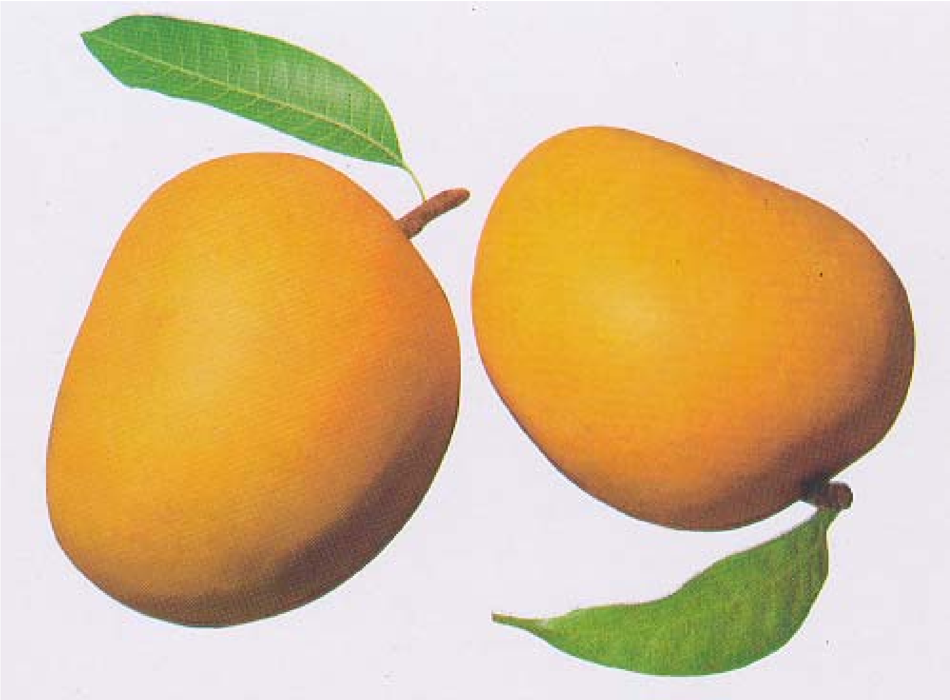
Australian Government

Department of Agriculture, Fisheries and Forestry

Mangoes from India

Draft Revised Import Policy



July 2004

Foreword

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GLOSSARY OF TERMS AND ABBREVIATIONS

ALOP	appropriate level of protection
APEDA	Agricultural and Processed Food Products Export Development Authority
AQIS	Australian Quarantine and Inspection Service
Area	an officially defined country, part of a country or all or parts of several countries
Biosecurity Australia	a major operating group within the Australian Government Department of Agriculture, Fisheries and Forestry
BPI	Bureau of Plant Industry Manila
Contaminating pest	a pest that is carried by a commodity and, in the case of plants and plant products, does not infest those plants or plant products
Control (of a pest)	suppression, containment or eradication of a pest population
DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
EDB	ethylene dibromide
Endangered area	an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss
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
Establishment	the perpetuation, for the foreseeable future, of a pest within an area after entry
FAO	Food and Agriculture Organization of the United Nations
Fresh	not dried, deep-frozen or otherwise conserved
HWT	hot water treatment
ICON	AQIS Import Conditions database
IMOA	Ministry of Agriculture of the Republic of India
Introduction	entry of a pest resulting in its establishment

IPPC	International Plant Protection Convention, as deposited in 1951 with FAO in Rome and as subsequently amended
IRA	import risk analysis
ISPM	International Standards for Phytosanitary Measures
National Plant Protection Organisation (NPPO)	official service established by a government to discharge the functions specified by the IPPC
Non-quarantine pest	pest that is not a quarantine pest for an area
Official	established, authorised or performed by a National Plant Protection Organisation
Official control (of a regulated pest)	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
Pathway	the ordered sequence of steps leading to an outcome, or event
PBPM	Plant Biosecurity Policy Memorandum
Pest	any species, strain or biotype of plant, animal, or pathogenic agent, injurious to plants or plant products
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
Pest free area	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
Pest free place of production	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
Pest risk analysis	the process of evaluating biological or other scientific evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it

Pest risk assessment (for quarantine pests)	evaluation of the probability of the introduction and spread of a pest and of the associated potential economic consequences
Pest risk management (for quarantine pests)	evaluation and selection of options to reduce the risk of introduction and spread of a pest
Phytosanitary measure	any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests
Phytosanitary regulation	official rule to prevent the introduction and/or spread of quarantine pests, by regulating the production, movement or existence of commodities or other articles, or the normal activity of persons, and by establishing schemes for phytosanitary certification
PRA	pest risk analysis
PRA area	area in relation to which a pest risk analysis is conducted
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
RBMC	red-banded mango caterpillar
Spread	expansion of the geographical distribution of a pest within an area
VHT	vapour heat treatment

Draft Revised Import Policy – Mangoes from India

EXECUTIVE SUMMARY

The Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) is considering the importation of fresh mango fruit from India following a request from the Agricultural and Processed Food Products Export Development Authority (APEDA) of India in 2000. On 12 September 2003, Biosecurity Australia officially advised stakeholders that India's import access request would be considered as an extension of existing policy.

Prior to 1996, India regularly exported fresh mango fruit to Australia with a mandatory on-arrival fumigation treatment with ethylene dibromide (EDB) effective against certain insect pests including fruit flies. Imports of mangoes from India were suspended in 1996 as a result of the global phase-out in use of EDB on the basis of worker health and safety concerns. Following the EDB phase-out, India was requested to propose equivalent measures and provide appropriate efficacy data, which they subsequently provided.

Fresh mangoes are currently imported from Mexico and the Philippines (Guimaras Island) based on existing quarantine policy developed by Biosecurity Australia. Biosecurity Australia has considered the importation of fresh mango fruit from India under existing policy for the importation of fresh mangoes from Mexico and the Philippines (Guimaras Island).

This document presents a draft revised import policy for fresh mango fruit imports into Australia from India.

Of the pests associated with fresh mango fruit in India, 32 pests (31 arthropods and one pathogen) were determined to be quarantine pests for Australia.

Of these pests, 26 arthropods were assessed to have an unrestricted risk estimate above Australia's appropriate level of protection (ALOP) and risk management measures have been proposed to mitigate the risk.

This draft revised import policy proposes that the risks associated with the importation of fresh mango fruit from India can be reduced to a level acceptable to Australia, based on Australia's ALOP by applying a combination of risk management measures and operational maintenance systems, specifically:

- Option of vapour heat treatment (VHT) or hot water treatment (HWT) for the management of fruit fly species;
- Designated pest free places of production or production sites for the management of *Sternochetus frigidus* (mango pulp weevil) and *S. mangiferae* (mango seed weevil) (initially for the areas of Barabanki, Malihabad, Saharanpur in the Lucknow region, in the State of Uttar Pradesh, the areas of

Navsari and Valsad in the State of Gujarat and the areas of Devgad, Kudal, Malvan, Sawantwadi and Vengurla in the State of Maharashtra);

- Inspection and remedial action for other identified quarantine pests such as red-banded mango caterpillar, mealybugs and scale insects; and
- Supporting operational systems to maintain and verify phytosanitary status.

Biosecurity Australia invites comments on the technical and economic feasibility of the proposed risk management measures, in particular, comments are welcome on the appropriateness of the measures and any alternative measures that stakeholders consider to be equivalent in achieving the identified objectives.

INTRODUCTION

Biosecurity Australia is responsible for developing quarantine policy for imports of plants, plant products and other regulated articles, and for liasing with overseas National Plant Protection Organisations (NPPOs) to determine their requirements for exports of Australian plants and plant products.

Biosecurity Australia conducted a policy review for mangoes from India with reference to existing quarantine policies and available measures for the mitigation of phytosanitary risks posed by the relevant mango pest groups of quarantine concern to Australia.

Imports of mangoes into Australia from India were suspended in 1996 as a result of the global phase-out in use of EDB on the basis of worker health and safety concerns. Technically, India still had access for mangoes to Australia, provided equivalent measures could be found to manage the phytosanitary risks previously addressed by the EDB fumigation treatment.

Following categorisation of the pests associated with mangoes from India, a PRA was completed on the quarantine pests for Australia. The likelihood of entry, establishment or spread and associated potential consequences were assessed to arrive at unrestricted risk estimates for relevant quarantine pests. Risk management was considered for those pests with unrestricted risk estimates that were above Australia's ALOP. Biosecurity Australia has previously developed quarantine policy for managing quarantine pests associated with the importation of fresh mangoes from Haiti, Mexico and the Philippines (Guimaras Island).

This document includes the following sections:

- background to this review under extension of existing policy;
- a description of the scope of this review under extension of existing policy;
- an outline of current quarantine policy for the importation of fresh mangoes;
- the methodology and results of pest categorisation and risk assessment;
- risk management; and
- recommended quarantine conditions for the importation of fresh mangoes from India into Australia.

PROPOSAL TO IMPORT FRESH MANGOES FROM INDIA

BACKGROUND

Prior to 1996, fresh mangoes were regularly exported from India to Australia under import conditions requiring mandatory on-arrival fumigation with EDB effective against certain insect pests including fruit flies and certification that the mangoes were grown in areas free of the mango weevil, *Sternochetus frigidus*.

Trade in mangoes was suspended in 1996 due to the global phase-out in use of EDB on the basis of worker health and safety concerns, and the subsequent withdrawal of EDB as a post-harvest disinfestation treatment in Australia. Technically, India still had access for mangoes to Australia, provided equivalent measures could be found to manage the phytosanitary risks previously addressed by the EDB fumigation treatment. India was requested to propose equivalent measures and provide appropriate efficacy data, which they subsequently provided.

In 2000, the Agricultural and Processed Food Products Export Development Authority (APEDA) of India requested access for Indian mangoes to Australia using vapour heat treatment (VHT) for the disinfestation of fruit flies. APEDA, in collaboration with the Ministry of Agriculture of the Republic of India (IMOA) has also provided updated pest lists and reports in 2002 and 2003 on the efficacy of using VHT and hot water treatment (HWT) for the disinfestation of fruit flies.

In response to the import access request for fresh mango fruit from India, Biosecurity Australia released a Plant Biosecurity Policy Memorandum (PBPM) 2003/27 on 12 September 2003 advising stakeholders that Biosecurity Australia was considering India's request to resume trade in the importation of mangoes as an extension of existing policy. Biosecurity Australia's consideration of the resumption of trade will focus on equivalent measures, as well as any other potential quarantine issues identified that are associated with Indian mangoes proposed for importation into Australia.

The existing conditions for fresh mangoes cover importation from Haiti, Mexico and the Philippines (Guimaras Island). Following a preliminary assessment, Biosecurity Australia considered that the potential quarantine pests associated with mangoes from India do not pose significantly different risks or require significantly different management measures than those for which policy already exists. Biosecurity Australia therefore determined to progress the access request as an extension of existing policy rather than proceed with an IRA.

SCOPE

In this draft revised import policy, Biosecurity Australia has considered the pests associated with fresh mango fruit in India in accordance with ISPM #11 (2004) *Pest Risk Analysis for Quarantine Pests including Analysis of Environmental Risks and Living Modified Organisms*.

Mango fruit is defined as fresh, mature fruit of *Mangifera indica* L. of the family Anacardiaceae that has been cultivated, harvested, packed and transported to Australia under commercial conditions from India. The major mango varieties covered in this review are Alphonso, Banganpalli, Chausa, Dashehari, Kesar, Langra, Mallika, Neelum and Totapuri.

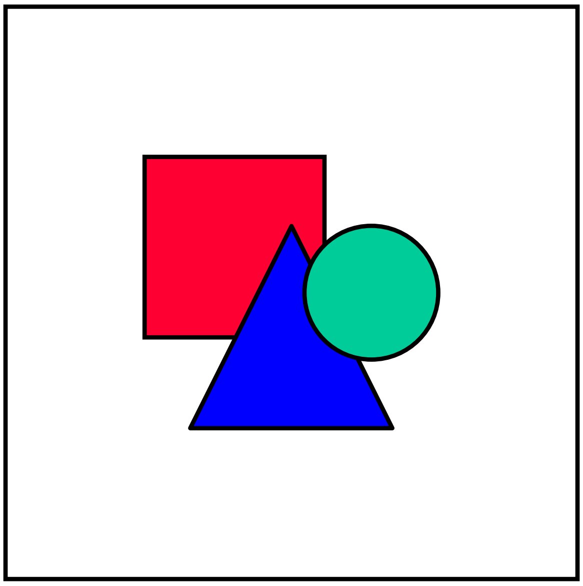
AUSTRALIA'S CURRENT QUARANTINE POLICY FOR IMPORTS OF FRESH MANGO FRUIT

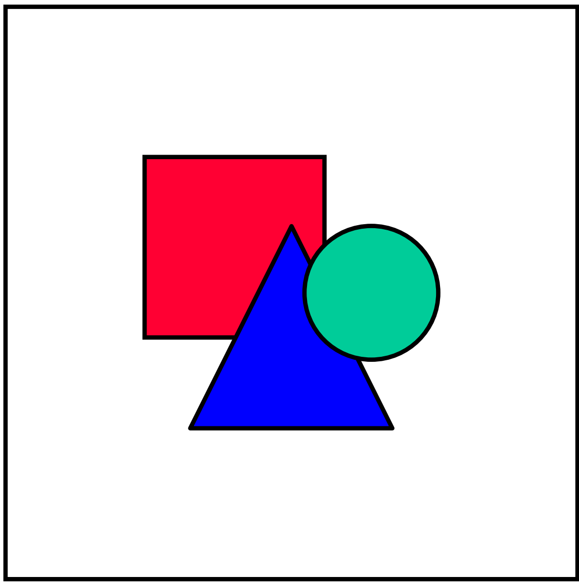
International quarantine policy

The existing conditions for mangoes currently cover importation from Haiti, Mexico and the Philippines (Guimaras Island). All imported consignments of mangoes are subject to existing condition C6000 'General Import requirements for all fruits and vegetables'.

In addition to these general requirements, each country has specific import conditions. Details of the importation requirements for fresh mango fruit are available on the AQIS Import Condition database (ICON) at http://www.aqis.gov.au/icon. The specific import conditions for each exporting country are summarised as follows:

Haiti

- 



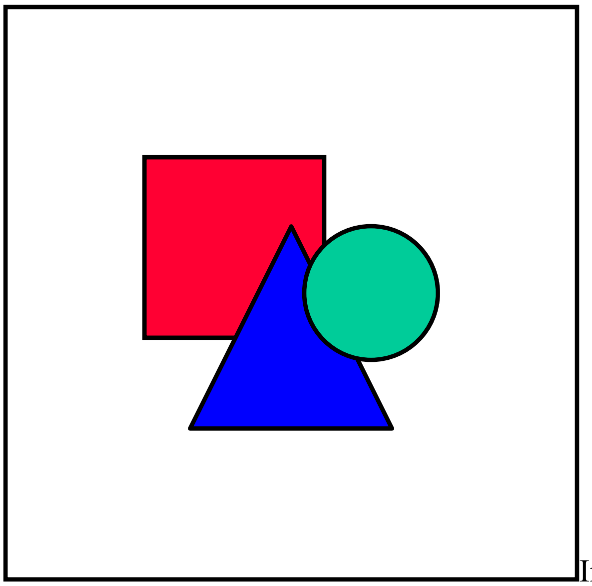
Each consignment of mango fruit from Haiti must be accompanied by a USDA Phytosanitary Certificate endorsed with the treatment details as follows:

"The fruit has been stored for not less than 14 consecutive days at 0°C ± 1°C."

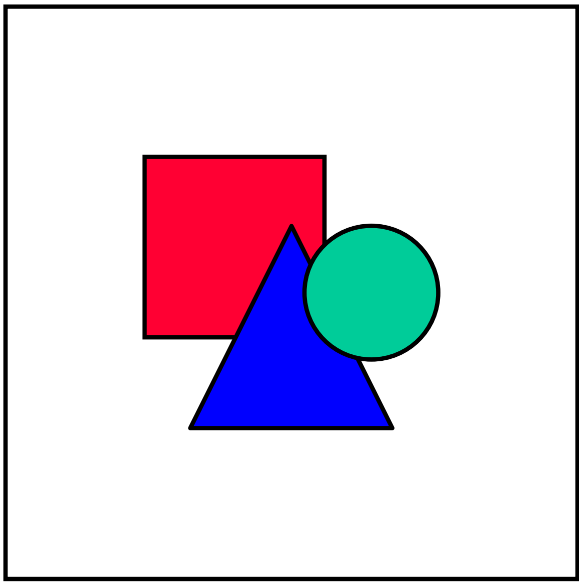
No Haitian Phytosanitary Certificates will be accepted.

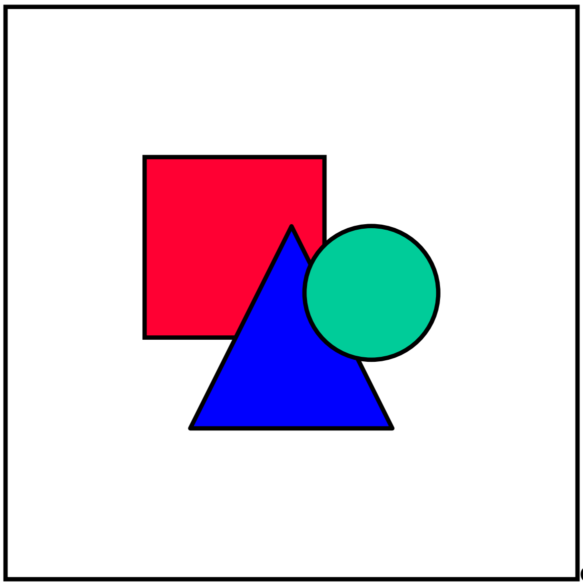
If intended for import into Western Australia, consignments must be accompanied by a Phytosanitary Certificate endorsed with the additional declaration:

"Mango seed weevil (Sternochetus mangiferae) and Mango fruit weevil (S. frigidus) have not been recorded in ....(name of country)."



- Insects and contaminants must be treated, removed or destroyed using an AQIS approved method.





- Mango fruit are to be kept in cold storage, with the flesh temperature of the fruit at 0ºC ± 1ºC for not less than 14 consecutive days.

Mexico

Fresh mango fruit imports from Mexico are subject to the following pre-shipment requirements:

- Mangoes are subject to hot water treatment at an approved treatment location and packing shed.
- Mangoes may only be imported through the airports and seaports of the United States of America.
- The mangoes shall be exported under certification of the Director-General de Sanitad Vegetal (DGSV) of Mexico.
- All packing sheds intended to be used for the grading, treatment and packing of mangoes for Australia will be registered by DGSV.

- Only packing sheds with combined on-site packing and screened treatment facilities may pack fruit for Australia. All activities within the sheds will be subject to the supervision of DGSV officers.
- The fruit will be packed and treated prior to export under the supervision of an authorised DGSV officer. Mangoes shall be treated with a hot water submersion treatment in accordance with the following schedule:

1. Fruit pulp temperature must be 21°C or above prior to commencing treatment.
2. Fruit must be submerged at least 10 cm below the water surface.
3. Water must circulate constantly and be kept at 46°C throughout the treatment period, with the following tolerances:
   a. During the first five minutes of the treatment – temperatures may fall as low as 45.4°C provided the temperature is at least 46°C at the end of the five-minute period.
   b. For treatments lasting 65 to 70 minutes – temperatures may fall as low as 45.4°C for no more than 10 minutes.
   c. For treatments lasting 90 minutes – temperatures may fall as low as 45.4°C for no more than 15 minutes.

Fruit shape	**Fruit weight (grams)**	**Dip time****
Rounded varieties*	up to 500 grams	75 minutes
	500 to 700 grams	90 minutes
	701 to 900 grams	110 minutes

* varieties such as 'Tommy Atkins', 'Kent', 'Hayden' and 'Keitt'.

** the dip time must be extended for an additional 10 minutes if hydrocooling starts immediately after the hot water immersion treatment.

- All consignments of treated mangoes destined for Australia **must be certified** by the United States Authorities as being permitted to enter the USA.
- All consignments of mangoes destined for Australia shall be accompanied by a Phytosanitary Certificate that has been issued and signed by an authorised officer of DGSV. The Phytosanitary Certificate shall be endorsed with the words:

"The product complies with the requirements of the agreement between AQIS and DGSV concerning the export of mangoes to Australia."

- The treatment details, packing shed registration numbers, fruit quantity, fruit varieties, state of origin and van or shipping container door seal numbers are to be inserted on the Phytosanitary Certificate.
- The fruit must be packed in approved export cartons stamped with a seal 5 x 8 cm or more to identify that the fruit is for Australia with the following

markings:

MANGO DE EXPORTACION
A AUSTRALIA
TRATADO, SARH, MEXICO

OR

MANGO DE EXPORTACION
A AUSTRALIA
TRATADO, SAGAR, MEXICO

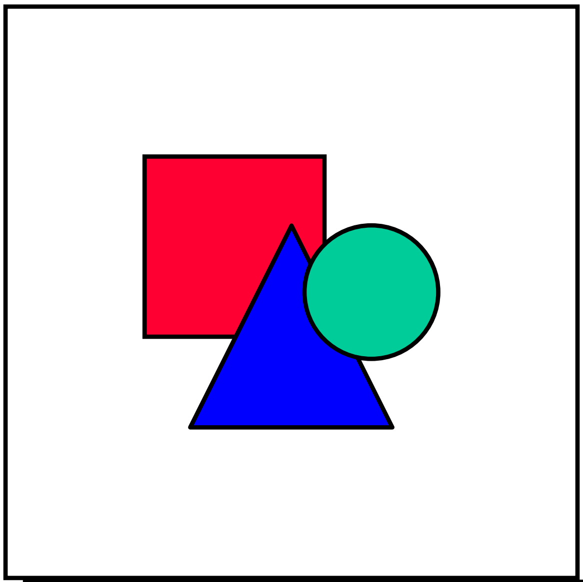
Fresh mango fruit imports from Mexico are subject to the following requirements on arrival into Australia:

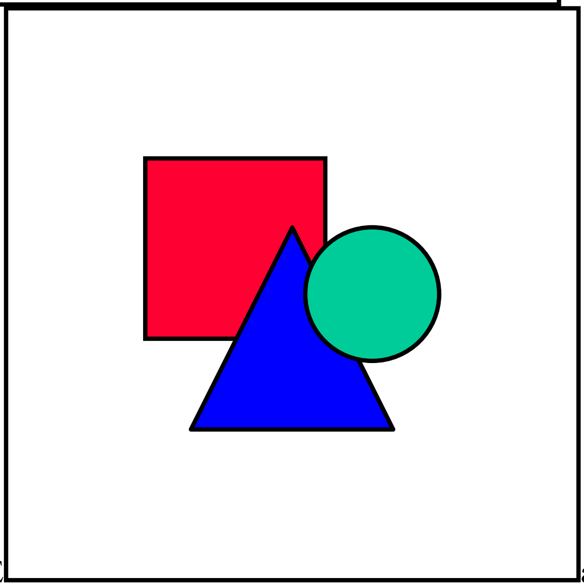
- The fruit is to be inspected on arrival using a 600 fruit sample per packing shed making up the consignment.
- The discovery of live quarantine pests in Australia will result in the destruction or re-export of the shipment and suspension of permission for further imports from Mexico. Any shipments in transit at the time of the suspension of the agreement will be destroyed or re-exported on arrival in Australia.
- Quarantine pests of mangoes from Mexico include *Anastrepha* spp. and *Ceratitis capitata*. If quarantine pests are detected on mangoes, AQIS Plant Programs must be notified immediately.

