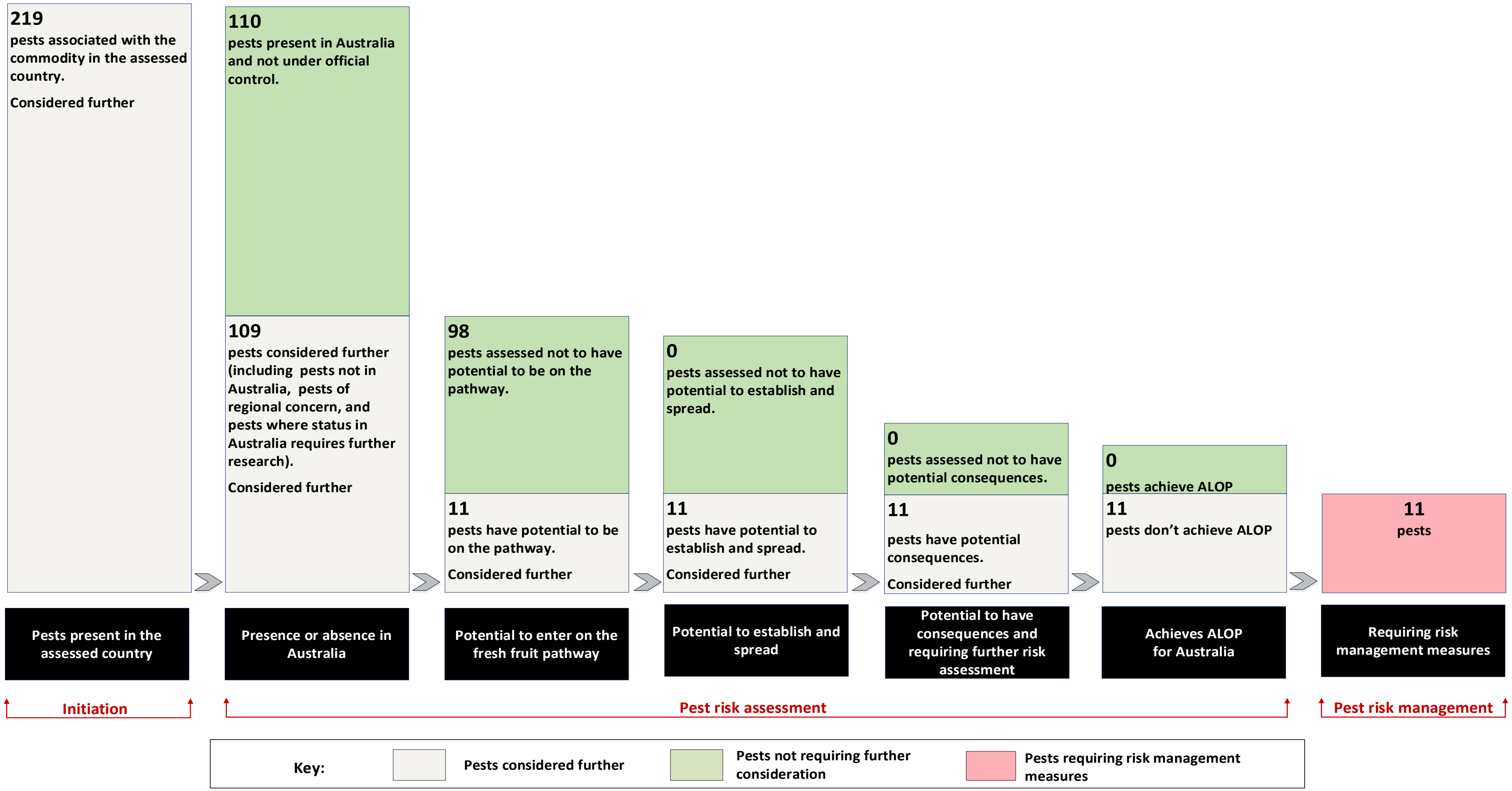
An overview of the decision process at the initiation, pest categorisation and pest risk assessment stages of the pest risk analysis for okra from India is presented diagrammatically in Figure 3.1.

Table 3.8 Pest risk assessment conclusions for pests, and pest groups, associated with the pathway of okra from India

Pest name	Likelihood of						Consequences	URE
	Entry			Establishment	Spread	EES		
	Importation	Distribution	**Overall**					
Fruit flies (Diptera: Tephritidae)								
Bactrocera zonata (EP)	Very Low	High	**Very Low**	High	High	Very Low	High	**Low**
Zeugodacus cucurbitae (EP)	Very Low	High	**Very Low**	High	High	Very Low	High	**Low**
Mealybugs (Hemiptera: Pseudococcidae)								
Paracoccus marginatus (GP)	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Phenacoccus madeirensis (GP)	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Phenacoccus solenopsis (GP, WA)	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Scale insect (Hemiptera: Diaspididae)								
Pseudaulacaspis pentagona (GP, WA)	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Thrips (Thysanoptera: Thripidae)								
Frankliniella intonsa (GP) (a)	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Scirtothrips dorsalis (GP, RA)	High	Moderate	**Moderate**	N/A	N/A	N/A	N/A	**N/A**
Thrips palmi (GP, SA, WA) (a)	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Spider mites (Trombidiformes: Tetranychidae)								
Tetranychus macfarlanei	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Tetranychus truncatus	High	Moderate	**Moderate**	High	High	Moderate	Low	**Low**
Orthotospoviruses [Bunyavirales: Tospoviridae] vectored by *Frankliniella intonsa* (a), *Scirtothrips dorsalis* (RA) and *Thrips palmi* (a)								
Listed in the thrips group PRA (GP)	Moderate	Moderate	**Low**	Moderate	High	Low	Moderate	**Low**

EP: Species has been assessed previously and import policy already exists. **GP:** Species has been assessed previously in a Group PRA and the Group PRA has been applied. **RA:** Regulated article. **WA:** Regional quarantine pest for Western Australia. **SA:** Regional quarantine pest for South Australia. **EES**: Overall likelihood of entry, establishment and spread. **URE**: Unrestricted risk estimate. **a**: Thrips species that is also identified as a regulated article for Australia as it can vector emerging quarantine orthotospoviruses, and this table presents the risk estimates for these viruses from the thrips Group PRA (DAWR 2017a). N/A: not applicable, as *S. dorsalis* is present in Australia and is not a quarantine pest.

Figure 3.1 Overview of the PRA decision process for okra from India



4 Pest risk management

Pest risk management evaluates and selects options for measures for quarantine pests and regulated articles identified in Chapter 3 as having a URE that does not achieve the ALOP for Australia. This chapter proposes specific risk management measures for those quarantine pests and regulated articles (section 4.1). It also proposes an operational system for the assurance, maintenance and verification of phytosanitary status (section 4.2). Both specific risk management measures (section 4.1) and the operational system (section 4.2) are required to reduce the risk of introduction of these quarantine pests and regulated articles to achieve the ALOP for Australia. These measures are in addition to existing commercial production practices for okra in India, as described in Chapter 2, as these practices have been considered in assessing the URE.

4.1 Pest risk management measures and phytosanitary procedures

This section describes the proposed risk management measures for the 10 quarantine pests and one regulated article assessed in Chapter 3 as posing a URE that does not achieve the ALOP for Australia.

Historical trade and pest interception data of other similar pathways, as described in section 4.1.1, have been considered in determining the appropriate risk management measures for the importation of okra from India.

Finalisation of the import conditions may be undertaken with input from the Australian states and territories, and India, as appropriate.

4.1.1 Analysis of pest interception data

Australia currently allows imports of fresh okra fruit from Fiji. However, there have been no imports of okra from Fiji since 2018. Between 2013 and 2017, Fiji exported a total of 3.6 t of okra to Australia. Interception data of okra from Fiji showed 2 detections of larvae of noctuid moths, which were appropriately actioned.

India has access to the Australian market for imported fresh fruit that present a similar risk pathway to okra fruit, including mangoes.

Since 2017, 297.9 t of mangoes have been imported. Of the 185 consignments, pests were detected on 35 consignments, with only 2 consignments requiring remedial treatment. All other consignments were cleared at the Australian border.

4.1.2 Risk management measures for quarantine pests and regulated articles associated with okra from India

Proposed specific risk management measures for the 10 quarantine pests (2 of which are also regulated articles) and one regulated article associated with okra from India are listed in Table 4.1.

Table 4.1 Proposed risk management measures for quarantine pests and regulated articles associated with okra from India.

Pest/pest group	Scientific name	Common name	Measures
Fruit flies [Diptera: Tephritidae]	*Bactrocera zonata* (EP)	Peach fruit fly	PFA, PFPP or PFPS **a** OR Fruit treatment known to be effective against all life stages of these fruit fly species such as irradiation
	Zeugodacus cucurbitae (EP)	Melon fly	
Mealybugs [Hemiptera: Pseudococcidae]	*Paracoccus marginatus* (GP)	Papaya mealybug	Pre-export visual inspection and, if found, remedial action **b**
	Phenacoccus madeirensis (GP)	Madeira mealybug	
	Phenacoccus solenopsis (GP, WA)	Cotton mealybug	
Scale insect [Hemiptera: Diaspididae]	*Pseudaulacaspis pentagona* (GP, WA)	Mulberry scale	Pre-export visual inspection and, if found, remedial action **b**
Thrips [Thysanoptera: Thripidae]	*Frankliniella intonsa* (GP) (c)	Eurasian flower thrips	Pre-export visual inspection and, if found, remedial action **b**
	Scirtothrips dorsalis (GP, RA)	Chilli thrips	
	Thrips palmi (GP, SA, WA) (c)	Melon thrips	
Spider mites [Acariformes: Tetranychidae]	*Tetranychus macfarlanei*	Okra red spider mite	Pre-export visual inspection and, if found, remedial action **b**
	Tetranychus truncatus	Okra mite	

a: PFA is pest free area, PFPP is pest free place of production and PFPS is pest free production site. This can include pest free places of production or pest free production sites during a limited period. **b:** Remedial action may include treatment of the consignment to ensure that the pest is no longer viable, or withdrawal of the consignment from export to Australia. **c:** Thrips species that is also identified as a regulated article for Australia as it vectors emerging quarantine orthotospoviruses, assessed in the thrips Group PRA (DAWR 2017) as posing an unrestricted risk that does not achieve the ALOP for Australia. **EP:** Species has been assessed previously and import policy already exists. **RA:** Regulated article. **GP:** Species has been assessed previously in a Group PRA and the Group PRA has been applied. **SA:** Regional quarantine pest for South Australia. **WA:** Regional quarantine pest for Western Australia.

The Australian Government Department of Agriculture, Water and the Environment (the department) proposes the following specific risk management measures for the identified quarantine pest and regulated articles:

- for fruit flies
  - pest free area, pest free place of production or pest free production site, or
  - fruit treatment considered to be effective against all life stages of fruit flies (such as irradiation)
- for mealybugs, scale insects, thrips and spider mites
  - pre-export visual inspection and, if detected, remedial action.

Measures for fruit flies

For the fruit flies *B. zonata* and *Z. cucurbitae*, the department proposes the options of pest free areas, pest free places of production or pest free production sites or fruit treatment considered to be effective against all life stages such as irradiation. The objective of each proposed measure is to reduce the risk associated with these fruit fly species to achieve the ALOP for Australia when applied in combination with the operational system outlined in section 4.2.

Proposed measure 1: Pest free area, pest free place of production or pest free production site

The requirements for establishing pest free areas (PFA) are set out in ISPM 4: *Requirements for the establishment of pest free areas* (FAO 2021b) and, more specifically, ISPM 26: *Establishment of pest free areas for fruit flies (Tephritidae)* (FAO 2021h). The requirements for establishing pest free places of production (PFPP) and pest free production sites (PFPS) are set out in ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites* (FAO 2021d).

Monitoring and trapping of fruit flies in the specified export farms and packing houses would be required, consistent with the procedures recommended in ISPM 26 (FAO 2021h). In the event of the detection of any fruit fly species of economic importance in the identified PFA, PFPP or PFPS, the Indian Government Department of Agriculture and Farmers Welfare (DAFW) would be required to notify the department within 48 hours of detection. The department would then assess the pest species, number of flies and specific information on individual flies detected, such as life stage, sex and gravidity of females, and the circumstances of the detection before advising DAFW of any action to be taken. If fruit flies were detected during pre-export inspection or during on-arrival inspection, trade under the PFA, PFPP or PFPS pathway would be suspended immediately, pending the outcome of an investigation.

Should India wish to use PFA, PFPP or PFPS as a measure to manage the risk posed by fruit flies, DAFW would need to provide a submission demonstrating the establishment of these to the department. The submission demonstrating PFA must fulfil requirements as set out in ISPM 4 (FAO 2021b) and ISPM 26 (FAO 2021h), and the submission demonstrating PFPP or PFPS must fulfil requirements as set out in ISPM 10 (FAO 2021d). The submission is subject to approval by the department.

Proposed measure 2: Fruit treatment such as irradiation

Fruit treatment known to be effective for all life stages of fruit flies such as irradiation applied pre-export may be used as a phytosanitary measure for *B. zonata* and *Z. cucurbitae*. The requirements for using irradiation as a phytosanitary measure are set out in ISPM 18: *Guidelines for the use of irradiation as a phytosanitary measure* (FAO 2021f). Irradiation is recognised as an effective method for pest risk management when performed in approved facilities and at specific dose rates recognised as effective for target pest groups. Food Standards Australia New Zealand permits irradiation dose rates up to a maximum of 1000 gray for quarantine purposes for fresh fruits and vegetables including okra (FSANZ 2017).

The department proposes a treatment schedule of 150 gray minimum absorbed dose, consistent with ISPM 28 Annex 7: *Irradiation treatment for fruit flies of the family Tephritidae (generic)* (FAO 2021i) for *B. zonata* and *Z. cucurbitae*.

The use of irradiation as a phytosanitary measure is subject to the department’s approval of the irradiation facilities identified by DAFW. Should India wish to use irradiation as a phytosanitary measure, DAFW would need to provide a submission to the department. The submission must fulfil requirements as set out in ISPM 18 (FAO 2021f).

Measures for mealybugs, scale insects, thrips and spider mites

The department proposes the option of pre-export visual inspection and, if found, remedial action for the species of mealybugs, scale insects, thrips and spider mites on the okra from India pathway. The method used for visual inspection must be able to detect all life stages of these pests, for example by using visual aids such as hand lens, where necessary. The inspection should be consistent with ISPM 23: *Guidelines for inspection* (FAO 2021g) and ISPM 31: *Methodologies for sampling of consignments* (FAO 2021j) and provide a 95% level of confidence that infestation greater than 0.5% will be detected. The objective of this proposed measure is to reduce the risk associated with these pests to achieve the ALOP for Australia when applied in combination with the operational system outlined in section 4.2.

Proposed measure: Pre-export visual inspection and, if found, remedial action

All okra consignments for export to Australia must be inspected by DAFW in accordance with ISPM 23 (FAO 2021g) and ISPM 31 (FAO 2021j). They must be found free of the mealybugs *Paracoccus marginatus, Phenacoccus madeirensis* and *Phenacoccus solenopsis*; the scale insect *Pseudaulacaspis pentagona*; the thrips *Frankliniella intonsa, Scirtothrips dorsalis* and *Thrips palmi*; and the spider mites *Tetranychus macfarlanei* and *Tetranychus truncatus*. Export consignments found to contain any of these pests must be subjected to remedial action. Remedial action may include withdrawing the consignment from export to Australia, or application of an approved treatment to ensure that the pest is no longer viable.

4.1.3 Consideration of alternative measures

Consistent with the principle of equivalence detailed in ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2021e), the department will consider any alternative measure proposed by DAFW. Alternative measures must demonstrably manage the target pests to achieve the ALOP for Australia. Evaluation of any such measure will require a technical submission from DAFW that details the proposed measure, including suitable information to support the claimed efficacy, for consideration by the department.

4.2 Operational system for the assurance, maintenance and verification of phytosanitary status

A system of operational procedures is necessary to ensure proposed specific risk management measures (section 4.1) are effectively applied, the phytosanitary status of okra from India is maintained, and these can be verified.

4.2.1 A system of traceability to source farms

The objectives of this procedure are to ensure that:

- okra are sourced only from farms producing commercial quality fruit
- farms from which okra are sourced can be identified, so that any investigation and corrective action can be targeted in the event that pests of biosecurity concern to Australia are intercepted
- where okra is grown/produced in an approved PFA, PFPP or PFPS, it can be verified that all fruit was sourced from the approved area, place or site and produced and exported under the conditions for that pathway.

DAFW must establish a system to enable traceability to where okra for export to Australia are sourced. DAFW must ensure that export okra growers are aware of pests of biosecurity concern for Australia and have systems in place to produce export quality fruit that meet Australia's requirements.

Where a pest risk management measure involving pest monitoring and controls during production and at harvest (such as PFA, PFPP, PFPS or systems approach) is used, export farms must be registered with DAFW before commencement of each harvest season. Records of registered farms and DAFW audits must be kept by DAFW and must be made available to the department upon request.

4.2.2 Registration of packing houses and treatment providers, and auditing of procedures

The objectives of this procedure are to ensure that:

- commercial quality okra are sourced only from packing houses that are approved by DAFW
- where applicable, treatment providers are approved by DAFW and capable of applying a treatment that suitably manages the target pests.

Okra export packing houses are to be registered with DAFW before the commencement of each harvest season. DAFW is required to ensure that the registered packing houses are suitably equipped and have a system in place to carry out the specified phytosanitary activities. The list of registered packing houses and records of DAFW audits must be kept by DAFW and must be made available to the department upon request.

In circumstances where okra undergo pre-export treatment, this process must be undertaken by treatment providers that have been registered with and audited by DAFW for that purpose. Records of DAFW registration requirements and audits are to be made available to the department upon request.

The approval of treatment providers by DAFW must include verification that suitable systems are in place to ensure compliance with treatment requirements. This may include:

- documented procedures to ensure okra are appropriately treated and safeguarded post treatment
- staff training to ensure compliance with procedures
- record-keeping procedures
- suitability of facilities and equipment
- DAFW's system of oversight of treatment application.

The department provides final approval of facilities, following review of regulatory oversight provided by DAFW and the capability demonstrated by the facility. Site visits may be required for the department to have assurance that treatment can be applied accurately and consistently.

4.2.3 Packaging, labelling and containers

The objectives of this procedure are to ensure that:

- okra intended for export to Australia, and associated packaging, are not contaminated by quarantine pests or regulated articles (as defined in ISPM 5: *Glossary of phytosanitary terms* (FAO 2021c))
- unprocessed packaging material is not imported with okra from India. Unprocessed packaging material is not permitted as it may vector pests identified as not being on the pathway or pests not known to be associated with okra
- all wood material associated with the consignment used in packaging and transport of okra complies with the department's import conditions, as published on BICON
- secure packaging is used for export of okra from India to Australia to prevent re-infestation during storage and transport and prevent escape of pests during clearance procedures on arrival in Australia. Packaging must meet Australia's secure packing options published on BICON
- consignments are made insect proof and secure by using at least one of the following secure consignment options:
  - **integral cartons**: produce may be packed in integral (fully enclosed) cartons (packages) with boxes having no ventilation holes and lids tightly fixed to the bases
  - **ventilation holes of cartons covered:** cartons (packages) with ventilation holes must have the holes covered/sealed with a mesh/screen of no more than 1.6 mm pore size and not less than 0.16 mm strand thickness. Alternatively, the vent holes may be taped over
  - **polythene liners:** vented cartons (packages) with sealed polythene liners/bags within are acceptable (folded polythene bags are acceptable)
  - **meshed or shrink-wrapped pallets or Unit Load Devices (ULDs):** ULDs transporting cartons with open ventilation holes/gaps, or palletised cartons with ventilation holes/gaps, must be fully covered or wrapped with polyethylene/plastic/foil sheet or mesh/screen of no more than 1.6 mm diameter pore size and not less than 0.16 mm strand thickness
  - **produce transported in fully enclosed containers:** cartons (packages) with holes as loose boxes or on pallets may be transported in fully enclosed containers. Enclosed containers include 6-sided containers with solid sides, or ULDs with tarpaulin sides that have no holes or gaps. The container must be transported to the inspection point intact.
- packaged okra from India must be labelled with sufficient identification for the purposes of traceability. This may include:
  - for treated product: the treatment facility name/number and treatment identification reference/number
  - for okra where the measures include pre-harvest controls/area freedom: the farm reference number
  - for okra where phytosanitary measures are applied at the packing house: the packing house reference/number.
- where applicable, packaged okra from India that have undergone irradiation treatment are labelled with a statement that the okra have been treated with ionising radiation.

Export packing houses and treatment providers (where applicable) must ensure packaging and labelling are suitable to maintain phytosanitary status of the export consignments.

4.2.4 Specific conditions for storage and movement

The objective of this procedure is to ensure that the quarantine integrity of the okra is maintained during storage and movement.

Treated and/or inspected okra for export to Australia must be kept secure and segregated at all times from any fruit for domestic or other markets, and from untreated/un-inspected product, to prevent mixing or cross-contamination. The area set aside for goods to Australia must be clearly identified with signage.

4.2.5 Freedom from trash

The objective of this procedure is to ensure that okra for export are free from trash (for example, loose stem and leaf material, seeds, soil, animal matter/parts or other extraneous material) and foreign matter.

Freedom from trash will be confirmed by the inspection procedures. Export lots or consignments found to contain trash or foreign matter must be withdrawn from export unless approved remedial action, such as reconditioning, is available and applied to the export consignment and then re-inspected.

4.2.6 Pre-export phytosanitary inspection and certification by the Indian Government Department of Agriculture and Farmers Welfare

The objectives of this procedure are to ensure that Australia's import conditions have been met. All consignments of okra from India for export to Australia must be inspected by DAFW and found free of pests of biosecurity concern for Australia. Pre-export visual inspection must be undertaken by DAFW in accordance with ISPM 23: *Guidelines for inspection* (FAO 2021g) and consistent with the principles of ISPM 31: *Methodologies for sampling of consignments* (FAO 2021j). Any netting or artificial wrapping material must be removed during the inspection.

All consignments must be inspected prior to export in accordance with official procedures for all visually-detectable quarantine pests and regulated articles (including trash). Sampling and inspection methods should be consistent with ISPM 23 and ISPM 31 and provide a 95% level of confidence that infestation greater than 0.5% will be detected. For a consignment equal to or greater than 1,000 units (one unit being a single okra fruit), this is equivalent to a 600-unit sample randomly selected across the consignment. Any netting or artificial wrapping material must be removed during the inspection.

A phytosanitary certificate must be issued for each consignment upon completion of pre-export inspection and treatment to verify that the required risk management measures have been undertaken prior to export and that the consignment meets Australia's import requirements.

Each phytosanitary certificate must include:

- a description of the consignment (including traceability information)
- details of disinfestation treatments (if required) which includes approved facility name and address, date of treatment and, where irradiation is used, absorbed dose (target and measured)

– additional declarations that may be required such as identification of the consignment as being sourced from a recognised pest free area, pest free place of production or pest free production site.

Some treatments (such as irradiation) may also require treatment certificates that accompany the phytosanitary certificate. BICON will describe where treatment certificates are required.

4.2.7 Phytosanitary inspection by the Department of Agriculture, Water and the Environment

The objectives of this procedure are to ensure that:

- consignments comply with Australian import requirements
- consignments are as described on the phytosanitary certificate
- quarantine integrity has been maintained.

On arrival in Australia, the department will:

– assess documentation to verify that the consignment is as described on the phytosanitary certificate, that required phytosanitary actions have been undertaken, and that product security has been maintained

– verify that the biosecurity status of consignments of okra from India meet Australia’s import requirements. When inspecting consignments, the department will use random samples of 600 units, or equivalent per phytosanitary certificate and an inspection method suitable for the commodity.

4.2.8 Remedial action(s) for non-compliance

The objectives of remedial action(s) for non-compliance are to ensure that:

- any quarantine pest or regulated article, including trash, is addressed by remedial action, as appropriate
- non-compliance with import requirements is addressed, as appropriate.

Any consignment that fails to meet Australia’s import conditions will be subject to suitable remedial treatment where an effective treatment is available for the identified biosecurity risks. Where an effective treatment is not available, the imported consignment will be exported or destroyed.

Other actions, including partial or complete suspension of the import pathway, may be taken depending on the identity and/or importance of the pest intercepted, for example, fruit flies of economic importance or pests for which PFAs, PFPPs or PFPSs are established.

In the event that consignments of okra from India are repeatedly non-compliant, the department may require enhanced risk management measures, including mandatory phytosanitary treatment. The department reserves the right to suspend imports (either all imports, or imports from specific pathways) and to conduct an audit of the risk management systems. Imports will be allowed to recommence only when the department is satisfied that appropriate corrective action has been undertaken.

4.3 Uncategorised pests

If an organism that has not been categorised, including a contaminant pest, is detected on okra on arrival in Australia, it will require assessment by the department to determine its quarantine status and whether phytosanitary action is required.

Assessment is also required if the detected species was categorised as not having the potential to be on the import pathway. If the detected species was categorised as on the pathway but assessed as having an unrestricted risk that achieves the ALOP for Australia, then it may require reassessment. The detection of any pests of biosecurity concern that were not identified in the analysis may result in remedial action and/or temporary suspension of trade while a review is conducted to ensure that existing measures continue to provide the ALOP for Australia.

4.4 Review of processes

4.4.1 Verification of protocol

Prior to or during the first season of trade, the department will verify the implementation of the required import requirements including registration, operational procedures and treatment providers, where applicable. This may involve representatives from the department visiting areas in India that produce okra for export to Australia.

4.4.2 Review of policy

The department will review the import policy after a suitable volume of trade has been achieved to ensure import requirements continue to be appropriate to manage the biosecurity risk of the pathway. In addition, the department reserves the right to review the import policy as deemed necessary. This may include if there is reason to believe that the pest or phytosanitary status in India has changed, or where alternative risk management or compliance-based intervention options become available.

DAFW must inform the department immediately on the detection of any new pests of okra in India that might be of potential biosecurity concern to Australia.

4.5 Meeting Australia's food laws

In addition to meeting Australia's biosecurity laws, imported food for human consumption must comply with the requirements of the *Imported Food Control Act 1992*, as well as Australian state and territory food laws. Among other things, these laws require all food, including imported food, to meet the standards set out in the Australia New Zealand Food Standards Code (the Code).

Food Standards Australia New Zealand (FSANZ) is responsible for developing and maintaining the Code. The Code is available at foodstandards.gov.au/code/Pages/default.aspx.

The department administers the *Imported Food Control Act 1992*, which supports the inspection and testing of imported food to verify its safety and compliance with Australia's food standards, including the Code. This is undertaken through a risk-based border inspection program, the Imported Food Inspection Scheme. More information about this scheme is available at awe.gov.au/biosecurity-trade/import/goods/food/inspection-compliance/inspection-scheme.

Standards 1.1.1, 1.1.2 and 1.4.4 of the code specify that a food for sale must not consist of, or have as an ingredient or component, a prohibited or restricted plant or fungus; unless expressly permitted by the code. The prohibited and restricted plants and fungi are listed in Schedules 23 and 24 of the Code, respectively.

Standard 1.4.2 and Schedules 20, 21 and 22 of the Code set out the maximum residue limits and extraneous residue limits for agricultural or veterinary chemicals that are permitted in foods for sale, including imported food. Standard 1.1.1 of the Code specifies that a food must not have, as an ingredient or a component, a detectable amount of an agvet chemical, or a metabolite or a degradation product of the agvet chemical, unless expressly permitted by the Code.

Certain imported food, including some minimally processed horticulture products, must be covered by a food safety management certificate to be imported into Australia. The certificate provides evidence that a food has been produced through a food safety management system. This system must have appropriate controls in place to manage food safety hazards. More information about the foods that require a food safety management certificate and how to comply is available at awe.gov.au/biosecurity-trade/import/goods/food/safety-management-certificates.

5 Conclusion

This draft risk analysis report was conducted to assess the proposal by India for market access to Australia for fresh okra fruit for human consumption.

The risk analysis was conducted in accordance with Australia's method for pest risk analysis (Appendix A), which is consistent with the International Standards for Phytosanitary Measures (ISPMs), including ISPM 2: *Framework for pest risk analysis* (FAO 2021a) and ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2021e), and the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (WTO 1995).

In conclusion, this draft report proposes that the importation of commercially produced fresh okra fruit to Australia from all commercial production areas of India be permitted, subject to a range of biosecurity requirements outlined in Chapter 4.

The findings of this draft report are based on a comprehensive analysis of scientific literature and other relevant information.

The Department of Agriculture, Water and the Environment considers that the risk management measures proposed in this report will provide an appropriate level of protection against the quarantine pests and regulated articles identified as associated with the trade of fresh okra fruit from India.

All fresh fruit, including okra fruit from India, have been determined by the Director of Biosecurity to be conditionally non-prohibited goods under s174 of the *Biosecurity Act 2015*. Conditionally non-prohibited goods cannot be brought or imported into Australia unless they meet specific import conditions.

This report, upon its finalisation, provides the basis for import conditions for fresh okra fruit from India for human consumption. The import conditions will be communicated on BICON. The publication of import conditions on BICON is subject to India being able to demonstrate that processes and procedures are in place to implement the required risk management measures.

Appendix A: Method for pest risk analysis

This section sets out the method for the pest risk analysis (PRA) used by the Department of Agriculture, Water and the Environment (the department). This method is consistent with the International Standards for Phytosanitary Measures (ISPMs), including ISPM 2: *Framework for pest risk analysis* (FAO 2021a) and ISPM 11: *Pest risk analysis for quarantine pests* (FAO 2021e) and the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (WTO 1995).

A PRA is 'the process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it' (FAO 2021c). A pest is 'any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products' (FAO 2021c). A 'quarantine pest' is 'a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled' (FAO 2021c).

Biosecurity risk consists of 2 major components: the likelihood of a pest entering, establishing and spreading in Australia for a defined import pathway; and the consequences should this happen. These 2 components are combined to give an overall estimate of the pest risk for the defined import pathway.

Unrestricted risk is estimated taking into account, where applicable, the existing commercial production practices of the exporting country and procedures that occur on arrival in Australia. These procedures include verification by the department that the consignment received is as described on the commercial documents and its integrity has been maintained.

Restricted risk is estimated with phytosanitary measure(s) applied. A phytosanitary measure is 'any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests' (FAO 2021c).

A PRA is conducted in 3 consecutive stages: initiation (A1), pest risk assessment (A2) and pest risk management (A3).

A1 Stage 1: Initiation

Initiation identifies the pest(s) and pathway(s) that are of biosecurity concern and should be considered for risk analysis in relation to the identified PRA area.

A pathway is 'any means that allows the entry or spread of a pest' (FAO 2021c). For this risk analysis, the 'pathway' being assessed is defined in Chapter 1 (section 1.2.2).

For this risk analysis, the 'PRA area' is defined as Australia for pests that are absent, or of limited distribution and under official control. For areas with regional freedom from a pest, the 'PRA area' may be defined based on a state or territory of Australia or may be defined as a region of Australia consisting of parts of a state or territory or several states or territories.

According to ISPM 11 (FAO 2021e), the PRA process may be initiated as a result of:

- the identification of a pathway that presents a potential pest hazard. For example, international trade is requested for a commodity not previously imported into the country or a commodity from a new area or new country of origin
- the identification of a pest that may require phytosanitary measures. For example, a new pest risk is identified by scientific research, a pest is repeatedly intercepted, a request is made to import an organism, or an organism is identified as a vector of other pests
- the review or revision of a policy. For example, a country's decision is taken to review phytosanitary regulations, requirements or operations or a new treatment or loss of a treatment system, a new process, or new information impacts on an earlier decision.

The basis for the initiation of this risk analysis is defined in Chapter 1 (section 1.2.1).

The primary elements considered in the initiation stage are:

- identity of the pests
- potential association of each pest with the pathway being assessed.

The identity of the pests is presented at species level by the species' scientific name in most instances, but a lower taxonomic level may be used where appropriate. Synonyms are provided where the current scientific name differs from that provided by the exporting country's National Plant Protection Organisation (NPPO) or where the cited literature used a different scientific name.

The potential association of each pest with the pathway being assessed considers information on:

- association of the pest with the host plant/commodity and
- the presence or absence of the pest in the exporting country/region relevant to the pathway being assessed.

A2 Stage 2: Pest risk assessment

The process for pest risk assessment includes 2 sequential steps:

- pest categorisation (A2.1) and
- further pest risk assessment, which includes evaluation of the likelihood of the introduction (entry and establishment) and spread of a pest (A2.2) and evaluation of the magnitude of the associated potential consequences (A2.3).

A2.1 Pest categorisation

Pest categorisation examines the pests identified in the initiation stage (A1) to determine which of these pests meet the definition of a quarantine pest and require further pest risk assessment.

ISPM 11 (FAO 2021e) states that '*The opportunity to eliminate an organism or organisms from consideration before in-depth examination is undertaken is a valuable characteristic of the categorisation process. An advantage of pest categorisation is that it can be done with relatively little information; however information should be sufficient to adequately carry out the categorisation*'. In line with ISPM 11, the department utilises the pest categorisation step to screen out some pests from further consideration where appropriate. For each pest that is not present in Australia, or is present but under official control, the department assesses its potential to enter (importation and distribution) on the pathway being assessed and, if having potential to enter, its potential to establish and spread in the PRA area. For a pest to cause economic consequences, the pest will need to enter, establish and spread in the PRA area. Therefore, pests that do not have potential to enter on the pathway being assessed, or have potential to enter but do not have potential to establish and spread in the PRA area, are not considered further. The potential for economic consequences is then assessed for pests that have potential to enter, establish and spread in the PRA area. Further pest risk assessments are then undertaken for pests that have potential to cause economic consequences, i.e., pests that meet the criteria for a quarantine pest.

Pest categorisation uses the following primary elements to identify the quarantine pests and to screen out some pests from further consideration where appropriate for the pathway being assessed:

- presence or absence and regulatory status in the PRA area
- potential for entry, establishment and spread in the PRA area
- potential for economic consequences in the PRA area.

A2.2 Assessment of the likelihood of entry, establishment and spread

ISPM 11 (FAO 2021e) provides details of how to assess the 'probability of entry', 'probability of establishment' and 'probability of spread' of a pest. The SPS Agreement (WTO 1995) uses the term 'likelihood' rather than 'probability' for these estimates. In qualitative PRAs, the department uses the term 'likelihood' as the descriptor. The use of the term 'probability' is limited to the direct quotation of ISPM definitions.

A summary of the assessment process is given here, followed by a description of the qualitative methodology used in this risk analysis.

A2.2.1 Likelihood of entry

The likelihood of entry describes the likelihood that a quarantine pest will enter Australia when a given commodity is imported, be distributed in a viable state in the PRA area and subsequently be transferred to a host.

For the purpose of considering the likelihood of entry, the department divides this step into 2 components:

- **Likelihood of importation**—the likelihood that a pest will arrive in Australia in a viable state when a given commodity is imported
- **Likelihood of distribution**— the likelihood that the pest will be distributed in a viable state, as a result of the processing, sale or disposal of the commodity, in the PRA area and subsequently transfer to a susceptible part of a host.

Factors to be considered in the likelihood of importation may include:

- likelihood of the pest being associated with the pathway at origin
    - prevalence of the pest in the source area
    - occurrence of the pest in a life-stage that would be associated with the commodity
    - mode of trade (for example, bulk, packed)
    - volume and frequency of movement along each pathway

  - seasonal timing of imports
  - pest management, cultural and commercial procedures applied at the place of origin (for example, application of plant protection products, handling, culling, and grading)
- likelihood of survival of the pest during transport or storage
  - speed and conditions of transport and duration and conditions of storage compared with the duration of the life cycle of the pest
  - vulnerability of the life-stages of the pest during transport or storage
  - prevalence of the pest likely to be associated with a consignment
  - commercial procedures (for example, refrigeration) applied to consignments during transport and storage in the country of origin, and during transport to Australia
- likelihood of pest surviving existing pest management procedures.

Factors to be considered in the likelihood of distribution may include:

- commercial procedures (for example, refrigeration) applied to consignments during distribution in Australia
- dispersal mechanisms of the pest, including vectors, to allow movement from the pathway to a suitable host
- whether the imported commodity is to be sent to a few or many destination points in the PRA area
- proximity of entry, transit and destination points to suitable hosts
- time of year at which import takes place
- intended use of the commodity (for example, for planting, processing or consumption)
- risks from by-products and waste.

A2.2.2 Likelihood of establishment

Establishment is defined as the 'perpetuation for the foreseeable future, of a pest within an area after entry' (FAO 2021c). In order to estimate the likelihood of establishment of a pest, reliable biological information (for example, lifecycle, host range, epidemiology, survival) is obtained from the areas where the pest currently occurs. The situation in the PRA area can then be compared with that in the areas where it currently occurs and expert judgement used to assess the likelihood of establishment.

Factors to be considered in the likelihood of establishment in the PRA area may include:

- availability of suitable hosts, alternate hosts and vectors in the PRA areas
  - prevalence of hosts and alternate hosts in the PRA area
  - whether hosts and alternate hosts occur within sufficient geographic proximity to allow the pest to complete its life cycle
  - whether there are other plant species, which could prove to be suitable hosts in the absence of usual host species
  - whether a vector, if needed for dispersal of the pest, is already present in the PRA area or likely to be introduced
- suitability of environment in the PRA area

  - factors in the environment in the PRA area (for example, suitability of climate, soil, pest and host competition) that are critical to the development of the pest, its host and if applicable its vector, and to their ability to survive periods of climatic stress and complete their life cycles
- cultural practices and control measures in the PRA area that may influence the ability of the pest to establish
- other characteristics of the pest
  - reproductive strategy of the pest and method of pest survival
  - potential for adaptation of the pest
  - minimum population needed for establishment.

A2.2.3 Likelihood of spread

Spread is defined as 'the expansion of the geographical distribution of a pest within an area' (FAO 2021c). The likelihood of spread considers the factors relevant to the movement of the pest, after establishment on a host plant or plants, to other susceptible host plants of the same or different species in other areas. In order to estimate the likelihood of spread of the pest, reliable biological information is obtained from areas where the pest currently occurs. The situation in the PRA area is then carefully compared with that in the areas where the pest currently occurs and expert judgement used to assess the likelihood of spread.

Factors to be considered in the likelihood of spread may include:

- suitability of the natural and/or managed environment for natural spread of the pest
- presence of natural barriers
- potential for movement with commodities, conveyances or by vectors
- intended use of the commodity
- potential vectors of the pest in the PRA area
- potential natural enemies of the pest in the PRA area.

A2.2.4 Assigning likelihoods for entry, establishment and spread

Likelihoods are assigned to each step of entry, establishment and spread. Six qualitative likelihood descriptors are used: High; Moderate; Low; Very Low; Extremely Low; and Negligible. Definitions for these descriptors and their indicative ranges are given in Table A.1. The indicative ranges are only provided to illustrate the boundaries of the descriptors and are not used beyond this purpose in qualitative PRAs. These indicative ranges provide guidance to the risk analyst and promote consistency between different pest risk assessments.

Table A.1 Nomenclature of likelihoods

Likelihood	Descriptive definition	Indicative range
High	The event would be very likely to occur	0.7 < to ≤ 1
Moderate	The event would occur with an even likelihood	0.3 < to ≤ 0.7
Low	The event would be unlikely to occur	0.05 < to ≤ 0.3
Very Low	The event would be very unlikely to occur	0.001 < to ≤ 0.05
Extremely Low	The event would be extremely unlikely to occur	0.000001 < to ≤ 0.001
Negligible	The event would almost certainly not occur	0 < to ≤ 0.000001

A2.2.5 Combining likelihoods

The likelihood of entry is determined by combining the likelihood that the pest will be imported into the PRA area and the likelihood that the pest will be distributed within the PRA area, using a matrix of rules (Table A.2). This matrix is then used to combine the likelihood of entry and the likelihood of establishment, and the likelihood of entry and establishment is then combined with the likelihood of spread to determine the overall likelihood of entry, establishment and spread.

For example, if a descriptor of Low is assigned for the likelihood of importation, Moderate for the likelihood of distribution, High for the likelihood of establishment and Very Low for the likelihood of spread, then the likelihood of importation of Low and the likelihood of distribution of Moderate are combined to give a likelihood of Low for entry. The likelihood for entry is then combined with the likelihood assigned for establishment of High to give a likelihood for entry and establishment of Low. The likelihood for entry and establishment is then combined with the likelihood assigned for spread of Very Low to give the overall likelihood for entry, establishment and spread of Very Low. This can be summarised as:

importation x distribution = entry [E]	**Low x Moderate = Low**
entry x establishment = [EE]	**Low x High = Low**
[EE] x spread = [EES]	**Low x Very Low = Very Low**

Table A.2 Matrix of rules for combining likelihoods

	High	Moderate	Low	Very Low	Extremely Low	Negligible
High	High	Moderate	Low	Very Low	Extremely Low	Negligible
Moderate		Low	Low	Very Low	Extremely Low	Negligible
Low			Very Low	Very Low	Extremely Low	Negligible
Very Low				Extremely Low	Extremely Low	Negligible
Extremely Low					Negligible	Negligible
Negligible						Negligible

Time and volume of trade

One factor affecting the likelihood of entry is the volume and duration of trade. If all other conditions remain the same, the overall likelihood of entry will increase as time passes and the overall volume of trade increases.

The department normally considers the likelihood of entry on the basis of the estimated volume of one year's trade. This is a convenient value for the analysis that is relatively easy to estimate and allows for expert consideration of seasonal variations in pest presence, incidence and behaviour to be taken into account. The consideration of the likelihood of entry, establishment and spread and subsequent consequences takes into account events that might happen over a number of years even though only one year's volume of trade is being considered. This difference reflects biological and ecological facts, for example where a pest or disease may establish in the year of import but spread may take many years.

The use of a one-year volume of trade has been taken into account when setting up the matrix that is used to estimate the risk and therefore any policy based on this analysis does not simply apply to one year of trade. Policy decisions that are based on the department's method that uses the estimated volume of one year's trade are consistent with Australia's policy on appropriate level of protection and meet the Australian Government's requirement for ongoing quarantine protection. If there are substantial changes in the volume and nature of the trade in specific commodities then the department will review the risk analysis and, if necessary, provide updated policy advice.

A2.3 Assessment of potential consequences

In estimating the potential consequences of a pest if the pest were to enter, establish and spread in Australia, the department uses a 2-step process. In the first step, a qualitative descriptor of the impact is assigned to each of the direct and indirect criteria in terms of the *level of impact* and the *magnitude of impact*. The second step involves combining the impacts for each of the criteria to obtain an 'overall consequences' estimation.

Step 1: Assessing direct and indirect impacts

Direct pest impacts are considered in the context of the impacts on:

- the life or health of plants and plant products

  This may include pest impacts on the life or health of the plants and production effects (yield or quality) either at harvest or during storage.

  - Where applicable, pest impacts on the life or health of humans or of animals and animal products may also be considered.
- other aspects of the environment.

Indirect pest impacts are considered in the context of the impacts on:

- eradication and control

  This may include pest impacts on new or modified eradication, control, surveillance or monitoring and compensation strategies or programs.
- domestic trade

  This may include pest impacts on domestic trade or industry, including changes in domestic consumer demand for a product resulting from quality changes and effects on other industries supplying inputs to, or using outputs from, directly affected industries.
- international trade

  This may include pest impacts on international trade, including loss of markets, meeting new technical requirements to enter or maintain markets and changes in international consumer demand for a product resulting from quality changes.
- non-commercial and environment

  This may include pest impacts on the community and environment, including reduced tourism, reduced rural and regional economic viability, loss of social amenity, and any 'side effects' of control measures.

For each of these direct and indirect criteria, the level of impact is estimated over 4 geographic levels, defined as:

- **Local**–an aggregate of households or enterprises (a rural community, a town or a local government area)
- **District**–a geographically or geopolitically associated collection of aggregates (generally a recognised section of a state or territory, such as 'Far North Queensland')
- **Regional**–a geographically or geopolitically associated collection of districts in a geographic area (generally a state or territory, although there may be exceptions with larger states such as Western Australia)
- **National**–Australia wide (Australian mainland states and territories and Tasmania).