Guimaras Island, the Philippines

Australia has a Specific Commodity Understanding (SCU) with the Philippines, which specifies that fresh mango fruit imported from the Philippines must be from Guimaras Island only. State quarantine regulations currently prohibit the entry of Philippine mangoes into the State of Western Australia. This matter is under negotiation between AQIS and the Department of Agriculture Western Australia.

The current requirements for fresh mango fruit imports includes the following:





- Each consignment must be accompanied by a Phytosanitary Certificate endorsed:

"Produced, treated and packed in accordance with the specific commodity understanding between BPI and AQIS."

AND

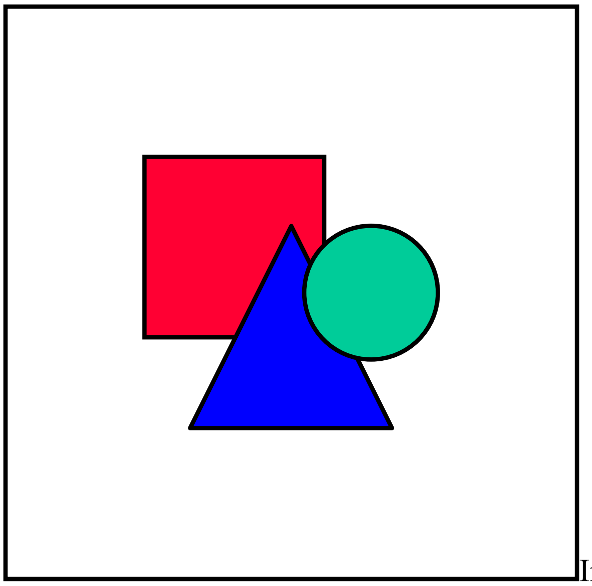
"Mangoes have been produced in Guimaras Island which has been subject to annual surveys and found to be free of mango pulp weevil (MPW; Sternochetus frigidus) and mango seed weevils (MSW; including S. mangiferae)."

AND either

"Shipped direct from the Philippines to Australia."

OR

"Trans-shipped via Singapore." (sealed containers only).

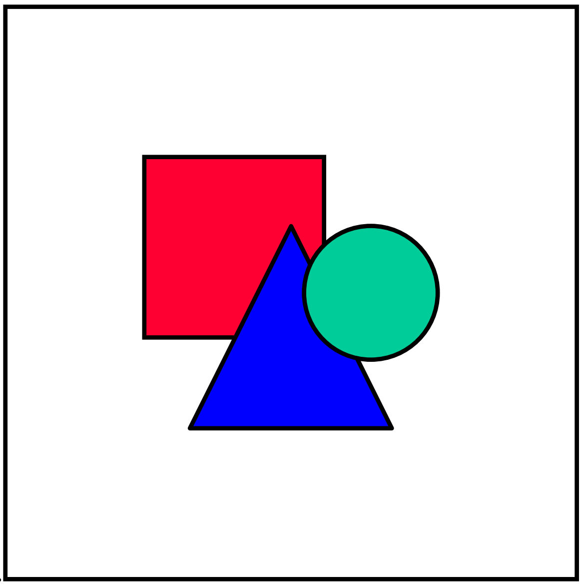


- In addition the following information must be entered onto the Phytosanitary Certificate:

1. Specific treatment details in the treatment section (i.e. vapour heat treated at not less than 46°C for at least 10 minutes).
2. The registered vapour heat treatment centre name in the additional information section in the treatment section.
3. The container number and container seal number, or if the container cannot be sealed (direct shipments only) the words "container not sealed by BPI", must be entered in the distinguishing marks and container numbers section.
4. The number of cartons for each lot in the consignment must be included within the phytosanitary certificate to facilitate trace back if necessary.
5. A copy of the Vapour Heat Treatment (VHT) data logger records for each respective treatment must be forwarded to AQIS with the Phytosanitary Certification.

Unsealed airfreight containers are permitted for direct shipments between the Philippines and Australia only.

- The fruit must be packed in cartons that have had any openings either screened with mesh no greater than 1.6 mm diameter or covered with tape to ensure that any opening greater than 1.6 mm is closed. In addition, the cartons must be sealed by BPI with BPI sticker/seal. All cartons must be marked "For Australia" and labelled with a unique lot number that incorporates the date of



treatment.

- Currently only the following facilities are registered treatment facilities. Importers must nominate the treatment facility on Import Permit Applications.

	Facility Name	**Address**
1	Philippine Far East Agro-Products, Inc.	Rambutan Road, FTI Complex, Taguig, Metro Manila
2	Diamond Star Agro-Product, Inc.	Multi-purpose Building, FTI Complex, Taguig, Metro Manila
3	Pelican Agro-Products, Inc.	DBP Avenue cnr Sirloin Street, FTI Complex, Taguig, Metro Manila
4	DHM Philippine Produce, Inc.	FTI Complex, Manila
5	Hi-Las Marketing Corporation	FTI Complex, Manila

- Insects and contaminants must be treated, removed or destroyed using an AQIS approved method.

THE FRESH MANGO INDUSTRY

THE MANGO INDUSTRY IN AUSTRALIA

Mangoes are grown mainly in tropical and subtropical regions. Queensland is the largest mango growing state, producing over 80% of Australia's crop (QFVG, 1997). Eighty percent of the Queensland crop is produced around the areas of Bowen, Home Hill, Ayr and the Atherton Tableland. The Atherton Tableland (Mareeba) is the second largest mango growing region, accounting for about 25% of the national annual crop. Mangoes are also grown locally around the Brisbane suburbs north to Bundaberg/Childers (Australian Horticulture, 1995).

Mangoes are also grown in the Northern Territory, Western Australia and along the northern coast of New South Wales. Approximately 15% of the national crop is grown in the Northern Territory with the main growing areas in Darwin and Katherine. There is also significant production in Carnarvon and the Kimberley area of Western Australia in Kununurra.

The four main varieties of mango grown in Australia are Kensington Pride (commonly known as Bowen Special), R2E2, Keitt and Palmer. The Kensington Pride variety accounts for almost 80% of production in Queensland. In addition, relatively small numbers of fruit are produced of other cultivars, such as Kent (originally from Florida) and the Nam Doc Mai (originally from Thailand). These are grown in north Queensland, the Northern Territory and Western Australia. Brooks and Haden are two other varieties grown in Australia on a small scale. Approximately 50% of new plantings in Queensland in the last five years consist of newer varieties such as Keitt, R2E2, Palmer and Nam Doc Mai (Holmes, 1997).

Due to the wide geographical distribution of growing regions, combined with the use of early and late maturing varieties, Australia is able to harvest mangoes for eight months of the year from September to April. However, approximately 50% of Australian production occurs in December. Kensington Pride is available from October to January and the R2E2 variety is available from December to January, while Keitt and Palmer varieties are available from January to late March.

With the industry development that is taking place and the significant plantings of mangoes over the last decade, Australian production is expected to increase. Fluctuations in mango production occur between years due to irregular flowering (Australian Horticulture, 1995). Australian mango production in 1998–99 decreased by 38.5% to 26,372 tonnes compared to 1997–98. Australian mango production in 1999–2000 increased from the previous season, which had been adversely affected by heavy rains and flooding in Queensland, with the total harvest up by 44% to 38,071 tonnes (ABS, 2001).

In 1998–99, 15% of the fresh produce was processed and in 1999–2000 it was 23%. The gross value of Australian mango production for 1998–99 was $66.7M, down $14M from 1997–98. Queensland was the main producing state with 28,233 tonnes or 75% of the national harvest (ABS, 2002). Mango production figures by state in Australia are presented in Table 1.

Table 1 Fresh mango production (tonnes) by state in Australia from 1990–2001

Season	NSW	NT	QLD	WA	TOTAL
1990–91	331	1 003	10 303	281	11 918
1991–92	183	2 020	11 756	568	14 527
1992–93	139	4 211	26 084	566	31 000
1993–94	117	3 897	18 799	1 400	24 213
1994–95	–	5 530	30 612	1 575	37 717
1995–96	–	5 666	20 445	1 607	27 718
1996–97	273	2 668	28 366	1 095	32 402
1997–98	–	–	–	–	36 567
1998–99	–	–	–	–	26 372
1999–2000	–	5 244	30 770	1 922	38 071
2000–01	386	6 718	28 233	2 060	37 398

Source: Australian Bureau of Statistics (2001, 2002)

Western Australia has strict quarantine requirements for the interstate movement of mangoes for pests such as mango seed weevil (MSW, *Sternochetus mangiferae*), which has not been reported in the state. WA will only accept mangoes from production areas in other Australian states that are free of MSW (e.g. Katherine in the Northern Territory). An eastern state property wishing to export to WA must undergo sampling for two years prior to the first consignment being permitted to cross the border to demonstrate property freedom (Cook, 2001). Maintenance of property freedom is accepted on the basis of there being no MSW infestation within 50 km of the property, and no detection in annual fruit sampling or consignment sampling (WAQIS, 1999).

Export of mangoes from Australia

Export markets for mangoes are well established, and account for 10% of Australian production. Due to the high cost of airfreight only a small quantity of fruit is currently exported to neighbouring South-East Asian countries such as Hong Kong, Singapore and to Saudi Arabia. Major export markets for Australian mangoes are given in Table 2.

Several countries such as Oman, Saudi Arabia and the United Arab Emirates (UAE) require mangoes to be free of MSW as a condition of entry into those countries. The phytosanitary protocol of area freedom for MSW is based on (i) annual surveys involving the cutting of random fruit samples to verify absence of MSW, and (ii) a mandatory 2% fruit cutting random sample of each export consignment, to demonstrate freedom from MSW. Currently, only Western Australia has area freedom for MSW. For all other areas other than the Western Australia growing areas of Carnarvon, Swan, Kununurra and areas north of Kununurra, a mandatory 2% destructive sample for MSW must be undertaken in addition to normal inspection for phytosanitary certification.

Exports of Australian mangoes in 1998–99 were 2,735 tonnes, which were well below the previous two years. In 1999–2000 exports were 3,226 tonnes, an increase by 491 tonnes against the previous year.

Table 2 Major export markets for Australian mangoes (quantity and value)

Importing country	1996–97		1997–98		1998–99		1999–2000	
	tonnes	($ 000)	tonnes	($ 000)	tonnes	($ 000)	tonnes	($ 000)
Hong Kong	1 860	4 574	2 540	6 196	1 290	3 891	1 067	2 550
Singapore	1 122	2 926	950	2 526	852	2 677	1 107	2 628
Japan	211	1 298	197	1 873	156	1 598	469	3 674
Malaysia	276	548	155	445	68	251	136	290
Saudi Arabia	157	406	274	725	111	383	110	390
France	29	145	74	236	66	300	85	401
Lebanon	40	136	69	170	33	112	14	56
Brunei	21	83	16	62	8.8	34	4.2	13
United Arab Emirates	23	66	145	383	105	437	118	412
Austria	10	57	0	0	–	–	–	–
Qatar	–	–	–	–	12	49	23	93
Other	44	279	157	538	33	141	93	229
Total	**3 793**	**10 518**	**4 577**	**13 127**	**2 735**	**9 873**	**3 226**	**10 736**

THE MANGO INDUSTRY IN INDIA

In India, mangoes are grown in tropical and subtropical regions from sea level to an altitude of 1500 m (i.e. from Cape Comorin to Himalayas). However, they are grown commercially in areas up to 600 m altitude where the temperature rarely goes below 0ºC (Negi, 2000), and grows best in temperatures around 27ºC.

There are nearly 1,000 cultivars or varieties in India. However only about 30 cultivars are grown commercially (Anon., 2003). These include Dashehari, Langra, Chausa, Bombay

Green and Fazli in north India; Banganpalli, Totapuri, Neelum, Pairi, Suvarnarekha, Mulgoa, Kalapady and Rumani in south India; Alphonso, Kesar, Mankurad, Fernandin and Vanraj in western India; and Langra, Fazli, Chausa, Zardalu, Himsagar and Malda in eastern India (Negi, 2000). Other important mango varieties include Amrapalli, Bangalora, Bombay, Gulab Khas, Kishen Bhog, Mallika and Samar Bahist Chausa (Anon., 2003). Most of the Indian mango cultivars have specific ecogeographical requirements for optimum growth and fruiting/yield. The general characteristics of major mango varieties grown in India are summarised in Table 3.

Table 3 Characteristics of major mango varieties grown in India

Variety	Shape	Flavour	Flesh fibre	Colour
Alphonso	Ovate oblique, base obliquely flattened, ventral shoulder broader and higher than dorsal	Sweet; characteristic aroma	Fibre; less soft	Medium thick/ yellow to orange yellow
Banganpalli	Oval; ventral shoulder higher than dorsal	Sweet; delightful flavour	Firm to meaty; fibreless	Thin, smooth and shining golden yellow
Chausa	Ovate to oval oblique with oblong ventral shoulder	Sweet; pleasant aroma	Fibreless; juicy	Thick golden yellow to light yellow
Dashehari	Oblong to oblong oblique, erected shoulder	Very sweet	Fibreless; juicy	Thin, yellowish green to yellow
Kesar	Oblong, flat shoulder	Sweet; pleasant aroma	Fibreless	Thin, smooth and golden yellow with red blush on shoulders
Langra	Oval, rounded to slight flattened shoulder	Sweet; strong aroma	Low fibres; moderate juicy	Thin, green to lettuce green
Malda	Ovate oblique, flattened base	Sweet; pleasant flavour	Fibreless; moderate juicy	Thick, primuline yellow
Neelum	Ovate oblique, slightly extended	Sweet delightful	Fibreless; moderate juicy	Medium thick, saffron yellow
Suvarnarekha	Ovate oblong, flat shoulder	Sweet	Medium fibre; firm	Thick, reddish yellow to light cadmium with a blush of jasper red
Totapuri	Oblong, erected shoulder with beak	Less sweet; flat aroma	Fibre; juicy	Thick, green, yellow or combination of both colours

Source: Lal and Reddy (2002)

Indian mangoes are cultivated around February/early March, when the cold weather begins to subside and the danger of destruction through frost disappears. Mango fruits mature in 3–4 months from flowering and the fruit colour changes from dark green to light green on maturity. The fruits are harvested at the green mature stage in the morning hours. The Alphonso variety from South India is an early season variety and comes to the market by mid February. Its season is about two months until April/May. Mangoes grown in Uttar Pradesh (i.e. Chausa, Dashehari and Langra) enter the market in April and their season lasts until July/August. Harvesting is normally started after a few fruits drop. It comes into market early in May and remains in market until August/September. The important commercial varieties, states and seasonality of mangoes in India are summarised in Table 4. Figure 1 shows the location of major mango production states on the map of India.

Table 4 Commercial varieties, states and seasonality of Indian mangoes

Variety	States	Feb		Mar		Apr		May		Jun		Jul		Aug		Sep	
Alphonso	Andhra Pradesh, Goa, Gujarat, Karnataka, Maharashtra			■	■	■	■	■	■								
Banganpalli	Andhra Pradesh, Karnataka, Orissa, Tamil Nadu					■	■	■	■	■	■	■	■				
Chausa	Bihar, Himachal Pradesh, Madhya Pradesh, Punjab, Uttar Pradesh									■	■	■	■	■	■		
Dashehari	Bihar, Haryana, Madhya Pradesh, Punjab, Uttar Pradesh									■	■	■	■				
Kesar	Gujarat, Maharashtra							■	■	■	■						
Langra	Bihar, Haryana, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, West Bengal									■	■	■	■	■	■		
Neelum	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu					■	■	■	■	■	■	■	■	■	■		
Suvarnarekha	Andhra Pradesh, Karnataka, Maharashtra					■	■	■	■	■	■						
Totapuri	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu					■	■	■	■	■	■	■	■				

Source: Anon. (2004a) and APEDA (2000)

Mango production in India

Mangoes are mainly grown in the states of Andhra Pradesh (29%), Tamil Nadu (5%), Karnataka (9%) in the south; Maharashtra (8.15%) and Gujarat (4.2%) in the west; Uttar Pradesh (19%) in the north and Bihar (16%) in the east (Lal and Reddy, 2002). Other growing states include Goa, Kerala, Madhya Pradesh, Punjab, West Bengal, and partially in Haryana, Orissa and Rajasthan (APEDA, 2000). The total area under mango cultivation is estimated to be 1,283,030 hectares with an estimated annual production of 10,810,957 metric tonnes (MTs) (Lal and Reddy, 2002). The mango area and production figures for major Indian states are shown in Table 5.

Table 5 Major mango production states in India

State	1996–97		1997–98		1998–99	
	Area (ha)	Prod. (MT)	Area (ha)	Prod. (MT)	Area (ha)	Prod. (MT)
Andhra Pradesh	271.3	3 256.6	276.0	3314.3	252.1	2270.0
Bihar	151.7	910.4	153.2	1838.8	154.8	1858.0
Gujarat	52.8	288.9	52.8	288.9	57.6	382.5
Karnataka	116.4	1106.6	123.8	1176.4	123.8	1177.0
Maharashtra	65.4	196.4	65.4	65.4	110.0	196.0
Tamil Nadu	96.6	413.9	104.5	135.9	93.2	559.2
Uttaranchal	–	N/A	–	N/A	22.0	668.0
Uttar Pradesh	256.1	2418.7	258.6	1659.4	240.5	1775.0
TOTAL	**1344.0**	**9881.0**	**1381.0**	**10156.0**	**1402.0**	**9782.0**

Source: Lal and Reddy (2002)

Figure 1 Map of India

Source: Anon. (2004b)

Export of mangoes from India

India is the largest producer of mangoes in the world, producing over 65% of total world production (Patil and Patil, 1994). India exports fresh mangoes to over 50 countries (Patil and Patil, 1994). The major importers of fresh Indian mangoes are Gulf countries such as the UAE, Saudi Arabia, Kuwait, Bahrain, Qatar and Yemen. Other countries such as Bangladesh, the United Kingdom (UK), France, Belgium, Germany, the Netherlands, Spain, Israel, Singapore, Sri Lanka, Malaysia, Hong Kong and China, Canada and the United States are also important markets. UAE, Saudi Arabia, Kuwait, UK, Bahrain, Qatar, Bangladesh, Singapore and Malaysia together account for 97.17% in total exports of fresh mangoes from India (Patil and Patil, 1994). In 1999–2000, exports of fresh Indian mangoes were 37,109.67 MT (Anon., 2004a), with a value of approximately US$20M (Lal and Reddy, 2002).

PEST RISK ANALYSIS

In accordance with the International Standard for Phytosanitary Measure (ISPM) #11 (2004) *Pest Risk Analysis for Quarantine Pests including Analysis of Environmental Risks and Living Modified organisms*, this pest risk analysis (PRA) comprises three interrelated stages:

- Stage 1: initiation
- Stage 2: risk assessment
- Stage 3: risk management.

A qualitative detailed pest risk assessment was conducted for the quarantine pests associated with mangoes from India. An outline of the methodology used for this review is provided in the Biosecurity Australia publication *Draft Guidelines for Import Risk Analysis*-September 2001.

STAGE 1: INITIATION

Initiation of this PRA followed the access request in 2000 for mango fruit from India into Australia using vapour heat treatment (VHT) for the disinfestaion of fruit flies. Prior to 1996, fresh mangoes were regularly exported from India to Australia under an ethylene dibromide (EDB) treatment and in 1996, trade in mangoes was suspended due to the global phase-out in use of EDB on the basis of worker health and safety concerns.

The “PRA area” is defined in this PRA as Australia or in the case of regional quarantine pests the “PRA area” is defined by the state of Australia that has regional freedom from the pest. The ‘endangered area’ is defined as any area within Australia, where susceptible hosts are present, and in which ecological factors favour the establishment of a pest that might be introduced in association with mango fruit from India. The pathway is considered to be fresh mango fruit, produced under commercial orchard production methods within India.

STAGE 2: RISK ASSESSMENT

Pest categorisation

The process of pest categorisation is to determine which of the pests associated with mango fruit from India meet the IPPC definition of a quarantine pest i.e. *“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, 1996).

The quarantine pests of mango fruit from India have been determined through consideration of relevant information on the pest status of mango fruit from India provided by APEDA, in collaboration with the Ministry of Agriculture of the Republic of India (IMOA) and available information on the status of these pests in Australia (present or absent, present but with restricted/limited distribution and under official control, present on the pathway (mango fruit), potential for entry, establishment or spread and associated consequences). These criteria are used to categorise and subsequently identify the quarantine pests of mango fruit from India to Australia. Pests that do not meet the definition of a quarantine pest are not considered further.

Appendix 1 lists the pests associated with mango fruit from India and their presence or absence in Australia and whether the pest occurs on the pathway (mango fruit) under consideration in this risk analysis.

Pests comprising 476 arthropods, 19 nematodes, 62 fungi, 5 bacteria, one virus and one alga were identified as being possibly associated with mango production in India (Appendix 1).

A number of pests listed in Appendix 1 are considered to be present in Australia but absent from Western Australia (based on the evidence provided to Biosecurity Australia by the Department of Agriculture Western Australia). Many of the pests associated with fresh mangoes in India occur in Australia or are not present on the import pathway. These pests a were not considered further in the risk assessment.

Of the 564 pests considered, 394 pests (358 arthropods, 7 nematodes, 28 fungi and 1 virus) were either not present in Australia, or if present under official control and hence considered further. Of these 394 pests that were considered further, 45 pests (42 arthropods and 3 fungi) were considered to be associated with the fresh mango fruit pathway (Appendix 1).

Appendix 2 lists each pest absent from Australia (or part (s) of Australia) and with potential for entry (considered to be associated with the fresh mango fruit pathway), according to (a) its potential to establish or spread in Australia, and (b) its potential for consequences. Categorisation of potential for establishment or spread and potential for consequences was expressed using the terms ‘feasible’/’not feasible’ and ‘significant’/’not significant’, respectively.

Of the 45 pests (42 arthropods and 3 fungi) associated with fresh mango fruit in India, 32 pests (31 arthropods and one pathogen) were assessed as having ‘feasible’ potential for entry, establishment or spread in the PRA area and ‘significant’ potential for associated consequences. These pests were considered to satisfy the IPPC criteria for a quarantine pest (Appendix 2).

A detailed pest risk assessment (PRA) was conducted for these 32 pests that were categorised as quarantine pests to determine an unrestricted risk estimate for each pest.

Four sooty mould causing fungi (*Capnodium mangiferae*, *Capnodium ramosum*, *Meliola mangiferae* and *Tripospermum myrti*) were identified as being on the pathway but are not considered further for risk assessment as they are weak pathogens or secondary invaders and are normally considered to be a cosmetic or aesthetic problem (Nameth *et al*., 2003). For further comments refer to Appendix 1.

Summary of pest categorisation

Thirty two pests of mango fruit from India are considered to satisfy the IPPC criteria for a quarantine pest and therefore require detailed risk assessment. These pests are listed in Table 6. Six of the 32 quarantine pests listed in Table 6 have been assessed in the previous import policy for mangoes from the Philippines (Guimaras Island), as indicated in the footnote. All 32 quarantine pests have been categorised in this draft revised import policy according to their status in Australia, presence on the pathway and potential for entry, establishment or spread in the PRA area and associated consequences.