For each criterion, the magnitude of impact at each of these geographic levels is described using 4 categories, defined as:

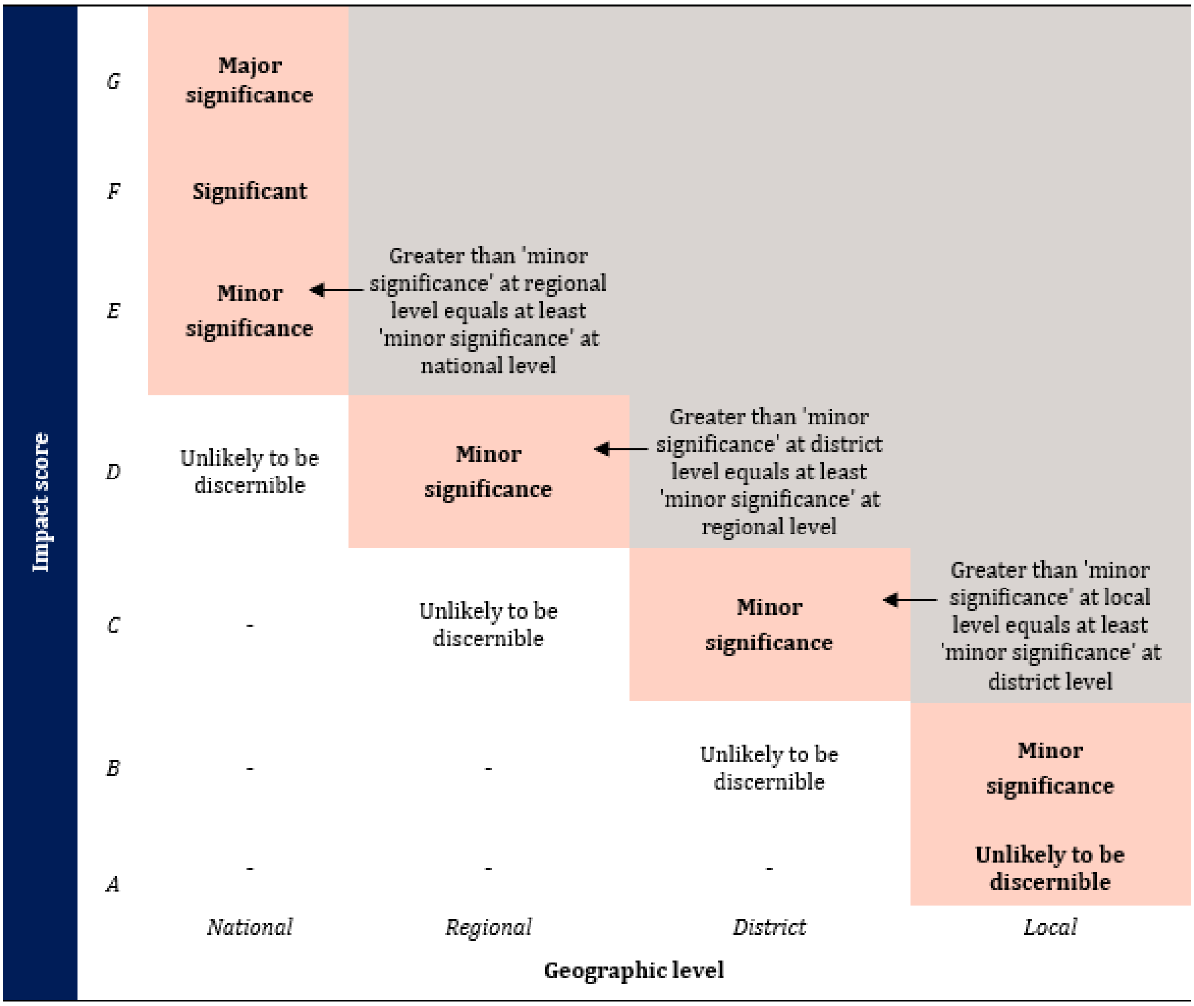
- **Unlikely to be discernible**–pest impact is not usually distinguishable from normal day-to-day variation in the criterion
- **Minor significance**–expected to lead to a minor increase in mortality/morbidity of hosts or a minor decrease in production but not expected to threaten the economic viability of production. Expected to decrease the value of non-commercial criteria but not threaten the criterion's intrinsic value. Effects would generally be reversible.
- **Significant**–expected to threaten the economic viability of production through a moderate increase in mortality/morbidity of hosts, or a moderate decrease in production. Expected to significantly diminish or threaten the intrinsic value of non-commercial criteria. Effects may not be reversible.
- **Major significance**–expected to threaten the economic viability through a large increase in mortality/morbidity of hosts, or a large decrease in production. Expected to severely or irreversibly damage the intrinsic 'value' of non-commercial criteria.

Each individual direct or indirect impact is given an impact score (A–G) using the decision rules in Figure A.1. This is done by determining which of the shaded cells with bold font in Figure A.1 correspond to the level and magnitude of the particular impact.

The following are considered during this process:

- At each geographic level below 'National', an impact more serious than 'Minor significance' is considered at least 'Minor significance' at the level above. For example, a 'Significant' impact at the state or territory level is considered equivalent to at least a 'Minor significance' impact at the national level.
- If the impact of a pest at a given level is in multiple states or territories, districts or regions or local areas, it is considered to represent at least the same magnitude of impact at the next highest geographic level. For example, a 'Minor significance' impact in multiple states or territories represents a 'Minor significance' impact at the national level.
- The geographic distribution of an impact does not necessarily determine the impact. For example, an outbreak could occur on one orchard/farm, but the impact could potentially still be considered at a state or national level.

Figure A.1 Decision rules for determining the impact score for each direct and indirect criterion, based on the *level of impact* and the *magnitude of impact*



For each criterion:

- the *level of impact* is estimated over 4 geographic levels: local, district, regional and national
- the *magnitude of impact* at each of the 4 geographic levels is described using 4 categories: unlikely to be discernible, minor significance, significant and major significance
- an impact score (A–G) is assigned by determining which of the shaded cells with bold font correspond to the level and magnitude of impact.

Step2: Combining direct and indirect impacts

The overall consequence for each pest or each group of pests is achieved by combining the impact scores (A–G) for each direct and indirect criterion using the decision rules in Table A.3. These rules are mutually exclusive, and are assessed in numerical order until one applies. For example, if the first rule does not apply, the second rule is considered, and so on.

Table A.3 Decision rules for determining the overall consequence rating for each pest

Rule	The impact scores for consequences of direct and indirect criteria	Overall consequence rating
1	Any criterion has an impact of 'G'; or more than one criterion has an impact of 'F'; or a single criterion has an impact of 'F' and each remaining criterion an 'E'.	Extreme
2	A single criterion has an impact of 'F'; or all criteria have an impact of 'E'.	High
3	One or more criteria have an impact of 'E'; or all criteria have an impact of 'D'.	Moderate
4	One or more criteria have an impact of 'D'; or all criteria have an impact of 'C'.	Low
5	One or more criteria have an impact of 'C'; or all criteria have an impact of 'B'.	Very Low
6	One or more but not all criteria have an impact of 'B', and all remaining criteria have an impact of 'A'.	Negligible

A2.4 Estimation of the unrestricted risk

Once the assessment of the likelihood of entry, establishment and spread and for potential consequences are completed, the unrestricted risk can be determined for each pest or each group of pests. This is determined by using a risk estimation matrix (Table A.4) to combine the estimates of the likelihood of entry, establishment and spread and the overall consequences of pest establishment and spread.

When interpreting the risk estimation matrix, note the descriptors for each axis are similar (for example, Low, Moderate, High) but the vertical axis refers to likelihood and the horizontal axis refers to consequences. Accordingly, a Low likelihood combined with High consequences, is not the same as a High likelihood combined with Low consequences—the matrix is not symmetrical. For example, the former combination would give an unrestricted risk rating of Moderate, whereas, the latter would give a Low rating.

Table A.4 Risk estimation matrix

Likelihood of pest entry, establishment and spread	Consequences of pest entry, establishment and spread					
	Negligible	Very Low	Low	Moderate	High	Extreme
High	Negligible risk	Very Low risk	Low risk	Moderate risk	High risk	Extreme risk
Moderate	Negligible risk	Very Low risk	Low risk	Moderate risk	High risk	Extreme risk
Low	Negligible risk	Negligible risk	Very Low risk	Low risk	Moderate risk	High risk
Very Low	Negligible risk	Negligible risk	Negligible risk	Very Low risk	Low risk	Moderate risk
Extremely Low	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very Low risk	Low risk
Negligible	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very Low risk

A2.5 The appropriate level of protection (ALOP) for Australia

The SPS Agreement defines the concept of an 'appropriate level of sanitary or phytosanitary protection (ALOP)' as the level of protection deemed appropriate by the WTO Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory.

Like many other countries, Australia expresses its ALOP in qualitative terms. The ALOP for Australia, which reflects community expectations through government policy, is currently expressed as providing a high level of sanitary or phytosanitary protection aimed at reducing risk to a very low level, but not to zero. The band of cells in Table A.4 marked 'Very Low risk' represents the ALOP for Australia.

A2.6 Adoption of outcomes from previous assessments

Outcomes of previous risk assessments have been adopted in this assessment for pests for which the risk profile is assessed as comparable to previously assessed situations.

The prospective adoption of previous risk assessment ratings for the likelihood of importation and the likelihood of distribution is considered on a case-by-case basis by comparing factors relevant to the pathway being assessed with those assessed previously. For assessment of the likelihood of importation, factors considered/compared include the commodity type, the prevalence of the pest and commercial production practices in the exporting country/region. For assessment of the likelihood of distribution of a pest the factors considered/compared include the commodity type, the ways the imported produce will be distributed within Australia as a result of the processing, sale or disposal of the imported produce, and the time of year when importation occurs and the availability and susceptibility of hosts at that time. After comparing these factors and reviewing the latest literature, previously determined ratings may be adopted if the department considers the likelihoods for the pathway being assessed to be comparable to those assigned in the previous assessment(s), and there is no new information to suggest that the ratings assigned in the previous assessment(s) have changed.

The likelihood of establishment and of spread of a pest species in the PRA area will be comparable between risk assessments, regardless of the import pathway through which the pest has entered the PRA area. This is because these likelihoods relate specifically to conditions and events that occur in the PRA area, and are independent of the import pathway. Similarly, the estimate of potential consequences associated with a pest species is also independent of the import pathway. Therefore, the likelihoods of establishment and of spread of a pest, and the estimate of potential consequences, are directly comparable between assessments. If there is no new information available that would significantly change the ratings for establishment or spread or the consequences the pests may cause, the ratings assigned in the previous assessments for these components may be adopted with confidence.

A2.7 Application of Group PRAs to this risk analysis

The Group PRAs that were applied to this risk analysis are:

- the *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (thrips Group PRA) (DAWR 2017).
- the *Final group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports* (mealybugs Group PRA) (DAWR 2019).

- the *Final group pest risk analysis for soft and hard scale insects on fresh fruit, vegetable, cut-flower and foliage imports* (scales Group PRA) (DAWE 2021).

The Group PRA approach is consistent with relevant international standards and requirements– including ISPM 2: *Framework for Pest Risk Analysis* (FAO 2021a), ISPM 11: Pest Risk Analysis for Quarantine Pests (FAO 2021e) and the SPS Agreement (WTO 1995). ISPM 2 states that 'Specific organisms may … be analysed individually, or in groups where individual species share common biological characteristics.'

Risk estimates derived from a Group PRA are 'indicative' in character. This is because the likelihood of entry (the combined likelihoods of importation and distribution) can be influenced by a range of pathway-specific factors, as explained in section A2.6. Therefore, the indicative likelihood of entry from a Group PRA needs to be verified on a case-by-case basis.

In contrast, and as noted in section A2.6, the risk factors considered in the likelihoods of establishment and spread, and the potential consequences associated with a pest species are not pathway-specific, and are therefore comparable across all import pathways within the scope of the Group PRA. This is because at these latter stages of the risk analysis the pest is assumed to have already found a host within Australia at or beyond its point of entry. Therefore, unless there is specific evidence to suggest otherwise, a Group PRA assessment can be applied as the default outcome for any pest species on a plant import pathway once the previously assigned likelihood of entry has been verified.

In a scenario where the likelihood of entry for a pest species on a commodity is assessed as different to the indicative estimate, the Group PRA-derived likelihoods of establishment and spread and the estimate of consequences can still be used, but the overall risk rating (the URE) may change.

Application of Group policy involves identification of up to 3 species of each relevant group associated with the import pathway. However, if any other quarantine pests or regulated articles not included in this risk analysis and/or in the relevant group policies are detected at pre-export or on arrival in Australia, the relevant Group policy will also apply.

A3 Stage 3: Pest risk management

Pest risk management describes the process of identifying and implementing phytosanitary measures to manage risks to achieve the ALOP for Australia, while ensuring that any negative effects on trade are minimised.

The conclusions from pest risk assessment are used to decide whether risk management is required and if so, the appropriate measures to be used. Where the unrestricted risk estimate does not achieve the ALOP for Australia, risk management measures are required to reduce this risk to a very low level. The guiding principle for risk management is to manage risk to achieve the ALOP for Australia. The effectiveness of any proposed/recommended phytosanitary measures (or combination of measures) is evaluated, using the same approach as used to evaluate the unrestricted risk. This ensures the restricted risk for the relevant pest or pests achieves the ALOP for Australia.

ISPM 11 (FAO 2021e) provides details on the identification and selection of appropriate risk management options and notes that the choice of measures should be based on their effectiveness in reducing the likelihood of entry of the pest.

Examples given of measures commonly applied to traded commodities include:

- options for consignments—for example, inspection or testing for freedom from pests, prohibition of parts of the host, a pre-entry or post-entry quarantine system, specified conditions on preparation of the consignment, specified treatment of the consignment, restrictions on end-use, distribution and periods of entry of the commodity
- options preventing or reducing infestation in the crop—for example, treatment of the crop, restriction on the composition of a consignment so it is composed of plants belonging to resistant or less susceptible species, harvesting of plants at a certain age or specified time of the year, production in a certification scheme
- options ensuring that the area, place or site of production or crop is free from the pest—for example, pest-free area, pest-free place of production or pest-free production site
- options for other types of pathways—for example, consider natural spread, measures for human travellers and their baggage, cleaning or disinfestations of contaminated machinery
- options within the importing country—for example, surveillance and eradication programs
- prohibition of commodities—if no satisfactory measure can be found.

Appendix B: Initiation and categorisation for pests of okra from India

The pest categorisation table does not represent a comprehensive list of all the pests associated with the entire plant of imported okra from India. Reference to soil-borne nematodes, soil-borne pathogens, wood-borer pests, root pests or pathogens, and secondary pests has not been made, as they are not directly related to the export pathway of Okra and would be addressed by Australia's current approach to contaminating pests.

The steps in the initiation and categorisation processes are considered sequentially with the assessment terminating at 'Yes' for column 3 (except for pests that are present, but under official control and/or pests of regional concern), or at the first 'No' for columns 4, 5, 6 or 7. In the final column of the table (column 8) the acronyms 'EP', 'GP', 'RA', 'SA', and 'WA' are used. The acronym 'EP' (existing policy) is used for pests that have been assessed by Australia and for which a policy exists. The acronym 'GP' (Group policy) is used for pests that have been assessed by Australia in a Group policy. The acronym 'RA' (regulated article) is used for pests that are known to vector pathogens of biosecurity concern and are therefore regulated articles. The acronym for the state or territory for which regional pest status is considered, such as 'SA' (South Australia) or 'WA' (Western Australia) is used to identify organisms that have been recorded in some regions of Australia, and due to interstate quarantine regulations are considered regional quarantine pests.

The *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (DAWR 2017), the *Final group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports* (DAWR 2019) and the *Final group pest risk analysis for soft and hard scale insects on fresh fruit, vegetable, cut-flower and foliage imports* (DAWE 2021) have been applied in this risk analysis. Application of Group policy involves identification of up to 3 species of each relevant group associated with the commodity pathway. However, if any other quarantine pests or regulated articles not included in this risk analysis and/or in the relevant Group policies are detected at pre-export or on-arrival in Australia, the relevant Group policy will also apply.

The Department of Agriculture, Water and the Environment (the department) is aware of the recent changes in fungal nomenclature which ended the separate naming of different states of fungi with a pleomorphic life cycle. However, as the nomenclature for these fungi is in a phase of transition and many priorities of names are still to be resolved, this report uses the generally accepted names and provides alternatively used names as synonyms, where required. The department is also aware of the changes in nomenclature of arthropod species based on the latest morphological and molecular reviews. As official lists of accepted fungus and arthropod names become available, these accepted names will be adopted.

A detailed description of the method used for a pest risk analysis is provided in Appendix A.

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
ARTHROPODS							
Coleoptera							
Adoretus versutus Harold, 1869. Synonym(s): *Adoretus bangalorensis* Brenske, 1900 [Scarabaeidae] Indian rose beetle	Yes (CABI 2022; Emmanuel, Sujatha & Gautam 2010)	No records found	No. Adult *Adoretus versutus* are leaf defoliators, while soil-dwelling larvae feed on the roots of host plants, humus and detritus (CABI 2022; Waterhouse 1997).	Assessment not required	Assessment not required	Assessment not required	No
Alcidodes affaber (Aurivillius) [Curculionidae] Shoot weevil	Yes (TNAU-NAIP 2020)	No records found	No. Larvae of *Alcidodes affaber* feed inside the shoot of the okra plant (Manjunatha et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No
Aulacophora indica (Gmelin, 1790) [Chrysomelidae] Pumpkin beetle	Yes (CABI-EPPO 1997; PaDIL 2020)	No records found	No. Adult *Aulacophora indica* feeding causes large holes in the leaves and may defoliate host plants. The larvae feed exclusively on the roots of host plants (Plantwise 2020; Wang et al. 2020).	Assessment not required	Assessment not required	Assessment not required	No
Aulacophora foveicollis (Lucas, 1849) [Chrysomelidae] Red pumpkin beetle	Yes (Luna et al. 2008; Rashid et al. 2014)	No records found	No. Adults are leaf and flower feeders and larvae feed on the roots of the host plant (Luna et al. 2008; Plantwise 2020; Rashid et al. 2014).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Cylas formicarius (Fabricius, 1798) [Curculionidae] Root weevil; Sweet potato weevil	Yes (CABI 2022; Korada et al. 2010)	Yes, Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld, NSW, Tas., SA, NT (APPD 2022).	No. *Cylas formicarius* adults are reported to feed on okra leaves and larvae feed on roots and tubers (CABI 2022; Korada et al. 2010; Tara, Sharma & Kour 2010).	Assessment not required	Assessment not required	Assessment not required	No
Epilachna ocellata (Redtenbacher, 1844) Synonym(s): *Henosepilachna ocellata* (Redtenbacher, 1844) [Coccinellidae] Leaf beetle	Yes (CABI 2022; Government of India 2007; Lal 1990)	No records found	No. *Epilachna ocellata* is polyphagous, with adults and larvae preferably feeding externally on leaves (Lal 1990). Also, okra is reported as a less preferred host whereas tomato and eggplant are reported as preferred hosts (Lal 1990).	Assessment not required	Assessment not required	Assessment not required	No
Monolepta signata (Olivier, 1808) [Chrysomelidae] White-spotted leaf beetle	Yes (Nair et al. 2017)	No records found	No. The beetle usually feeds on leaves and flowers (Nair et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Mylabris phalerata (Pallas, 1781) [Meloidae] Yellow-banded blister beetle	Yes (Dattagupta & Nath 2010)	No records found	No. Although okra is reported to be a host plant for *M. phalerata*, adult beetles only feed on the reproductive parts of the plants such as flowers, preventing the development of pods (Durairaj & Ganapathy 2003; Rolania, Yadav & Saini 2016; Sharma & Singh 2018).	Assessment not required	Assessment not required	Assessment not required	No
Mylabris pustulata Thunberg, 1791 [Meloidae] Blister beetle	Yes (Boopathi et al. 2011; Rolania, Yadav & Saini 2016)	No records found	No. Although okra is reported to be a host for *M. pustulata* (Brice et al. 2017), this beetle lays eggs in the soil and upon hatching larvae feed on soil-dwelling insects. Adults are destructive external feeders on the reproductive parts of plants, reducing fruit setting (Kedar, Kumerang & Thodsare 2013; Nair et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Myllocerus undecimpustulatus Faust, 1891 [Curculionidae] Sri Lankan weevil	Yes (CABI 2022; Dhamdhere, Bahadur & Misra 1985)	No records found	No. *Myllocerus undecimpustulatus* adults feed on leaves of host plants and larvae feed on roots (Neal 2017).	Assessment not required	Assessment not required	Assessment not required	No
Oxycetonia versicolor (Fabricius, 1775) [Scarabaeidae, subfamily: Cetonidae] Chafer beetle	Yes (TNAU-NAIP 2020)	No records found	No. *Oxycetonia versicolor* is reported as a minor pest of okra in India (Daravath, Kasbe & Musapuri 2020; Taggar et al. 2012; TNAU-NAIP 2020). Adults and larvae only feed on buds and flowers of host plants (Taggar et al. 2012).	Assessment not required	Assessment not required	Assessment not required	No
Pempherulus affinis (Faust, 1898) [Curculionidae] Cotton stem weevil	Yes (TNAU-NAIP 2020)	No records found	No. *Pempherulus affinis* is reported as a pest of okra in India. The larvae feed on roots and shoots of okra (TNAU-NAIP 2020).	Assessment not required	Assessment not required	Assessment not required	No
Podagrica bowringi Baly, 1876 Synonym(s): *Nisotra bowringi* (Baly, 1876) [Chrysomelidae] Okra flea beetle	Yes (Kelkar et al. 2018)	No records found	No. *Podagrica bowringi* adult beetles feed on leaves, flowers and flower buds, and larvae feed on roots of okra (Kelkar et al. 2018).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Podagrica fuscicornis (Linnaeus, 1767) Synonym(s): *Chrysomela fuscicornis* Linnaeus, 1767 [Chrysomelidae] Flea beetle	Yes (Singhal et al. 2018)	No records found	No. *Podagrica fuscicornis* is reported to be a leaf feeder of okra (Singhal et al. 2018).	Assessment not required	Assessment not required	Assessment not required	No
Spermophagus mannarensis (Decelle, 1986) [Bruchidae]	Yes (Borowiec 1991)	No records found	No. Some *Spermophagus* spp. are reported to lay eggs externally on pods of some other host plants (Delobel & Klaus-Werner 2011; Southgate 1979; Tóth, Vráblová & Cagáň 2001). While Borowiec (1991) lists okra as a host for this pest, this appears to be based on a likely contamination of this species with okra seed imported into the United States, as the literature is inconclusive. There is no evidence available for the association between this pest and okra fruit in India.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Spermophagus kuskai (Borowiec, 1986) [Bruchidae]	Yes (Borowiec 1985)	No records found	No. Some *Spermophagus spp*. are reported to lay eggs externally on pods of host plants (Delobel & Klaus-Werner 2011; Southgate 1979; Tóth, Vráblová & Cagáň 2001). While Borowiec (1991) lists okra as a host plant for *S. kuskai*, there is no evidence that this pest lays eggs on pods of okra. Additionally, there is no evidence available for the association between this species and okra fruit in India.	Assessment not required	Assessment not required	Assessment not required	No
Trachys herilla Obenberger, 1916 [Buprestidae] Leaf miner	Yes (TNAU-NAIP 2020)	No records found	No. *Trachys herilla* is a leaf miner, primarily associated with the leaves of okra. Larvae feed within the leaf mesophyll tissue forming a mine and adults feed on the margins of young okra leaves. (Fernando & Bandaranayake 1991; TNAU-NAIP 2020). The eggs of *Trachys herilla* are deposited on the leaf surface (Fernando & Bandaranayake 1991).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Urophorus humeralis (Fabricius, 1798) Synonym(s): *Carpophilus humeralis* (Fabricius, 1798); *Nitidula humeralis* Fabricius, 1798 [Nitidulidae] Dried fruit beetle; Pineapple sap beetle	Yes (CABI 2022; Dasgupta & Pal 2019; MAF 1999)	Yes. NSW, Qld, NT, Vic., Tas., SA, WA (APPD 2022; Government of Western Australia 2022; James et al. 1993)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Diptera							
Atherigona orientalis Schiner, 1868 [Muscidae] Pepper fruit fly	Yes (Gupta, Srivastava & Pandey 1991)	Yes. NSW, NT, Qld, WA (APPD 2022; CABI 2022; Government of Western Australia 2022; Pont 1986)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Bactrocera dorsalis Hendel 1912 Synonym(s): *Bactrocera invadens* (Drew, Tsuruta & White, 2005) [Tephritidae] Oriental fruit fly	Yes (Balikai, Kotikal & Prasanna 2009)	No. Eradicated from mainland Australia (Hancock et al. 2000)	No. Okra has been reported to be a viable host in a no-choice host assay laboratory study where the emergence rate in whole fruit was very low (Kumagai, Tsuchiya & Katsumata 1996). There are no reports available of *B. dorsalis* infesting okra in the field.	Assessment not required	Assessment not required	Assessment not required	No