Table 6 Quarantine pests for mangoes from India

Scientific name	Common name
ARTHROPODA	
**Abgrallaspis cyanophylli* (Signoret) [Hemiptera: Diaspididae]	Cyanophyllum scale
**Aspidiotus nerii* Bouché [Hemiptera: Diaspididae]	Oleander scale
Bactrocera caryeae (Kapoor) [Diptera: Tephritidae]	Fruit fly
Bactrocera correcta (Bezzi) [Diptera: Tephritidae]	Guava fruit fly
Bactrocera cucurbitae[1] (Coquillett) [Diptera: Tephritidae]	Melon fly
Bactrocera diversa (Coquillett) [Diptera: Tephritidae]	Three striped fruit fly
Bactrocera dorsalis (Hendel) [Diptera: Tephritidae]	Oriental fruit fly
Bactrocera tau (Walker) [Diptera: Tephritidae]	Fruit fly
Bactrocera zonata (Saunders) [Diptera: Tephritidae]	Peach fruit fly
Ceroplastes actiniformis Green [Hemiptera: Coccidae]	Soft scale
**Coccus longulus* (Douglas) [Hemiptera: Coccidae]	Long soft scale
Cryptoblabes gnidiella (Millière) [Lepidoptera: Pyralidae]	Honeydew moth
Deanolis sublimbalis[1] (Hampson) [Lepidoptera: Pyralidae]	Red-banded mango caterpillar
Deudorix isocrates (Fabricius) [Lepidoptera: Lycaenidae]	Pomegranate fruit borer
Dysdercus koenigii (Fabricius) [Hemiptera: Pyrrhocoridae]	Red cotton bug

Scientific name	Common name
**Ferrisia virgata* (Cockerell) [Hemiptera: Pseudococcidae]	Striped mealybug
**Hemiberlesia rapax* (Comstock) [Hemiptera: Diaspididae]	Greedy scale
**Lepidosaphes beckii* (Newman) [Hemiptera: Diaspididae]	Mussel scale
**Lepidosaphes gloverii* (Packard) [Hemiptera: Diaspididae]	Glover's scale
Milviscutulus mangiferae (Green) [Hemiptera: Coccidae]	Mango shield scale
Nipaecoccus nipae (Maskell) [Hemiptera: Pseudococcidae]	Coconut mealybug
Orgyia postica (Walker) [Lepidoptera: Lycaenidae]	Cocoa tussock moth
Planococcus ficus (Signoret) [Hemiptera: Pseudococcidae]	Grapevine mealybug
Planococcus lilacinus[1] (Cockerell) [Hemiptera: Pseudococcidae]	Coffee mealybug
**Planococcus minor* (Maskell) [Hemiptera: Pseudococcidae]	Pacific mealybug
Rastrococcus iceryoides (Green) [Hemiptera: Pseudococcidae]	Downey snowline mealybug
Rastrococcus invadens Williams [Hemiptera: Pseudococcidae]	Mealybug
Rastrococcus spinosus (Robinson) [Hemiptera: Pseudococcidae]	Philippine mango mealybug
Spilostethus pandurus (Scopoli) [Hemiptera: Pyrrhocoridae]	Indian milkweed bug
Sternochetus frigidus[1] (Fabricius) [Coleoptera: Curculionidae]	Mango pulp weevil
**Sternochetus mangiferae*[1] (Fabricius) [Coleoptera: Curculionidae]	Mango seed weevil
FUNGI	
**Elsinoë mangiferae*[1] Bitancourt & Jenkins [Dothideales: Elsinoaceae]	Mango scab

[1] Assessed under existing policy for mangoes from the Guimaras Island, the Philippines (refer Appendix 3).

* WA only – these species are quarantine pests for the State of Western Australia due to their absence from this State.

The next section of the document comprises the detailed risk assessment for the 32 identified quarantine pests for mango fruit from India.

DETAILED RISK ASSESSMENT FOR QUARANTINE PESTS

A detailed risk assessment is presented here for each of the quarantine pests identified through the process of pest categorisation. The risk assessment involved the estimation of the level of unrestricted risk posed by each quarantine pest on mangoes from India by combining likelihood estimates for entry, establishment and spread with the estimate of associated potential consequences. The unrestricted risk estimates were then compared with Australia's appropriate level of protection (ALOP) to determine which quarantine pests presented an unacceptable level of risk requiring the further consideration of risk mitigation options.

Likelihood estimates for entry, establishment and spread and estimates of associated potential consequences are supported by relevant biological information. . Where pests shared similar biological characteristics, risk assessments were based on grouping of such pests (e.g. fruit flies). The proposed risk management measures were also developed for these groups.

In the context of the scope of this document, the risk assessments were conducted on the basis of standard cultivation, harvesting and packing activities involved in the commercial production of mango fruit i.e. in-field hygiene and management of pests (e.g. orchard control program), cleaning and hygiene during packing, and commercial quality control activities.

The groups are: fruit flies (7 species), weevils (2 species), armoured scales (5 species), soft scales (3 species), mealybugs (8 species), plant bugs (2 species), lepidopterans (4 species) and one pathogen.

ARTHROPODS

GROUP 1 – FRUIT FLIES

Fruit flies are serious pests of a wide variety of fruits and vegetables and have the potential to be of major economic importance. The fruit flies [Diptera: Tephritidae] examined in this pest risk analysis are:

- *Bactrocera caryeae* (Kapoor) – Fruit fly
- *Bactrocera correcta* (Bezzi) – Guava fruit fly
- *Bactrocera cucurbitae* (Coquillett) – Melon fly
- *Bactrocera diversa* (Coquillett) – Three striped fruit fly

- *Bactrocera dorsalis* (Hendel) – Oriental fruit fly
- *Bactrocera tau* (Walker) – Fruit fly
- *Bactrocera zonata* (Saunders) – Peach fruit fly.

Synonyms and changes in combination:

Bactrocera caryeae: *Dacus caryeae* Kapoor, *Dacus poonensis* Kapoor.

Bactrocera correcta: *Chaetodacus correctus* Bezzi; *Dacus bangaloriensis* Agarwal & Kapoor; *Dacus dutti* Kapoor; *Strumeta paratuberculatus* Philip; *Dacus correctus* (Bezzi).

Bactrocera cucurbitae: *Dacus cucurbitae* Coquillett, 1899; *Chaetodacus cucurbitae* (Coquillett); *Dacus aureus* Tseng & Chu; *Dacus yuiliensis* Tseng & Chu; *Strumeta cucurbitae* (Coquillett); *Zeugodacus cucurbitae* (Coquillett).

Bactrocera diversa: *Dacus diversus* Coquillett; *Dacus citronellae* Kapoor & Katiyar, *Dacus quadrifidus* Hendel.

Bactrocera dorsalis: *Dacus dorsalis* Hendel, 1912; *Bactrocera conformis* Doleschall, 1858 (preocc.); *Bactrocera ferrugineus* (Fabricius); *Chaetodacus dorsalis* (Hendel); *Chaetodacus ferrugineus* (Fabricius); *Chaetodacus ferrugineus dorsalis* (Hendel); *Chaetodacus ferrugineus okinawanus* Shiraki, 1933; *Dacus ferrugineus* Fabricius; *Dacus ferrugineus dorsalis* Fabricius; *Dacus ferrugineus* var. *dorsalis* Fabricius; *Dacus ferrugineus okinawanus* (Shiraki); *Musca ferruginea* Fabricius (preocc.); *Musca ferruginea* Fabricius, 1794; *Strumeta dorsalis* (Hendel); *Chaetodacus ferrugineus* (Fabricius); *Strumeta ferrugineus* (Fabricius).

Bactrocera tau: *Dacus tau* Walker; *Bactrocera hageni* (Hendel); *Bactrocera* (*Zeugodacus*) *tau* (Walker); *Dacus hageni* (de Meijere); *Chaetodacus tau* (Walker); *Dacus caudatus* var. *nubilus* (Hendel); *Dacus nubilus* (Hendel); *Dasyneura tau* (Walker); *Zeugodacus nubilus* (Hendel).

Bactrocera zonata: *Dasyneura zonatus* Saunders, 1841; *Dacus ferrugineus* var. *mangiferae* Cotes; *Rivellia persicae* Bigot; *Chaetodacus zonatus* (Saunders); *Dacus* (*Strumeta*) *zonatus* (Saunders); *Dacus mangiferae* Cotes; *Dacus persicae* (Bigot); *Dacus zonatus* (Saunders); *Strumeta zonata* (Saunders); *Dasyneura zonata* Saunders; *Dacus persicus* (Biggott); *Strumeta zonatus* (Saunders).

Host(s):

Bactrocera caryeae: *Mangifera indica* (mango) (Peña and Mohyuddin, 1997).

Bactrocera correcta: Primary hosts are: *Anacardium occidentale* (cashew), *Mangifera indica* (mango), *Manilkara zapota* (sapodilla), *Mimusops elengi* (Asian bulletwood), *Muntingia calabura* (Jamaica cherry), *Psidium guajava* (guava), *Syzygium samarangense*

(Java apple), *Terminalia catappa* (Indian almond), *Ziziphus jujuba* (jujube) (CAB International, 2003).

Bactrocera cucurbitae: *B. cucurbitae* is a very serious pest of cucurbit crops. According to Weems (1964) it has been recorded from over 125 plants, including members of families other than Cucurbitaceae. However, many of those records were based on casual observation of adults resting on plants or caught in traps set in non-host trees.

Hosts include: *Carica papaya* (papaya, pawpaw) (Tsuruta *et al*., 1997); *Citrullus lanatus* (wild melon), *Cucumis melo* (melon) (Allwood *et al*., 1999); *Cucurbita maxima* (giant pumpkin) (Tsuruta *et al*., 1997); *Cucurbita pepo* (pumpkin, squash), *Lycopersicon esculentum* (tomato) (Allwood *et al*., 1999); *Mangifera indica* (mango) (CAB International, 2003); *Manilkara zapota* (sapodilla), *Phaseolus vulgaris* (bean), *Psidium guajava* (guava); *Trichosanthes cucumerina* (snake gourd) (Tsuruta *et al*., 1997); *Vigna unguiculata* (cowpea) (Allwood *et al*., 1999).

Bactrocera diversa: *Cucurbita maxima* (giant pumpkin), *Cucurbita pepo* (pumpkin, squash), *Lagenaria siceraria* (bottle gourd), *Luffa acutangula* (angled luffa), *Luffa aegyptiaca* (smooth loofah), *Ziziphus jujuba* (jujube) (CAB International, 2003); *Mangifera indica* (mango) (Srivastava, 1997).

Bactrocera dorsalis: *B. dorsalis* is a very serious pest of a wide variety of fruits and vegetables (CAB International, 2003). Due to the confusion between *B. dorsalis* and related species in the Oriental fruit fly species complex (some 52 species that are found in the Oriental region, and a further 16 species native to Australasia), there are very few published host records which definitely refer to true *B. dorsalis* (CAB International, 2003). No host plant survey has yet been carried out to show which hosts are of particular importance within the Asian range of true *B. dorsalis*.

Recorded commercial hosts are: *Aegle marmelos* (bael fruit), *Anacardium occidentale* (cashew), *Annona reticulata* (bullock's heart), *Annona squamosa* (sugar apple), *Areca catechu* (betelnut palm), *Artocarpus altilis* (breadfruit), *Artocarpus heterophyllus* (jackfruit), *Capsicum annuum* (bell pepper), *Chrysophyllum cainito* (caimito), *Citrus maxima* (pummelo), *Citrus reticulata* (mandarin orange), *Coffea arabica* (arabica coffee), *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Dimocarpus longan* (longan), *Ficus racemosa* (cluster fig), *Litchi chinensis* (lychee), *Malus pumila* (apple), *Mangifera foetida* (bachang mango), *Mangifera indica* (mango), *Manilkara zapota* (sapodilla), *Mimusops elengi* (Asian bulletwood), *Momordica charantia* (bitter gourd), *Muntingia calabura* (Jamaica cherry), *Musa* sp. (banana), *Nephelium lappaceum* (rambutan), *Persea americana* (avocado), *Prunus armeniaca* (apricot), *Prunus avium* (gean), *Prunus cerasus* (sour cherry), *Prunus domestica* (plum, prune), *Prunus mume* (Japanese apricot), *Prunus persica* (peach), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Pyrus communis* (pear), *Syzygium aqueum* (water apple), *Syzygium aromaticum* (clove), *Syzygium cumini* (jambolan), *Syzygium jambos* (rose apple), *Syzygium malaccense* (Malay apple), *Syzygium samarangense* (wax apple), *Terminalia catappa* (Indian almond), *Ziziphus jujuba* (jujube); *Ziziphus mauritiana* (Chinese date) (Allwood *et al*., 1999; Tsuruta *et al*., 1997).

Bactrocera tau: *B. tau* appears to show a preference for attacking the fruits of Cucurbitaceae, but it has also been reared from the fruits of several other plant families (CAB International, 2003). Due to the recent separation of previously confused species, the host data given below were taken from a recently published host catalogue that was largely based on a 1990s survey carried out in Thailand and Malaysia (Allwood *et al*., 1999).

Hosts include: *Cucumis melo* (melon), *Cucumis sativus* (cucumber), *Cucurbita maxima* (giant pumpkin), *Luffa acutangula* (angled luffa), *Momordica charantia* (balsam apple) (CAB International, 2003); *Mangifera indica* (mango) (Peña and Mohyuddin, 1997).

Bactrocera zonata: Primary hosts are: *Mangifera indica* (mango), *Prunus persica* (peach), *Psidium guajava* (guava) (CAB International, 2003). Other hosts include: *Aegle marmelos* (bael tree), *Annona squamosa* (sugar apple), *Careya arborea* (slow match tree), *Carica papaya* (papaya, pawpaw), *Citrus* sp., *Cydonia oblonga* (quince), *Ficus carica* (fig), *Grewia asiatica* (phalsa), *Luffa* sp. (loofah), *Malus pumila* (apple), *Momordica charantia* (balsam pear), *Phoenix dactylifera* (date-palm), *Punica granatum* (pomegranate), *Terminalia catappa* (Indian almond) (CAB International, 2003).

Plant part(s) affected: Fruit (Peña and Mohyuddin, 1997; Srivastava, 1997).

Distribution:

Bactrocera caryeae: India (Karnataka, Tamil Nadu (IIE, 1994a), Maharashtra (Carroll *et al*., 2002)); Sri Lanka (IIE, 1994a).

Bactrocera correcta: India (Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Punjab, Tamil Nadu), Japan, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, United States (CAB International, 2003). In India, this potential pest often occurs with serious pest species such as *B. dorsalis* and *B. zonata* (Kapoor, 1989).

Bactrocera cucurbitae: *B. cucurbitae* is widely distributed in Asia, but also occurs in Africa, North America and Oceania regions (CAB International, 2003). In Asia, *B. cucurbitae* is recorded from Afghanistan (IIE, 1995a); Bangladesh (CAB International, 2003); Brunei Darussalam (Waterhouse, 1993); Cambodia (IIE, 1995a); China (CAB International, 2003); India (Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal) (CAB International, 2003; IIE, 1995a); Indonesia, Iran, Laos, Malaysia, Myanmar, Nepal, Oman, Pakistan, Philippines, Saudi Arabia (CAB International, 2003); Singapore (IIE, 1995a); Sri Lanka, Thailand, United Arab Emirates and Vietnam (CAB International, 2003). For a full distribution listing, refer to CAB International (2003).

Bactrocera diversa: China, Sri Lanka, Thailand (CAB International, 2003); India (DPP, 2001).

Bactrocera dorsalis: True *B. dorsalis* is restricted to mainland Asia (except the peninsula of southern Thailand and West Malaysia), as well as Taiwan and its adventive population in Hawaii (Drew and Hancock, 1994). CAB International (2003) also includes California and Florida, USA, in the distribution because the fly is repeatedly trapped there in small numbers. This species is a serious pest of a wide range of fruit crops in Taiwan, southern Japan, China and in the northern areas of the Indian subcontinent (CAB International, 2003).

In Asia, *B. dorsalis* is recorded from Bangladesh (IIE, 1994b); Bhutan, Cambodia, China (Drew and Hancock, 1994); Guam (Waterhouse, 1993); Laos, Myanmar (Drew and Hancock, 1994); Nauru (Waterhouse, 1993); Nepal, Pakistan, Sri Lanka, Thailand, United States (Hawaii) and Vietnam (Drew and Hancock, 1994).

Bactrocera tau: Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China (Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hong Kong, Sichuan, Taiwan, Yunnan, Zhejiang), India (Uttar Pradesh), Indonesia (Sumatra), Laos, Malaysia (Peninsular Malaysia, Sabah, Sarawak), Myanmar, Singapore, Thailand, Vietnam (CAB International, 2003).

Bactrocera zonata: Bangladesh, Egypt, India (Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal), Iran, Laos, Mauritius, Myanmar, Oman, Pakistan, Réunion, Saudi Arabia, Sri Lanka, Thailand, United Arab Emirates, Vietnam (CAB International, 2003).

NOTE: The listed fruit fly species are recognised as significant pests of mangoes in India. Due to the recognised universal importance of *Bactrocera dorsalis*, it was used as the basis for the risk assessment and development of proposed risk management measures for all fruit fly species identified.

Introduction and spread potential

Probability of importation

The likelihood that fruit flies will arrive in Australia with the importation of fresh mangoes from India: **High**.

- *B. dorsalis* is known to be associated with the mango fruit pathway. This species infests mango fruits in the entire Asian-Pacific region (Srivastava, 1997). The dark puncture caused by the oviposition of an adult *B. dorsalis* fly is not very conspicuous as its colour blends with the dark green colour of the fruit (Srivastava, 1997). However, it is very clearly visible in some yellow and pale brown mango varieties.

- Eggs are laid below the skin of the fruit (CAB International, 2003). Upon hatching, the larvae (maggots) feed on the pulp of the fruit for a few days. This feeding damage causes a brown rotten patch to appear on the fruit surface and the mesocarp becomes dirty brown.
- Fruit fly larvae can survive in picked fruit and are likely to be present in fruit that is packed for export. As fruit fly eggs are laid internally, infested fruit are not likely to be detected during sorting, packing and inspection procedures. Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit with regard to blemishes, bruising or damage to the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of internal pests that may be feeding under the surface of the fruit.
- Routine washing procedures undertaken within the packinghouse would not remove the eggs or larvae from under the fruit surface.

Probability of distribution

The likelihood that fruit flies will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **High**.

- It is likely that fruit fly larvae of this spp. would survive storage and transportation due to their ability to tolerate cold temperatures and the availability of an ample food supply.
- The pests are likely to survive storage and transportation as adult females of *Bactrocera dorsalis* are known to hibernate during the winter in India (Srivastava, 1997). Adults of *B. dorsalis* occur throughout the year and live for 1-3 months depending on temperature (up to 12 months in cool conditions) (Christenson and Foote, 1960).
- Fruit infested with eggs and larvae are likely be distributed throughout Australia for retail sale. Adults, larvae and eggs are likely to be associated with infested waste.
- Although damaged fruit are likely to be detected and removed from consignments due to quality concerns, fruit flies have the capacity to complete their development in discarded fruit and transfer to suitable hosts.
- Eggs can develop into larvae within stored fruit, at the point of sale or after purchase by consumers.

- Larvae can develop into adult flies, which are strong flyers (Fletcher, 1989) and able to move directly from fruit into the environment to find a suitable host. Many *Bactrocera* spp. can fly 50-100 km (Fletcher, 1989).

Probability of entry (importation × distribution)

The likelihood that fruit flies will enter Australia as a result of trade in fresh mangoes from India and be distributed in a viable state to the endangered area: **High**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Probability of establishment

The likelihood that fruit flies will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- For pests to establish and spread, a threshold limit must be reached. This threshold limit is the smallest number of pests capable of establishing a colony. One infested fruit is likely to contain many fruit fly larvae (e.g. clutch sizes of 3-30 eggs have been recorded for *B. dorsalis* (Fletcher, 1989)).
- Surviving female flies must be successful in locating suitable mating partners and fruiting hosts to lay eggs. The mating behaviour of *B. dorsalis* requires that males gather to form aggregations or leks (Shelly and Kaneshiro, 1991). Females fly to such male aggregations to increase their chances of mating. However, there will be a limited number of males available to form a lek, therefore reducing the probability of a successful mating. Shelly (2001) reported that *B. dorsalis* females were observed more frequently at larger leks (of 18 males or more). There is a likelihood of many suitable hosts for fruit fly species around the vicinity of the port of entry and other suburban areas around Australia. *B. carambolae* and *B. papayae* are members of the *B. dorsalis* complex of fruit flies (CAB International, 2003), and would have similar mating behaviour to *B. dorsalis*.
- There have previously been exotic fruit fly incursions in Australia of species from the *Bactrocera dorsalis* complex, which have been eradicated. *B. papayae* was detected around Cairns, northern Queensland in 1995. It was eradicated from Queensland by implementing an eradication programme using male annihilation and protein bait spraying (SPC, 2002). This example demonstrates that fruit fly species from the *B. dorsalis* complex can establish in Australia.

- Adults may live for many months and in laboratory studies, the potential fecundity of females of *B. dorsalis* was well over 1000 eggs (Fletcher, 1989).

Probability of spread

The likelihood that fruit flies will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Fruit flies possess many characteristics that facilitate successful colonisation. These include their high reproductive rate, longevity of adult flies, broad environmental tolerances and host range of both commercial and wild species which are widespread in Australia.
- The incidence of *B. papayae* in northern Australia in 1995 is indicative of the ability of introduced fruit fly species from the *Bactrocera dorsalis* complex to spread. Initially, the infested area covered 4,500 km² (Allwood, 1995), and was centred around Cairns. The declared pest quarantine area later expanded to 78,000 km² of north Queensland, including urban areas, farms, rivers, coastline and a large part of the Wet Tropics World Heritage Area (Cantrell *et al*., 2002). *B. dorsalis* and other *Bactrocera* spp. would have a similar capacity to spread in Australia due to their close biological relationship to *B. papayae* and their wide host range.

Probability of entry, establishment or spread

The overall likelihood that fruit flies will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **High**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of fruit flies: **High**.

Criterion	**Estimate**
Direct consequences	
Plant life or health	**D** — Fruit flies can cause direct harm to a wide range of plant hosts and are estimated to have consequences of minor significance at the national level.
Any other aspects of	**A** — Fruit flies introduced into a new environment will compete for

the environment	resources with native species. They are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**E** — A control program would add considerably to the cost of production of the host fruit, costing between $200-900 per ha depending on the variety of fruit produced and the time of harvest (Anon., 1991). In 1995, the *B. papayae* (papaya fruit fly) eradication programme using male annihilation and protein bait spraying cost AU$35 million (SPC, 2002). Fruit flies are estimated to have significant consequences at the national level and highly significant consequences at the regional level.
Domestic trade	**D** — The presence of fruit flies in commercial production areas will have a significant effect at the regional level due to any resulting interstate trade restrictions on a wide range of commodities.
International trade	**D** — Fruit flies are regarded as the most destructive horticultural pests in the world. While they can cause considerable yield losses in orchards and suburban backyards, the major consequence facing Australian horticultural industries is the negative effect they have on gaining and maintaining export markets. For example, when the papaya fruit fly outbreak occurred in north Queensland, Australia experienced trade effects that affected the whole country. In the first two months of the papaya fruit fly eradication campaign, about $600,000 worth of exports were interrupted by Australian trade partners (Cantrell *et al*., 2002). Within a week of the papaya fruit fly outbreak being declared, Japan ceased imports of mangoes at a cost of about $570,000, New Zealand interrupted its $30,000 banana trade and the Solomon Islands completely stopped importing fruit and vegetables from Queensland (Cantrell *et al*., 2002). Fruit flies are estimated to have consequences of minor significance at the national level.
Environment	**A** — Pesticides required to control fruit flies are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001. **High**.

GROUP 2A – MANGO PULP WEEVIL

The mango pulp weevil (MPW) causes serious economic damage to mangoes in north-east India (Srivastava, 1997). All *Mangifera indica* varieties and wild *Mangifera* species are susceptible to MPW. In Indonesia, infestation may range from 30-80% or higher (CAB International, 2003). The occurrence of many infested fruits considerably reduces the value of the product. The pulp weevil [Coleoptera: Curculionidae] examined in this pest risk analysis is:

- *Sternochetus frigidus* (Fabricius) – Mango pulp weevil.

Synonyms and changes in combination: *Curculio frigidus* Fabricius, 1787; *Cryptorrhynchus gravis* Fabricius; *Sternochetus gravis* (Fabricius); *Cryptorhynchus frigidus* (Fabricius); *Acryptorrhynchus frigidus* (Fabricius).

Host(s): *Mangifera foetida* (bachang mango), *Mangifera indica* (mango), *Mangifera sylvatica* (Nepal mango) (CAB International, 2003).

Plant part(s) affected: Fruit/pod (CAB International, 2003).

Distribution: Bangladesh, Brunei Darussalam, India, Indonesia, Malaysia, Myanmar, Pakistan, Papua New Guinea, Philippines, Singapore, Thailand (CAB International, 2003).

Introduction and spread potential

Probability of importation

The likelihood that *Sternochetus frigidus* will arrive in Australia with the importation of fresh mangoes from India: **High**.

- *S. frigidus* lays eggs on mango fruits with a minimum diameter of 6 cm (De and Pande, 1988). The newly hatched larva tunnels directly through the fruit pulp. The larvae form a chamber adjacent to the kernel from which they tunnel into the pulp. Pupation takes place in a brown cocoon, constructed of frass, within these chambers. The weevils leave the ripe fruit through a hole in the peel. Before they emerge, the fruit shows no outward sign of infestation (CAB International, 2003).
- This pest is likely to survive storage and transportation. Reproductively immature adult weevils overwinter inside seeds or other protective places from May until February in India (De and Pande, 1988). Around 58.5% of adults hibernate in seeds (Srivastava, 1997). Adults found in fruits usually survive and may assist in the dispersal of the pest (CAB International, 2003).

Probability of distribution

The likelihood that *Sternochetus frigidus* will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **Moderate**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin, seed).
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: eggs may be discarded with mango skin, or adults found in fruit may fly directly to a suitable host plant. Srivastava (1997) states that although adults possess well-developed wings, they are very poor flyers

and can fly only 50-90 cm in a horizontal direction.

- Up to 30-50% of newly hatched larvae die if they come in contact with gum laden tissues while they tunnel through the fruit pulp (CAB International, 2003). Up to 20% of the larvae die when the fruits are harvested, because they are unable to complete their development. Dry conditions affect young adults adversely (CAB International, 2003).

Probability of entry (importation × distribution)

The likelihood that *Sternochetus frigidus* will arrive in Australia as a result of trade in fresh mango fruit, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Sternochetus frigidus* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- The host range of *S. frigidus* is limited and is only known to include *Mangifera foetida*, *M. indica* and *M. sylvatica* (CAB International, 2003).
- *Sternochetus* species (e.g. *S. mangiferae*) is already established in tropical and subtropical parts of eastern Australia.
- Females lay about 75-180 eggs in 3 weeks, and if deprived of suitable fruits for 5 months, egg production drops to 3 eggs per day (De and Pande, 1988). The female dies soon after oviposition (CAB International, 2003).
- MPW leave the ripe fruit through a hole in the mango peel. After 6 weeks, they are fully mature and are able to mate (CAB International, 2003). Adults mate repeatedly (Kalshoven and Laan, 1981).
- Srivastava (1997) reported that the duration of one complete life cycle varied from 34-35 days. In Indonesia, development from egg to adult takes 5-7 weeks (Kalshoven and Laan, 1981). The weevil has only one generation during the fruit season (Kalshoven and Laan, 1981).

Probability of spread

The likelihood that *Sternochetus frigidus* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *S. frigidus* because other *Sternochetus* species are recorded from these environments.
- Adults found in the fruits usually survive and may assist in the dispersal of the pest.
- Although adults possess well-developed wings, they are very poor flyers and are only capable of flying 50-90 cm in a horizontal direction (Srivastava, 1997).
- Very few natural enemies are known (CAB International, 2003).

Probability of entry, establishment or spread

The overall likelihood that *Sternochetus frigidus* will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of mango pulp weevil: **Moderate**.

Criterion	**Estimate**
Direct consequences	
Plant life or health	**C** — *Sternochetus frigidus* (mango pulp weevil, MPW) can cause significant direct harm to mango production at the district level. MPW is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — There are no known direct consequences of this pest on other aspects of the environment. *S. frigidus* is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses and this would increase production costs. Imported mango fruit from countries where *S. frigidus* occurs is subjected to a quarantine treatment.

Domestic trade	**C** — The presence of mango pulp weevil in commercial production areas may have a significant effect at the district level due to any resulting interstate trade restrictions. MPW is estimated to have consequences which are unlikely to be discernible at the national level and of minor significance at the regional level.
International trade	**D** — Mango pulp weevil is regarded as a destructive pest of mango in growing areas. Infestation does not cause increased fruit shedding (Kalshoven and Laan, 1981). However, the occurrence of many infested fruits considerably reduces the value of the product. In Indonesia, infestation of 30-80% has been reported (CAB International, 2003). MPW has a limited host range and is therefore unlikely to have a significant effect on international trade in plant commodities. MPW is estimated to have consequences of minor significance at the national level.
Environment	**A** — Although additional pesticide applications would be required to control MPW on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001. **Low**.

GROUP 2B – MANGO SEED WEEVIL

The mango seed weevil (MSW) is one of the most serious and important pests of mango. All mango cultivars are susceptible to MSW attack but no external symptoms of attack are readily visible on infested fruits, apart from the brown hardened secretion remaining attached to them at the sites of oviposition (CAB International, 2003). The seed weevil [Coleoptera: Curculionidae] examined in this pest risk analysis is:

- **Sternochetus mangiferae* (Fabricius, 1775) – Mango seed weevil.

Synonyms and changes in combination: *Cryptorhynchus mangiferae* Fabricius, 1775; *Acryptorhynchus mangiferae* (Fabricius); *Curculio mangiferae* (Fabricius); *Sternochetus ineffectus* (Walker); *Sternochetus olivieri* Faust.

Host(s): *Mangifera indica* (mango) (CAB International, 2003).

Plant part(s) affected: Fruit/pod, seed (CAB International, 2003); leaf, shoot (CABI/EPPO, 1997).

Distribution: Australia (New South Wales, Northern Territory, Queensland), Bangladesh, Barbados, Bhutan, Central African Republic, China (Hong Kong), Dominica, Fiji, French Guiana, French Polynesia (Society Islands), Gabon, Ghana, Guadeloupe,

* This species is a quarantine pest for the State of Western Australia due to its absence from this State.

Guam, Guinea, India, Indonesia, Kenya, Liberia, Madagascar, Malawi, Malaysia (Peninsular, Sabah), Martinique, Mauritius, Mozambique, Myanmar, Nepal, New Caledonia, Nigeria, Réunion, Northern Mariana Islands, Pakistan, Seychelles, South Africa, Sri Lanka, St Lucia, Tanzania, Thailand, Tonga, Trinidad and Tobago, Uganda, United Arab Emirates, United States, United States Virgin Islands, Vietnam, Wallis and Futuna Islands, Zambia (EPPO, 2002).

Introduction and spread potential

Probability of importation

The likelihood that *Sternochetus mangiferae* will arrive in Australia with the importation of fresh mangoes from India: **High**.

- Females of *S. mangiferae* lay eggs singly on the skin of immature to ripe fruit or sometimes on the stems; most eggs are laid on the sinus of the fruit (Shukla *et al*., 1985). The adult female carves out a cavity on the fruit surface and deposits an egg, which is immediately covered by a brown exudate produced by the wound (Follett, 2002). Infested fruits are difficult to detect since usually no damage is visible externally (Kalshoven and Laan, 1981).
- After hatching, the larvae burrow through the flesh and into the seed. As fruit and seed develop, the tunnel and seed entry are completely obliterated so that in time it is impossible to distinguish infested from non-infested seeds unless they are cut open (Balock and Kozuma, 1964). Complete larval development usually occurs within the maturing seed, but also very occasionally within the flesh (Hansen *et al*., 1989). Larvae feed within the seed and pupate in the seed cavity (Follett, 2002). The majority of infested seeds have one or two weevils, but seeds containing 5 or more have been
- Adult weevils can live for more than two years when provided with fresh mangoes and water (Follett, 2002).

Probability of distribution

The likelihood that *S. mangiferae* will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **High**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin, seed).
- This pest may enter the environment in two ways: eggs may be discarded with mango skin, or larvae may be discarded with seed. Upon maturation, the adults rapidly move out of the seeds and seek hiding places by crawling rather than flying (Shukla and Tandon, 1985).

Probability of entry (importation × distribution)

The likelihood that *Sternochetus mangiferae* will arrive in Australia as a result of trade in fresh mango fruit, and be distributed to the endangered area: **High**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Sternochetus mangiferae* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- *S. mangiferae* is already established in tropical and subtropical parts of eastern Australia (i.e. New South Wales, Northern Territory and Queensland).
- The host range of *S. mangiferae* is limited to mango (*Mangifera indica*) (CAB International, 2003).
- Females may lay 15 eggs per day, with a maximum of almost 300 over a three month period in the laboratory. Adults usually remain in the vicinity of the parent tree until the following fruiting season (Jarvis, 1946). High infestations appear every year in some locations, while low infestations appear in others (Balock and Kozuma, 1964).
- MSW is univoltine (i.e. has one generation per year) (Follett, 2002).

Probability of spread

The likelihood that *Sternochetus mangiferae* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Western Australia would be suitable for the spread of *S. mangiferae* because this pest is present in eastern Australia (i.e. New South Wales, Northern Territory and Queensland).
- Adults are capable of surviving long unfavourable periods. During non-fruiting periods, weevils diapause under loose bark on mango tree trunks and in branch terminals or in crevices near mango trees. A few adults live through two seasons with a diapause period between (Balock and Kozuma, 1964).
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment or spread

The overall likelihood that *Sternochetus mangiferae* will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Consequences

Consideration of the direct and indirect consequences of mango seed weevil: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Sternochetus mangiferae* (mango seed weevil, MSW) can cause significant direct harm to mango production at the district level. MSW is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — There are no known direct consequences of this pest on other aspects of the environment. *S. mangiferae* is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses and this would increase production costs. Imported mango fruit from countries where *S. mangiferae* occurs can be subjected to a quarantine treatment.
Domestic trade	**B** — The presence of mango seed weevil in commercial production areas may have a significant effect at the local level due to any resulting interstate trade restrictions. MSW is estimated to have consequences which are unlikely to be discernible at the national level and of minor significance at the district level.
International trade	**C** — Mango seed weevil is regarded as a destructive pest of mango in growing areas. No external symptoms of attack by seed weevil are readily visible on infested fruits and yields are not significantly affected, since the larvae usually feed entirely within the stone, very rarely in the pulp of the fruit. Probably its greatest significance as a pest is to reduce the germination capacity of seeds greatly and to interfere with the export of fruit, because of quarantine restrictions imposed by importing countries. In India, all cultivars are susceptible and levels of infestation vary between 48-87% (Bagle and Prasad, 1985). MSW is estimated to have consequences which are unlikely to be discernible at the national level and of minor significance at the regional level.
Environment	**A** — Although additional pesticide applications would be required to control mango seed weevil on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001. **Low**.

GROUP 3A – ARMOURED SCALES

Armoured or hard scales damage the host plant by sucking the plant sap through their stylets. They do not produce honeydew, but their feeding can blemish fruit or cause leaf drop (Smith *et al*., 1997). They can inject toxins into plant tissues and high populations can reduce plant vigour or cause the death of trees (Beardsley and Gonzalez, 1975; Smith *et al*., 1997). The armoured scales [Hemiptera: Diaspididae] examined in this pest risk analysis are:

- **Abgrallaspis cyanophylli* (Signoret, 1869) – Cyanophyllum scale
- **Aspidiotus nerii* Bouché, 1833 – Oleander scale
- **Hemiberlesia rapax* (Comstock, 1881) – Camellia scale; greedy scale
- **Lepidosaphes beckii* (Newman, 1869) – Mussel scale
- **Lepidosaphes gloverii* (Packard, 1869) – Glover's scale.

Synonyms and changes in combination:

<u>Abgrallaspis cyanophylli</u>: *Aspidiotus cyanophylli* Signoret, 1869; *Fucaspis cyanophylli* (Signoret); *Hemiberlesia cyanophylli* (Signoret).

<u>Aspidiotus nerii</u>: *Aspidiotus aloes* Signoret; *Aspidiotus limonii* Signoret; *Aspidiotus genistae* Westwood; *Aspidiotus bouchei* (Targioni Tozzetti); *Aspidiotus affinis* Targioni Tozzetti; *Aspidiotus caldesii* Targioni Tozzetti; *Aspidiotus denticulatus* Targioni Tozzetti;

Aspidiotus villosus Targioni Tozzetti; *Aspidiotus budleiae* Signoret; *Aspidiotus ceratoniae* Signoret; *Aspidiotus cycadicola* (Boisduval); *Aspidiotus epidendri* Signoret; *Aspidiotus ericae* (Boisduval); *Aspidiotus gnidii* Signoret; *Aspidiotus ilicis* Signoret; *Aspidiotus myricinae* Signoret; *Aspidiotus ulicis* Signoret; *Aspidiotus uriesciae* Signoret; *Aspidiotus lentisci* Signoret; *Aspidiotus capparis* Signoret; *Aspidiotus myrsinae* Signoret; *Aspidiotus budlaei* Maskell; *Aspidiotus atherospermae* Maskell; *Aspidiotus oleae* Colvée; *Aspidiotus corynocarpi* Colvée; *Aspidiotus oleastin* Colvée; *Aspidiotus offinis* Comstock; *Aspidiotus sophorae* Maskell; *Aspidiotus carpodeti* Maskell; *Aspidiotus transpareus* var. *simillimus* Cockerell; *Aspidiotus vagabundus* Cockerell; *Aspidiotus simillimus* (Cockerell); *Aspidiotus transvaalensis* Leonardi; *Aspidiotus confusus* Froggatt; *Aspidiotus tasmaniae* Green; *Aspidiotus viresciae* Leonardi; *Aspidiotus transpareus* var. *rectangulatus* Lindinger; *Aspidiotus rectangulatus* (Lindinger); *Aspidiosus unipectinatus* Ferris; *Aspidiotus hederae* var. *urenae* Hall; *Aspidiotus urenae* (Hall); *Octaspidiotus anthospermae* Balachowsky; *Aspidiotus hederae* Signoret; *Aspidiotus hederae hederae* Schmutterer; *Aspidiotus hederae* ssp. *unisexualis* Schmutterer; *Chermes aloes* Boisduval; *Chermes ericae* Boisduval;

*These species are quarantine pests for the State of Western Australia due to their absence from this State.

Chermes cycadicola Boisduval; *Chermes genistae* (Westwood); *Chermes hederae* (Signoret); *Chermes nerii* Boisduval; *Chermes osmanthi* Ferris; *Diaspis bouchei* Targioni Tozzetti; *Octaspidiotus atherospermae* (Maskell).

<u>*Hemiberlesia rapax*</u>: *Aspidiotus rapax* Comstock, 1881; *Aspidiotus camelliae* Signoret; *Aspidiotus convexus* Comstock; *Aspidiotus lucumae* Cockerell; *Aspidiotus tricolor* Cockerell; *Hemiberlesia argentina* Leonardi.

<u>*Lepidosaphes beckii*</u>: *Coccus beckii* Newman, 1869; *Aspidiotus citricola* Packard, 1869; *Coccus anguinis* Boisduval; *Mytilaspis flavescens* Targioni Tozzetti; *Mytilaspis citricola* (Packard); *Mytilaspis citricola tasmaniae* Maskell; *Mytilaspis tasmaniae* (Maskell); *Mytilaspis beckii* (Newman); *Mytilaspis* (*Lepidosaphes*) *beckii* (Newman); *Lepidosaphes citricola* (Packard); *Lepidosaphes* (*Mytilaspis*) *beckii* (Newman); *Mytilaspis anguineus* (Boisduval); *Mytilococcus piniformis*; *Mytilococcus beckii* (Newman); *Cornuaspis beckii* (Newman); *Parlatoria beckii* (Newman).

<u>*Lepidosaphes gloverii*</u>: *Aspidiotus gloverii* Packard, 1869; *Mytilaspis gloverii* (Packard); *Mytilaspis* (*Aspidiotus*) *gloverii* (Packard); *Mytiella sexspina* Hoke; *Coccus gloverii* (Packard); *Mytilococcus gloverii* (Packard); *Opuntiaspis sexspina* (Packard); *Insulaspis gloverii* (Packard); *Cornuaspis gloverii* (Packard).

Host(s):

<u>*Abgrallaspis cyanophylli*</u>: *Acalypha hispida* (chenille plant), *Annona squamosa* (sugar apple), *Annona* sp. (custard apple), *Artocarpus altilis* (breadfruit), *Bauhinia* sp., *Barringtonia* sp., *Camellia sinensis* (tea), *Capsicum ovatum*, *Ceiba pentandra* (kapok tree), *Cinnamomum verum* (cinnamon), *Clerodendrum* sp., *Coccoloba uvifera* (Jamaican kino, sea-grape), *Cocos nucifera* (coconut), *Coffea arabica* (arabica coffee), *Coffea* sp. (coffee), *Coleus* sp., *Cordyline fruticosa* (palm lily), *Dioscorea alata* (greater yam), *Dioscorea* spp. (yam), *Elettaria cardamomum* (cardamom), *Eriobotrya japonica* (loquat), *Eugenia* sp., *Ficus* sp. (fig), *Guettarda speciosa* (beach gardenia), *Hevea brasiliensis* (rubber tree), *Hibiscus syriacus* (rose-of-Sharon), *Jatropha curcas* (Barbados-nut, physic nut), *Macadamia tetraphylla* (rough-shell Queensland nut), *Mangifera indica* (mango), *Manihot esculenta* (cassava, tapioca), *Musa* × *paradisiaca* (banana), *Musa* sp. (banana), *Persea americana* (avocado), *Piper methysticum* (kava kava), *Plumeria rubra* f. *acutifolia*

(Mexican frangipani, pagoda tree), *Psidium guajava* (guava), *Swietenia macrophylla* (Honduras mahogany), *Theobroma cacao* (cocoa), *Toona ciliata* (Australian red cedar) (Williams and Watson, 1988); *Nerium* sp. (oleander, rose laurel) (CAB International, 2003).

<u>*Aspidiotus nerii*</u>: *A. nerii* is a highly polyphagous insect that has been recorded on hundreds of host species in over 100 plant families (Beardsley and Gonzalez, 1975). Its many hosts include agricultural crops, palms, cut flowers and woody ornamentals (but not conifers) (CAB International, 2003).

Hosts include: *Actinidia chinensis* (Chinese gooseberry), *Ananas comosus* (pineapple), *Asparagus setaceus* (climbing asparagus fern), *Asplenium nidus* (bird's nest fern), *Ceratonia* sp. (carob), *Citrus* sp., *Cocos nucifera* (coconut), *Dianthus caryophyllus* (carnation), *Diospyros* sp. (ebony, persimmon), *Hedera helix* (ivy), *Ilex aquifolium* (English holly), *Juniperus* sp. (juniper), *Laurus nobilis* (laurel, sweet bay), *Magnolia* sp., *Mangifera indica* (mango), *Melia azedarach* (chinaberry), *Morus* sp. (mulberry), *Musa* × *paradisiaca* (plantain), *Nerium* sp. (oleander, rose laurel), *Olea* sp. (olive), *Pandanus* sp. (screwpine), *Phoenix* sp. (palm), *Plumeria rubra* f. *acutifolia* (Mexican frangipani, pagoda tree), *Prunus persica* (peach), *Pyrus communis* (pear), *Rosa* sp. (rose), *Simmondsia chinensis* (jojoba), *Vitis vinifera* (wine grape) (CAB International, 2003).

<u>*Hemiberlesia rapax*</u>: *H. rapax* is primarily found on the leaves and bark of woody ornamentals representing over 117 genera (Davidson and Miller, 1990). Dekle (1976) listed 92 hosts for this species.

Hosts include: *Actinidia chinensis* (Chinese gooseberry), *Actinidia deliciosa* (kiwi fruit), *Beilschmiedia tarairi*, *Carya illinoensis* (pecan), *Olea europaea* subsp. *europaea* (olive), *Vaccinium* sp. (blueberry) (CAB International, 2003); *Mangifera indica* (mango) (Butani, 1993).

<u>*Lepidosaphes beckii*</u>: *Agave sisalana* (sisal agave), *Elaeagnus* sp. (oleaster), *Mangifera indica* (mango), *Musa* sp. (banana) (CAB International, 2003); *Citrus aurantifolia* (lime), *Citrus limon* (lemon), *Citrus maxima* (pummelo, shaddock), *Citrus* × *paradisi* (grapefruit), *Citrus reticulata* (mandarin orange, tangerine), *Citrus sinensis* (sweet orange), *Hibiscus* sp. (Williams and Watson, 1988).

<u>*Lepidosaphes gloverii*</u>: *L. gloverii* attacks all citrus cultivars. According to Davidson and Miller (1990), the host range of *L. gloverii* covers 8 plant families and 19 genera. Hosts include: *Alocasia macrorrhizos* (giant taro), *Carissa* sp. (CAB International, 2003); *Citrus aurantifolia* (lime), *Citrus aurantium* (sour orange), *Citrus limon* (lemon), *Citrus maxima* (pummelo, shaddock), *Citrus reticulata* (mandarin orange, tangerine), *Citrus sinensis* (sweet orange) (Williams and Watson, 1988); *Codiaeum variegatum* (croton), *Erythrina* spp. (coral tree), *Euonymus* sp. (spindle tree), *Fortunella* sp. (kumquat), *Mangifera indica* (mango), *Poncirus* sp. (bitter orange, trifoliate orange) (CAB International, 2003).

Plant part(s) affected: For the listed armoured scales, the plant parts affected include leaves, stem and fruit (CAB International, 2003; Srivastava, 1997).

Distribution:

Abgrallaspis cyanophylli: Cook Islands, Fiji, French Polynesia (Tahiti) (Williams and Watson, 1988); Georgia, India (Tamil Nadu) (CAB International, 2003); Kiribati, New Caledonia, Papua New Guinea, Tonga, Tuvalu, Vanuatu, Western Samoa (Williams and Watson, 1988). This species has also been recorded in Australia (New South Wales, Queensland, Tasmania), but not in Western Australia (AICN, 2004).

Aspidiotus nerii: *A. nerii* has a worldwide distribution (DeBach and Rosen, 1991). In Asia, *A. nerii* is recorded from China (CAB International, 2003); India (Butani, 1993); Iran, Israel, Japan, Jordan, Lebanon, Saudi Arabia, Syria and Turkey (CAB International, 2003). This species has also been recorded in Australia (New South Wales, Queensland, Tasmania), but not in Western Australia (CAB International, 2003). For a full distribution listing, refer to CAB International (2003).

Hemiberlesia rapax: *H. rapax* is thought to be native to Europe (Gill, 1997). It is now found in Africa, Central and South America, Europe and southern Asia (CAB International, 2003). In Asia, *H. rapax* is recorded from India (Arunachal Pradesh, Meghalaya, West Bengal), Iran, Iraq, Japan, Malaysia, Pakistan and Sri Lanka (CAB International, 2003). This species has also been recorded in Australia (South Australia, Tasmania, Victoria), but not in Western Australia (CAB International, 2003). For a full distribution listing, refer to CAB International (2003).