			Potential to enter on pathway				
Pest	**Present in India**	**Present within Australia**	**Potential for importation**	**Potential for distribution**	**Potential for establishment and spread**	**Potential for economic consequences**	**Pest risk assessment required**
Bactrocera zonata Saunders, 1842 Synonym(s): *Dacus zonatus* (Saunders, 1842) [Diptera: Tephritidae] Peach fruit fly	Yes (Agarwal & Kumar 1999)	No records found	Yes. Okra is reported to be a host of *B. zonata* (El-Gendy 2017). *Bactrocera zonata* has been reared on okra in field situations (Syed, Ghani & Murtaza 1970).	Yes. Okra fruit will be distributed across Australia for sale and could potentially carry fruit fly eggs and larvae. Immature stages that could be potentially present in imported okra could pupate and develop into adults and disperse to new hosts available in Australia.	Yes. *Bactrocera zonata* has suitable hosts and environments available in Australia. This species has established in areas with a wide range of climatic conditions (Alzubaidy 2000). *Bactrocera zonata* has spread across pan-tropical areas, with a minimum developmental temperature of 13°C (Alzubaidy 2000; Duyck, Sterlin & Quilici 2004). *Bactrocera zonata* is reported to disperse long distances (Qureshi et al. 1974).	Yes. *Bactrocera zonata* is highly polyphagous, feeding on over 50 host plants, some of which are commercial crops of economic importance in Australia (Alzubaidy 2000; EPPO 2015). In heavy infestations, total crop losses have been reported (Alzubaidy 2000; Mahmoudi et al. 2017).	Yes (EP)

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Dacus ciliatus Loew, 1862 [Tephritidae] Lesser pumpkin fly	Yes (Kapoor 2002)	No records found	No. *Dacus ciliatus* is a pest of cucurbit crops. In a taxonomic study, Munro (1984) listed okra as a host plant but provided no supporting evidence for the host association. In a review, White and Elson-Harris (1994), citing Munro (1984), noted okra as an unusual host. There is no report available of *D. ciliatus* infesting okra in the field.	Assessment not required.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Delia radicum (Linnaeus. 1758) Synonym(s): *Anthomyia brassicae* (Bouche. 1833); *Musca radicum* Linnaeus, 1758 [Anthomyiidae] Cabbage root fly	Yes (Sharma & Rao 2012)	No records found	No. *Delia radicum* is primarily a pest of *Brassica* species. There are reports of this pest feeding on okra seedlings and mature fruit (Ahmed 2012; Sharma & Rao 2012). *Delia radicum* is not reported to be a pest of concern on okra in India, and highly unlikely to be present in commercially grown export quality okra, as the fruit for consumption is harvested several weeks before reaching maturity.	Assessment not required	Assessment not required	Assessment not required	No
Drosophila melanogaster Meigen. 1830 [Drosophilidae] Common fruit fly; Vinegar fly	Yes (Ramasubbaiah & Lal 1976)	Yes NSW, Vic., Tas., WA (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Liriomyza sativae Blanchard, 1938 [Agromyzidae] Vegetable leaf miner	Yes (CABI 2022; Firake et al. 2018)	Yes, Under official control (National). Restricted distribution and regulated in Qld (QDAF 2018).	No. *Liriomyza sativae* is a leaf miner that feeds primarily on the leaves of a host plant (CABI 2022; QDAF 2018).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Liriomyza trifolii Burgess in Comstock, 1880 [Agromyzidae] American serpentine; Leafminer	Yes (Pal, Maji & Mondal 2013)	Yes, Under official control (National) (IPPC 2021). Present with restricted distribution in Qld and WA (Business Queensland 2021; DPIRD 2021).	No. *Liriomyza trifolii* is a leaf miner, primarily feeding on leaves of host plants, allowing possible secondary fungal and viral infections (Hore, Chakraborty & Banerjee 2017).	Assessment not required	Assessment not required	Assessment not required	No
Melanagromyza hibisci (Spencer. 1961) [Agromyzidae] Okra stemfly; Okra petiole maggot	Yes (Kanwar 2017)	No records found	No. *Melanagromyza hibisci* damages the petiole of okra plants, infesting stems and feeding on the pith inside the stem (Kanwar 2017).	Assessment not required	Assessment not required	Assessment not required	No
Melanagromyza obtusa (Malloch. 1914) [Agromyzidae] Pod fly	Yes (TNAU-NAIP 2020)	No records found	No. *Melanagromyza obtusa* is reported as a minor pest of okra (TNAU-NAIP 2020). The maggot of *M. obtusa* bores through the stem tissue, resulting in wilting and death of the affected plants or branches (Venugopal & Venkataramani 1954).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Zeugodacus cucurbitae (Coquillett, 1899) Synonym(s): *Bactrocera cucurbitae* (Coquillett, 1899) [Tephritidae] Melon fly	Yes (Kumagai, Tsuchiya & Katsumata 1996; Sarada et al. 2020)	No records found	Yes. *Zeugodacus cucurbitae* has been reported to infest okra fruit (McQuate, Liquido & Nakamichi 2017; Wong et al. 1989).	Yes. Okra fruit will be distributed across Australia for sale and could potentially carry eggs and larvae. Immature stages that are present in imported okra could pupate and develop into adults and disperse to new hosts available in Australia.	Yes. *Zeugodacus cucurbitae* has the potential to establish and spread in Australia, as suitable hosts and environments are available. It has a wide range of hosts and is found across Asia (CABI 2022; Dhillon et al. 2005; Kumagai, Tsuchiya & Katsumata 1996). Its hosts and geographic distribution suggest that it could establish and spread in Australia.	Yes. *Zeugodacus cucurbitae* has potential to cause economic consequences in Australia. It is reported to damage 81 host plant species (Allwood et al. 1999; CABI 2022; Dhillon et al. 2005; FDACS 2017), causing up to 100% damage depending on host species and the season (CABI 2022; Dhillon et al. 2005). *Zeugodacus cucurbitae* is a major pest of cucurbit crops including melons and pumpkins, as well as beans, which are all commercial crops of economic importance to	Yes (EP)

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
						Australia. Host crops are widely grown in Australia and would be at risk of infestation.	

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Hemiptera							
Chinavia hilaris (Say, 1832) Synonym(s): *Acrosternum hilare* (Say, 1832) [Pentatomidae] Green stink bug	Yes (Pal, Maji & Mondal 2013)	No records found	No. *Chinavia hilaris* is a member of the family Pentatomidae, an external feeder with nymphs and adults sucking sap from fruit of the host plant (Gomez & Mizell 2013). *Chinavia hilaris* is unlikely to be present in export quality okra as they characteristically drop from their hosts when disturbed, or fly away (Alcock 1971). Harvest and packing house practices will likely remove *C. hilaris* from the pathway.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Aleurodicus dispersus Russell 1965 [Aleyrodidae] Spiralling white fly	Yes (Prathapan 1996)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022) and Tas (DPIPWE Tasmania 2021). Present in NT, Qld (APPD 2022; DJPR 2019; Lambkin 1999). *Aleurodicus dispersus* is a suspected vector of at least 25 plant viruses (Banjo 2010). Therefore, this species is a potential regulated article for Australia.	No. This species is a phloem feeder and females lay eggs on the underside of leaves. Adults superficially feed externally on fruit (Banjo 2010; CABI 2022; Sathe & Gangate Ujjwala 2015). Adult whiteflies are very active and are unlikely to remain on the fruit when disturbed during harvesting and packing house practices.	Assessment not required	Assessment not required	Assessment not required	No

			Potential to enter on pathway				
Pest	**Present in India**	**Present within Australia**	**Potential for importation**	**Potential for distribution**	**Potential for establishment and spread**	**Potential for economic consequences**	**Pest risk assessment required**
Amrasca biguttula biguttula (Ishida, 1912) [Cicadellidae] Leafhopper; Indian cotton jassid	Yes (TNAU-NAIP 2020)	No records found. Leafhoppers can act as vectors for phytoplasmas in the 16SrI (B) group (Lee, Gundersen-Rindal & Bertaccini 1998; Lee et al. 2004b). Therefore, this pest is a potential regulated article for Australia.	No. The leafhopper *Amrasca biguttula biguttula* is associated with okra leaves (CABI 2022; Chandio et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No
Antecerococcus indicus (Maskell, 1879) Synonym(s): *Cerococcus hibisci* Green 1908 [Cerococcidae] Yellow cotton scale	Yes (García Morales et al. 2022)	No records found	No. *Antecerococcus indicus* is a pest of okra (García Morales et al. 2022), but is only reported to feed on leaves and branches of host plants (Pushpaveni, Rao & Rao 1974).	Assessment not required	Assessment not required	Assessment not required	No
Aonidiella aurantii (Maskell, 1879) [Diaspididae] Red scale	Yes (Verma & Dinabandhoo 2005)	Yes. Qld, NSW, SA, Vic., Tas., NT, WA (APPD 2022; Dao et al. 2017; Government of Western Australia 2022; Naumann 1993)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

			Potential to enter on pathway				
Pest	**Present in India**	**Present within Australia**	**Potential for importation**	**Potential for distribution**	**Potential for establishment and spread**	**Potential for economic consequences**	**Pest risk assessment required**
Aphis craccivora Koch, 1854 [Aphididae] Groundnut aphid; Cowpea aphid	Yes (Singh et al. 1999)	Yes. Qld, NSW, SA, Vic., Tas., NT, WA (APPD 2022; Government of Western Australia 2022; Gutierrez et al. 1974)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Aphis fabae Scopoli, 1763 [Aphididae] Black bean aphid	Yes (CABI 2022; DPP 2007)	No records found	No. Nymphs and adults of *Aphis* spp. feed externally on leaves by sucking plant sap (Kedar, Kumerang & Thodsare 2013).	Assessment not required	Assessment not required	Assessment not required	No
Aphis gossypii Glover, 1877 [Aphididae] Cotton aphid	Yes (Singh et al. 1999)	Yes. Qld, NSW, SA, Vic., Tas., NT, WA (APPD 2022; Government of Western Australia 2022; Naumann 1993)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Bemisia tabaci Gennadius 1889 complex Synonym(s): *Bemisia argentifolii* Bellows and Perring. [Aleyrodidae] Tobacco whitefly	Yes (Balikai, Kotikal & Prasanna 2009). There are at least five *Bemisia tabaci* species present in India, consisting of Asia I, Asia II-5, Asia II-7, Asia II-8 and MEAM1 (Chowda-Reddy et al. 2012).	Yes, but only some members of the complex. At least three species (AUS1, AUS II and MEAM 1) are known to be present in Australia, but most species in the complex remain absent from Australia. The *B. tabaci* complex is a known vector for Begomoviruses, several of which are quarantine pests of concern for Australia (Fiallo-Olivé et al. 2020). Therefore, the *B. tabaci* complex, including those known to be present in Australia, are regulated articles for Australia.	No. The *Bemisia tabaci* species complex is a phloem feeder and females lay eggs on the underside of leaves (Kedar, Kumerang & Thodsare 2013; Li et al. 2011; TNAU-NAIP 2020). Adult whiteflies are very active and are unlikely to remain on the fruit when disturbed during harvesting and packing house practices.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Ceroplastes floridensis (Comstock, 1881) [Coccidae] Florida wax scale	Yes (García Morales et al. 2022; Konar & Roy 2008)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in NSW, Qld (APPD 2022).	No. *Ceroplastes floridensis* primarily attack stems, leaves and branches of host plants (Drees, Reinert & Williams 2011). Direct damage is caused by scales feeding on cellular fluid in leaves. Excessive consumption of fluid results in secretion of honeydew, which enables fungi to develop on leaf surfaces (Drees, Reinert & Williams 2011).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Dysdercus cingulatus (Fabricius, 1775) [Pyrrhocoridae] Red cotton stainer bug	Yes (Nair et al. 2017)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in NSW, NT, Qld, SA (APPD 2022; Naumann 1993).	No. *Dysdercus cingulatus* feeds on sap from the stem, leaves and fruit of okra (Butani & Jotwani 1984; Nair et al. 2017). However, eggs, nymphs and adults of *D. cingulatus* are highly visible and likely to be detected during harvesting, sorting and packing (Butani & Jotwani 1984). Therefore, it is highly unlikely that this pest would be present in commercially prepared okra fruit.	Assessment not required	Assessment not required	Assessment not required	No
Dysdercus koenigii (Fabricius, 1775) [Pyrrhocoridae] Red cotton bug	Yes (Dhamdhere, Bahadur & Misra 1985)	No records found	No. *Dysdercus koenigii* feed on seeds inside of the host fruit using their stylus to pierce through the outer wall of the fruit (Shah 2014). Adults and nymphs are highly mobile and are unlikely to remain on the fruit when disturbed during harvesting and packing house practices.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Ferrisia virgata (Cockerell, 1893) [Pseudococcidae] Striped mealybug; Guava mealybug	Yes (Pal, Maji & Mondal 2013)	Yes. NSW, NT, Qld, WA (APPD 2022; CABI 2022; CSIRO & DAFF 2004; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Halyomorpha halys (Stål, 1855) Synonym(s): *Pentatoma halys* Stål, 1855 [Pentatomidae] Brown marmorated stink bug; Yellow-brown stink bug	Yes (Rout et al. 2018)	No records found	No. *Halyomorpha halys* adults suck sap externally from the fruit of okra (Kuhar et al. 2012; Zobel, Hooks & Dively 2016). Pentatomid bugs are not likely to be associated with the fruit because they characteristically drop from their hosts or fly away when disturbed (Alcock 1971).	Assessment not required	Assessment not required	Assessment not required	No
Icerya formicarum Newstead, 1897 [Monophlebidae] Scale insect	Yes (Varshney 1992)	No records found	No. Okra is reported to be a host of *Icerya formicarum* (Varshney 1992). However, *Icerya* spp. primarily feed on the stems and the lower side of leaves of its host plants (Watson & Malumphy 2004).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Jacobiasca lybica de (Bergevin & Zanon, 1922) Synonym(s): Chlorita lybica Bergevin & Zanon, 1922 [Cicadellidae] Cotton jassid; Green leafhopper	Yes (Sohi, Shinger & Mann 1988)	No records found. Leafhoppers can act as vectors for phytoplasmas in the 16SrI (B) group (Lee, Gundersen-Rindal & Bertaccini 1998; Lee et al. 2004b). Therefore, this pest is also a potential regulated article for Australia.	No. *Jacobiasca lybica* feeds on leaves of okra plants (Hendawy, El-Fakharany & Hegazy 2017).	Assessment not required	Assessment not required	Assessment not required	No
Lohita grandis Gray, 1832 Synonym(s): *Macroceroea grandis* (Gray, 1832) [Largidae] Giant red bug	Yes (Government of India 2007)	No records found	No. Nymphs and adults of *L. grandis* feed on fruit, stems and leaves of host plants (Joshi & Khan 1990). Eggs of *L. grandis* are deposited in soil and are not associated with okra fruit (Joshi & Khan 1990). Harvesting and packing house practices will likely remove the large sized, externally feeding *L. grandis* from the pathway.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Maconellicoccus hirsutus (Green, 1908) Synonym(s): *Phenacoccus hirsutus* Green, 1908 [Pseudococcidae] Pink hibiscus mealybug	Yes (Nagrare, Kumar & Dharajothi 2014)	Yes. NT, Qld, Vic., SA, WA (APPD 2022; CSIRO 2005; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Myzus persicae (Sulzer, 1776) [Aphididae] Green peach aphid	Yes (Sharma & Rao 2012)	Yes. NT, Qld, SA, Vic., NSW, Tas., WA (CABI 2022; Government of Western Australia 2022; Vorburger, Lancaster & Sunnucks 2003)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Nezara viridula (Linnaeus, 1758) Synonym(s): *Cimex viridulus* Linnaeus, 1758 [Pentatomidae] Green stink bug; Green vegetable bug	Yes (Government of India 2007)	Yes. Qld, NSW, NT, Vic., SA, Tas., WA (APPD 2022; Coombs 2004; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Nipaecoccus viridis (Newstead, 1894) [Pseudococcidae] Spherical mealybug	Yes (Varshney 1992)	Yes. NT, Qld, WA (APPD 2022; Bellis et al. 2004; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Oxycarenus hyalinipennis (A. Costa, 1847) Synonym(s): *Aphanus hyalinipennis* A. Costa, 1843 [Lygaeidae] Dusky cotton bug; Cotton seed bug	Yes (Kedar, Kumerang & Thodsare 2013; TNAU-NAIP 2020)	No records found	No. *Oxycarenus hyalinipennis* is an externally feeding polyphagous pest and nymphs and adults are reported to infest okra (Kedar, Kumerang & Thodsare 2013; Shah et al. 2016). However, harvesting and packing house practices would likely remove the externally feeding *O. hyalinipennis* from the pathway.	Assessment not required	Assessment not required	Assessment not required	No
Paracoccus marginatus (Williams and Granara de Willink, 1992). [Pseudococcidae] Papaya mealybug	Yes (Sakthivel et al. 2012)	No records found	Yes. *Paracoccus marginatus* is a pest of okra (Sakthivel et al. 2012). This species sucks the sap from various parts of the host plant, including the leaves, stems, flowers and fruit (Khan et al. 2014; Mani, Shivaraju & Shylesha 2012). Due to its small size, it is possible that an early stage of infestation on okra fruit may remain undetected and be present on the pathway.	Yes. *Paracoccus marginatus* has a wide host range including crop plants and ornamentals (Krishnan et al. 2016), and many hosts are available in Australia. Imported okra will be distributed throughout Australia via the wholesale and retail trade pathway. Mealybugs present on discarded okra fruit waste could potentially disperse to a new host within close proximity.	Yes. Assessed in the mealybug group PRA (DAWR 2019).	Yes. Assessed in the mealybug group PRA (DAWR 2019).	Yes (GP)

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Parasaissetia nigra (Nietner, 1861) Synonym(s): *Lecanium nigrum* Nietner, 1861 [Coccidae] Pomegranate scale	Yes (Ananda 2007; Balikai, Kotikal & Prasanna 2009)	Yes. Qld, NSW, NT, Vic., SA, WA (Government of Western Australia 2022; Lin et al. 2017a; Lin et al. 2017b; Naumann 1993)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Phenacoccus madeirensis Green, 1923 [Pseudococcidae] Madeira mealybug	Yes (Ben-Dov 1994; CABI 2022; Shylesha & Joshi 2012)	No records found	Yes. *Phenacoccus madeirensis* is reported to be a pest of okra (Ben-Dov 1994). In India, *P.madeirensis* heavily infests all above-ground parts of Malvaceae host plants, causing severe damage by feeding externally on leaves, stems, flowers and fruit (Shylesha & Joshi 2012). Due to its smaller size, it is possible that *P. madeirensis* on okra fruit may remain undetected and be present on the pathway.	Yes. *Phenacoccus madeirensis* has a wide host range including crop plants and ornamentals (CABI 2022), and many hosts are available in Australia. Imported okra will be distributed throughout Australia via the wholesale and retail trade pathway. Mealybugs present on discarded okra fruit waste could potentially disperse to a new host within close proximity.	Yes. Assessed in the mealybug group PRA (DAWR 2019).	Yes. Assessed in the mealybug group PRA (DAWR 2019).	Yes (GP)

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Phenacoccus solenopsis (Tinsley 1898) [Pseudococcidae] Cotton mealybug	Yes (Kedar, Kumerang & Thodsare 2013)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld, NT (APPD 2022; DAF 2013).	Yes. *Phenacoccus solenopsis* is a pest of okra (Kedar, Kumerang & Thodsare 2013; Sahito & Abro 2012). Both nymphs and adults of *P. solenopsis* feed on leaves, flower buds, petioles, twigs and fruit and lay eggs on the leaves of host plants (Kedar, Kumerang & Thodsare 2013; Sahito & Abro 2012). Due to its smaller size, it is possible that *P. solenopsis* on okra fruit may remain undetected and be present on the pathway.	Yes. *Phenacoccus solenopsis* has a wide host range including crop plants and ornamentals (Sahito & Abro 2012), and many hosts are available in Australia. Imported okra will be distributed throughout WA via the wholesale and retail trade pathway. Mealybugs present on discarded okra fruit waste could potentially disperse to a new host within close proximity	Yes. Assessed in the mealybug group PRA (DAWR 2019).	Yes. Assessed in the mealybug group PRA (DAWR 2019).	Yes (GP, WA)
Piezodorus hybneri (Gmelin, 1790) [Pentatomidae] Legume stink bug; Red-banded shield bug	Yes (Parveen et al. 2015)	Yes. NSW, NT, SA, Qld, Vic., ACT, WA (APPD 2022; CSIRO 2004)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Pinnaspis strachani (Cooley, 1899) Synonym(s): *Hemichionaspis strachani*, 1899 [Diaspididae] Lesser snow scale; Hibiscus snow scale	Yes (Suresh & Mohanasundaram 1996)	Yes. NT, Qld, WA (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Pseudaulacaspis pentagona (Targioni Tozzetti, 1886) Synonym(s): *Diaspis pentagona* Targioni Tozzetti, 1886 [Diaspididae] Mulberry scale; White peach scale	Yes (Nakahara 1982)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld, NSW (CABI 2022).	Yes. *Pseudaulacaspis pentagona* is a pest of okra (MAF 1999; McKenzie 1956; Morales-Rodrigues & McKenna 2019). *Pseudaulacaspis pentagona* removes sap from the host plant, feeding primarily on the bark and occasionally on the leaves and fruit, reducing vigour. In deciduous fruits, foliage of infested trees may become sparse and yellow. Fruit size may be reduced and premature fruit drop is likely to occur, whereas heavy infestations can result in the drying out and death of twigs, branches, and even large mature trees if left unattended (Malumphy et al. 2016; Morales-Rodrigues & McKenna 2019). It is possible that *P. pentagona* on okra fruit may remain undetected due to their small size and lack of apparent damage at the	Yes. *Pseudaulacaspis pentagona* has a wide host range including crop plants and ornamentals (Malumphy et al. 2016), and many hosts are available in Australia. Imported okra will be distributed throughout WA via the wholesale and retail trade pathway. Scales present on discarded okra fruit waste could potentially disperse to a new host within close proximity.	Yes. Assessed in the scale group PRA (DAWE 2021).	Yes. Assessed in the scale group PRA (DAWE 2021).	Yes (GP, WA)