Lepidosaphes beckii: *L. beckii* is documented as having a worldwide distribution (DeBach and Rosen, 1991). It primarily infests citrus trees. In Asia, *L. beckii* is recorded from Bhutan, Brunei Darussalam, Cambodia, China, India (Assam, Karnataka, Kerala, Manipur, Sikkim, Tamil Nadu, Uttar Pradesh), Indonesia, Iran, Iraq, Israel, Japan, Laos, Lebanon, Malaysia, Maldives, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Syria, Thailand, Turkey and Vietnam (CAB International, 2003; CIE, 1982). This species has also been recorded in Australia (New South Wales, Queensland, South Australia, Tasmania, Victoria (Ben-Dov *et al*., 2001); Northern Territory (CAB International, 2003)), but not in Western Australia (CAB International, 2003). For a full distribution listing, refer to CAB International (2003).

Lepidosaphes gloverii: In Asia, *L. gloverii* is recorded from China, India (Bihar), Indonesia, Israel, Japan, Korea, Democratic People's Republic, Korea, Republic of, Lebanon, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand and Turkey (CAB International, 2003; CIE, 1962). This species has also been recorded in Australia (New South Wales, Queensland, Victoria), but not in Western Australia (Ben-Dov *et al*., 2001). For a full distribution listing, refer to CAB International (2003).

Introduction and spread potential

Probability of importation

The likelihood that armoured scales will arrive in Australia with the importation of fresh mangoes from India: **High**.

- Armoured scale species are frequently reported in mango orchards in India (DPP, 2001; Srivastava, 1997), and they are associated with mango fruit.
- First instar nymphs (or crawlers) are incapable of further movement once they have settled and commenced feeding (Beardsley and Gonzalez, 1975), as crawlers lose their legs at the first moult. Subsequent instars are sessile (CAB International, 2003).
- Armoured scales construct an external protective covering or ‘scale’, that protects them against physical and chemical aggressions (Foldi, 1990). Without this scale cover, the adult insect would die from desiccation.
- Armoured scales are likely to be difficult to remove during fruit cleaning, sorting and packing, especially at low population levels due to this scale cover.
- Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit with regard to blemishes, bruising or damage to the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of small arthropod pests present on the fruit surface.
- Routine washing procedures undertaken within the packinghouse will not completely remove all pests from the fruit surface. While armoured scales may be affected by the washing solution, they are unlikely to be destroyed by it. The physical properties of the scale cover (i.e. hardness and impermeability, provide an effective barrier against contact toxicants (Foldi, 1990)).
- Armoured scales are likely to survive storage and transportation. *L. beckii* may over-winter in the egg stage (CAB International, 2003).

Probability of distribution

The likelihood that armoured scales will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **Moderate**.

- Adults and crawlers are likely to survive storage and transport and be associated with infested waste. Armoured scales may enter the environment in several ways: adults may be discarded with fruit, first instar nymphs (crawlers) may be discarded with waste carton and liners, or crawlers can be blown by wind currents or carried by other vectors (Beardsley and Gonzalez, 1975), from mangoes at the point of sale or after purchase by consumers. Long-range dispersal would require movement of adults and nymphs with infested host material (Beardsley and Gonzalez, 1975). Shorter-range dispersal would occur readily through the random movement of crawlers with wind currents, or biological or mechanical vectors.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin).
- Because armoured scales are polyphagous and all life stages survive in the environment for some time, they could be transferred to a susceptible host.
- Dispersal of first-instar nymphs or crawlers is accomplished mainly by active wandering and wind (Beardsley and Gonzalez, 1975). Birds, insects and other animals, including humans may act as vectors (Beardsley and Gonzalez, 1975). Subsequent instars are sessile. Adult males short-lived, winged and capable of weak flight (CAB International, 2003). They lack functional mouthparts and cannot feed. Longevity of this stage generally is limited to a few hours (Beardsley and Gonzalez, 1975).

Probability of entry (importation × distribution)

The likelihood that armoured scales will arrive in Australia as a result of trade in fresh mango fruit, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication Guidelines for Improt Risk Analysis, September 2001.

Probability of establishment

The likelihood that armoured scales will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- Armoured scales are polyphagous and host plants are common in Australia (e.g. citrus and mango), particularly in the warmer subtropical and tropical regions of Australia.
- Existing control programs (e.g. broad spectrum pesticide applications) may be effective to control armoured scales on some hosts, but may not be effective on hosts where specific integrated pest management programs are used.
- Reproduction can be either sexual or parthenogenetic (without fertilisation) (CAB International, 2003). Adult females of *A. nerii* lay eggs under their scale armour. Eggs hatch as crawlers (first instar nymphs), and leave the scale

armour when conditions are suitable (CAB International, 2003).

- Armoured scales have a moderate reproductive rate (e.g. *A. nerii* females average a total of around 100-150 eggs per female (CAB International, 2003), while each *L. gloverii* female lays about 200 eggs during her lifespan (CAB International, 2003)). Armoured scales have 2-6 generations per year, depending on the species and climatic conditions (i.e. temperature (Beardsley and Gonzalez, 1975)). For example, on citrus in Queensland, *L. beckii* has 5-6 generations per year, compared to 2-4 generations per year in New South Wales (Smith *et al*., 1997). The life cycle from egg to adult on citrus can take 6-8 weeks for *L. beckii* and *L. gloverii* (Smith *et al*., 1997).
- Adult males are short-lived, winged and capable of weak flight (CAB International, 2003). They lack functional mouthparts and cannot feed. Longevity of this stage generally is limited to a few hours (Beardsley and Gonzalez, 1975).

Probability of spread

The likelihood that armoured scales will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Once second and then subsequent generations of armoured scales are established on commercial, susceptible household and wild host plants, they are likely to persist indefinitely and to spread progressively over time. This spread would be assisted by wind dispersal, vectors and by the movement of infested plant material (Beardsley and Gonzalez, 1975). It is very unlikely that armoured scales would be contained by management practices or by regulation.
- Crawlers may be moved within and between plantations by the movement of infested plant material, vectors and wind (Beardsley and Gonzalez, 1975).

Probability of entry, establishment or spread

The overall likelihood that armoured scales will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication Guidelines for Improt Risk Analysis, September 2001.

Consequences

Consequences (direct and indirect) of armoured scales: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Armoured scales can cause direct harm to a wide range of host plants, affecting fruit quality and the whole plant health. These armoured scale species are highly polyphagous and host plants are common in Australia (e.g. citrus, mango). Armoured scales are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — Armoured scales introduced into a new environment will compete for resources with native species. They are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. Existing control programs (e.g. broad spectrum pesticide applications) may be effective to control armoured scales on some hosts, but may not be effective on hosts where specific integrated pest management programs are used. Armoured scales are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of these pests in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	**C** — The presence of these pests in commercial production areas of a range of export commodities (e.g. citrus, mango) may have a significant effect at the district level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001. **Low**.

GROUP 3B – SOFT SCALES

Soft scales damage host plants by sucking nutrients from plant parts, and excreting large amounts of sugary honeydew onto fruit and leaves (Smith *et al*., 1997). The main economic damage caused by soft scales is from the downgrading of fruit quality because of sooty mould fungus growing on the honeydew (Smith *et al*., 1997). Heavy infestations can reduce tree vigour and rates of photosynthesis.

The soft scales [Hemiptera: Coccidae] examined in this pest risk analysis are:

- *Ceroplastes actiniformis* Green, 1896 – Soft scale
- **Coccus longulus* (Douglas, 1887) – Long soft scale

*This species is a quarantine pest for the State of Western Australia due to its absence from this State.

- *Milviscutulus mangiferae* (Green, 1889) – Mango shield scale.

Synonyms and changes in combination:

<u>*Ceroplastes actiniformis*</u>: *Ceroplastes actiniformes* (Green).

<u>*Coccus longulus*</u>: *Lecanium longulum* Douglas, 1887; *Lecanium chirimoliae* Maskell, 1890; *Lecanium ficus* Maskell, 1897; *Coccus longulum* (Douglas); *Coccus ficus* (Maskell); *Lecanium frontale* Green, 1904; *Coccus frontalis* (Green); *Coccus elongatus* (incorrect synonymy); *Lecanium* (*Coccus*) *celtium* Kuwana, 1909; *Coccus celtium* (Kuwana); *Lecanium* (*Coccus*) *longulus* (Douglas); *Lecanium wistariae* Brain, 1920; *Coccus* (*Lecanium*) *longulus* (Douglas); *Lecanium kraunhianum* Lindinger, 1928; *Lecanium* (*Coccus*) *frontale* (Green); *Coccus frontalis* (Green); *Coccus celticum* (Kuwana); *Parthenolecanium wistaricola* Borchsenius, 1957.

<u>*Milviscutulus mangiferae*</u>: *Lecanium mangiferae* Green, 1889; *Coccus mangiferae* (Green); *Lecanium psidii* Green, 1904; *Saissetia psidii* (Green); *Lecanium wardi* Newstead, 1922; *Coccus wardi* (Newstead); *Lecanium desolatum* Green, 1922; *Lecanium ixorae* Green, 1922; *Protopulvinaria mangiferae* (Green); *Coccus ixorae* (Green); *Coccus kuraruensis* Takahashi, 1939; *Protopulvinaria ixorae* (Green); *Coccus desolatum* (Green); *Kilifia mangiferae* (Green); *Udinia psidii* (Green).

Host(s):

<u>*Ceroplastes actiniformis*</u>: *Alstonia scholaris* (devil tree), *Annona montana* (mountain soursop), *Areca catechu* (betel palm, betelnut), *Calophyllum inophyllum* (Indian laurel, laurelwood), *Calophyllum* sp., *Canna* sp., *Cocos nucifera* (coconut), *Ficus carica* (fig), *Ficus* sp. (fig), *Loranthus* sp., *Mangifera indica* (mango), *Phoenix canariensis* (Canary Island date palm), *Phoenix dactylifera* (date palm), *Psidium guajava* (guava), *Saccharum officinarum* (sugarcane), *Santalum album* (white sandalwood), *Sapium* sp., *Triadica sebifera* (Chinese tallowtree), *Washingtonia filifera* (California fan palm), *Vitis vinifera* (wine grape) (Ben-Dov *et al*., 2001).

<u>*Coccus longulus*</u>: *C. longulus* is highly polyphagous, attacking plants belonging to over 130 genera placed in 54 families including Annonaceae, Araceae, Euphorbiaceae, Leguminosae, Malvaceae and Rutaceae (Ben-Dov et al., 2001).

Hosts include: *Acacia* spp. (wattle), *Annona* spp. (custard apple), *Arachis hypogaea* (peanut), *Areca catechu* (betel palm, betelnut), *Artocarpus* spp. (breadfruit), *Averrhoa carambola* (carambola, starfruit), *Bougainvillea* sp., *Cajanus cajan* (pigeon pea), *Camellia* sp., *Carica papaya* (papaya, pawpaw), *Casuarina equisetifolia* (beach she-oak), *Citrus* spp., *Cocos nucifera* (coconut), *Codiaeum variegatum* (garden croton), *Coffea* spp. (coffee), *Colocasia esculenta* (taro), *Cucurbita pepo* (pumpkin, squash), *Delonix regia* (peacock-flower), *Ficus* spp. (fig), *Glycine max* (soybean), *Grevillea robusta* (silky oak), *Gossypium herbaceum* (Arabian cotton), *Hibiscus* spp., *Inocarpus fagifer* (Tahiti chestnut), *Jatropha* spp., *Leucaena leucocephala* (horse tamarind), *Litchi chinensis* (lychee), *Malpighia glabra* (acerola), *Mangifera indica* (mango), *Morus alba* (white mulberry), *Musa* sp. (banana), *Myrtus communis* (true myrtle), *Persea americana* (avocado), *Pinus caribaea* (Caribbean pine), *Psidium guajava* (guava), *Rosa* sp. (rose), *Saccharum officinarum* (sugarcane), *Spathiphyllum* spp., *Tamarindus indica* (tamarind), *Theobroma cacao* (cocoa), *Vitis vinifera* (wine grape), *Wisteria* sp. (Ben-Dov *et al*., 2001).

Milviscutulus mangiferae: *M. mangiferae* is polyphagous, attacking plants belonging to over 65 genera placed in 40 families including Anacardiaceae, Euphorbiaceae, Moraceae, Myrtaceae and Rutaceae (Ben-Dov *et al*., 2001).

Hosts include: *Ananas* sp. (pineapple), *Artocarpus* spp. (breadfruit), *Bixa orellana* (annatto), *Blighia sapida* (akee), *Carica papaya* (papaya, pawpaw), *Cinnamomum* spp. (camphor, cinnamon), *Citrus* spp., *Cocos nucifera* (coconut), *Codiaeum variegatum* (garden croton), *Eucalyptus* sp. (eucalypt, gum tree), *Ficus* spp. (fig), *Hibiscus* sp., *Ixora coccinea* (jungle geranium), *Malpighia glabra* (acerola), *Mangifera indica* (mango), *Persea americana* (avocado), *Pometia pinnata* (Pacific lychee), *Psidium guajava* (guava), *Psychotria* sp. (wild coffee), *Schefflera* sp., *Strelitzia* sp. (bird-of-paradise), *Terminalia* spp. (tropical almond), *Thevetia peruviana* (lucky nut), *Vanilla* sp. (Ben-Dov *et al*., 2001).

Plant part(s) affected: For the listed soft scales, the plant parts affected include leaves and fruit (Smith *et al*., 1997; Peña and Mohyuddin, 1997; USDA, 2001).

Distribution:

Ceroplastes actiniformis: Brazil, Egypt, India (Bihar, Goa, West Bengal), Indonesia (Java, Sumatra), Israel, Spain (Canary Islands), Sri Lanka (Ben-Dov *et al*., 2001).

Coccus longulus: *C. longulus* is distributed in Asia, Europe, Africa, North, Central and South America and Oceania regions. In Asia, *C. longulus* is recorded from China (Taiwan), Cyprus, Egypt, Guam, India (Andhra Pradesh, Assam, Karnataka, Tamil Nadu), Indonesia, Israel, Japan, Lebanon, Philippines, Saudi Arabia, Sri Lanka and Thailand (Ben-Dov *et al*., 2001). This species has also been recorded in Australia (New South Wales, Northern Territory, Queensland, South Australia), but not in Western Australia (Ben-Dov *et al*., 2001). For a full distribution listing, see Ben-Dov *et al*. (2001).

Milviscutulus mangiferae: Antigua and Barbuda, Bangladesh, Brazil, China (Hong Kong, Taiwan), Colombia, Comoros, Costa Rica, Côte d'Ivoire, Cuba, Dominican Republic, Ecuador, El Salvador, Fiji, Ghana, Guyana, Honduras, India (Bihar, Tamil Nadu, West Bengal), Indonesia, Israel, Jamaica, Japan, Kenya, Madagascar, Malaysia, Martinique, Mauritius, Mexico, Nicaragua, Pakistan, Palau, Panama, Papua New Guinea, Philippines, Puerto Rico, Réunion, Seychelles, Singapore, Solomon Islands, South Africa, Sri Lanka, Tanzania (Zanzibar), Thailand, Tonga, United States (Florida, Hawaii, Texas), United States Virgin Islands, Venezuela, Vietnam, Western Samoa (Ben-Dov *et al*., 2001).

Introduction and spread potential

Probability of importation

The likelihood that soft scales will arrive in Australia with the importation of fresh mangoes from India: **High**.

- Soft scale species are frequently reported in mango orchards in India (DPP, 2001), and they are associated with mango fruit.
- Soft scales are usually sessile (i.e. the complete life cycle of the adult male or female takes place at the settling site of the first instar nymph or crawler (Ben-Dov, 1997)). However, the majority of species possess functional legs in all instars and consequently several species exhibit considerable mobility between various organs of the host plant in the course of their annual development (Ben-Dov, 1997).
- Most species of coccids are individually minute and inconspicuous but are often easily discovered when congregated in masses or when covered with the waxy matter excreted from their bodies (Srivastava, 1997).
- Soft scales are likely to be difficult to remove during fruit cleaning, sorting and packing, especially at low population levels.
- Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit with regard to blemishes, bruising or damage to the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of small arthropod pests present on the fruit surface.
- Routine washing procedures undertaken within the packinghouse will not totally remove all pests from the fruit surface. While soft scales may be affected by the washing solution, they are unlikely to be destroyed by it. This is particularly true of those adult females or nymphs that are protected by hard, waxy secretions. However, soft scales secrete very little wax compared to armoured scales (Mau and Kessing, 1992).
- Soft scales are likely to survive storage and transportation.

Probability of distribution

The likelihood that soft scales will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **Moderate**.

- Adults and crawlers are likely to survive storage and transport and be associated with infested waste. Soft scales may enter the environment in several ways: adults may be discarded with fruit, first instar nymphs (crawlers) may be discarded with waste carton and liners, crawlers can be blown by wind currents over considerable distances (Greathead, 1997), or crawlers and gravid females may be transferred by birds, human clothing and in the hair of mammals, from mangoes at the point of sale or after purchase by consumers. Long-range dispersal would require movement of adults and nymphs with infested vegetative material. Shorter-range dispersal would occur readily through the random movement of crawlers with wind currents, or biological or mechanical vectors.
- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin).
- Because soft scales are polyphagous and all life stages survive in the environment for some time, they could be transferred to a susceptible host.
- Gravid females would need to be carried onto hosts by vectors such as people or animals (Greathead, 1997). The first-instar is the main means of dispersal, by active crawling and passive dispersal by wind and animals.

Probability of entry (importation × distribution)

The likelihood that soft scales will arrive in Australia as a result of trade in fresh mango fruit, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Probability of establishment

The likelihood that soft scales will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- Soft scales are highly polyphagous and host plants are common in Australia (e.g. citrus and mango), particularly in the warmer subtropical and tropical regions of Australia.

- Existing control programs (e.g. broad spectrum pesticide applications) may be effective to control soft scales on some hosts, but may not be effective on hosts where specific integrated pest management programs are used.
- Soft scales have a high reproductive rate (e.g. on citrus in Israel, *Ceroplastes floridensis* produced 52-1329 eggs per female in the spring generation (Podoler *et al*., 1981)). *Coccus longulus* has 4-6 generations per year on citrus (Smith *et al*., 1997).
- Reproduction for *Coccus longulus* occurs through parthenogenesis (without fertilisation) and adult females give birth to live young (Mau and Kessing, 1992).

Probability of spread

The likelihood that soft scales will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- *Coccus longulus* has 4-6 generations per year on citrus (Smith *et al*., 1997). Once second and then subsequent generations of soft scales are established on commercial, susceptible household and wild host plants, they are likely to persist indefinitely and to spread progressively over time. This spread would be assisted by wind dispersal, vectors and by the movement of plant material (Greathead, 1997). It is very unlikely that soft scales would be contained by management practices or by regulation.
- Gravid females and crawlers may be moved within and between plantations by birds, human clothing and in the hair of mammals (Greathead, 1997). Crawlers can be dispersed by wind currents over considerable distances (Greathead, 1997).

Probability of entry, establishment or spread

The overall likelihood that soft scales will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of soft scales: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Soft scales can cause direct harm to a wide range of plant hosts, affecting fruit quality and whole plant health. Fruit quality can be reduced by the presence of secondary sooty mould. These soft scale species are highly polyphagous and host plants are common in Australia (e.g. citrus, mango). Soft scales are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — Soft scales introduced into a new environment will compete for resources with native species. They are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. Existing control programs (e.g. broad spectrum pesticide applications) may be effective to control soft scales on some hosts, but may not be effective on hosts where specific integrated pest management programs are used. Soft scales are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of these pests in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	**C** — The presence of these pests in commercial production areas of a range of export commodities (e.g. citrus, mango) may have a significant effect at the district level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis*, September 2001. **Low**.

GROUP 3C – MEALYBUGS

Mealybugs injure the host plant by sucking sap through their tubular stylets, and excreting large amounts of sugary honeydew onto fruit and leaves. Heavy infestations may damage plants directly, while indirect damage may result from the ability of some mealybugs to vector plant viruses. Sooty mould fungus growth on the honeydew can render the fruit unmarketable and reduce the photosynthetic efficiency of leaves and cause leaf drop (CAB International, 2003). Many mealybug species pose particularly serious problems to agriculture when introduced into new areas of the world where their natural enemies are not present (Miller *et al*., 2002).

The mealybugs [Hemiptera: Pseudococcidae] examined in this pest risk analysis are:

- **Ferrisia virgata* (Cockerell) – Striped mealybug
- *Nipaecoccus nipae* (Maskell) – Coconut mealybug
- *Planococcus ficus* (Signoret) – Grapevine mealybug
- *Planococcus lilacinus* (Cockerell) – Coffee mealybug
- **Planococcus minor* (Maskell) – Pacific mealybug
- *Rastrococcus iceryoides* (Green) – Downey snowline mealybug
- *Rastrococcus invadens* Williams – Mealybug
- *Rastrococcus spinosus* (Robinson) – Philippine mango mealybug.

Synonyms and changes in combination:

<u>*Ferrisia virgata*</u>: *Dactylopius segregatus* Cockerell, 1893; *Dactylopius virgatus* Cockerell, 1893; *Dactylopius virgatus farinosus* Cockerell, 1893; *Dactylopius virgatus humilis* Cockerell, 1893; *Dactylopius ceriferus* Newstead, 1894; *Dactylopius talini* Green, 1896; *Dactylopius dasylirii* Cockerell, 1896; *Dactylopius setosus* Hempel, 1900; *Pseudococcus virgatus* (Cockerell); *Dactylopius magnolicida* King, 1902; *Pseudococcus magnolicida* (King); *Pseudococcus virgatus farinosus* (Cockerell); *Pseudococcus dasylirii* (Cockerell); *Pseudococcus segregatus* (Cockerell); *Pseudococcus virgatus humilis* (Cockerell); *Dactylopius virgatus madagascariensis* Newstead, 1908; *Pseudococcus marchali* Vayssière, 1912; *Pseudococcus virgatus madagascariensis* (Newstead); *Pseudococcus bicaudatus* Keuchenius, 1915; *Ferrisiana virgata* (Cockerell); *Heliococcus malvastrus* McDaniel, 1962; *Ferrisiana setosus* (Hempel).

<u>*Nipaecoccus nipae*</u>: *Dactylopius nipae* Maskell, 1893; *Dactylopius pseudonipae* Cockerell, 1897; *Ripersia serrata* Tinsley, 1900; *Pseudococcus nipae* (Maskell); *Dactylopius dubia* Maxwell-Lefroy, 1903 (nomen nudum); *Pseudococcus pseudonipae* (Cockerell); *Ceroputo nipae* (Maskell); *Pseudococcus magnoliae* Hambleton, 1935; *Ripersia nipae* (Maskell); *Nipaecoccus pseudonipae* (Cockerell); *Trechocorys nipae* (Maskell).

<u>*Planococcus ficus*</u>: *Dactylopius ficus* Signoret, 1875; *Dactylopius vitis* Signoret, 1875; *Dactylopius subterraneus* Hempel, 1901; *Pseudococcus ficus* (Signoret); *Pseudococcus vitis* (Signoret); *Coccus vitis* Niedielski; *Pseudococcus vitis* Leonardi, 1920; *Pseudococcus citrioides* Ferris, 1922; *Pseudococcus vitis* Bodenheimer, 1924; *Coccus vitis* Borchsenius,

1949; *Planococcus citrioides* (Ferris); *Planococcus vitis* (Signoret); *Pseudococcus praetermissus* Ezzat, 1962 (nomen nudum).