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			early stage of infestation, and be present on the pathway.				
Russellaspis pustulans pustulans (Cockerell, 1892) Synonym(s): *Asterolecanium pustulans* Cockerell, 1892 [Asterolecaniidae] Oleander pit scale	Yes (García Morales et al. 2022)	No records found	No. *Russellaspis pustulans pustulans* is usually restricted to branches and stems, inducing galls around feeding sites (Gullan, Miller & Cook 2005).	Assessment not required	Assessment not required	Assessment not required	No
Saissetia coffeae (Walker, 1852) Synonym(s): *Lecanium coffeae* Walker, 1852 [Coccidae] Hemispherical scale	Yes (Konar & Roy 2008; TNAU-NAIP 2020)	Yes NSW, Qld, NT, SA, Vic., Tas., WA (APPD 2022; Ben-Dov 1993; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Saissetia miranda (Cockerell & Parrott in Cockerell, 1899) Synonym(s): *Lecanium miranda* Cockerell & Parrot, 1899 [Coccidae] Mexican black scale	Yes (Varshney 1992)	Yes. Qld, NT, WA (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Selenaspidus articulatus (Morgan, 1889) Synonym(s): *Aspidiotus articulatus* Morgan, 1889; *Selenaspidis articulatus* (Morgan, 1889) [Diaspidae] Rufous scale; West Indian red scale	Yes (Mamet 1958b)	Not present, *Selenaspidus articulatus* is listed as present in (Mamet 1958a), however it is considered absent due to the unreliability of the record.	No. *Selenaspidus articulatus* is listed as a pest of okra (MAF 1999). However, there is no further evidence available for the association between this pest and okra fruit in India.	Assessment not required	Assessment not required	Assessment not required	No
Trialeurodes vaporariorum Westwood 1856 Synonym(s): *Aleurodes papillifer* Maskell [Aleyrodidae] Greenhouse whitefly	Yes (Roopa et al. 2012)	Yes. Qld, NSW, SA, NT, Vic., Tas., WA (APPD 2022; Gambley et al. 2010; Government of Western Australia 2022). *Trialeurodes vaporariorum* is a vector of Tomato leaf curl New Delhi virus (ToLCNDV) (Fiallo-Olivé et al. 2020), which is a quarantine pest for Australia. Therefore, *T. vaporariorum* is a regulated article for Australia.	No. *Trialeurodes vaporariorum* is a phloem leaf feeder and females lay eggs on the underside of leaves (Martin Kessing & Mau 2007). Adults may superficially feed on fruit (Hamasaki, Kawabata & Nakamoto 2017). Adult whiteflies are very active and are unlikely to remain on the fruit when disturbed during harvesting and packing house practices.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Lepidoptera							
Agrotis ipsilon (Hufnagel, 1766) Synonym(s): *Phalaena ipsilon* Hufnagel, 176 [Noctuidae] Black cutworm	Yes (Government of India 2007)	Yes. Qld, NSW, NT, SA, Tas., WA (APPD 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Agrotis segetum (Denis & Schiffermuller, 1775) Synonym(s): *Noctua segetum* Denis & Schiffermuller, 1775 [Noctuidae] Turnip moth; Common cutworm	Yes (Government of India 2007)	No records found	No. *Agrotis segetum* adults are highly polyphagous and reported to feed on stems or leaves (Moir et al. 2007). Eggs of *A. segetum* are laid in soil (Moir et al. 2007).	Assessment not required	Assessment not required	Assessment not required	No
Amsacta moorei (Butler, 1876) [Arctiidae] Tiger moth; Red hairy caterpillar	Yes (Netam, Ganguli & Dubey 2007)	No records found	No. *Amsacta moorei* larvae feed on leaves of the host plant (CABI 2022).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Anomis erosa (Hübner, 1821) Synonym(s): *Cosmophila erosa* (Hübner, 1821) [Noctuidae] Yellow scallop moth; Abutilon moth	Yes (Vishakantaiah & Govindan 1975)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in NSW (Gurney 1924).	No. *Anomis erosa* has only been reported as a leaf defoliator (Chittenden 1913).	Assessment not required	Assessment not required	Assessment not required	No
Anomis flava (Fabricius, 1775) Synonym(s): *Noctua flava* Fabricius, 1775 [Noctuidae] Cotton semi-looper	Yes (Government of India 2007; Nair et al. 2017; TNAU-NAIP 2020)	Yes. Qld, NSW, NT, WA (ALA 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Anomis fulvida (Guenée, 1852) [Noctuidae]	Yes (Nair et al. 2017)	Yes, Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (APPD 2022).	No. *Anomis fulvida* has only been reported as a minor pest of okra leaves (Nair et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Anomis sabulifera (Guenée, 1852) Synonym(s): *Gonitis sabulifera* (Guenée, 1852) [Noctuidae] Brown cotton moth; Jute semi-looper	Yes (Majumder et al. 2018)	No records found	No. *Anomis* spp. larvae are leaf feeders and pupate inside folded leaves (Kravchenko et al. 2014; Nair et al. 2017; TNAU-NAIP 2020).	Assessment not required	Assessment not required	Assessment not required	No
Archips micaceana Walker, 1863 [Tortricidae] Soyabean leafroller	Yes (Gilligan, Baixeras & Brown 2018; Pathania et al. 2020; Sharma et al. 2008)	No records found	No. *Archips micaceana* is reported as a defoliator (Sottikul 1989). Other *Archips* spp. are primarily leaf or stem feeders (Brunner 1993; Razowski 1977). The eggs of *Archips* spp. are laid on the leaf surface, or on the soil surface (Razowski 1977).	Assessment not required	Assessment not required	Assessment not required	No
Archips philippa (Meyrick, 1918) [Tortricidae] Leafroller	Yes (Pathania et al. 2020; Robinson et al. 2022)	No records found	No. *Archips* spp. are primarily leaf feeders (Brunner 1993; Razowski 1977).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Argyrogramma signata (Fabricius, 1775) Synonym(s): *Noctua signata* Fabricius, 1775; *Plusia diminuta* (Walker, 1865); *Plusia signata* (Holloway 1976) [Noctuidae] Green semi-looper	Yes (Rao, Thontadarya & Rangadhamaiah 1979)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (Herbison-Evans & Crossley 2022).	No. *Argyrogramma signata* has only been reported as a foliage feeder (Herbison-Evans & Crossley 2022).	Assessment not required	Assessment not required	Assessment not required	No
Chrysodeixis eriosoma Doubleday, 1843 [Noctuidae] Green looper; Green garden looper	Yes (CABI 2022; Government of India 2007)	Yes. NSW, NT, Qld, SA, Tas., Vic., WA (APPD 2022; CABI 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Crocidosema plebejana (Zeller, 1847) [Tortricidae] Cotton tipworm; Mallow tipborer	Yes (Government of India 2007; Pathania et al. 2020)	Yes. Qld, NSW, NT, SA, Vic., Tas., WA (APPD 2022; CABI 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Condica capensis (Guenée, 1852) Synonym(s): *Apamea capensis* (Guenée, 1852) [Noctuidae] African moth; Safflower caterpillar	Yes (Robinson et al. 2022; Smetacek 2008)	No records found	No. *Candica capensis* larvae are reported to feed on leaves and stems of the host plants (Chakravarthy & Sridhara 2016).	Assessment not required	Assessment not required	Assessment not required	No
Corcyra cephalonica (Stainton, 1866) Synonym(s): *Anerastia lineata* (Legrand, 1965); *Melissoblaptes cephalonica* Stainton, 1866 [Pyralidae] Rice meal moth	Yes (Kaur 2020; Robinson et al. 2022)	Yes. NSW, NT, Qld, Vic., WA (APPD 2022; CABI 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Cricula trifenestrata (Helfer, 1837) Synonym(s): *Saturnia trifenestrata* (Helfer, 1837); *Cricula andrei* (Holloway, 1976) [Saturniidae] Silk moth	Yes (CABI 2022; Robinson et al. 2022; Tikader, Vijayan & Saratchandra 2014)	No records found	No. *Cricula trifenestrata* larvae usually feed on leaves and stems of the host plants (Plantwise 2020).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Delias eucharis (Drury, 1773) [Pieridae] Common Jezebel	Yes (Pillai & Kumar 2020)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (APPD 2022).	No. *Delias eucharis* is reported to feed on foliage (Naidu, Reddy & Ramana 2011).	Assessment not required	Assessment not required	Assessment not required	No
Dudua aprobola (Meyrick, 1886) Synonym(s): *Eccopsis aprobola* (Meyrick, 1886) [Tortricidae] Mango flower webworm	Yes (Pathania et al. 2020; Robinson et al. 2022)	Yes. Qld, NT, NSW, WA (APPD 2022; Nielsen, Edwards & Rangsi 1996; Zborowski & Edwards 2007)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Earias biplaga (Walker, 1866) Synonym(s): *Earias citrina* (Saalmüller, 1884) [Noctuidae] Spiny bollworm; Shoot and fruit borer	Yes (Smetacek 2008)	No records found	No. *Earias biplaga* is a major pest of cotton; but, reported on okra. It feeds on the terminal shoots and fruit of host plants (Hill 2008; Munthali & Tshegofatso 2013). *Earias* spp. larvae bore into fruit, leaving noticeable bore holes filled with frass, often deforming fruit and causing premature fruit drop (Butani & Jotwani 1984; Hill 2008; Kedar, Kumerang & Thodsare 2013; Vennila et al. 2007). Eggs of *E. biplaga* are 0.5 mm, blue/green and laid indiscriminately over the whole plant (Entwistle 1969; Hill 2008). First instar larvae are 0.23 mm wide and white, darkening to a pale brown as they mature (Entwistle 1969; Hill 2008). Size/colour of the eggs and larvae, and symptoms caused, would make the pest unlikely to be present in commercially prepared	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			export quality okra from India.				

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Earias cupreoviridis Walker, 1862 [Noctuidae] Cupreous Bollworm; Shoot and fruit borer	Yes (Dhawan & Sidhu 1984; Muddasar & Venkateshalu 2018)	No records found	No. *Earias cupreoviridis* is a major pest of cotton and has been reported to attack okra, attacking terminal shoots and fruit of host plants (Dhawan & Sidhu 1984; Pant 1960). No information is available for the association between *E. cupreoviridis* on okra, however larvae of *Earias* spp. bore into fruit, leaving noticeable holes filled with frass, and often deforming fruit and causing premature fruit drop (Butani & Jotwani 1984; Hill 2008; Kedar, Kumerang & Thodsare 2013; Vennila et al. 2007). Eggs of *Earias* spp. are 0.5 mm, blue/green and laid over the whole plant (Butani & Jotwani 1984; Hill 2008). First instars of the closely related *E. vittella* are 1.6 mm long and 0.2-0.5 mm wide and white, darkening to a pale brown colour as they mature (Dadasaheb	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
			2007; Hill 2008). The size and colour of the eggs/larvae, and damage caused, would make the pest unlikely to be present on export quality okra fruit.				

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Earias insulana (Boisduval, 1833) Synonym(s): *Acontia xanthophila* (Walker, 1863); *Earias chlorion* (Rambur, 1866); *Tortrix insulana* Boisduval, 1833 [Noctuidae] Egyptian stem borer; Shoot and fruit borer	Yes (Konar & Rai 1990)	No records found	No. *Earias insulana* is a pest of okra, attacking the terminal shoots and fruit of the host plant (Chakravarthy & Sridhara 2016; Hill 2008; Sharma et al. 2008; Vennila et al. 2007). No information is available for the association between E. *insulana* on okra, however larvae of *Earias* spp. bore into fruit, leaving noticeable holes filled with frass, often deforming fruit and causing premature fruit drop (Butani & Jotwani 1984; Hill 2008; Kedar, Kumerang & Thodsare 2013; Vennila et al. 2007). The eggs are 0.5 mm, blue/green and laid over the whole plant (Hill 2008; Vennila et al. 2007). First instar larvae of *E. insulana* are 1.6 mm long and 0.6 mm wide and white, darkening to a pale brown as they mature (Hill 2008; Mursal 2000). The size and colour of the eggs/	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			larvae, and the damage caused, would make the pest unlikely to be present on export quality okra fruit.				
Earias vittella (Fabricius, 1794) Synonym(s): *Erias fabia* (Stoll, 1781) [Noctuidae] Spiny bollworm; Northern rough bollworm; Shoot and fruit borer	Yes (Kedar, Kumerang & Thodsare 2013)	Yes. Qld, NT, NSW, WA (ALA 2020; APPD 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Euproctis fraterna (Moore, 1883) Synonym(s): *Artaxa fraterna* (Moore, 1883) [Lymantriidae] Coffee hairy caterpillar	Yes (Manoharan, Chockalingam & Noorjahan 1982; Venkatesha, Gopinath & Chandramohan 1992)	No records found	No. *Euproctis fraterna* is a leaf feeder of okra (Manoharan, Chockalingam & Noorjahan 1982; Venkatesha, Gopinath & Chandramohan 1992). Larvae feed on the epidermal tissues of leaves of host plants by scraping the chlorophyll content of leaves, resulting in the skeletonization of leaves (Nizamani et al. 2016).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Haritalodes derogata (Fabricius, 1775) Synonym(s): *Syllepte derogota* Fabricius, 1775 [Crambidae] Cotton leaf roller; Hibiscus leafroller	Yes (Chakraborty, Kumar & Rajadurai 2014; TNAU-NAIP 2020)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld, NSW, NT (ALA 2020; APPD 2022; PestNet 2022).	No. *Haritalodes derogata* larvae primarily feed on the leaves and stems of the host plants (TNAU-NAIP 2020).	Assessment not required	Assessment not required	Assessment not required	No
Helcystogramma hibisci (Stainton, 1859) Synonym(s): *Onebala hibisci* (Meyrick, 1925) [Gelechiidae] Leaf roller	Yes (Ponomarenko 1997; Sharma et al. 2008)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (ALA 2020; APPD 2022; Common 1990).	No. *Helcystogramma hibisci* has only been associated with the leaves of okra (Butani & Jotwani 1984).	Assessment not required	Assessment not required	Assessment not required	No
Helicoverpa armigera (Hübner, 1808) Synonym(s): *Noctua armigera* Hübner, 1808; *Heliothis armigera* (Hübner, 1808) [Noctuidae] Cotton bollworm	Yes (TNAU-NAIP 2020)	Yes. Qld, NSW, SA, NT, Vic., Tas., WA (Government of Western Australia 2022; Naumann 1993)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Helicoverpa zea (Boddie, 1850) Synonym(s): *Heliothis zea* (Boddie, 1850) [Noctuidae] American cotton bollworm; Corn earworm moth	No. *Helicoverpa zea* was reported to be present in India in a preliminary study by Sharma and Rao (2012), but this is likely to be a misidentification. *Helicoverpa zea* is distributed in North America and South America (CABI 2022). There is no further evidence supporting the presence of *H. zea* in India, or Asia in general.	No records found	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Homona coffearia Nietner, 1861 Synonym(s): *Tortrix coffearia* (Nietner, 1861) [Tortricidae] Tea tortrix; Camellia tortrix	Yes (Pathania et al. 2020; Robinson et al. 2022)	No records found	No. *Homona coffearia* is leaf roller and the larvae make shelters by fastening 2 or more leaves together with silk and feeding inside the leaf (Cranham & Danthanarayana 1971).	Assessment not required	Assessment not required	Assessment not required	No
Hypolimnas misippus (Linnaeus, 1764) Synonym(s): *Papilio misippus* Linnaeus, 1764 [Nymphalidae] Diadem butterfly; Danaid Eggfly	Yes (Robinson et al. 2022; Varshney & Smetacek 2015)	Yes. Qld, NT, NSW, WA (ALA 2020; APPD 2022; Braby 2000; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Leucinodes orbonalis (Guenée, 1854) Synonym(s): *Syngamia octavialis* (Walker, 1859) [Crambidae] Eggplant fruit and shoot borer	Yes (Dixit & Awasthi 2017)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (APPD 2022).	No. *Leucinodes orbonalis* has been reported to be almost entirely restricted to *Solanum* spp. or Solanaceae (Hayden et al. 2013; Herbison-Evans & Crossley 2022; Mainali 2014; Robinson et al. 2022) and is reported to be a major pest of eggplant (Ardez, Sumalde & Taylo 2008; Dixit & Awasthi 2017). However, *Leucinodes orbonalis* has been intercepted on okra from Ghana to the United States (Boateng et al. 2005). According to a choice assay between eggplant and a number of other plants (including okra), *L. orbonalis* oviposits solely on eggplant and the pest was unable to complete its life cycle on okra (Ardez, Sumalde & Taylo 2008). There is no further evidence available for its association with okra fruit.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Maruca vitrata (Fabricius, 1787) Synonym(s): *Maruca testulalis* (Geyer, 1832); *Phalaena vitrata* Fabricius, 1787 [Crambidae] Cowpea pod borer; Bean pod borer; Mung moth	Yes (Rathee & Dalal 2018)	Yes. NT, NSW, Qld, WA (ALA 2020; APPD 2022; Business Queensland 2018; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Ochropleura flammatra (Denis & Schiffermüller, 1775) Synonym(s): *Agrotis flammatra* (Fabricius, 1787) [Noctuidae] Indian cutworm	Yes (Gupta 1990; Singh & Misra 1988)	No records found	No. *Ochropleura flammatra* is reported as a minor pest of okra in India, with larvae feeding on seedlings (Tindall 1987). There is no evidence available for the association between this pest and okra fruit in India.	Assessment not required	Assessment not required	Assessment not required	No
Pardoxia graellsii (Feisthamel, 1837) Synonym(s): *Acontia graellsii* (Feisthamel, 1837); *Xanthodes graellsii* Feisthamel 1837 [Nolidae] Yellow drab	Yes (De Prins & De Prins 2022)	No records found	No. *Pardoxia graellsii* is reported as a major pest of okra in India, feeding on leaves and occasionally defoliating whole plants (Dwomoh & Boakye 2003).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Pectinophora gossypiella (Saunders, 1844) Synonym(s): *Depressaria gossypiella* (Saunders, 1844) [Gelechiidae] Pink bollworm	Yes (Murthy, Nagaraj & Prabhuraj 2018)	Yes. Qld, NT, SA, WA (ALA 2020; APPD 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Plutella xylostella (Linnaeus, 1758) Synonym(s): *Phalaena xylostella* (Linnaeus, 1758) [Plutellidae] Diamondback moth	Yes (Pandey et al. 2006)	Yes. NSW, Qld, NT, Vic., Tas., WA (APPD 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Somena scintillans (Walker, 1855) Synonym(s): *Euproctis scintillans* (Walker, 1855) [Erebidae] Tussock moth	Yes (Gupta, Tara & Pathania 2013; Robinson et al. 2022)	No records found	No. Okra is reported to be a host of *Somena scintillans*; however, it is primarily a leaf feeder (Robinson et al. 2022; Sharma & Ramamurthy 2009).	Assessment not required	Assessment not required	Assessment not required	No
Spilosoma obliqua Walker, 1855 Synonym(s): *Diacrisia obliqua* (Walker, 1855) [Arctiidae] Bihar hairy caterpillar	Yes (Nair et al. 2017)	No records found	No. *Spilosoma obliqua* is a leaf feeder (Nair et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Spodoptera exigua (Hübner, 1808) Synonym(s): *Caradrina pygmaea* (Rumbur, 1834); *Noctua exigua* Hübner, 1808 [Noctuidae] Beet armyworm; Lesser armyworm	Yes (Pathan et al. 2018; Robinson et al. 2022)	Yes. ACT, NSW, NT, Qld, SA, Tas., Vic., WA (APPD 2022; Common 1990; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Spodoptera frugiperda (Smith and Abbot, 1797) Synonym(s): *Phalaena frugiperda* (Smith, 1797) [Noctuidae] Fall armyworm (FAW)	Yes (Mahadeva Swamy et al. 2018)	Yes. NT, Qld, WA, Tas. (Biosecurity Tasmania 2021; Government of Western Australia 2022; IPPC 2020)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Spodoptera littoralis Boisduval, 1833 Synonym(s): *Hadena littoralis* Boisduval; *Noctua gossypii* [Noctuidae] Cotton leafworm	Yes (Sivasankaran et al. 2012)	No records found	No. *Spodoptera littoralis* is only known as a leaf feeder of okra (Obeng-Ofori & Sackey 2003). *Spodoptera littoralis* has not been recorded attacking okra fruit (Gerson & Applebaum 2022).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Spodoptera litura Fabricius, 1775 Synonym(s): *Prodenia tasmanica* (Guenée, 1852) [Noctuidae] Taro caterpillar; Cluster caterpillar	Yes (CABI 2022; Chakraborty, Kumar & Rajadurai 2014)	Yes. Qld, NSW, NT, Vic., Tas., WA (APPD 2022; Government of Western Australia 2022; Naumann 1993)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Trichoplusia ni (Hübner, 1803) Synonym(s): *Autographa brassicae* (Riley, 1870); *Plusia innata* (Herrich-Schäffer, 1868); *Autographa ni* (Hübner, 1821); *Noctua ni* Hübner, 1803 [Noctuidae] Cabbage looper moth	Yes (Jagtap, Shetgar & Nalwandikar 2007)	No records found	No. *Trichoplusia ni* is a leaf feeder of okra (Capinera 2011).	Assessment not required	Assessment not required	Assessment not required	No
Tarache nitidula Fabricius, 1787 Synonym(s): *Acontia nitidula* (Fabricius, 1787) [Noctuidae] Semiloopers	Yes (Kannan & Uthamasamy 2006; TNAU-NAIP 2020)	No records found	No. *Tarache nitidula* is a pest of okra in India and is a leaf miner (Kannan & Uthamasamy 2006).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Thalassodes quadraria (Guenée, 1857) Synonym(s): *Thalassodes ricinaria* (Guenée, 1857) [Geometridae] Looper	Yes (Singh, Singh & Singh 1973)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in NSW, Qld (Balciunas, Burrows & Edwards 1993).	No. *Thalassodes quadraria* has been reared on okra fruit in no-choice assays in a laboratory study; however, there are no records of this pest attacking okra fruit in the field and it is regarded as an external leaf feeder (Muhamed, Kumari & Kurien 2018; Singh, Singh & Singh 1973).	Assessment not required	Assessment not required	Assessment not required	No
Xanthodes intersepta (Guenée, 1852) Synonym(s): *Xanthodes duplicata* (Walker, 1865) [Noctuidae] Semi-looper; Leaf feeder	Yes (Singh & Joshi 2003)	No records found	No. *Xanthodes* spp. are reported as minor pests of okra and are primarily leaf feeding pests (Nair et al. 2017; Sahayaraj 2015).	Assessment not required	Assessment not required	Assessment not required	No
Xanthodes albago (Fabricius, 1794) Synonym(s): *Noctua albago* (Fabricius, 1794); *Xanthodes malvae* (Esper, 1805) [Noctuidae] Semi-loopers	Yes (Nair et al. 2017)	Yes. Qld, WA (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Xanthodes transversa Guenée, 1852 Synonym(s): *Trileuca dentalis* (Smith, 1891) [Noctuidae] Transverse moth	Yes (Nair et al. 2017)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in NSW, Qld (APPD 2022; Common 1990).	No. *Xanthodes transversa* larvae are reported to feed primarily on leaves and tender stems of host plants (Nair et al. 2017).	Assessment not required	Assessment not required	Assessment not required	No
Zeuzera coffeae Nietner, 1861 Synonym(s): *Zeuzera oblita* (Swinhoe, 1890) [Cossidae] Coffee carpenter; Red coffee borer	Yes (Government of India 2007; Remadevi & Raja 1998)	No records found	No. *Zeuzera coffeae* is a stem borer in host plants (Remadevi & Raja 1998).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Orthoptera							
Diabolocatantops axillaris (Thunberg, 1815) Synonym(s): *Gryllus axillaris* (Thunberg, 1815) *Catantops axillaris* (Jago, 1984) [Acrididae] Devil grasshopper	Yes (Kumar & Usmani 2014)	No records found	No. *Diabolocatantops axillaris* is reported as a minor pest of okra (Anderson 1964). Nymphs and adults of *D. axillaris* have only been reported to feed on the leaves and flowers of okra (Anderson 1964).	Assessment not required	Assessment not required	Assessment not required	No
Diabolocatantops pinguis (Stål, 1861) [Acrididae]	Yes (Vedham, Kolatkar & Muralirangan 2002)	No records found	No. *Diabolocatantops pinguis* is reported to survive on okra in the absence of preferred hosts (Vedham, Kolatkar & Muralirangan 2002). *Diabolocatantops pinguis* is polyphagous and is primarily known to feed on the leaves of the host plant (Ayyasamy & Regupathy 2013).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Poecilocerus pictus (Fabricius, 1775) Synonym(s): *Gryllus pictus* (Fabricius, 1775); *Poekilocerus pictus* (Fabricius, 1775) [Acrididae] Painted grasshopper	Yes (Thara et al. 2019; TNAU-NAIP 2020)	No records found	No. *Poecilocerus pictus* is a minor pest of okra (TNAU-NAIP 2020). It primarily feeds on the leaves and stem of the host plant (Sharma 1991). Eggs of *P. pictus* are deposited in soil and the pest is not known to be associated with okra fruit (Sultana et al. 2015).	Assessment not required	Assessment not required	Assessment not required	No
Oxya fuscovittata (Marshall, 1836) Synonym(s): *Gryllus fuscovittatus* Marshall, 1836 [Acrididae]	Yes (Srinivasan & Prabakar 2013)	No records found	No. *Oxya fuscovittata* is a minor pest of okra (Srinivasan & Prabakar 2013). *Oxya fuscovittata* is most often associated with leaf feeding and there is no evidence to suggest that *O. fuscovittata* is associated with okra fruit (Srinivasan & Prabakar 2013).	Assessment not required	Assessment not required	Assessment not required	No
Oxya japonica (Thunberg, 1815) Synonym(s): *Gryllus japonicus* Thunberg, 1815 [Acrididae] Rice grasshopper	Yes (TNAU-NAIP 2020)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (ALA 2020; APPD 2022).	No. *Oxya japonica* is a minor pest of okra (TNAU-NAIP 2020). *Oxya japonica* is often associated with the leaves of grasses (Tajamul & Ahmad 2016).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Thysanoptera							
Frankliniella intonsa (Trybom, 1895) Synonym(s): *Thrips intonsa* Trybom, 1895 [Thripidae] Eurasian flower thrips	Yes (CABI 2022; Rachana et al. 2020)	No records found	Yes. *Frankliniella intonsa* is a polyphagous pest and okra is reported as a host (CABI 2022). It usually feeds externally on the flowers, buds and fruit of host plants (CABI 2022). *Frankliniella intonsa* is routinely intercepted on horticultural products at the Australian border (DAWR 2017). India has suspended export of okra to Europe due to live thrips on okra (Hey 2015).	Yes. *Frankliniella intonsa* has a wide host range including crop plants and ornamentals (Miyazaki & Kudo 1988), and many hosts are available in Australia. Imported okra will be distributed throughout Australia via the wholesale and retail trade pathway. Thrips present on discarded okra fruit waste could potentially disperse to a new host within close proximity.	Yes. Assessed in the thrips Group PRA (DAWR 2017).	Yes. Assessed in the thrips Group PRA (DAWR 2017).	Yes (GP)