*These species are quarantine pests for the State of Western Australia due to their absence from this State.

Planococcus lilacinus: *Pseudococcus lilacinus* Cockerell, 1905; *Pseudococcus tayabanus* Cockerell, 1905; *Dactylopius crotonis* Green, 1906 (nomen nudum); *Dactylopius coffeae* Newstead, 1908; *Pseudococcus coffeae* (Newstead); *Dactylopius crotonis* Green, 1911;

Pseudococcus crotonis (Green); *Pseudococcus deceptor* Betrem, 1937; *Tylococcus mauritiensis* Mamet, 1939; *Planococcus crotonis* (Green); *Planococcus tayabanus* (Cockerell).

Planococcus minor: *Dactylopius calceolariae minor* Maskell, 1897; *Pseudococcus calceolariae minor* (Maskell); *Planococcus pacificus* Cox, 1981.

Rastrococcus iceryoides: *Phenacoccus iceryoides* Green, 1908; *Dactylopius* (*Pseudococcus*) *obtusus* Newstead; *Phenacoccus obtusus* (Newstead); *Ceroputo iceryoides* (Green); *Rastrococcus cappariae* Avasthi & Shafee; *Parlatoria iceryoides* (Green).

Rastrococcus invadens: None known.

Rastrococcus spinosus: *Phenacoccus spinosus* Robinson, 1918; *Puto spinosus* (Robinson); *Ceroputo spinosus* (Robinson).

Host(s):

Ferrisia virgata: *F. virgata* is one of the most highly polyphagous mealybugs known, attacking plant species belonging to some 160 genera in over 70 families (Ben-Dov *et al*., 2001; CAB International, 2003). Many of the host species belong to the Leguminosae and Euphorbiaceae families. Among the hosts of economic importance are: *Anacardium occidentale* (cashew), *Ananas comosus* (pineapple), *Annona cherimola* (custard apple), *Brassica oleracea* (cauliflower), *Cajanus cajan* (pigeon pea), *Citrus* spp., *Coffea* spp. (coffee), *Corchorus* sp. (jute), *Elaeis guineensis* (African oil palm), *Glycine max* (soybean), *Gossypium* sp. (cotton), *Litchi chinensis* (lychee), *Lycopersicon esculentum* (tomato), *Mangifera indica* (mango), *Manihot esculenta* (cassava, tapioca), *Musa* × *paradisiaca* (banana), *Persea americana* (avocado), *Piper nigrum* (black pepper), *Psidium guajava* (guava), *Solanum melongena* (aubergine, eggplant), *Theobroma cacao* (cocoa) and *Vitis vinifera* (wine grape) (CAB International, 2003).

Nipaecoccus nipae: *N. nipae* has an extensive host range, attacking over 80 genera of plants belonging to 43 families including Annonaceae, Moraceae, Myrtaceae and Palmae (Ben-Dov *et al*., 2001). It is recorded feeding on a wide range of economically important plants, mostly fruit crops and ornamentals, and include: *Ananas comosus* (pineapple), *Annona muricata* (soursop), *Annona reticulata* (bullock's heart), *Carica papaya* (papaya, pawpaw), *Citrus* sp., *Cocos nucifera* (coconut), *Elaeis guineensis* (African oil palm), *Ficus* spp. (fig), *Mangifera indica* (mango), *Musa* sp. (banana), *Persea americana* (avocado), *Psidium guajava* (guava), *Theobroma cacao* (cocoa) (CAB International, 2003). *N. nipae* seems to prefer palms, such as species of *Areca*, *Cocos*, *Kentia*, *Kentiopsis* and *Sabal* (CAB International, 2003). In temperate regions in Europe and North America, *N. nipae* often attacks ornamental palms grown under glass.

Planococcus ficus: *Bambusa* sp. (bamboo), *Cydonia oblonga* (quince), *Dahlia* sp., *Dichrostachys cinerea* subsp. *cinerea* (sickle bush), *Ficus benjamini* (Benjamin-tree), *Ficus carica* (fig), *Fraxinus* sp. (ash), *Juglans* sp. (walnut), *Malus domestica* (apple), *Malus pumila* (paradise apple), *Mangifera indica* (mango), *Morus* sp. (mulberry), *Nerium oleander* (oleander), *Persea americana* (avocado), *Phoenix dactylifera* (date palm), *Platanus orientalis* (Oriental plane), *Prosopis farcta*, *Punica granatum* (pomegranate), *Salix* sp. (willow), *Styrax officinalis* (storax), *Tephrosia purpurea* (purple tephrosia), *Theobroma cacao* (cocoa), *Vitis vinifera* (wine grape), *Ziziphus spina-christi* (Christ's thorn) (Ben-Dov *et al*., 2001; CAB International, 2003).

Planococcus lilacinus: The host range of *P. lilacinus* is extremely wide, attacking over 65 genera of plants within 35 families including Anacardiaceae, Asteraceae, Euphorbiaceae, Fabaceae, Leguminosae and Rutaceae (Ben-Dov *et al*., 2001). Comprehensive lists of alternative host plants may be found in Williams (1982), Cox (1989) and Ben-Dov *et al*. (2001). *P. lilacinus* attacks *Theobroma cacao* (cocoa), *Psidium guajava* (guava), *Coffea* spp. (coffee), *Mangifera indica* (mango) (Ben-Dov *et al*., 2001), and other tropical and sub-tropical fruits and shade trees (IIE, 1995b).

Planococcus minor: *P. minor* has a wide host range, attacking over 180 genera of plants belonging to 64 families including *Mangifera indica* (mango) (Ben-Dov *et al*., 2001).

Rastrococcus iceryoides: *R. iceryoides* is one of the most polyphagous species of *Rastrococcus*, occurring on plants belonging to diverse botanical families (CAB International, 2003). It has been recorded attacking over 60 genera of plants belonging to 32 families including *Mangifera indica* (mango) (Ben-Dov *et al*., 2001; CAB International, 2003).

Rastrococcus invadens: *R. invadens* attacks plant species belonging to 48 genera in 27 families including *Mangifera indica* (mango) (Ben-Dov *et al*., 2001; CAB International, 2003). Agounké *et al*. (1988) listed 45 species of host plants from 22 families attacked by *R. invadens* in West Africa, while Biassangama *et al*. (1991) listed 23 species from Central Africa. Since then, a total of over 100 host-plant species have been found in Africa, particularly where populations of this insect are abundant on the primary host, mango (CAB International, 2003).

Rastrococcus spinosus: *Anacardium occidentale* (cashew), *Antidesma nitidum*, *Artocarpus altilis* (breadfruit), *Artocarpus heterophyllus* (jackfruit), *Calophyllum* sp., *Citrus* sp., *Cocos nucifera* (coconut), *Ficus ampelas*, *Garcinia mangostana* (mangosteen), *Hevea brasiliensis* (rubber tree), *Lansium domesticum* (langsat), *Mangifera indica* (mango), *Mangifera odorata* (kuwini), *Nypa fruticans* (mangrove palm, nipa palm), *Plumeria robusta*, *Psidium guajava* (guava), *Syzygium aqueum* (water apple), *Tabernaemontana* sp. (Ben-Dov *et al*., 2001).

Plant part(s) affected: For the listed mealybug species, the plant parts affected include leaves and fruit (Bentley *et al*., 2003; CAB International, 2003; Peña and Mohyuddin, 1997; Srivastava, 1997; USDA, 2001).

Distribution:

Ferrisia virgata: *F. virgata* has spread to all zoogeographical regions, mainly in the tropics, but often extends well into the temperate regions (CAB International, 2003). It is widely distributed in Africa, Asia, North, Central and South America and Oceania regions. Early geographical records of *F. virgata* need to be verified due to confusion with *F. malvastra* (Ben-Dov, 1994).

In Asia, *F. virgata* is recorded from Bangladesh, British Indian Ocean Territory, Brunei Darussalam, Cambodia, China (Guangdong, Hong Kong, Taiwan) (CAB International, 2003); India (Andhra Pradesh, Goa, Kerala, Orissa, Punjab, Rajasthan, Tripura (CAB International, 2003); Assam, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal (Ben-Dov *et al*., 2001)), Indonesia, Japan, Laos, Malaysia, Myanmar, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Thailand, United Arab Emirates, Vietnam and Yemen (CAB International, 2003). This species has also been recorded in Australia (Northern Territory, Queensland), but not in Western Australia (Ben-Dov *et al*., 2001; CAB International, 2003). For a full distribution listing, refer to Ben-Dov *et al*. (2001) and CAB International (2003).

Nipaecoccus nipae: *N. nipae* is found in Asia, Africa, Europe, North, Central and South America and Oceania (Ben-Dov *et al*., 2001; CIE, 1966). There is a tentative record of *N. nipae* in Australia (Williams, 1985). However, Ben-Dov *et al*. (2001) does not list this species as being present in Australia. In northern and central Europe, *N. nipae* is found in glasshouses, particularly in botanical gardens, and does not appear to occur in the open. It is therefore recorded as occasionally present in this region.

In Asia, *N. nipae* is recorded from Bangladesh, China, Georgia (CAB International, 2003); India (Bihar, Tamil Nadu, West Bengal) (CIE, 1966), Korea, Republic of, Pakistan, Thailand, Turkey and Vietnam (CAB International, 2003). For a full distribution listing, refer to Ben-Dov *et al*. (2001) and CAB International (2003).

Planococcus ficus: Afghanistan, Argentina, Azerbaijan, Brazil, Chile, Cyprus, Dominican Republic, Egypt, France, Greece, India, Iran, Iraq, Israel, Italy, Lebanon, Libya, Mauritius, Pakistan, Portugal, Sardinia, Saudi Arabia, Sicily, South Africa, Spain (Canary Islands), Syria, Trinidad and Tobago, Tunisia, Turkmenistan, United States (Alabama, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Texas), Uruguay (Ben-Dov *et al*., 2001).

Planococcus lilacinus: *P. lilacinus* occurs mainly in the Palaearctic, Malaysian, Oriental, Australasian and Neotropical regions and is the dominant cocoa mealybug in Sri Lanka and Java (Entwistle, 1972). Williams (1982) reports that the species was probably introduced into the South Pacific from Southern Asia. According to Le Pelley (1968), the species does not occur above 1000 m.

In Asia, *P. lilacinus* is recorded from Bangladesh, Brunei Darussalam, Cambodia, China (Taiwan), India (Andaman and Nicobar Islands, Bihar, Delhi, Gujarat, Kerala, Karnataka, Maharashtra, Orissa, Tamil Nadu), Indonesia, Japan, Laos, Malaysia, Maldives, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam and Yemen (CAB International, 2003). For a full distribution listing, refer to CAB International (2003).

Planococcus minor: American Samoa, Antigua and Barbuda, Argentina, Australia (New South Wales, Northern Territory, Queensland, South Australia), Bangladesh, Bermuda, Brazil, British Indian Ocean Territory, China (Taiwan), Colombia, Cook Islands, Costa Rica, Cuba, Dominica, Ecuador (Galapagos Islands), Fiji, French Polynesia (Austral Islands, Society Islands), Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, India (Karnataka), Indonesia (Irian Jaya, Kalimantan, Sumatra), Jamaica, Japan, Kiribati, Madagascar, Malaysia, Mauritius (Rodriques Island), Mexico, Myanmar, New Caledonia, Niue, Papua New Guinea, Philippines (Luzon), Saint Lucia, Seychelles, Singapore, Solomon Islands, Suriname, Thailand, Tonga, Trinidad and Tobago, United States Virgin Islands, Uruguay, Vanuatu, Western Samoa (Ben-Dov *et al*., 2001; CAB International, 2003).

Rastrococcus iceryoides: Williams (1989) notes that *R. iceryoides* is known throughout much of southern Asia and is one of the most widespread species of *Rastrococcus*. It is distributed throughout the Indian region and Malaysia and has extended its range to East Africa, where it was probably introduced at the beginning of the twentieth century (CAB International, 2003).

This species is present in Bangladesh, India (Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh, West Bengal), Indonesia, Kenya, Singapore, Sri Lanka, Tanzania (Zanzibar) (Williams, 1989); China (Hong Kong) (Ben-Dov *et al*., 2001); Malawi (Luhanga and Gwinner, 1993).

Rastrococcus invadens: Bangladesh, Benin, Bhutan, China (Hong Kong), Congo, Gabon, Ghana, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Togo, Vietnam (Ben-Dov *et al*., 2001); Congo Democratic Republic, Côte d'Ivoire, India (Andhra Pradesh, Bihar, Gujarat, Karnataka, Maharashtra, Orissa, Sikkim, Uttar Pradesh, West Bengal), Nigeria, Sierra Leone (CABI/EPPO, 1998).

Rastrococcus spinosus: Bangladesh, Brunei Darussalam, China (Taiwan), India, Indonesia (Bali, Java, Sulawesi), Laos, Pakistan, Philippines (Luzon), Singapore, Sri Lanka, Vietnam (Ben-Dov *et al*., 2001); Malaysia, Thailand (Waterhouse, 1993).

NOTE: The listed mealybug species are recognised as significant pests of mangoes in India. Due to the recognised importance of *Rastrococcus iceryoides*, it was used as the basis for the risk assessment and development of proposed risk management measures for all mealybug species identified.

Introduction and spread potential

Probability of importation

The likelihood that mealybugs will arrive in Australia with the importation of fresh mangoes from India: **High**.

- Mealybugs are known to be associated with mango fruit in India (Srivastava, 1997). Later instar nymphs and adult females of *Rastrococcus iceryoides* usually feed on the tender terminal shoots, inflorescences and fruits, while first instar nymphs feed on the underside of leaves (Rawat and Jakhmola, 1970). In severe infestations, all the tender shoots, inflorescences and fruits of mango are infested by different stages of the pest (Rawat and Jakhmola, 1970).
- Mealybugs have limited mobility, are small (0.5-4 mm) and often inconspicuous, but may be present in significant populations on fruit.
- Mealybugs are likely to be present on the surface of the fruit, and are likely to be difficult to remove during cleaning, sorting and packing especially at low population levels.
- Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit with regard to blemishes, bruising or damage to the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of small arthropod pests present on the fruit surface.
- Routine washing procedures undertaken within the packinghouse may not totally remove all pests from the fruit surface. While mealybugs may be affected by the washing solution, they are unlikely to be destroyed by it. This is particularly true of those adult females or nymphs that are protected by waxy

cocoons or coating/covering.

- The pests are likely to survive storage and transportation as adult females of *R. iceryoides* are known to hibernate during the winter in India (Rawat and Jakhmola, 1970). Mated adult females of *R. iceryoides* can live for 13-23 days and unmated females can live for up to 80 days, while adult males live for only 1-2 days (Rawat and Jakhmola, 1970). There is a high likelihood that viable mealybugs present on the fruit would remain viable on arrival in Australia.

Probability of distribution

The likelihood that mealybugs will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **Moderate**.

- The pests are likely to survive storage and transportation as adult females of *R. iceryoides* are known to hibernate during the winter in India (Rawat and Jakhmola, 1970). Mated adult females of *R. iceryoides* can live for 13-23 days and unmated females can live for up to 80 days, while adult males live for only 1-2 days (Rawat and Jakhmola, 1970). There is a high likelihood that viable mealybugs present on the fruit would remain viable on arrival in Australia.
- Adults and nymphs are likely to be associated with infested waste. Mealybugs can enter the environment in three ways: adults can be associated with discarded mango skin, first instar nymphs (crawlers) may be discarded with waste carton and liners, or crawlers can be blown by wind currents (Ben-Dov, 1994) or carried by other vectors, from mangoes at the point of sale or after purchase by consumers. Long-range dispersal would require movement of adults and nymphs on infested plant material (CAB International, 2003). Shorter-range dispersal would occur readily through the random movement of crawlers with wind currents, or biological or mechanical vectors (CAB International, 2003). Because all stages of mealybugs survive in the environment for some time, they could be transferred to a susceptible host because they are highly polyphagous.
- Adult female mealybugs would need to be carried onto hosts by vectors such as people or animals. Adult males of *R. iceryoides* are winged but fragile and short-lived and do not persist for more than 1-2 days (Rawat and Jakhmola, 1970). The first-instar is the main means of dispersal, by active crawling and passive dispersal by wind and animal agencies (CAB International, 2003).

Probability of entry (importation × distribution)

The likelihood that mealybugs will arrive in Australia as a result of trade in fresh mango fruit, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that mealybugs will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- Mealybugs are highly polyphagous and host plants are common in Australia (e.g. citrus, mango and pineapple), particularly in the warmer subtropical and tropical regions of Australia.
- Mealybugs have a high reproductive rate. The reproductive strategy, and thus persistence, of these pests is based largely on the longevity and fecundity of the adult female, the mobility of the short-lived adult male and the ability of the crawlers to disperse via crawling, vectors or wind and locate new hosts. For example, *R. iceryoides* is known to reproduce sexually, and mating must occur for viable eggs to be produced (Rawat and Jakhmola, 1970). On mango, fecundity of *R. iceryoides* ranged from 450-585 eggs per female (Rawat and Jakhmola, 1970).
- Unmated females of *R. iceryoides* live for up to 80 days while mated females can live for 13-23 days (Rawat and Jakhmola, 1970). Adult males live for only 1-2 days and start copulation soon after their emergence (Rawat and Jakhmola, 1970). The first instar nymphs or 'crawlers' disperse by active crawling and passive dispersal by wind and animal agencies to suitable feeding sites on new or host plants (CAB International, 2003). Nymphs are active during the first instar stage and can travel some distance to a new plant before their mobility becomes limited for the remaining nymphal instars.
- Although mealybugs imported with fruit are likely to be at non-mobile stages, they can be transported to suitable hosts by ants.
- Many mealybugs are considered invasive and have been introduced into new areas and established (Miller *et al*., 2002). These mealybug species have shown that they have the ability to establish after being introduced into new environments. For example, *P. lilacinus* is native to the Afrotropical region (Miller *et al*., 2002) and is now established in the Palaearctic, Malaysian, Oriental, Australasian and Neotropical regions (CAB International, 2003).

Probability of spread

The likelihood that mealybugs will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- *R. iceryoides* is capable of completing 6-9 generations on mango (Rawat and Jakhmola, 1970). Once second and then subsequent generations of mealybugs are established on commercial, susceptible household and wild host plants, mealybugs are likely to persist indefinitely and to spread progressively over time. This spread would be assisted by wind dispersal, vectors and by the movement of plant material. It is very unlikely that mealybugs would be contained by management practices or by regulation.
- Adults and nymphs of *R. iceryoides* can be moved within and between plantations with the movement of infested plant material and animal vectors, and crawlers can be dispersed onto other plants by wind and animals (CAB International, 2003).
- Insecticides do not generally provide adequate control of *R. iceryoides* because of the waxy coating on the mealybug (CAB International, 2003). Heavily infested branches may be pruned to control the pest, especially on the tender branches before flowering begins. However, biological control using natural enemies (i.e. predators and parasitoids) are commonly used to control *R. iceryoides* in mango orchards in India (CAB International, 2003).

Probability of entry, establishment or spread

The overall likelihood that mealybugs will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of mealybugs: **Low**.

Criterion	**Estimate**
Direct consequences	
Plant life or health	**C** — Mealybugs can cause direct harm to a wide range of plant hosts (CAB International, 2003). Fruit quality can be reduced by the presence of

	secondary sooty mould. Mealybug are highly polyphagous and host plants are common in Australia (e.g. citrus, mango, pineapple). Mealybugs are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — Mealybugs introduced into a new environment will compete for resources with native species. They are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. Existing control programs can be effective for some hosts (e.g. broad spectrum pesticide applications) but not all hosts (e.g. where specific integrated pest management programs are used). Insecticides do not generally provide adequate control of *R. iceryoides* owing to the waxy coating on the mealybug (CAB International, 2003). Mealybugs are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of these pests in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions can lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	**C** — The presence of these mealybugs in commercial production areas of a wide range of commodities (e.g. citrus, mango, pineapple) could have a significant effect at the local level due to any limitations to access to overseas markets where these pests are absent. These pests are all associated with citrus. Australia exports citrus fruit worth $40-60 million to the USA from the Riverland-Sunraysia-Riverina (R-S-R) area. Extension of this area has also been negotiated for the USA market. Consideration for export of citrus from areas in Queensland and New South Wales to the USA market is also underway. *Ferrisia virgata* has been reported in the USA (Ben-Dov *et al*., 2001) and therefore will not be likely to affect citrus trade with the USA if they became established in Australia. *Planococcus lilacinus* and *Rastrococcus iceryoides*, however, do not occur in the continental USA (Miller *et al*., 2002) and, if it became established in the R-S-R and other possible export areas in Australia, would complicate citrus trade with the USA and might result in the reintroduction of fumigation for unidentifiable mealybugs or the necessity for pest survey to verify freedom from mealybugs in the export citrus orchards.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Low**.

GROUP 3D – PLANT BUGS

Plant bugs injure a wide range of plants, from vegetables to trees. They damage the host plant by sucking nutrients from plant parts using their stylets (Hori, 2000). This causes injury to plant tissues, and can result in lesions at the feeding point, as well as tissue malformations when they feed on young growing tissues (e.g. young fruits) (Hori, 2000). During the feeding process, they may also transmit plant disease organisms, which increases their damage potential. The plant bugs [Hemiptera: Lygaeidae, Pyrrhocoridae] examined in this pest risk analysis are:

- *Dysdercus koenigii* (Fabricius) – Red cotton bug
- *Spilostethus pandurus* (Scopoli) – Indian milkweed bug.

Synonyms and changes in combination:

Dysdercus koenigii: *Cimex koenigii*.

Spilostethus pandurus: *Cimex pandurus* Scopoli, 1763; *Lygaeus pandurus* (Scopoli); *Lygaeus civilis*; *Spilostethus civilis*; *Spilostethus macilentus* (Stål, 1874).

Host(s):

Dysdercus koenigii: *Abelmoschus esculentus* (okra), *Alcea rosea* (hollyhock), *Gossypium* sp. (cotton), *Hibiscus syriacus* (rose-of-Sharon) (CAB International, 2003); *Mangifera indica* (mango) (DPP, 2001).

Spilostethus pandurus: *S. pandurus* is highly polyphagous and is reported from 15 to 16 plant families (Sweet, 2000). Hosts include: *Abelmoschus esculentus* (okra), *Arachis hypogaea* (peanut), *Cajanus cajan* (pigeon pea), *Calotropis procera* (Sodom's milkweed), *Cicer arietinum* (chickpea), *Citrus* sp., *Corylus avellana* (European hazel), *Eleusine coracana* (finger millet), *Gossypium* spp. (cotton), *Hibiscus sabdariffa* (roselle), *Ipomoea batatas* (sweet potato), *Litchi chinensis* (lychee), *Luffa acutangula* (angled luffa), *Lycopersicon esculentum* (tomato), *Mangifera indica* (mango), *Medicago sativa* (alfalfa, lucerne), *Nicotiana* spp. (tobacco), *Pennisetum glaucum* (pearl millet), *Pistacia vera* (pistachio), *Prunus armeniaca* (apricot), *Prunus persica* (peach), *Psidium guajava* (guava), *Saccharum officinarum* (sugarcane), *Sapindus mukorossi* (Chinese soapberry), *Sesamum indicum* (sesame), *Solanum melongena* (aubergine, eggplant), *Sorghum bicolor* (sorghum), *Stachys affinis* (Chinese artichoke), *Syzygium cumini* (jambolan), *Vicia faba* (broad bean), *Vigna mungo* (black gram), *Vitis vinifera* (wine grape) (Sweet, 2000); *Nerium oleander* (oleander) (CAB International, 2003).