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Scirtothrips dorsalis (Hood, 1919) Synonym(s): *Heliothrips minutissimus* (Bagnall, 1919); *Neophysopus fragariae* (Girault, 1927); *Anaphothrips andreae* (Karny, 1925) [Thripidae] Chilli thrips	Yes (Balikai, Kotikal & Prasanna 2009; CABI 2022; Tyagi & Kumar 2014)	Yes. NSW, Qld, NT, WA (Government of Western Australia 2022; Mound, Tree & Paris 2018). *Scirtothrips dorsalis* was previously assessed in the thrips group PRA as a vector of quarantine orthotospoviruses. Therefore, it is a regulated article for Australia (DAWR 2017).	Yes. It is a major pest of okra (CABI 2022). It usually feeds externally on leaves and flowers of host plants. However, fruit may also be damaged with scars and deformities due to feeding injury (CABI 2022). *Scirtothrips* spp. are routinely intercepted on horticultural products at the Australian border (DAWR 2017). Europe has suspended okra imports from India due to live thrips on okra (Hey 2015).	*Scirtothrips dorsalis* has a wide host range including crop plants and ornamentals (CABI 2022), and many hosts are available in Australia. Imported okra will be distributed throughout Australia via the wholesale and retail trade pathway. Thrips present on discarded okra fruit waste could potentially disperse to a new host within close proximity.	Not applicable to vector. However, the emerging quarantine orthotospoviruses vectored by this thrips have potential for establishment and spread (DAWR 2017).	Not applicable to vector. However, the emerging quarantine orthotospoviruses vectored by this thrips have potential for consequences (DAWR 2017).	Yes (GP, RA)

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Thrips palmi (Karny, 1925) Synonym(s): *Thrips clarus* (Moulton, 1928); *Thrips gossypicola* (Priesner, 1939) [Thripidae] Melon thrips	Yes (Sushil et al. 2020; Tyagi & Kumar 2014)	Yes, Under official control (Regional) for SA and WA (Government of Western Australia 2022; PIRSA 2019). Present in NSW, NT, Qld, WA (APPD 2022; Government of Western Australia 2022).	Yes. *Thrips palmi* is a pest of okra in India (Sushil et al. 2020). It usually feeds externally on leaves and flowers of host plants. However, *T. palmi* is routinely intercepted on horticultural products at the Australian border (DAWR 2017). India has suspended export of okra to Europe due to live thrips on okra (Hey 2015).	Yes. *Thrips palmi* is a polyphagous species that attacks many hosts in Cucurbitaceae, Solanaceae and Fabaceae (CABI 2022; Young & Zhang 1998), and many hosts are available in Australia. Imported okra will be distributed throughout WA and SA via the wholesale and retail trade pathway. Thrips present on discarded okra fruit waste could potentially disperse to a new host within close proximity.	Yes. Assessed in the thrips Group PRA (DAWR 2017).	Yes. Assessed in the thrips Group PRA (DAWR 2017).	Yes (GP, SA, WA)

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Trombidiformes							
Aculops lycopersici (Tryon, 1917) Synonym(s): *Phyllocoptes lycopersici* (Massee, 1937) [Eriophyidae] Tomato russet mite	Yes (Kashyap, Sharma & Sood 2015; Kumar, Raghuraman & Singh 2015)	Yes. NSW, Qld, SA, Vic., Tas., NT, WA (APPD 2022; CABI 2022; CSIRO 2005; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Brevipalpus californicus (Banks, 1904) Synonym(s): *Tenuipalpus californicus* Banks, 1904; *Brevipalpus australis* (Baker, 1949) [Tenuipalpidae] Citrus flat mite	Yes (Mitra, Acharya & Ghosh 2018; Plantwise 2020)	Yes. NSW, SA, Vic., Tas., NT, WA (APPD 2022; CSIRO 2005; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Brevipalpus obovatus Donnadieu, 1875 [Tenuipalpidae] Scarlet tea mite	Yes (Gupta 1985)	Yes. NSW, Vic., Qld, NT, WA (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Brevipalpus yothersi Baker, 1949 Synonym(s): *Brevipalpus phoenicoides* Gonzalez 1975; *Brevipalpus mcbridei* Baker 1949 [Tenuipalpidae]	Yes (Beard et al. 2015)	Yes. Qld, NT, WA (Beard et al. 2015)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Eutetranychus orientalis (Klein, 1936) Synonym(s): *Anychus orientalis* Klein, 1936; *Eutetranychus anneckei* (Meyer, 1974) [Tetranychidae] Citrus brown mite	Yes (Balikai, Kotikal & Prasanna 2009; Kumawat & Singh 2002)	Yes. Qld, NT, WA (ALA 2020; Government of Western Australia 2022; Walter, Halliday & Smith 1995)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Oligonychus biharensis (Hirst, 1924) Synonym(s): *Oligonychus (Pritchardinychus) biharensis* (Hirst, 1924); *Oligonychus hawaiiensis* (McGregor, 1950); *Paratetranychus biharensis* (Hirst, 1924) [Tetranychidae] Spider mite	Yes (CABI 2022; Government of India 2007; Jaydeb, Mukherjee & Sarkar 1996)	Yes. Under official control (Regional) for WA (Government of Western Australia 2022). Present in Qld (Halliday 2000).	No. *Oligonychus biharensis* is only known to feed on the leaves of host plants (Kaimal & Ramani 2011)	Assessment not required	Assessment not required	Assessment not required	No
Oligonychus gossypii (Zacher, 1921) Synonym(s): *Paratetranychus gossypii* Zacher, 1921 [Tetranychidae]	Yes (Ghosh 2004)	No records found	No. *Oligonychus gossypii* primarily feeds on the leaves and stems of okra (Boateng et al. 2005; Migeon & Dorkeld 2022)	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Polyphagotarsonemus latus (Banks, 1904) Synonym(s): *Hemitarsonemus latus* (Banks, 1904); *Tarsonemus latus* Banks, 1904 [Tarsonemidae] Broad mite; Yellow mite	Yes (Grewal 1992; Gupta 1985; Prasad & Singh 2011)	Yes. NSW, Qld, SA, Vic., NT, WA (APPD 2022; CSIRO 2005; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus ludeni Zacher, 1913 Synonym(s): *Epitetranychus ludeni* (Zacher, 1921) [Tetranychidae] Red spider mite; Bean spider mite	Yes (Kumar, Raghuraman & Singh 2015)	Yes. Qld, NSW, NT, Vic., WA, SA (ALA 2020; APPD 2022; CSIRO 2005; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tetranychus macfarlanei Baker & Pritchard, 1960 [Tetranychidae] Okra red spider mite	Yes (Migeon & Dorkeld 2022; Prasad & Singh 2011)	No records found	Yes. *Tetranychus macfarlanei* is a major pest of okra in India (Jeppson, Keifer & Baker 1975; Kumar, Raghuraman & Singh 2015; Rajgopal & Srinivasa 2017). Okra red spider mites usually feed on leaves, causing various symptoms like yellowing, bronzing and causing the formation of cholorotic spots on the feeding surface of leaves (Satyagopal et al. 2014). In the case of heavy infestation, leaves wither and dry and flower and fruit formation is affected (Satyagopal et al. 2014).	Yes. Okra fruit will be distributed across Australia for sale and could potentially carry mite nymphs and/or adults. *Tetranychus macfarlanei* is polyphagous and suitable hosts may be available within the proximity, especially in rural/regional Australia. Spider mites primarily disperse by crawling. Although less likely, it is possible that spider mites present on discarded okra fruit waste could potentially find suitable hosts within close proximity (Kennedy & Smitley 1985).	Yes. *Tetranychus macfarlanei* has the potential to establish and spread in Australia as suitable hosts and environments are available. This species has established in areas with a wide range of climatic conditions (Bolland, Gutierrez & Flechtmann 1998; Jeppson, Keifer & Baker 1975; Zeity, Srinivasa & Gowda 2017). *Tetranychus macfarlanei* is polyphagous, feeding on several host plants (Bolland, Gutierrez & Flechtmann 1998; Zeity, Srinivasa &	Yes. *Tetranychus macfarlanei* has caused serious damage to okra, eggplant, pumpkin and cucumber (Jeppson, Keifer & Baker 1975). In India, it is a serious pest of okra, cotton, soybean, eggplant and other cucurbits (Latha et al. 2019; Rajgopal & Srinivasa 2017; Satish et al. 2018; Zeity, Srinivasa & Gowda 2017). In India, soybean fields infested with red spider mites can cause 40-60% yield reduction (Satish et al. 2018). It is also an important pest of many agricultural	Yes

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
					Gowda 2017). Some of these hosts are widespread in Australia.	crops in Bangladesh (Ali, Naif & Huang 2011).	
Tetranychus marianae McGregor, 1950 [Tetranychidae] Mariana mite	Yes (Migeon & Dorkeld 2022; Zeity, Srinivasa & Gowda 2016)	Yes. Qld, NT, WA (APPD 2022; CABI 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus neocaledonicus André, 1933 Synonym(s): *Eotetranychus neocaledonicus* (Andre, 1933) [Tetranychidae] Vegetable red spider mite	Yes (Rajgopal & Srinivasa 2017; Singh & Chauhan 2019)	Yes. NT, Qld, WA (APPD 2022; CSIRO 2005; Government of Western Australia 2022; Seeman & Beard 2011)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tetranychus puschelii Meyer, 1974 [Tetranychidae]	Yes (Gupta & Bose 2017; Migeon & Dorkeld 2022)	No records found	No. Okra is reported as a host of *Tetranychus puschelii* (Migeon & Dorkeld 2022) in Africa. However, there is no further evidence available for the association between this pest and okra fruit in India, or other countries.	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Tetranychus truncatus Ehara, 1956 [Tetranychidae] Okra mite	Yes (Bachhar et al. 2019; Migeon & Dorkeld 2022)	No records found	Yes. *Tetranychus truncatus* is a serious pest of okra in Kerala, India (Bachhar et al. 2019). *Tetranychus truncatus* usually feeds and produces webbing on the lower surface of the leaf. In cases of heavy infestation, *Tetranychus* spp. colonies cover whole plants, including the flowers and fruit (Satyagopal et al. 2014).	Yes. Okra fruit will be distributed across Australia for sale and could potentially carry mite nymphs and/or adults. *Tetranychus truncatus* is polyphagous and suitable hosts may be available in close proximity, especially in rural/regional Australia. Spider mites primarily disperse by crawling. Although less likely, it is possible that spider mites present on discarded okra fruit waste could potentially find suitable hosts within close proximity (Kennedy & Smitley 1985).	Yes. *Tetranychus truncatus* has the potential to establish and spread in Australia as suitable hosts and environments are available. This species has established in areas with a wide range of climatic conditions (Bolland, Gutierrez & Flechtmann 1998; Migeon & Dorkeld 2022). This species is polyphagous, feeding on several host plants (Bolland, Gutierrez & Flechtmann 1998; Migeon & Dorkeld 2022). Some of these hosts are	Yes. *Tetranychus truncatus* has the potential for economic consequences in Australia. *Tetranychus truncatus* is highly polyphagous, causing damage to economically important crops, including cotton, jute, maize, papaya and many vegetable crops (Jin et al. 2018; Migeon & Dorkeld 2022; Vacante 2016). *Tetranychus truncatus* can reduce crop yield through feeding and from the large amounts of webbing (Ullah, Gotoh & Lim 2014).	Yes

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
					widespread in Australia.		
Tetranychus turkestani (Ugarov & Nikolskii, 1937) Synonym(s): *Eotetranychus turkestani* Ugarov & Nikolskii, 1937 [Tetranychidae] Strawberry spider mite	Yes (Gupta & Gupta 1994; Migeon & Dorkeld 2022)	No records found	No. *Tetranychus turkestani* has only been reported feeding on the leaves of host plants (Carey & Bradley 1982).	Assessment not required	Assessment not required	Assessment not required	No
Tetranychus urticae Koch, 1836 Synonym(s): *Tetranychus telarius* L. 1758; *Tetranychus cinnabarinus* (Boisduval, 1867) [Tetranychidae] Two-spotted spider mite	Yes (DPP 2007; Gupta 1985; Kumar, Raghuraman & Singh 2015; Kumaran, Douressamy & Ramaraju 2007)	Yes. NSW, NT, Qld, SA, Tas., Vic., WA (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
BACTERIA							
Bacillus subtilis (Ehrenberg 1835) Cohn 1872 Synonym(s): *Vibrio subtilis* Ehrenberg 1835 [Bacillales: Bacillaceae]	Yes (Rao et al. 2014)	Yes. NSW, Qld, SA (APPD 2022; Broadbent, Baker & Waterworth 1971)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Leuconostoc mesenteroides (Tsenkovskii 1878) van Tieghem 1878 Synonym(s): Betacoccus arabinosaceus Orla-Jensen 1919 [Lactobacillales; Leuconostocaceae]	Yes (Savitri et al. 2017)	Yes. NSW (Elhalis, Cox & Zhao 2020)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Pectobacterium carotovorum (Jones 1901) Waldee 1945 (Approved Lists 1980) emend. Portier et al. 2019 Synonym(s): *Bacillus carotovorus* Jones 1901; *Bacterium carotovorum* (Jones 1901) Lehmann and Neumann 1927; *Erwinia carotovora* (Jones 1901) Bergey et al. 1923 [Enterobacterales; Pectobacteriaceae] Soft rot	Yes (Maisuria & Nerurkar 2013; Plantwise 2020)	Yes. NSW, Qld, SA, Vic., WA (APPD 2022; Government of Western Australia 2022; Waleron, Waleron & Lojkowska 2013)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Priestia megaterium (de Bary 1884) Gupta et al. 2020 Synonym(s): *Bacillus megaterium* de Bary 1884 [Bacillales: Bacillaceae]	Yes (Baliah & Muthulakshmi 2017)	Yes. NSW, WA (Fluidquip Australia 2009; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Pseudomonas cichorii (Swingle 1925) Stapp 1928 Synonym(s): *Phytomonas cichorii* Swingle 1925; *Bacterium cichorii* (Swingle 1925) Elliott 1930; *Chlorobacter cichorii* (Swingle 1925) Patel and Kulkarni 1951 [Pseudomonadales; Pseudomonadaceae] Bacterial blight of endive	Yes (Babu et al. 2013)	Yes. NSW, Qld, NT, WA, Vic. (APPD 2022; Government of Western Australia 2022; Peters et al. 2004)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Pseudomonas syringae pv. *syringae* van Hall 1902 [Pseudomonadales; Pseudomonadaceae] Bacterial canker	Yes (Kumar 2019)	Yes. NSW, Qld, WA, SA, Vic., Tas., NT (APPD 2022; Government of Western Australia 2022; Peters et al. 2004)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Xanthomonas campestris pv. *esculenti* (Rangaswami & Easwaran 1962) Dye 1978 [Xanthomonadales; Xanthomonadaceae] Leafspot	Yes (Muthaiyan 2009)	No records found	No. *Xanthomonas campestris* pv. *esculenti* causes leaf blight in okra (Kumar 2019).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
CHROMALVEOLATA							
Phytophthora capsici Leonian Synonym(s): *Phytophthora hydrophila* Curzi 1927; *Phytophthora mexicana* Hotson & Hartge [Peronosporales: Peronosporaceae] Stem and fruit rot of capsicum	Yes (Chowdappa 2017)	Yes. NSW, Qld, WA (APPD 2022; Government of Western Australia 2022; Weinert et al. 1998)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Phytophthora palmivora (E.J. Butler) E.J. Butler Synonym(s): *Pythium palmivorum* E.J. Butler; *Phytophthora faberi* Maubl. [Peronosporales: Peronosporaceae] Root and stem rot	Yes (Khare et al. 2016)	Yes. NSW, Qld, NT, Vic., WA (APPD 2022; Barber et al. 2013; Vawdrey 2001)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Phytophthora nicotianae Breda de Haan Synonym(s): *Phytophthora nicotiana*e var. nicotianae Breda de Haan.; *Phytophthora parasitica* var. nicotianae (Breda de Haan) Tucker; *Phytophthora allii* Sawada; *Phytophthora melongenae* Sawada [Peronosporales: Peronosporaceae] Black shank	Yes (Chowdappa et al. 2016)	Yes. NSW, Qld, NT, WA, SA, Vic. (APPD 2022; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

			Potential to enter on pathway				
Pest	**Present in India**	**Present within Australia**	**Potential for importation**	**Potential for distribution**	**Potential for establishment and spread**	**Potential for economic consequences**	**Pest risk assessment required**
FUNGI							
Alternaria alternata (Fr.) Keissl Synonym(s): *Alternaria tenuis* Nees, Torula alternata Fr.; *Macrosporium fasciculatum* Cooke & Ellis; *Macrosporium erumpens* Cooke; *Macrosporium meliloti* Peck; *Macrosporium polytrichi* Peck; *Macrosporium seguierii* Allesch [Pleosporales: Pleosporaceae]	Yes (Dadabhau 2009)	Yes. NSW, Qld, NT, WA, SA, Vic., Tas. (APPD 2022; Le & Gregson 2019)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Alternaria chlamydospora Mouch. [Pleosporales: Pleosporaceae] Alternaria leaf spot	Yes (Hurule et al. 2019)	Yes. NSW, WA, Vic. (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Alternaria hibiscina (Thüm.) E.G. Simmons Synonym(s): *Macrosporium hibiscinum* Thuem [Pleosporales: Pleosporaceae] Alternaria leaf spot	Yes (Khare et al. 2016)	No records found	No. *Alternaria hibiscina* is reported to cause leaf spot (Khare et al. 2016).	Assessment not required	Assessment not required	Assessment not required	No
Alternaria infectoria E.G. Simmons Synonym(s): *Pleospora infectoria* Fuckel; *Sphaeria infectora* (Fuckel) Wehm. [Pleosporales: Pleosporaceae] Fruit rot	Yes (Khare et al. 2016)	Yes. NSW, WA (APPD 2022; Government of Western Australia 2022; Moslemi et al. 2017)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Alternaria zinniae H. Pape ex M.B. Ellis [Pleosporales: Pleosporaceae] Leaf spot of Zinnia	Yes (Varshney 1986)	Yes. ACT, NSW, Qld, Vic. (APPD 2022; Auld, Talbot & Radburn 1992)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Alternaria tenuissima (Kunze) Wiltshire Synonym(s): *Helminthosporium tenuissimum* Nees & T. Nees : Fr.; *Macrosporium tenuissimum* (Nees & T. Nees : Fr.) Fr. [Pleosporales: Pleosporaceae] Nail head spot of tomato	Yes (Vashisht & Chauhan 2016)	Yes. NSW, Qld, WA, SA, Vic., Tas. (APPD 2022; Government of Western Australia 2022; Harteveld, Akinsanmi & Drenth 2013)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Ampelomyces quisqualis Ces. Synonym(s): *Cicinobolus cesatii* de Bary; *Capnodium lygodesmiae* Ellis & Everh [Pleosporales: Phaeosphaeriaceae] Powdery mildew	Yes (Gopalakrishnan & Valluvaparidasan 2009)	Yes. NSW, Qld, SA, Vic., Tas. (APPD 2022; Clare 1964)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Ascochyta abelmoschi Harter [Pleosporales: Didymellaceae] Pod spot of okra	Yes (Sohi & Puttoo 1973)	Yes. Qld (APPD 2022; Shivas 1989)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Aspergillus flavus Link, Synonym(s): *Monilia flava* (Link) Pers.; *Aspergillus flavus* var. proliferans Anguli, Rajam, Thirum., Rangiah & Ramamurthi; *Sterigmatocystis lutea* Tiegh. [Eurotiales: Trichocomaceae] Aspergillus ear rot	Yes (Kumkum, Sindhu & Shagufta 1989)	Yes. NSW, Qld, NT, WA, Vic. (APPD 2022; Geiser, Pitt & Taylor 1998; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Aspergillus fumigatus Fresen. Synonym(s): *Aspergillus fumigatus* var. fumigatus (1863); *Aspergillus fumigatus* var. minimus Sartory [Eurotiales: Aspergillaceae]	Yes (Kumar et al. 2013b)	Yes. NSW, Qld, WA, Vic., Tas. (APPD 2022; Government of Western Australia 2022; Talbot et al. 2018)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Aspergillus nidulans (Eidam) G. Winter Synonym(s): *Emericella nidulans* (Eidam) Vuillemin; *Diplostephanus nidulans* (Eidam) Neveu-Lem [Eurotiales: Aspergillaceae]	Yes (Yadav, Kushwaha & Jain 2020)	Yes. NSW, Vic. (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Aspergillus niger Tiegh. [Eurotiales: Trichocomaceae]	Yes (Kumkum, Sindhu & Shagufta 1989)	Yes. NSW, Qld, NT, WA, SA, Vic. (APPD 2022; Government of Western Australia 2022; Varga et al. 2007)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Aspergillus sydowii (Bainier & Sartory) Thom & Church Synonym(s): *Sterigmatocystis sydowii* Bainier & Sartory; *Aspergillus sydowii* var. achlamydosporus Nakaz; *aspergillus sydowii* var. major Mehrotra & Basu [Eurotiales: Trichocomaceae]	Yes (Prasad et al. 2000a)	Yes. Qld, Tas. (APPD 2022; Farr & Rossman 2020)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Aspergillus ustus (Bainier) Thom & Church Synonym(s): *Sterigmatocystis usta* Bainier [Eurotiales: Trichocomaceae]	Yes (Kulkarni & Chavan 2010)	Yes. Qld, Tas. (APPD 2022; Farr & Rossman 2020)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Athelia rolfsii (Curzi) C.C. Tu & Kimbr. Synonym(s): *Corticium rolfsii* Curzi, Boll; *Pellicularia rolfsii* (Curzi) E. West; *Botryobasidium rolfsii* (Curzi) Venkatar); *Sclerotium rolfsii* Sacc. [Atheliales: Atheliaceae] Sclerotium rot	Yes (Mahadevakumar et al. 2016)	Yes. NSW, Qld, NT, WA, SA, Vic., Tas. (APPD 2022; Bhuiyan et al. 2019; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Berkeleyomyces basicola (Berk. & Broome) W.J. Nel, S.W. de Beer, T.A. Duong & M.J. Wingf. Synonym(s): *Chalara elegans* Nag Raj & W.B. Kendr); *Thielavia basicola* (Berk & Broome) Zopf; *Thielaviopsis basicola* (Berk & Broome) Ferraris [Helotiales: Helotiaceae] Black root rot	Yes (CABI 2022; Shukla, Fatima & Kumari 2020)	Yes. NSW, Qld, SA, Vic., Tas., WA (APPD 2022; Government of Western Australia 2022; Harvey, Nehl & Aitken 2004)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Boeremia exigua (Desm.) Aveskamp, Gruyter & Verkley Synonym(s): *Phoma exigua* Desm. [Pleosporales: Didymellaceae] Leaf spot; Pea black spot	Yes (Parveen et al. 2019)	Yes. NSW, Qld, WA, Vic., Tas. (APPD 2022; Tran et al. 2013)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Botrytis cinerea Pers. Synonym(s): *Botryotinia fuckeliana* (de Bary) Whetzel [Helotiales: Sclerotiniaceae] Grey mould-rot	Yes (Saranraj, Sivasakthivelan & Sivasakti 2016)	Yes. NSW, SA, Vic., Tas., WA (APPD 2022; Government of Western Australia 2022; Lindbeck, Bretag & Ford 2009)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Cercospora malayensis F. Stevens & Solheim Synonym(s): *Cercospora hibisci-sabdariffae* Sawada [Capnodiales: Mycosphaerellaceae]	Yes (Khare et al. 2016)	Yes. NSW, Qld (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Chaetomium globosum Kunze Synonym(s): *Chaetomium affine* Corda; *Chaetomium olivaceum* Cooke & Ellis [Sordariales: Chaetomiaceae] Antagonist of Venturia	Yes (Kumar 2019)	Yes. NSW, Qld, WA, Vic. (APPD 2022; Rahmadi & Fleet 2008)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Choanephora cucurbitarum (Berk. & Ravenel) Thaxt Synonym(s): *Choanephora heterospora* B.S. Mehrotra & M.D. Mehrotra; *Choanephora americana* A. Möller; *Rhopalomyces cucurbitarum* Berk. & Ravenel [Mucorales: Choanephoraceae] Wet rot; Choanephora pod rot	Yes (Kumar 2019)	Yes. NSW, Qld (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Choanephora infundibulifera (Curr.) Sacc. Synonym(s): *Cunninghamia infundibulifera* Curr; *Choanephora conjuncta* Couch [Mucorales: Choanephoraceae]	Yes (Das et al. 2017; Farr & Rossman 2022)	Yes. Qld (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Cladosporium cladosporioides (Fresen.) G.A. de Vries Synonym(s): *Cladosporium cladosporioides* f. pisicola (W.C. Snyder); *Cladosporium pisicola* W.C. Snyder; *Monilia humicola* Oudem; *Penicillium cladosporioides* Fresen) [Capnodiales: Cladosporiaceae] Antagonist of Botrytis cinerea	Yes (Kumar et al. 2013b)	Yes. NSW, Qld, NT, WA, SA, Vic., Tas. (APPD 2022; Government of Western Australia 2022; Ma, de Silva & Taylor 2020)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Cladosporium herbarum (Pers.) Link *Synonym(s): Sphaerella tassiana* De Not.; *Davidiella tassiana* (De Not.) Crous & U. Braun; *Sphaerella tulasnei* Jancz.; *Mycosphaerella tassiana* (De Not.) Johanson [Capnodiales: Mycosphaerellaceae] Antagonist of Botrytis cinerea	Yes (Pande 2008; Plantwise 2020)	Yes. Qld, WA, Vic., Tas. (APPD 2022; Maxwell & Scott 2008)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Curvularia lunata (Wakker) Boedijn Synonym(s): *Cochliobolus lunatus* R.R. Nelson & F.A. Haasis [Pleosporales: Pleosporaceae] Head mould of grasses, rice and sorghum	Yes (Kumkum, Sindhu & Shagufta 1989)	Yes. NSW, Qld, NT, WA, Vic. (APPD 2022; Government of Western Australia 2022; Pak et al. 2017)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Colletotrichum dematium (Pers.) Grove Synonym(s): *Sphaeria dematium* Pers.; *Exosporium dematium* (Pers.) Link; *Vermicularia dematium* (Pers.) Fr.; *Lasiella dematium* (Pers.) Quél. [Glomerellales: Glomerellaceae] Leaf spot	Yes (Khare et al. 2016)	Yes (NSW, Qld, NT, SA, Vic., Tas. (APPD 2022; Shivas et al. 2016; Washington et al. 2006)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc Synonym(s): *Gloeosporium fructigenum* Berk.; *Gloeosporium affine* Sacc.; *Phyllosticta araliae* Ellis & Everh.; *Gloeosporium anthurii* Allesch.; *Gloeosporium mangiferae* Henn.; *Gloeosporium begonia* Magnaghi; *Colletotrichum chardonianum* Nolla; *Colletotrichum tabaci* Böning) [Glomerellales: Glomerellaceae]	Yes (Gautam 2014)	Yes. NSW, Qld, NT, WA, SA, Vic., Tas., (APPD 2022; Giblin, Coates & Irwin 2010; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Corynespora cassiicola (Berk. & M.A. Curtis) C.T. Wei Synonym(s): *Cercospora melonis* Cooke [Pleosporales: Corynesporascaceae] Target leaf spot	Yes (Kamei et al. 2019)	Yes. NSW, Qld, NT, Vic., WA (APPD 2022; Government of Western Australia 2022; Silva et al. 1995)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Curvularia oryzae Bugnic. Synonym(s): *Brachysporium oryzae* S. Ito & Ishiy [Pleosporales: Pleosporaceae]	Yes (Busi et al. 2009)	Yes. Qld, Tas. (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Dendryphiella vinosa (Berk & M. A. Curtis) Reisinger & Ravenel Synonym(s): *Curvularia interseminata* (Berk. & Ravenel) J.C. Gilman; *Dendryphiella interseminata* (Berk. & Ravenel) Bubák,; *Dendryphion vinosum* (Berk. & M.A. Curtis) S. Hughes [Pleosporales: Dictyosporiaceae]	Yes (HerbIMI 2020; Nonzom & Sumbali 2014)	Yes. Qld (APPD 2022; Queensland Department of Agriculture 1995)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Fibroidium abelmoschi (Thüm.) U. Braun & R.T.A. Cook Synonym(s): *Oidium abelmoschi* Thüm; *Euoidium abelmoschi* (Thüm.) Y.S. Paul & J.N. Kapoor [Erysiphales: Erysiphaceae]	Yes (Hosagoudar 1991)	No records found	No. *Fibroidium abelmoschi* was reported to be present on leaves, stems and petioles, causing powdery mildew in okra plants (Hosagoudar 1991; Kumar 2019).	Assessment not required	Assessment not required	Assessment not required	No
Fusarium chlamydosporum Wollenw. & Reinking, Synonym(s): *Fusarium sporotrichioides* var. chlamydosporum; *Dactylium fusarioides* Gonz. Frag. & Cif.; *Fusarium sporotrichioides* subsp. Minus (Wollenw.) Raillo [Hypocreales: Nectriaceae] Stem canker	Yes (Khare et al. 2016)	Yes. NSW, Qld, SA, Vic., WA (APPD 2022; Burgess & Summerell 1992; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Fusarium equiseti (Corda) Sacc. Synonym(s): *Selenosporium equiseti* Corda; *Fusarium bullatum* Sherb; *Fusarium equiseti* var. bullatum (Wollenw.) Wollenw.; *Fusarium equiseti* var. bullatum (Sherb.) Wollenw.; *Fusarium falcatum* Appel & Wollenw.; *Gibberella intricans* Wollenw.; Fusoma pallidum Bonord [Hypocreales: Nectriaceae] Fusarium stalk rot	Yes (Singha et al. 2016)	Yes. NSW, Qld, WA, SA, Vic., Tas. (APPD 2022; Burgess & Summerell 1992)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Fusarium fujikuroi Nirenberg Synonym(s): *Gibberella fujikuroi* (Sawada) S., *Lisea fujikuroi* Sawada [Hypocreales: Nectriaceae] Bakanae disease of rice	Yes (Jamadar, Ashok & Shamarao 2001; Prasad et al. 2000b)	Yes. NSW, WA (Government of Western Australia 2022; Liew et al. 2016)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Fusarium oxysporum f.sp. *vasinfectum* (G.F. Atk.) W.C. Snyder & H.N. Hansen Synonym(s): *Fusarium vasinfectum* G.F. Atk. [Hypocreales: Nectriaceae] Fusarium wilt	Yes (Khare et al. 2016)	Yes. NSW, Qld (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Fusarium oxysporum Schltdl. Synonym(s): *Fusarium angustum* Sherb [Hypocreales: Nectriaceae] Basal rot	Yes (Khare et al. 2016)	Yes. NSW, Qld, NT, WA, SA, Vic., Tas. (APPD 2022; Burgess & Summerell 1992)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Fusarium rosea (Preuss) Sacc. Synonym(s): *Fusarium sambucinum* Fuckel; *Sphaeria pulicaris* Fr. : Fr. 1823; *Gibberella pulicaris* (Fr. : Fr.) Sacc. [Hypocreales: Nectriaceae] Basal canker on hop	Yes (Sagar et al. 2011)	Yes. NSW, WA, SA, Vic., Tas. (APPD 2022; Tan et al. 2011)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Geotrichum candidum Link Synonym(s): *Geotrichum versiforme* M. Moore; Oidium matalense Castell.; *Geotrichum redaelli* Negroni & I. Fisch. [Saccharomycetales: Dipodascaceae] Citrus sour rot	Yes (Prakash et al. 2012)	Yes. NSW, Qld, WA, Vic., Tas. (APPD 2022; Government of Western Australia 2022; Shivas 1989)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Golovinomyces cichoracearum (DC.) V.P. Heluta Synonym(s): *Erysiphe cichoracearum* DC; *Golovinomyces ambrosiae* (Schwein.) U. Braun & R.T.A. Cook; *Oidium asteris* punicei Peck [Erysiphales: Erysiphaceae] Powdery Mildew	Yes (Khare et al. 2016)	Yes. NSW, Qld, WA, Vic., Tas. (APPD 2022; Cunnington, Lawrie & Pascoe 2010)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Golovinomyces orontii (Castagne) V.P. Heluta Synonym(s): *Oidium violae* Pass.; *Euoidium violae* (Pass.) U. Braun & R.T.A. Cook [Erysiphales: Erysiphaceae] Powdery mildew	Yes (HerbIMI 2020; Sujata et al. 2018)	Yes. Qld, SA, Vic. (APPD 2022; Cunnington, Lawrie & Pascoe 2005)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Lasiodiplodia theobromae (Pat.) Griffon & Maubl. Synonym(s): *Botryodiplodia theobromae* Pat; *Diplodia theobromae* (Pat.) W. Nowell [Botryosphaeriales: Botryosphaeriaceae] Stem end rot; Pod rot of cocoa	Yes (Dayal & Srivastava 1973)	Yes. NSW, Qld, WA (APPD 2022), NT, SA (CABI 2022; Government of Western Australia 2022; Peterson et al. 1991)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Leptosphaerulina trifolii (Rostr.) Petr. Synonym(s): *Sphaerulina trifolii* Rostr; *Pseudoplea trifolii* (Rostr.) Petr. [Pleosporales: Pleosporaceae] Leaf spot	Yes (Potkar & Jadhav 2015)	Yes. NSW, Qld, WA, SA, Vic., Tas. (APPD 2022; Barbetti 2007; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Leveillula taurica (Lév.) G. Arnaud Synonym(s): *Erysiphe taurica* Lév.; *Leveillula solanacearum* Golovin; *Oidiopsis taurica* (Lév.) E.S. Salmon; *Ovulariopsis cynarea* (Ferraris & Massa) Ciccar. [Erysiphales: Erysiphaceae] Powdery mildew of cotton	Yes (Ullasa et al. 1981)	Yes. NSW, Qld, NT, WA, Vic. (APPD 2022; Liberato 2006)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Macrophomina phaseolina (Tassi) Goid. Synonym(s): *Botryodiplodia phaseoli* (Maubl.) Thirum.; *Dothiorella cajani* Syd., P. Syd. & E. J. Butl.; *Macrophoma cajani* Syd., P. Syd. & E. J. Butl.; *Macrophoma corchori* Sawada [Botryosphaeriales, Botryosphaeriaceae] Charcoal rot of bean/ tobacco; Seedling blight	Yes (Begum, Lokesh & Kumar 2005)	Yes. NSW, Qld, NT, WA, SA, Vic. (APPD 2022; Government of Western Australia 2022; Hutton, Gomez & Mattner 2013)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Neocosmopora solani (Mart.) L. Lombard & Crous Synonym(s): *Fusarium solani* (Mart.) Sacc; *Fusarium aduncisporum* Weimer & Harter; *Nectria bogoriensis* Bernard; *Nectria calonectricola* Henn. [Hypocreales: Nectriaceae]	Yes (Kapadiya et al. 2013)	Yes. NSW, NT, Qld, WA, SA, Vic., Tas. (Elmer et al. 1997; Government of Western Australia 2022; Liew et al. 2016; Sangalang et al. 1995)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Paramyrothecium roridum (Tode) L. Lombard & Crous Synonym(s): *Myrothecium roridum* Tode; *Dacrydium roridum* (Tode) Link [Hypocreales: Stachybotryaceae] Blight eggplant; Brown Leaf spot of Mulberry	Yes (Singh & Narain 2008)	Yes. NSW, Qld, NT, SA, Vic. (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Penicillium chrysogenum Thom Synonym(s): *Penicillium brunneorubrum* Dierckx; *Penicillium chlorophaeum* Biourge [Eurotiales: Aspergillaceae]	Yes (Kumar et al. 2013b)	Yes. NSW, Qld, Vic., Tas., WA (APPD 2022; Government of Western Australia 2022; Visagie et al. 2014)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Penicillium citrinum Thom Synonym(s): *Penicillium steckii* Zaleski; *Penicillium aurifluum* Biourge; *Citromyces subtilis* Bainier & Sartory [Eurotiales: Aspergillaceae] Post-harvest decay	Yes (Kumar 2019)	Yes. NSW, Qld, Vic. (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Penicillium digitatum (Pers.) Sacc. Synonym(s): *Aspergillus digitatus* Pers.; *Monilia digitata* (Pers.) Pers.; *Mucor digitata* (Pers.) Mérat; *Penicillium olivaceum* Wehmer, Beitr. Kennt.; *Penicillium lanosogrisellum* Biourge [Eurotiales: Aspergillaceae] Green mould	Yes (Sharma, Maharshi & Gaur 2012)	Yes. NSW, Qld, WA, SA, Vic. (APPD 2022; Cook & Dubé 1989; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Phyllosticta hibiscina Ellis & Everh. [Botryosphaeriales: Phyllostictaceae] Phyllosticta leaf spot	Yes (Khare et al. 2016)	No records found	No. *Phyllosticta hibiscina* has been reported to cause leaf spot disease on okra (Khare et al. 2016; Texas A&M AgriLife Extension 2020).	Assessment not required	Assessment not required	Assessment not required	No
Podosphaera fuliginea (Schltdl.) U. Braun & S. Takam. Synonym(s): *Alphitomorpha fuliginea* Schltdl.; *Erysiphe fuliginea* (Schltdl.) Fr.; *Sphaerotheca fuliginea* var. fuliginea [Erysiphales: Erysiphaceae] Powdery mildew	Yes (Khare et al. 2016)	Yes. NSW, Qld, NT, WA, SA, Vic. (APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Podosphaera xanthii (Castagne) U. Braun & Shishkoff Synonym(s): *Sphaerotheca caricae-papayae* Tanda & U. Braun; *Meliola calendulae* Malbr. & Roum. [Erysiphales: Erysiphaceae] Powdery mildew of cucurbits	Yes (Nayak & Bandamaravuri 2018)	Yes. Qld, NT, WA, Vic. (APPD 2022; Liberato, Shivas & Cunnington 2006)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Pseudocercospora abelmoschi (Ellis & Everh.) Deighton Synonym(s): *Cercospora abelmoschi* Ellis & Everh.; *Cercospora hibisci* Tracy & Earle [Capnodiales: Mycosphaerellaceae] Leaf spot of okra	Yes (Ganesha & Jayalakshmi 2017)	Yes. WA (APPD 2022)	No. *Pseudocercospora abelmoschi* is reported to affect leaves only (Ganesha & Jayalakshmi 2017; Kumar 2019).	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Pseudocercospora hibiscina (Ellis & Everh) Y.L. Guo & X.J. Liu Synonym(s): *Cercospora hibiscina* (Ellis & Everh.) [Capnodiales: Mycosphaerellaceae] Hibiscus leaf spot	Yes (Khare et al. 2016)	No records found	No. The spots caused by *Pseudocercospora hibiscina* produces dark olivaceous patches of mouldy growth on lower surface of the leaf. (Khare et al. 2016).	Assessment not required	Assessment not required	Assessment not required	No
Pseudothielavia terricola (J.C. Gilman & E.V. Abbott) X. Wei Wang & Houbraken Synonym(s): *Thielavia terricola* (Gilman & Abbott) Emmons; *Coniothyrium terricola* J.C. Gilman & E.V. Abbott; *Chaetomium terricola* J.C. Gilman & E.V. Abbott [Melanosporales: Ceratostomataceae]	Yes (Dayal & Srivastava 1973)	Yes. ACT, Tas. (APPD 2022; Shivas 1989)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
Pythium aphanidermatum (Edson) Fitzp. Synonym(s): *Rheosporangium aphanidermatum* Edson; *Pythium butleri* Subraman; *Nematosporangium aphanidermatum* (Edson) Fitzp. [Pythiales: Pythiaceae] Damping-off	Yes (Ashwathi et al. 2017)	Yes. NSW, Qld, Vic., WA (APPD 2022; Cook & Dubé 1989; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Rhizoctonia solani J.G. Kühn Synonym: *Corticium solani* (Prill. & Delacr.) Bourdot & Galzin; *Pellicularia filamentosa* f. sp. Sasakii Exner; *Pellicularia solani* (J.G. Kühn) Exner; *Moniliopsis solani* (J.G. Kühn); *Thanatephorus cucumeris* (Frank) Donk [Cantharellales: Ceratobasidiaceae] Root rot; Damping off; Thread blight	Yes (Anitha & Tripathi 2000)	Yes. NSW, Qld, NT, WA, SA, Vic., Tas. (APPD 2022; Cook & Dubé 1989; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Rhizopus arrhizus A. Fisch. Synonym(s): *Mucor arrhizus* (A. Fisch.) Hagem; *Rhizopus oryzae* Went & Prins. Geerl.; *Rhizopus tritici* Saito [Mucorales: Mucoraceae] Barn rot of tobacco	Yes (Kumari, Jayachandran & Ghosh 2019)	Yes. NSW, Qld, Vic., WA (APPD 2022; DAFWA 2015; Kennedy et al. 2016)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Rhizopus stolonifer (Ehrenb.) Vuill. Synonym(s): *Mucor stolonifer* Ehrenb.; *Rhizopus nigricans* Ehrenb.; *Rhizopus necans* Massee [Mucorales: Mucoraceae] Bulb rot	Yes (Shukla et al. 2006)	Yes. NSW, Qld, NT, WA, Vic. (APPD 2022; Cook & Dubé 1989; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Sclerotinia sclerotiorum (Lib.) de Bary Synonym(s): *Hymenoscyphus sclerotiorum* (Lib.) W. Phillips; *Whetzelinia sclerotiorum* (Lib.) Korf & Dumont [Helotiales: Sclerotiniaceae] Cottony soft rot	Yes (Bag & Dutta 2009)	Yes. NSW, Qld, WA, SA, Vic., Tas. (APPD 2022; Cook & Dubé 1989; Government of Western Australia 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No
Uromyces heterogeneus Cooke Synonym(s): *Caeomurus heterogeneus* (Cooke); *Coeomurus heterogeneus* (Cooke) Kuntze [Pucciniales: Pucciniaceae] Rust of okra	Yes (Khare et al. 2016)	No records found	No. *Uromyces heterogeneus* is reported to only affect the leaves of okra (Smart Gardener 2019).	Assessment not required	Assessment not required	Assessment not required	No
Verticillium dahliae Kleb. Synonym(s): *Verticillium alboatrum* var. dahliae (Kleb.) R. Nelson [Glomerellales: Plectosphaerellaceae] Verticillium wilt	Yes (Kumar, Tapwal & Borah 2012)	Yes. ACT, NSW, Qld, NT, SA, Vic., Tas. (APPD 2022; Shivas 1989)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
PHYTOPLASMAS							
'*Candidatus* Phytoplasma asteris' [16SrI] (B)	Yes (Kumar, Singh & Lakhanpaul 2012)	No records found	Yes. It infects okra and symptoms include shortening of internodes, aggregation of leaves at the apical region, reduced leaf lamina, stem reddening, fruit bending, phyllody and stunting of plants (Kumar, Singh & Lakhanpaul 2012). Affected fruit show a distinct bend or extreme curling and are devoid of seeds, being replaced by thin placental extensions (Kumar, Singh & Lakhanpaul 2012). As this phytoplasma infects systemically, infected fruit could be exported.	No. Phytoplasmas are transmitted by phloem-feeding insects (Marcone 2014). 16SrI (B) group phytoplasmas are transmitted by a range of leafhoppers, primarily Macrosteles fascifrons (Lee, Gundersen-Rindal & Bertaccini 1998; Lee et al. 2004a). The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of this phytoplasma by leafhopper vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia. Vectors of this phytoplasma that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
				susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.			