Plant part(s) affected: Fruit, inflorescence, leaf, stem (DPP, 2001).

Distribution:

Dysdercus koenigii: India (Himachal Pradesh, Madhya Pradesh), Pakistan (CAB International, 2003).

Spilostethus pandurus: Cyprus, France, India (Delhi, Rajasthan), Iran, Israel, Italy, Lebanon, Morocco (CAB International, 2003); Egypt, Iraq, Libya, Pakistan, Ethiopia, Somalia, Sudan (Gentry, 1965)

Introduction and spread potential

Probability of importation

The likelihood that plant bugs will arrive in Australia with the importation of fresh mangoes from India: **Very low**.

- Both species are known to be associated with mango fruit in India (DPP, 2001). However, *Dysdercus koenigii* is regarded as an important and damaging pest of cotton rather than mango (Schaefer and Ahmad, 2000), while *Spilostethus pandurus* feeds preferentially on members of the Asclepiadaceae such as *Calotropis* (Sweet, 2000). *S. pandurus* sucks sap from the flower, fruits, the epidermis of tender branches, shoot and leaves of broad bean and jamon branches (Bhattacherjee, 1959), and had a devastating effect on the number of fruit developing.
- *D. koenigii* lays eggs in soil litter (Kamble, 1971) or eggs are scattered on the substrate (Ahmad and Mohammad, 1983), while females of *S. pandurus* lay eggs in one or more clusters underneath fallen leaves or flowers (Sweet, 2000).
- Adults of *D. koenigii* are 11-15.5 mm in length; adults of *S. pandurus* are 12 mm. Both are large and easily visible.
- The adults fly away from fruit when disturbed.
- Routine washing procedures undertaken within the packinghouse would remove all pests from the fruit surface.

Probability of distribution

The likelihood that plant bugs will be distributed as a result of the processing, sale or disposal of fresh mangoes from India, to the endangered area: **Moderate**.

- Adults and nymphs are likely to be associated with infested waste. Plant bugs are likely to enter the environment in two ways: nymphs may be discarded with mango skin, mature into adults and fly to a suitable host plant, or adults can fly directly to suitable hosts.

Probability of entry (importation × distribution)

The likelihood that plant bugs will arrive in Australia as a result of trade in fresh mango fruit, and be distributed to the endangered area: **Very low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that plant bugs will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- Plant bugs can infest a moderate range of plants that include citrus, cotton, lychee, mango, peach and sugarcane (DPP, 2001; Sweet, 2000). Plant bugs are likely to survive and find suitable hosts, especially in the warmer subtropical and tropical regions of Australia.
- Bhattacherjee (1959) reported that 50 to 60 eggs are laid per *S. pandurus* female, with as many as 90 laid in one or more clusters underneath fallen leaves or flowers. Thangavelu (1979) recorded 45 to 90 eggs with an exceptional case of 130. Higher oviposition levels of 75-232 with an average of 150 has been reported when *S. pandurus* is fed on *Calotropis* seeds (Mukhopadhyay, 1983).
- At temperature lower than 60°F there was no copulation or oviposition by *S. pandurus* (Thangavelu, 1979).
- Average longevity of *S. pandurus* adults in captivity was 24-32 days in the summer and 24-48 days in the winter (Bhattacherjee, 1959). Kugelberg (1973) found the adults to live for about 3 months and some individuals survived for 7 months. These differences may be attributed to different geographic populations or ecotypes.
- In southern India under warmer conditions, there are 6-7 overlapping generations for *S. pandurus* (Thangavelu, 1979).

Probability of spread

The likelihood that plant bugs will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- *S. pandurus* is capable of completing 6-7 overlapping generations in the warmer conditions found in southern India (Thangavelu, 1979). Once second and then subsequent generations of plant bugs are established on commercial, susceptible household and wild host plants, plant bugs are likely to persist indefinitely and to spread progressively over time. This spread would be assisted by the movement of plant material and adult flight. It is very unlikely that plant bugs would be contained by management practices or by regulation.

- Eggs and instars of *D. koenigii* are probably the most chemical-sensitive stages, against which the least amount of pesticides might be used (Schaefer and Ahmad, 2000). Several natural plant products have been tested for sterilising or growth-inhibiting effects, but their potential is still being investigated. There are only a few reports of biological control, such as a spider, reduviid bug and predaceous pyrrhocorid *Antilochus coquebertii*, preying on *D. koenigii*, a helminth occasionally parasitising females, and a mite *Hemipteroseius indicus* reducing populations of this red cotton bug (Schaefer and Ahmad, 2000).
- Bhattacherjee (1959) recommends the removal and destruction of reservoir plant species, like *Calotropis* (milkweed) and *Vernonia*, and the use of long-lasting contact insecticide to protect the crop plant from *S. pandurus*. Insecticides such as methyl-parathion, methyl-demeton, phosphamidon, dimethoate, malathion, carbaryl, endosulfan, chlordane, BHS, endrin and toxaphene are effective against *S. pandurus* (Sweet, 2000).

Probability of entry, establishment or spread

The overall likelihood that plant bugs will enter Australia as a result of trade in fresh mangoes from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Very low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of plant bugs: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Plant bugs can cause direct harm to a moderate range of plant hosts. *D. koenigii* can damage cotton by introducing fungi (Schaefer and Ahmad, 2000). Plant bugs are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — Plant bugs introduced into a new environment will compete for resources with native species. They are estimated to have consequences that

	are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**C** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. A variety of insecticides are effective against *S. pandurus*. However, the potential of natural plant products in sterilising or inhibiting the growth of *D. koenigii* is still being investigated. There are only a few reports of biological control of *D. koenigii*. Plant bugs are estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of these pests in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. These restrictions can lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	**C** — The presence of these pests in commercial production areas of a wide range of commodities (e.g. cotton, mango) is likely to have a significant effect at the regional level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications would be required to control these pests on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Negligible**.

GROUP 4A – RED-BANDED MANGO CATERPILLAR

The red-banded mango caterpillar (RBMC) is recorded as a pest of mango fruit in India. It has been described as a major pest in the Orissa region (Butani, 1979) and has previously caused considerable damage to mango fruit in the Andhra Pradesh region (Zaheruddeen and Sujatha, 1993). Larvae bore into both young and more mature fruits and feed on the fruit pulp; later instar larvae feed on the seed (CAB International, 2003). The caterpillar [Lepidoptera: Pyralidae] examined in this pest risk analysis is:

- *Deanolis sublimbalis* Snellen – Red-banded mango caterpillar.

Synonyms and changes in combination: *Noorda albizonalis* Hampson, 1903; *Deanolis albizonalis* (Hampson); *Autocharis albizonalis* (Hampson).

Host(s): *Cyperus rotundus* (nut grass, purple nut sedge), *Mangifera indica* (mango), *Mangifera odorata* (kuwini) (CAB International, 2003).

Plant part(s) affected: Fruit (Srivastava, 1997; Zaheruddeen and Sujatha, 1993); seed (CAB International, 2003).

Distribution: *D. sublimbalis* is restricted to Asia and has been recorded in Brunei Darussalam, India (Andhra Pradesh, Orissa), Indonesia (Java), Philippines and Thailand (CAB International, 2003).

Introduction and spread potential

Probability of importation

The likelihood that *Deanolis sublimbalis* will arrive in Australia with the importation of fresh mango fruit from India: **Moderate**.

- *D. sublimbalis* is known to be associated with the mango fruit pathway (CAB International, 2003). Eggs are laid in masses on the fruit apex and hatch in 3-4 days (Golez, 1991). Young larvae attack tender fruit at an early stage and start boring at the distal end of the fruit (Srivastava, 1997). Larvae bore into both young and more mature fruits and produce a small dot at the point of entry (CAB International, 2003). The affected part heals up and a ring like a pale brown patch is formed (CAB International, 2003; Srivastava, 1997). Larvae begin by feeding on the fruit pulp and form a network of tunnels; later instar larvae feed on the seed (CAB International, 2003). Up to eleven larvae have been found in a single fruit (CAB International, 2003).
- An external sign of infestation is the presence of a liquid exudate from the mouth of a tunnel chewed by the caterpillar through the skin (QDPIF, 2004). The exudate trickles down to the tip of the fruit and accumulates. Although almost clear when fresh, the liquid quickly darkens and shows up as a dark streak on the skin leading to a dark spot, often about 1 cm in diameter, at the fruit tip (QDPIF, 2004). Early signs of infestation may not be as easily seen and could include small darkened boreholes on the fruit caused by entering larvae (QDPIF, 2004).
- Damaged fruits may be secondarily attacked by fruit flies and various decaying microorganisms. They fall from the tree prematurely even if apparently ripe (Peña and Mohyuddin, 1997).
- Infested fruit can be detected by the presence of a dark brown ring and caterpillar frass at the entry point (CAB International, 2003).
- Inspection procedures carried out in the packing station are concerned primarily with quality standards of fruit with regard to blemishes, bruising or damage to the skin. Although all fruit are visually inspected, the procedures are not specifically directed at the detection of internal pests that may be feeding under the surface of the fruit.

- Routine washing procedures undertaken within the packinghouse would not remove the larvae from under the fruit surface.
- It is likely that RBMC larvae would survive storage and transportation due to the availability of an ample food supply. Larvae take about two weeks to fully develop and mature larvae pupate inside the fruit (CAB International, 2003).

Probability of distribution

The likelihood that *Deanolis sublimbalis* will be distributed to the endangered area as a result of the processing, sale or disposal of mango fruit from India: **High**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin, seed).
- Although damaged fruit are likely to be detected and removed from consignments due to quality concerns, RBMC larvae have the capacity to complete their development in discarded fruit and transfer to suitable hosts.
- Larvae take about 14-20 days to complete their development (Peña and Mohyuddin, 1997). Mature larvae can pupate inside the stored fruit, at the point of sale or after purchase by consumers.
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: larvae may be discarded with mango fruit, or adults may fly directly to a suitable host plant.

Probability of entry (importation × distribution)

The likelihood that *Deanolis sublimbalis* will arrive in Australia as a result of trade in fresh mango fruit from India, and be distributed to the endangered area: **Moderate**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Deanolis sublimbalis* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- The host range of RBMC is limited and is only known to include *Cyperus rotundus*, *Mangifera indica* and *M. odorata* (CAB International, 2003). However, host plants such as mango (*Mangifera indica*) are present throughout tropical and subtropical regions of Australia.

- Since 1990, RBMC has been detected on several Torres Strait Islands. RBMC is now known to occur at several locations near the northern tip of Cape York Peninsula, Queensland, after its detection in 2001 (QDPIF, 2004). A control program and surveys are currently in place to eradicate RBMC from Cape York Peninsula.
- Conducive conditions for the establishment of RBMC may occur in some mango production areas in Australia during the growing season.
- Infested fruit is likely to be discarded, therefore the pest may survive and might find a suitable host nearby, especially in the warmer subtropical and tropical regions of Australia where suitable hosts are grown.
- Adults can survive for 8-9 days (Peña and Mohyuddin, 1997). The life cycle is completed in 28-41 days (Peña and Mohyuddin, 1997).
- In the absence of mango fruits, adults fail to reproduce in other parts of mango or in other fruit species (Peña and Mohyuddin, 1997).

Probability of spread

The likelihood that *Deanolis sublimbalis* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Tropical or subtropical areas of Australia would be suitable for the spread of RBMC because they are recorded from these environments.
- Adult moths are able to fly so are likely to spread to other host plants.
- No successful control methods have been recorded for this species (CAB International, 2003). However, Golez (1991) reported that cyfluthrin and deltamethrin were effective in controlling RBMC. Two species of egg parasitoids (*Trichogramma chilonis* and *T. chilotraeae*) and one larval predator species (*Rhychium attrisimum*) have been observed attacking immature stages of RBMC in the Philippines (Golez, 1991).

Probability of entry, establishment or spread

The overall likelihood that *Deanolis sublimbalis* will enter Australia as a result of trade in fresh mango fruit from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Moderate**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of red-banded mango caterpillar: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Deanolis sublimbalis* can cause direct harm to mangoes at the district level. In tropical parts of Asia, it causes commercial losses in the order of 10-15% (QDPIF, 2004). RBMC is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — There are no known consequences of this pest on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**C** — A control program would need to be implemented in infested orchards to reduce fruit damage and yield losses, thereby increasing production costs. A quarantine area has been established on Cape York Peninsula and Torres Strait north of 13°45'S latitude by the Queensland Department of Primary Industry to restrict the spread of RBMC (QDPIF, 2004). The Coen Information and Inspection Centre is enforcing controls on mango fruit and plant movements (QDPIF, 2004). Control of RBMC is difficult and has not been successfully eradicated anywhere in the world (QDPIF, 2004). RBMC is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Domestic trade	**C** — The presence of this pest in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restriction on a wide range of commodities.
International trade	**C** — The presence of this pest in commercial mango production areas is likely to have a significant effect at the local level due to any limitations to access to overseas markets where this pest is absent. RBMC is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Environment	**A** — Although additional pesticide applications would be required to control RBMC on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Low**.

GROUP 4B – HONEYDEW MOTH

The honeydew moth is polyphagous and is often encountered on commercial crops such as avocado, sorghum, maize, rice and mangoes (CAB International, 2003). It is an important pest of citrus, grapes, loquats and pomegranates in the Mediterranean area (Balachowsky, 1972). The moth [Lepidoptera: Pyralidae] examined in this pest risk analysis is:

- *Cryptoblabes gnidiella* (Millière) – Honeydew moth.

Synonyms and changes in combination: *Ephestia gnidiella* Millière, 1867; *Albinia casazzar* Briosi; *Albinia wockiana* Briosi; *Albinia gnidiella* (Millière); *Cryptoblabes aliena* Swezey; *Cryptoblabes wockeana* (Briosi).

Host(s): *Cryptoblabes gnidiella* is polyphagous and able to use almost any plant, but it is most often encountered on commercial crops (CAB International, 2003).

Hosts include: *Allium sativum* (garlic) (Swailem and Ismail, 1972); *Annona muricata* (soursop) (CAB International, 2003); *Azolla anabaena* (azolla) (Sasmal and Kelshreshtha, 1978); *Azolla pinnata* (ferny azolla) (Takara, 1981); *Citrus limon* (lemon) (Sternlicht, 1979); *Citrus sinensis* (sweet orange) (Silva and Mexia, 1999); *Coffea* sp. (coffee) (CAB International, 2003); *Eleusine corana* (ragi) (Singh and Singh, 1997); *Eriobotrya japonica* (loquat) (Ascher *et al*., 1983); *Ficus* sp. (fig) (CAB International, 2003); *Gossypium hirsutum* (cotton) (Swailem and Ismail, 1972); *Macadamia ternifolia* (smooth shell macadamia nut) (Wysoki, 1986); *Malus domestica* (apple) (Carter, 1984); *Mangifera indica* (mango) (CAB International, 2003); *Mespilus* sp. (medlar) (CAB International, 2003); *Morus alba* (mulberry) (CAB International, 2003); *Musa* sp. (banana) (Jager and Daneel, 1999); *Myrica faya* (fayatree, firetree) (Duffy and Gardner, 1994); *Oryza sativa* (rice) (Sasmal and Kulshreshtha, 1984); *Osmanthus* sp. (CAB International, 2003); *Panicum miliacem* (millet panic) (Singh and Singh, 1997); *Paspalum dilatatum* (paspalum) (Yehuda *et al*., 1991-1992); *Pennisetum glaucum* (pearl millet) (Kishore, 1991); *Pennisetum typhoideus* (pearl millet) (Singh and Singh, 1997); *Persea americana* (avocado) (Ascher *et al*., 1983); *Phaseolus* sp. (bean), *Philodendron* sp. (CAB International, 2003); *Prunus domestica* (plum, prune), *Prunus persica* (peach), *Punica granatum* (pomegranate) (Carter, 1984); *Ricinus communis* (castor bean), *Saccharum officinarum* (sugarcane), *Schinus terebinthifolius* (Brazilian pepper tree) (CAB International, 2003); *Solanum melongena* (eggplant) (Swailem and Ismail, 1972); *Sorghum vulgare* (sorghum) (Singh and Singh, 1995); *Swietenia macrophylla* (mahogany) (Akanbi, 1973); *Tarchardia lacca* (Yunus and Ho, 1980); *Vaccinium* sp. (blueberry) (Molina, 1998); *Vitis vinifera* (grapevine) (Hashem *et al*., 1997); *Zea mays* (maize) (Swailem and Ismail, 1972).

Plant part(s) affected: Fruit, leaf, stem (CAB International, 2003).

Distribution: *C. gnidiella* is a cosmopolitan species in warm climates, unable to survive winters in cooler temperate areas into which it may be imported with produce (CAB International, 2003). Records from the Netherlands, Scandinavian countries (Denmark, Finland, Norway and Sweden) and the United Kingdom are from interceptions on imported material (Karsholt, 1996). In Asia, *C. gnidiella* is recorded in India (Karnataka, Maharashtra, Orissa, Uttar Pradesh), Israel, Lebanon, Pakistan, Thailand and Turkey (CAB International, 2003).

Introduction and spread potential

Probability of importation

The likelihood that *Cryptoblabes gnidiella* will arrive in Australia with the importation of fresh mango fruit from India: **Moderate**.

- *C. gnidiella* lays up to 100 eggs on fruit or foliage and these hatch in 4-7 days (Carter, 1984). On citrus, larvae mainly attack the fruit, but also feed on the foliage, bark and twigs (Liotta and Mineo, 1964). Larvae are often found in association with infestations of other pests (e.g. on citrus with the mealybug *Planococcus citri* (Carter, 1984)). This moth is attracted to honeydew excreted by mealybugs (Swirski *et al*., 1980).
- Routine washing procedures undertaken within the packinghouse may remove eggs and larvae from the fruit surface.
- However, this pest is likely to survive storage and transportation. *C. gnidiella* is known to overwinter in Israeli avocado orchards on fresh or dry fruits remaining on the trees or on leaves infested with *Protopulvinaria pyriformis*, on the weed *Paspalum dilatatum* and on various other plants (Yehuda *et al*., 1991-1992). Overwintering moths emerge during March and April and produce a first generation that does not cause any damage to the crop. The fifth generation, flying in October to November, establishes the overwintering population (Yehuda *et al*., 1991-1992). On sorghum in India, this pest was active from the end of March to November and overwintered in the pupal stage with the onset of cold weather (Singh and Singh, 1995).

Probability of distribution

The likelihood that *Cryptoblabes gnidiella* will be distributed to the endangered area as a result of the processing, sale or disposal of mango fruit from India: **Moderate**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin).
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: larvae may be discarded with mango fruit, or adults may fly directly to a suitable host plant.

Probability of entry (importation × distribution)

The likelihood that *Cryptoblabes gnidiella* will arrive in Australia as a result of trade in fresh mango fruit from India, and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Cryptoblabes gnidiella* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- *C. gnidiella* is polyphagous and host plants are common in Australia (e.g. citrus and mango), particularly in the warmer subtropical and tropical regions of Australia.
- *C. gnidiella* has a moderate reproductive rate. Under laboratory conditions, the average fecundity is 105 eggs per female (Wysoki *et al*., 1993). Pre-oviposition period lasts a full day after mating and then most of the eggs are laid during the first night (Wysoki *et al*., 1993).
- Under laboratory conditions, both sexes mate only once a night (Wysoki *et al*., 1993). Most females mate only once in their lifetime, a few mated 2-4 times, whereas males mated up to 6 times. Insects that lived longer also mated more times. A delay in mating results in egg fertility dropping from 91% to 73% (Wysoki *et al*., 1993).
- On sorghum, the period from egg to adult is 27.63 days (Singh and Singh, 1995). Adults of both sexes are short-lived. Female longevity was 3.94 days compared to 2.55 days for males (Singh and Singh, 1995). This species has 3-4 generations a year in southern Europe and up to 5 in North Africa (Carter, 1984). Singh and Singh (1995) reported 9 generations per year on sorghum in India.

Probability of spread

The likelihood that *Cryptoblabes gnidiella* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- *C. gnidiella* has 3-4 generations a year in southern Europe and up to 5 in North Africa (Carter, 1984). Singh and Singh (1995) reported 9 generations per year on sorghum in India. Once second and then subsequent generations of *C.*

gnidiella are established on commercial, susceptible household and wild host plants, they are likely to persist indefinitely and to spread progressively over time. It is very unlikely that *C. gnidiella* would be contained by management practices or by regulation.

- Adult moths are able to fly so are likely to spread to other host plants.
- *C. gnidiella* larvae are highly susceptible to *Bacillus thuringiensis*, especially the first and second instars (CAB International, 2003).
- Studies have been conducted on the use of natural enemies and parasitoids, chemicals (insecticides and synthetic pyrethroids) and pheromones to control this pest in orchards and crops (CAB International, 2003).

Probability of entry, establishment or spread

The overall likelihood that *Cryptoblabes gnidiella* will enter Australia as a result of trade in fresh mango fruit from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of honeydew moth: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Cryptoblabes gnidiella* is polyphagous and host plants are common in Australia (e.g. citrus, mango). This species is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — There are no known consequences of this pest on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of this pest on host plants are likely to be costly and include pesticide applications and crop monitoring. A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses, thereby increasing production costs. *C. gnidiella* is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of this pest in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restriction on a wide range of commodities. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.

International trade	**B** — The presence of this pest in commercial mango production areas is likely to have a significant effect at the local level due to any limitations to access to overseas markets where this pest is absent.
Environment	**B** — Although additional pesticide applications would be required to control the honeydew moth on susceptible crops, this is not considered to have significant consequences for the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Very low**.

GROUP 4C – POMEGRANATE FRUIT BORER

Pomegranate fruit borer larvae bore inside the fruit and feed internally (Srivastava, 1997). The fruit borer [Lepidoptera: Lycaenidae] examined in this pest risk analysis is:

- *Deudorix isocrates* (Fabricius, 1793) – Pomegranate fruit borer.

Synonyms and changes in combination: *Virachola isocrates* (Fabricius).

Host(s): *Eriobotrya japonica* (loquat), *Litchi chinensis* (lychee), *Malus domestica* (apple), *Mangifera indica* (mango), *Manilkara zapota* (sapota), *Phyllanthus emblica* (aonla, emblic), *Prunus domestica* (plum), *Psidium guajava* (guava), *Pyrus communis* (pear), *Ziziphus jujuba* (ber) (Srivastava, 1997).

Plant part(s) affected: Fruit, stem (Srivastava, 1997).

Distribution: India (DPP, 2001; Srivastava, 1997).

Introduction and spread potential

Probability of importation

The likelihood that *Deudorix isocrates* will arrive in Australia with the importation of fresh mango fruit from India: **Moderate**.

- *D. isocrates* lays a single egg on various parts of the shoots and the larva which hatches out within 7-10 days bores inside the fruit (Srivastava, 1997).
- Infestation by this pest may result in rotting of fruit or premature fruit drop so infested fruit are unlikely to be packed for export.
- Infested fruit can be detected by the presence of grassy material near the hole (Srivastava, 1997).

- The presence of the larva on fruit can be easily discerned as the stout-bodied, long larva is dark brown in colour (Srivastava, 1997).
- Although the signs of insect infestation on fruits can be detected, it is likely that recently infested fruit would be exported as the larva can remain inside the fruit.
- The larvae of the borer in the shipment must survive for at least 15-16 days before emerging from fruit to pupate upon arrival.