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	**Potential for distribution**			
VIRUSES							
Cucumber mosaic virus (CMV) [Bromoviridae: Cucumovirus]	Yes (Kumar, Gautam & Raj 2014; Lepcha, Chaudhary & Pratap 2017)	Yes. NSW, Qld, SA, Tas., Vic., WA (Alberts, Hannay & Randles 1985; APPD 2022)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Okra yellow vein mosaic virus (OYVMV) [Geminiviridae: Begomovirus]	Yes (Ansar et al. 2014; Solankey, Singh & Singh 2016)	No records found	Yes. OYVMV disease causes homogenous yellowing of veins in leaf tissue that become yellowish/creamy colour, which later become necrotic. It causes stunting okra (Ali et al. 2012; Plantwise 2020; Venkataravanappa et al. 2015). It is unlikely that these viruses will be present on the pathway, as fruit from infected plants are yellow or white in colour making them unmarketable (Venkataravanappa et al. 2015). However, fruit at the early stage of the infection may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. Yellow vein mosaic virus disease of okra spreads in areas with high rainfall and humidity and is transmitted by whitefly, Bemisia tabaci (Gilbertson et al. 2015). The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of OYVMV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984).	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
				Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.			
Radish leaf curl virus (RaLCV) [Geminiviridae: Begomovirus]	Yes (Kumar et al. 2012)	No records found	No. Characteristic symptoms of this disease on okra include leaf curling and overall stunting of plants that bear no fruit (Kumar et al. 2012).	Assessment not required	Assessment not required	Assessment not required	No
Tobacco streak virus (TSV) [Bromoviridae: Ilarvirus]	Yes (Krishnareddy, Jalali & Samuel 2007; Vemana & Jain 2010)	Yes. Qld (Sharman, Thomas & Persley 2008)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Tomato leaf curl New Delhi virus (ToLCNDV) [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2012b)	No records found	Yes. ToLCNDV infects okra plants and symptoms include yellow mosaic and vein thickening of leaves, veinal clearing, chlorosis and swelling, coupled with slight downward curling of leaf margins, twisting of petioles, and retardation of growth (Venkataravanappa et al. 2012b). As this virus infects plants systemically, in theory, there is a possibility of the virus being present in fruit. Fruit harvested from infected plants especially at the early stage of the infection may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of ToLCNDV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Turnip mosaic virus (TuMV) [Potyviridae; Potyvirus]	Yes (Mongamaithem & Rebika 2018; Singh et al. 2015)	Yes. NSW, SA, Vic., WA (Coutts, Walsh & Jones 2007; Government of Western Australia 2022; Persley, Cooke & House 2010; Schwinghamer et al. 2014)	Assessment not required	Assessment not required	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Okra Enation Leaf Curl Virus (OELCuV) [Geminiviridae: Begomovirus]	Yes (Chandran et al. 2013)	No records found	Yes. OELCuV has been reported in multiple states in India and affected okra plants show foliar symptoms such as upward curling, venal thickening, warty, rough leaves and severe stunting of plant growth, causing small, deformed fruit unfit for marketing or consumption (Kumar, Esakky & Acharya 2019; Sanwal et al. 2014; Yadav et al. 2018). However, fruit harvested from infected plants, especially at the early stage of the infection, may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of OELCuV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Bhendi yellow vein mosaic Delhi virus [BYVDV-IN (India: Delhi: okra)] [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2012b)	No records found	Yes. BYVDV-IN is spreading rapidly throughout India, affecting okra plants at all growth stages and resulting in plants failing to produce or yielding unmarketable fruit (Venkataravanappa et al. 2012b). Symptoms of BYVDV-IN include yellow vein mosaic, vein twisting, reduced leaves with a bushy appearance, veinal clearing, chlorosis and swelling, coupled with slight downward curling of leaf margins, twisting of petioles and retardation of growth (Venkataravanappa et al. 2012b). However, fruit harvested from infected plants especially at the early stage of the infection may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of BYVDV-IN by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Bhendi yellow vein Bhubhaneswar virus (BYVBV) [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2013)	No records found	Yes. Okra plants affected by BYVBV show yellow veins and stunted growth (Venkataravanappa et al. 2013). As this virus infects plants systemically, in theory, there is a possibility of the virus being present in fruit. Fruit harvested from infected plants, especially at the early stage of the infection, may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of BYVBV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Bhendi yellow vein Madurai virus (BYVMV) [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2015)	No records found	Yes. BYVMV infected okra plants exhibit symptoms such as yellow mosaic, vein thickening, petiole bending, complete yellowing, upward leaf curling and stunted growth, with pale yellow and deformed fruit (Sisodia & Mahatma 2020; Venkataravanappa et al. 2015). However, fruit harvested from infected plants, especially at the early stage of the infection, may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of BYVMV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Bhendi yellow vein Maharashtra virus (BYVMaV) [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2015)	No records found	Yes. BYVMaV infected okra plants exhibit symptoms such as yellow mosaic, vein thickening, petiole bending, complete yellowing, upward leaf curling and stunted growth, with pale yellow and deformed fruit (Sisodia & Mahatma 2020; Venkataravanappa et al. 2015). However, fruit harvested from infected plants, especially at the early stage of the infection, may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of BYVMaV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Cotton leaf curl Alabad virus (CLCuAV) [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2012a)	No records found	Yes. CLCuAV infected okra plants exhibit mottling, downward leaf curling, vein thickening and twisting and yellowing symptoms (Venkataravanappa et al. 2012a). It is unlikely that CLCuAV will be present on the pathway, as virus infected fruit are largely deformed and unmarketable and likely to be removed following packing house quality grading practices. However, as this virus infects plants systemically, in theory, there is a possibility of the virus being present in fruit. Fruit harvested from infected plants, especially at the early stage of the infection, may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of CLCuAV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway		Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
			Potential for importation	Potential for distribution			
Bhendi yellow vein Haryana virus [BYVHV (India: Haryana:06)] [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2015)	No records found	Yes. BYVHV infected okra plants exhibit symptoms such as yellow mosaic, vein thickening, petiole bending, complete yellowing, upward leaf curling and stunted growth, with pale yellow and deformed fruit (Sisodia & Mahatma 2020; Venkataravanappa et al. 2015). However, fruit harvested from infected plants, especially at the early stage of the infection, may show no obvious symptom; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of BYVHV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Pest	Present in India	Present within Australia	Potential to enter on pathway: Potential for importation	Potential to enter on pathway: Potential for distribution	Potential for establishment and spread	Potential for economic consequences	Pest risk assessment required
Bhendi yellow vein Karnal virus (BYVKnV) [Geminiviridae: Begomovirus]	Yes (Venkataravanappa et al. 2015)	No records found	Yes. okra plants affected by BYVKnV exhibit symptoms such as yellow mosaic, vein thickening, petiole bending, complete yellowing, upward leaf curling and stunted growth (Venkataravanappa et al. 2015). The fruit of the infected plants exhibit pale yellow colour, become deformed, small and tough in texture (Sisodia & Mahatma 2020). However, fruit harvested from infected plants especially at the early stage of the infection may show no obvious symptoms; therefore, may not be removed during harvest and post-harvest processes and potentially be exported.	No. The end use (consumption), short shelf life of okra fruit (7–10 days), and the mode of transmission of BYVKnV by grafting and whitefly vectors make this pest extremely unlikely to be able to transfer to a suitable host in Australia (Gilbertson et al. 2015). Vectors of this virus that may be present in Australia would be unlikely to feed on discarded, dehydrated okra fruit, as it is highly perishable and susceptible to water loss (Tamura & Minamide 1984). Huberty and Denno (2004) demonstrated vascular feeding arthropods experience negative responses when forced to feed on water-stressed hosts.	Assessment not required	Assessment not required	No

Glossary, acronyms and abbreviations

Term or abbreviation	Definition
ACT	Australian Capital Territory
Additional declaration	A statement that is required by an importing country to be entered on a phytosanitary certificate and which provides specific additional information on a consignment in relation to regulated pests (FAO 2021c).
Appropriate level of protection (ALOP)	The level of protection deemed appropriate by the Member establishing a sanitary or phytosanitary measure to protect human, animal or plant life or health within its territory (WTO 1995).
Appropriate level of protection (ALOP) for Australia	The *Biosecurity Act 2015* defines the appropriate level of protection (or ALOP) for Australia as a high level of sanitary and phytosanitary protection aimed at reducing biosecurity risks to very low, but not to zero.
Area	An officially defined country, part of a country or all or parts of several countries (FAO 2021c).
Area of low pest prevalence	An area, whether all of a country, part of a country, or all parts of several countries, as identified by the competent authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures (FAO 2021c).
Arthropod	The largest phylum of animals, including the insects, arachnids and crustaceans.
Asexual reproduction	The development of a new individual from a single cell or group of cells in the absence of meiosis.
Australian territory	Australian territory as referenced in the *Biosecurity Act 2015* refers to Australia, Christmas Island and Cocos (Keeling) Islands and any external Territory to which that provision extends.
BA	Biosecurity Advice
BICON	Australia's Biosecurity Import Conditions system bicon.agriculture.gov.au/BiconWeb4.0
Biosecurity	The prevention of the entry, establishment or spread of unwanted pests and infectious disease agents to protect human, animal or plant health or life, and the environment.
Biosecurity import risk analysis (BIRA)	The *Biosecurity Act 2015* defines a BIRA as an evaluation of the level of biosecurity risk associated with particular goods, or a particular class of goods, that may be imported, or proposed to be imported, into Australian territory, including, if necessary, the identification of conditions that must be met to manage the level of biosecurity risk associated with the goods, or the class of goods, to a level that achieves the ALOP for Australia. The risk analysis process is regulated under legislation.
Biosecurity measures	The *Biosecurity Act 2015* defines biosecurity measures as measures to manage any of the following: biosecurity risk, the risk of contagion of a listed human disease, the risk of listed human diseases entering, emerging, establishing themselves or spreading in Australian territory, and biosecurity emergencies and human biosecurity emergencies.
Biosecurity risk	The *Biosecurity Act 2015* refers to biosecurity risk as the likelihood of a disease or pest entering, establishing or spreading in Australian territory, and the potential for the disease or pest causing harm to human, animal or plant health, the environment, economic or community activities.
Calyx	A collective term referring to all of the sepals in a flower.
Consignment	A quantity of plants, plant products or other articles being moved from one country to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or more commodities or lots) (FAO 2021c).

Term or abbreviation	Definition
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO 2021c).
Crawler	Intermediate mobile nymph stage of certain arthropods.
DAFW	Indian Government Department of Agriculture and Farmers Welfare
Endangered area	An area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss (FAO 2021c).
Endemic	Belonging to, native to, or prevalent in a particular geography, area or environment.
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO 2021c).
EP	Existing policy. This denotes a pest species has previously been assessed in another policy published by the department.
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO 2021c).
FAO	Food and Agriculture Organization of the United Nations
Fresh	Living; not dried, deep-frozen or otherwise conserved (FAO 2021c).
FSANZ	Food Standards Australia New Zealand (foodstandards.gov.au/Pages/default.aspx) and the Australia New Zealand Food Standards Code (foodstandards.gov.au/code/Pages/default.aspx)
Fumigation	A method of pest control that completely fills an area with gaseous pesticides to suffocate or poison the pests within.
Genus	A taxonomic category ranking below a family and above a species and generally consisting of a group of species exhibiting similar characteristics. In taxonomic nomenclature the genus name is used, either alone or followed by a Latin adjective or epithet, to form the name of a species.
Goods	The *Biosecurity Act 2015* defines goods as an animal, a plant (whether moveable or not), a sample or specimen of a disease agent, a pest, mail or any other article, substance or thing (including, but not limited to, any kind of moveable property).
GP	Group policy. This refers to the *Final group pest risk analysis for thrips and orthotospoviruses on fresh fruit, vegetable, cut-flower and foliage imports* (thrips Group PRA) (DAWR 2017), the *Final group pest risk analysis for mealybugs and the viruses they transmit on fresh fruit, vegetable, cut-flower and foliage imports* (mealybugs Group PRA) (DAWR 2019) and the *Final group pest risk analysis for soft and hard scale insects on fresh fruit, vegetable, cut-flower and foliage imports* (scales Group PRA) (DAWE 2021).
Host	An organism that harbours a parasite, mutual partner, or commensal partner, typically providing nourishment and shelter.
Host range	Species capable, under natural conditions, of sustaining a specific pest or other organism (FAO 2021c).
Import permit	Official document authorising importation of a commodity in accordance with specified phytosanitary import requirements (FAO 2021c).
Infection	The internal ‘endophytic’ colonisation of a plant, or plant organ, and is generally associated with the development of disease symptoms as the integrity of cells and/or biological processes are disrupted.
Infestation (of a commodity)	Presence in a commodity of a living pest of the plant or plant product concerned. Infestation includes infection (FAO 2021c).
Inspection	Official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (FAO 2021c).

Term or abbreviation	Definition
Intended use	Declared purpose for which plants, plant products, or other regulated articles are imported, produced or used (FAO 2021c).
Interception (of a pest)	The detection of a pest during inspection or testing of an imported consignment (FAO 2021c).
International Plant Protection Convention (IPPC)	The IPPC is an international plant health agreement, established in 1952, that aims to protect cultivated and wild plants by preventing the introduction and spread of pests. The IPPC provides an international framework for plant protection that includes developing International Standards for Phytosanitary Measures (ISPMs) for safeguarding plant resources.
International Standard for Phytosanitary Measures (ISPM)	An international standard adopted by the Conference of the Food and Agriculture Organization, the Interim Commission on Phytosanitary Measures or the Commission on Phytosanitary Measures, established under the IPPC (FAO 2021c).
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO 2021c).
Larva	A juvenile form of animal with indirect development, undergoing metamorphosis (for example, insects or amphibians).
Lot	A number of units of a single commodity, identifiable by its homogeneity of composition, origin et cetera, forming part of a consignment (FAO 2021c). Within this report a 'lot' refers to a quantity of fruit of a single variety, harvested from a single production site during a single pick and packed at one time.
Mature fruit	Commercial maturity is the start of the ripening process. The ripening process will then continue and provide a product that is acceptable to consumers. Maturity assessments include colour, starch, index, soluble solids content, flesh firmness, acidity, and ethylene production rate.
National Plant Protection Organization (NPPO)	Official service established by a government to discharge the functions specified by the IPPC (FAO 2021c).
NSW	The state of New South Wales in Australia.
NT	The Northern Territory of Australia.
Nymph	The immature form of some insect species that undergoes incomplete metamorphosis. It is not to be confused with larva, as its overall form is already that of the adult.
Official control	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 (FAO 2021c).
Pathogen	A biological agent that can cause disease to its host.
Pathway	Any means that allows the entry or spread of a pest (FAO 2021c).
Pest	Any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products (FAO 2021c).
Pest categorisation	The process for determining whether a pest has or has not the characteristics of a quarantine pest or those of a regulated non-quarantine pest (FAO 2021c).
Pest free area (PFA)	An area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained (FAO 2021c).
Pest free place of production (PFPP)	Place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period (FAO 2021c).
Pest free production site (PFPS)	A production site in which a specific pest is absent, as demonstrated by scientific evidence, and in which, where appropriate, this condition is being officially maintained for a defined period (FAO 2021c).

Term or abbreviation	Definition
Pest risk analysis (PRA)	The process of evaluating biological or other scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated, and the strength of any phytosanitary measures to be taken against it (FAO 2021c).
Pest risk assessment (for quarantine pests)	Evaluation of the probability of the introduction and spread of a pest and of the magnitude of the associated potential economic consequences (FAO 2021c).
Pest risk assessment (for regulated non-quarantine pests)	Evaluation of the probability that a pest in plants for planting affects the intended use of those plants with an economically unacceptable impact (FAO 2021c).
Pest risk management (for quarantine pests)	Evaluation and selection of options to reduce the risk of introduction and spread of a pest (FAO 2021c).
Pest risk management (for regulated non-quarantine pests)	Evaluation and selection of options to reduce the risk that a pest in plants for planting causes an economically unacceptable impact on the intended use of those plants (FAO 2021c).
Pest status (in an area)	Presence or absence, at the present time, of a pest in an area, including where appropriate its distribution, as officially determined using expert judgement on the basis of current and historical pest records and other information (FAO 2021c).
Phytosanitary certificate	An official paper document or its official electronic equivalent, consistent with the model of certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (FAO 2021c).
Phytosanitary certification	Use of phytosanitary procedures leading to the issue of a phytosanitary certificate (FAO 2021c).
Phytosanitary measure	Phytosanitary relates to the health of plants. Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO 2021c). In this risk analysis the term 'phytosanitary measure' and 'risk management measure' may be used interchangeably.
Phytosanitary procedure	Any official method for implementing phytosanitary measures including the performance of inspections, tests, surveillance or treatments in connection with regulated pests (FAO 2021c).
Phytosanitary regulation	Official rule to prevent the introduction and/or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests, including establishment of procedures for phytosanitary certification (FAO 2021c).
Polyphagous	Feeding on a relatively large number of hosts from different plant family and/or genera.
PRA area	Area in relation to which a pest risk analysis is conducted (FAO 2021c).
Production site	In this report, a production site is a continuous planting of *Abelmoschus esculentus* plants treated as a single unit for pest management purposes. If a property is subdivided into one or more units for pest management purposes, then each unit is a production site.
Qld	The state of Queensland in Australia.
Quarantine	Official confinement of regulated articles for observation and research or for further inspection, testing or treatment (FAO 2021c).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO 2021c).
Regulated article (RA)	Any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved (FAO 2021c).

Term or abbreviation	Definition
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party (FAO 2021c).
Regulated pest	A quarantine pest or a regulated non-quarantine pest (FAO 2021c).
Restricted risk	Restricted risk is the risk estimate when risk management measures are applied.
Risk analysis	Refers to the technical or scientific process for assessing the level of biosecurity risk associated with the goods, or the class of goods, and if necessary, the identification of conditions that must be met to manage the level of biosecurity risk associated with the goods, or class of goods to a level that achieves the ALOP for Australia.
Risk management measure	Conditions that must be met to manage the level of biosecurity risk associated with the goods or the class of goods, to a level that achieves the ALOP for Australia. In this risk analysis, the term 'risk management measure' and 'phytosanitary measure' may be used interchangeably.
SA	The state of South Australia.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO 2021c).
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures.
Stakeholders	Government agencies, individuals, community or industry groups or organizations, whether in Australia or overseas, including the proponent/applicant for a specific proposal, who have an interest in the policy issues.
Surveillance	An official process which collects and records data on pest occurrence or absence by surveying, monitoring or other procedures (FAO 2021c).
Systems approach(es)	The integration of different risk management measures, at least 2 of which act independently, and which cumulatively achieve the appropriate level of protection against regulated pests.
Tas.	The state of Tasmania in Australia.
Trash	Soil, splinters, twigs, leaves and other plant material, other than fruit as defined in the scope of this risk analysis. For example, stem and leaf material, seeds, soil, animal matter/parts or other extraneous material
Treatment	Official procedure for the killing, inactivation or removal of pests, or for rendering pests infertile or for devitalisation (FAO 2021c).
Unrestricted risk	Unrestricted risk estimates apply in the absence of risk management measures.
Vector	In this report, a vector is an organism that is capable of harbouring and spreading a pest from one host to another.
Viable	Alive, able to germinate or capable of growth and/or development.
Vic.	The state of Victoria in Australia.
WA	The state of Western Australia.
WTO	World Trade Organization

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