Probability of distribution

The likelihood that *Deudorix isocrates* will be distributed to the endangered area as a result of the processing, sale or disposal of mango fruit from India: **Moderate**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin).
- If adults and larvae were to survive storage and transport, they may enter the environment in two ways: larvae may be discarded with mango fruit, or adults may fly directly to a suitable host plant.

Probability of entry (importation × distribution)

The likelihood that *Deudorix isocrates* will arrive in Australia as a result of trade in fresh mango fruit from India, and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Deudorix isocrates* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- *D. isocrates* is a polyphagous pest and infests fruit of apple, ber, litchi, guava, loquat, mango, pear, plum, aonla and sapota.
- Adult longevity for males and females is 6.1 and 11.2 days respectively.
- In laboratory studies, the fecundity of females was 31.9±2.21 and 27.3±2.53 in the first and second generations, respectively on aonla (Singh and Singh, 2001).
- On aonla, the longevity of males and females was 7.8±1.6 and 11.9±1.3 days, respectively, in the first generation while in the second generation it was

6.8±0.98 and 11.3±0.40 days, respectively (Singh and Singh, 2001).

- Surviving female borers must then be successful in locating suitable mating partners and fruiting hosts to lay eggs. The total life cycle is completed in 50 days.
- *Deudorix* species (e.g. *D. epijarbas*) is already established in tropical and subtropical parts of eastern Australia.

Probability of spread

The likelihood that *Deudorix isocrates* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *D. isocrates* because other *Deudorix* species are recorded from these environments.
- The adult moths are able to fly so are likely to spread to other host plants.
- This pest can be controlled by using biological control (i.e. hymenopteran wasps as larval parasitoids) and chemical sprays such as phosphamidon, phenthoate, fenthion, methamidophos and endosulfan (Srivastava, 1997).

Probability of entry, establishment or spread

The overall likelihood that *Deudorix isocrates* will enter Australia as a result of trade in fresh mango fruit from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of fruit borer: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Deudorix isocrates* can cause direct harm to a wide range of plant species and is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — There are no known consequences of this pest on other aspects of the environment.

Indirect consequences

Eradication, control etc.	**B** — A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses, thereby increasing production costs. *D. isocrates* is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of this pest in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restriction on a wide range of commodities.
International trade	**B** — The presence of this pest in commercial mango production areas is likely to have a significant effect at the local level due to any limitations to access to overseas markets where this pest is absent.
Environment	**A** — Although additional pesticide applications would be required to control this fruit borer on susceptible crops, this is unlikely to affect the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Very low**.

GROUP 4D – COCOA TUSSOCK MOTH

The larvae of cocoa tussock moth cause serious damage to the young leaves of cacao in the Philippines, both in nurseries and plantations. When very numerous they can cause total defoliation, killing or stunting the tree (Sanchez and Laigo, 1968). The larvae also attack fruits, especially mango, rendering them unsuitable for sale (Fasih *et al*., 1989). The tussock moth [Lepidoptera: Lymantriidae] examined in this pest risk analysis is:

- *Orgyia postica* (Walker, 1855) – Cocoa tussock moth.

Synonyms and changes in combination: *Lacida postica* (Walker); *Notolophus australis posticus* (Walker); *Notolophus postica* (Walker); *Notolophus posticus* (Walker); *Orgyia australis postica* (Walker); *Orgyia ceylanica* Nietner, 1862; *Orgyia ocularis* Moore; *Orgyia posticus* (Walker).

Host(s): *Amherstia nobilis*, *Camellia sinensis* (tea), *Cinchona* sp., *Cinnamomum* sp. (camphor, cinnamon), *Coffea* sp. (coffee), *Dimocarpus longan* (longan), *Durio zibethinus* (durian), *Erythrina* spp. (coral tree), *Garcinia mangostana* (mangosteen), *Glycine max* (soybean), *Hevea brasiliensis* (rubber), *Lablab purpureus* (hyacinth bean), *Leucaena leucocephala* (horse tamarind), *Litchi chinensis* (lychee), *Malpighia punicifolia* (Barbados cherry tree), *Mangifera indica* (mango), *Nephelium lappaceum* (rambutan), *Populus deltoides* (black poplar), *Pyrus communis* (pear), *Ricinus communis* (castor bean), *Rosa* sp. (rose), *Syzygium cumini* (jambolan), *Tamarix plumosus*, *Theobroma cacao* (cocoa), *Vigna* *radiata* (mung bean), *Vitis vinifera* (wine grape), *Ziziphus jujuba* (jujube), Orchidaceae (orchid) (CAB International, 2003).

Plant part(s) affected: Fruit, leaf, panicle, shoot (Fasih *et al*., 1989); stalk (Gupta & Singh, 1986).

Distribution: Bangladesh, Brunei Darussalam, China, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam (CAB International, 2003).

Introduction and spread potential

Probability of importation

The likelihood that *Orgyia postica* will arrive in Australia with the importation of fresh mango fruit from India: **Moderate**.

- Diapausing egg masses on female cocoons can be found amongst stored fruit (CAB International, 2003).
- Larvae of *O. postica* cause large scale defoliation of mango trees and in some cases the fruits are also attacked and rendered unmarketable, so infested fruit are unlikely to be packed for export.
- Larvae feed on stalks, skin and pulp of fruits and on new flushes of leaves (Gupta and Singh, 1986). Damage to fruits is more severe in comparison to leaves as larvae prefer to feed on the fruits (Gupta and Singh, 1986). Gupta and Singh (1986) reported that up to 30% of trees in the Behat area of the Saharanpur district were infested in late June to early July. The fruits, on their stalk being damaged, drop from the tree prematurely and those left on the tree with damaged skin and pulp lose their market value (Gupta and Singh, 1986).
- Larvae in the shipment must survive for at least 15-28 days to fully grow and pupate in a cocoon on either leaves or stems.

Probability of distribution

The likelihood that *Orgyia postica* will be distributed to the endangered area as a result of the processing, sale or disposal of mango fruit from India: **Moderate**.

- The commodity is likely to be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. mango skin).
- If eggs and larvae were to survive storage and transport, they may enter the environment through discarded mango fruit.

Probability of entry (importation × distribution)

The likelihood that *Orgyia postica* will arrive in Australia as a result of trade in fresh mango fruit from India, and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Orgyia postica* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- *O. postica* is a polyphagous pest and infests a wide range of crops (Fasih *et al*., 1989). Larvae prefer to feed on fruit .
- Females are flightless and cling to the exterior of their cocoons and call males to them (Sanchez and Laigo, 1968). Oviposition is generally on the cocoon, with up to 60% of eggs producing larvae (Sanchez and Laigo, 1968).
- Eggs hatch after about 5-6 days, and the resulting male larvae take 15-26 days to become fully grown; the larger, female larvae take 15-28 days (Sanchez and Laigo, 1968). The female and male pupal stages last 4-5 and 6-7 days, respectively (Sanchez and Laigo, 1968).

Probability of spread

The likelihood that *Orgyia postica* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *O. postica* because it is recorded from these environments.
- Female moths are flightless, but males are diurnal and able to fly, so are likely to spread to other host plants.
- Nuclear polyhedrosis virus in the Philippines has been recorded to cause larval mortality. Few parasitoids and pathogens are recorded as natural enemies of *O. postica* (CAB International, 2003).

Probability of entry, establishment or spread

The overall likelihood that *Orgyia postica* will enter Australia as a result of trade in fresh mango fruit from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of cocoa tussock moth: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Orgyia postica* can cause direct harm to a wide range of plant species and is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the regional level.
Any other aspects of the environment	**A** — There are no known consequences of this pest on other aspects of the environment.
Indirect consequences	
Eradication, control etc.	**B** — A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses, thereby increasing production costs. *O. postica* is estimated to have consequences that are unlikely to be discernible at the national level and of minor significance at the district level.
Domestic trade	**B** — The presence of this pest in commercial production areas is likely to have a significant effect at the local level due to any resulting interstate trade restriction on a wide range of commodities.
International trade	**B** — The presence of this pest in commercial mango production areas is likely to have a significant effect at the local level due to any limitations to access to overseas markets where this pest is absent.
Environment	**A** — Although additional pesticide applications would be required to control cocoa tussock moth on susceptible crops, this is unlikely to affect the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Very low**.

FUNGI

GROUP 5 – MANGO SCAB

Mango scab causes little economic damage if it is effectively controlled with chemicals. Without chemical control, losses as high as 90% have been observed in one mango orchard during an investigation in 1996-97 in Darwin, Australia (B.D. Condé, NT Department of Primary Industry and Fisheries, Darwin, Australia, unpublished data) (CAB International, 2003). The mango scab [Dothideales: Elsinoaceae] examined in this pest risk analysis is:

***Elsinoë mangiferae* Bitancourt & Jenkins.

Synonyms and change in combination: *Sphaceloma mangiferae* [anamorph] Bitancourt & Jenkins.

Host(s): *Mangifera indica* (mango) (CAB International, 2003).

Plant part(s) affected: Fruit/pod, inflorescence, leaf, growing points (CAB International, 2003).

Distribution: Australia (Northern Territory, Queensland), Brazil, Canada, China (Taiwan), Cuba, Dominican Republic, Haiti, India, Jamaica, Kenya, Nepal, Panama, Philippines, Puerto Rico, United States (CAB International, 2003).

Introduction and spread potential

Probability of importation

The likelihood that *Elsinoë mangiferae* will arrive in Australia with the importation of fresh mango fruit from India: **Low**.

- The conidia of *Elsinoë* can only infect young tissue of the leaves, stem, flower, fruit stalk and young fruit. Fruit is no longer susceptible after it reaches about half size. Heavily affected fruits fall off the tree (CAB International, 2003).
- Lesions on the fruit of the cultivar Kensington Pride, which remain on the tree, develop into light-brown scabs or scar tissue, either as small scabs or large, irregular scar tissue when the lesions coalesce.
- The disease is controlled mostly through fungicide use.
- Due to the visible symptoms of the disease on the mature fruit which remain on the tree, most infected fruit will be discarded during sorting although some fruit with minor symptoms may not be observed and be exported.

Probability of distribution

The likelihood that *Elsinoë mangiferae* will be distributed as a result of the processing, sale or disposal of mango fruit from India, to the endangered area: **Moderate**.

*This species is a quarantine pest for the State of Western Australia due to its absence from this State.

- The pathogen is likely to survive storage and transportation but may progress to visible lesions ranging from small black spots to small or large scarred areas before distribution (CAB International, 2003).

Probability of entry (importation × distribution)

The likelihood that *Elsinoë mangiferae* will enter Australia as a result of trade in fresh mango fruit from India, and be distributed in a viable state to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Probability of establishment

The likelihood that *Elsinoë mangiferae* will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- The host range of *E. mangiferae* is limited to mango.
- Conducive conditions for the establishment of *E. mangiferae* may occur in some production areas in Australia during the growing season. *E. mangiferae* was recorded in Australia (in Northern Territory and Queensland). Active lesions, characterised by pale brown growth of the conidiophores and conidia, have only been found during wet weather (CAB International, 2003).
- Mango imports would generally be counter-seasonal to Australian mango production.
- The skin of infected fruit is likely to be thrown into backyard compost heaps, therefore the pathogen may survive and might find mango host nearby, especially in the warmer subtropical and tropical regions of Australia where mangoes are grown.

Probability of spread

The likelihood that *Elsinoë mangiferae* will spread based on a comparative assessment of those factors in the area of origin and in Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Tropical or subtropical environments of Australia would be suitable for the spread of *E. mangiferae* if mango hosts were available.
- The pathogen requires rain splash and periods of free water to produce conidia and for the germination of these conidia to produce new infections.
- Under extremely wet and gusty conditions, but in a sheltered situation, the disease was observed to spread 4.25 m (CAB International, 2003).
- Sexual stage of the fungus (ascospores) was only rarely found and asexual conidia were responsible for the bulk of infections (CAB International, 2003).

Probability of entry, establishment or spread

The overall likelihood that *Elsinoë mangiferae* will enter Australia as a result of trade in fresh mango fruit from India, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

The probability of entry, establishment or spread is determined by combining the likelihoods of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001.

Consequences

Consequences (direct and indirect) of mango scab: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — *Elsinoë mangiferae* is likely to cause significant direct harm to mango production at the district level.
Any other aspects of the environment	**A** — There are no known direct consequences of this pest on the natural or built environment, such as the physical environment or microorganisms but their introduction into a new environment may lead to competition for resources with native species. There are no known direct consequences of this disease on human life, health or welfare.
Indirect consequences	
Eradication, control etc.	**B** — Programs to minimise the impact of this disease on host plants are likely to be required and incur costs for fungicide sprays and additional crop monitoring.
Domestic trade	**B** — The presence of this disease in commercial production areas may have a significant effect at the local level due to any resulting interstate trade

	restrictions on mangoes.
International trade	**B** — The presence of this disease in commercial production areas of mango may have a significant effect at the local level due to any limitations to access to overseas markets where this pest is absent.
Environment	**A** — Although additional fungicide applications would be required to control this disease on mango, this is unlikely to affect the environment.

Unrestricted risk estimate

The unrestricted risk estimate as determined by combining the overall ‘probability of entry, establishment or spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Improt Risk Analysis*, September 2001. **Very low**.

CONCLUSION: RISK ASSESSMENTS

Table 7 summarises the detailed risk assessments and provides unrestricted risk estimates for the quarantine pests considered to be associated with fresh mangoes from India.

Five arthropods (*Cryptoblabes gnidiella*, *Deudorix isocrates*, *Dysdercus koenigii*, *Orgyia postica*, *Spilostethus pandurus*) and one pathogen (*Elsinoë mangiferae*) were assessed to have an unrestricted risk below Australia’s ALOP and do not require risk management measures. The remaining 26 quarantine pests were assessed to have an unrestricted risk estimate above Australia’s ALOP and require risk management measures.

Table 8 provides the final list of quarantine pests associated with fresh mangoes from India that have been assessed to have unrestricted risk assessment above Australia’s ALOP, and therefore require risk management measures. The proposed risk management measures are described in the following section.

Table 7 Results of the risk assessments

Scientific name	Common name	Probability of Entry	Probability of Establishment	Probability of Spread	Overall Probability of entry, establishment and spread	Consequences	Unrestricted risk
ARTHROPODA							
Coleoptera [beetles, weevils]							
Sternochetus frigidus (Fabricius)	Mango pulp weevil	Moderate	High	Moderate	Low	Moderate	Low
**Sternochetus mangiferae* (Fabricius)	Mango seed weevil	High	High	Moderate	Moderate	Low	Low
Diptera [flies]							
Bactrocera caryeae (Kapoor)	Fruit fly	High	High	High	High	High	High
Bactrocera correcta (Bezzi)	Guava fruit fly	High	High	High	High	High	High
Bactrocera cucurbitae (Coquillett)	Melon fly	High	High	High	High	High	High
Bactrocera diversa (Coquillett)	Three striped fruit fly	High	High	High	High	High	High
Bactrocera dorsalis (Hendel)	Oriental fruit fly	High	High	High	High	High	High
Bactrocera tau (Walker)	Fruit fly	High	High	High	High	High	High
Bactrocera zonata (Saunders)	Peach fruit fly	High	High	High	High	High	High
Hemiptera [aphids, leafhoppers, mealybugs, psyllids, scales, true bugs, whiteflies]							
**Abgrallaspis cyanophylli* (Signoret)	Cyanophyllum scale	Moderate	High	High	Moderate	Low	Low
**Aspidiotus nerii* Bouché	Oleander scale	Moderate	High	High	Moderate	Low	Low
Ceroplastes actiniformis Green	Soft scale	Moderate	High	High	Moderate	Low	Low
**Coccus longulus* (Douglas)	Long soft scale	Moderate	High	High	Moderate	Low	Low

Scientific name	Common name	Entry	Probability of Establishment	Spread	Overall Probability of entry, establishment and spread	Consequences	Unrestricted risk
Dysdercus koenigii (Fabricius)	Red cotton bug	Very low	Moderate	Moderate	Very low	Low	Negligible
**Ferrisia virgata* (Cockerell)	Striped mealybug	Moderate	High	High	Moderate	Low	Low
**Hemiberlesia rapax* (Comstock)	Greedy scale	Moderate	High	High	Moderate	Low	Low
**Lepidosaphes beckii* (Newman)	Mussel scale	Moderate	High	High	Moderate	Low	Low
**Lepidosaphes gloverii* (Packard)	Glover's scale	Moderate	High	High	Moderate	Low	Low
Milviscutulus mangiferae (Green)	Mango shield scale	Moderate	High	High	Moderate	Low	Low
Nipaecoccus nipae (Maskell)	Coconut mealybug	Moderate	High	High	Moderate	Low	Low
Planococcus ficus (Signoret)	Grapevine mealybug	Moderate	High	High	Moderate	Low	Low
Planococcus lilacinus (Cockerell)	Coffee mealybug	Moderate	High	High	Moderate	Low	Low
**Planococcus minor* (Maskell)	Pacific mealybug	Moderate	High	High	Moderate	Low	Low
Rastrococcus iceryoides (Green)	Downey snowline mealybug	Moderate	High	High	Moderate	Low	Low
Rastrococcus invadens Williams	Mealybug	Moderate	High	High	Moderate	Low	Low
Rastrococcus spinosus (Robinson)	Philippine mango mealybug	Moderate	High	High	Moderate	Low	Low
Spilostethus pandurus (Scopoli)	Indian milkweed bug	Very low	Moderate	Moderate	Very low	Low	Negligible
Lepidoptera [butterflies, moths]							
Cryptoblabes gnidiella (Millière)	Honeydew moth	Low	High	High	Low	Low	Very low
Deanolis sublimbalis Snellen	Red-banded mango caterpillar	Moderate	High	High	Moderate	Low	Low

Scientific name	Common name	Entry	Probability of Establishment	Spread	Overall Probability of entry, establishment and spread	Consequences	Unrestricted risk
Deudorix isocrates (Fabricius)	Pomegranate fruit borer	Low	High	Moderate	Low	Low	Very low
Orgyia postica (Walker)	Cocoa tussock moth	Low	Moderate	Moderate	Low	Low	Very low
FUNGI							
**Elsinoë mangiferae* Bitancourt & Jenkins	Mango scab	Low	Moderate	Moderate	Low	Low	Very low

* WA only – this species is a quarantine pest for the State of Western Australia due to its absence from this State.

Table 8 Quarantine pests for fresh mango fruit from India assessed to have unrestricted risk estimates above Australia's ALOP

Scientific name	Common name
ARTHROPODA	
Abgrallaspis cyanophylli (Signoret)	Cyanophyllum scale
Aspidiotus nerii Bouché	Oleander scale
Bactrocera caryeae (Kapoor)	Fruit fly
Bactrocera correcta (Bezzi)	Guava fruit fly
Bactrocera cucurbitae (Coquillett)	Melon fly
Bactrocera diversa (Coquillett)	Three striped fruit fly
Bactrocera dorsalis (Hendel)	Oriental fruit fly
Bactrocera tau (Walker)	Fruit fly
Bactrocera zonata (Saunders)	Peach fruit fly
Ceroplastes actiniformis Green	Soft scale
Coccus longulus (Douglas)	Long soft scale
Deanolis sublimbalis Snellen	Red-banded mango caterpillar
Ferrisia virgata (Cockerell)	Striped mealybug
Hemiberlesia rapax (Comstock)	Greedy scale
Lepidosaphes beckii (Newman)	Mussel scale
Lepidosaphes gloverii (Packard)	Glover's scale
Milviscutulus mangiferae (Green)	Mango shield scale
Nipaecoccus nipae (Maskell)	Coconut mealybug
Planococcus ficus (Signoret)	Grapevine mealybug
Planococcus lilacinus (Cockerell)	Coffee mealybug
Planococcus minor (Maskell)	Pacific mealybug
Rastrococcus iceryoides (Green)	Downey snowline mealybug
Rastrococcus invadens Williams	Mealybug
Rastrococcus spinosus (Robinson)	Philippine mango mealybug
Sternochetus frigidus (Fabricius)	Mango pulp weevil
Sternochetus mangiferae (Fabricius)	Mango seed weevil

STAGE 3: PEST RISK MANAGEMENT

Pest risk management evaluates and selects options for measures to reduce the risk of entry, establishment or spread of quarantine pests assessed to pose an unacceptable level of risk to Australia via the importation of commercially produced mangoes from India (i.e. produced under standard cultivation, harvesting and packing activities).

Biosecurity Australia considers that the risk management measures proposed below are commensurate with the identified risks and invites comments on their technical and economic feasibility. In particular, comments are welcome on the appropriateness of the measures and any alternative measures that stakeholders consider to be equivalent in achieving the identified objectives Note that Biosecurity Australia regards the measures listed below to be consistent with, and equivalent to, the measures that are currently in place for the importation of fresh mangoes from Mexico and the Philippines (Guimaras Island).

The measures described below will form the basis of the import conditions for fresh mango fruit from India.

There are 4 categories of measures proposed to mitigate the risks identified in the pest risk assessment:

1. Pre-export vapour heat treatment (VHT) or hot water treatment (HWT) for the management of fruit fly species;
2. Designated pest free places of production or production sites for the management of *Sternochetus frigidus* (mango pulp weevil) and *S. mangiferae* (mango seed weevil);
3. Inspection and remedial action for other identified quarantine pests; and
4. Supporting operational systems to maintain and verify phytosanitary status

It is important to note that it is only appropriate for the unrestricted risk assessments to take into account the minimum border procedures used by relevant government agencies and not those measures approved by such agencies that are intended to mitigate risks associated with the commodity itself. The minimum procedures include verifying that the commodity is as described in the shipping documents and identifying external and internal contaminations of containers and packaging. In order to have least trade restrictive measures, the starting point for evaluation of the restricted risk management options first considered the use of a 600-unit inspection in detecting quarantine pests requiring risk management, and the subsequent remedial actions or treatments that might be applied if a pest is intercepted.

The standard AQIS sampling protocol requires inspection of 600 units, for quarantine pests in systematically selected random samples per homogeneous consignment or lot. The unit for mango is defined as one mango fruit. Biometrically, if no pests are detected by the inspection, this sample size achieves a confidence level of 95% that not more than 0.5% of the units in the consignment are infested/infected. The level of confidence depends on each fruit in the consignment having about the same likelihood of being affected by a quarantine pest and the inspection technique being able to reliably detect all quarantine pests in the sample. If no live quarantine pests are detected in the sample, the consignment is considered to be free from quarantine pests and would be released from quarantine. Where a quarantine pest is intercepted in a sample, the remedial actions or treatments may (depending on the location of the inspection) include:

- withdrawing the consignment from export to Australia;
- re-export of the consignment from Australia;
- destruction of the consignment; or
- treatment of the consignment to ensure that the pest is no longer viable.

It should be emphasised that inspection is not a measure that mitigates the risk of a pest. It is the remedial actions or treatment that can be taken based on the results of the inspection that would reduce a pest risk.

RISK MANAGEMENT MEASURES AND PHYTOSANITARY PROCEDURES

[1] Pre-export vapour heat treatment (VHT) or hot water treatment (HWT) for the management of fruit fly species

Fruit flies, *Bactrocera caryeae*, *B. correcta*, *B. cucurbitae*, *B. diversa*, *B. dorsalis*, *B. tau* and *B. zonata* have been assessed as quarantine pests of high risk for mangoes from India and therefore require measures to mitigate that risk.

Visual inspection alone is not considered to be an appropriate risk management option in view of the level of risk identified and because clear visual signs of infestation (particularly in recently infested fruit) may not be present. If infested fruit was not detected at inspection, fruit flies may enter, establish and spread. Other measures that might be applied to mitigate risks associated with fruit flies are either the use of disinfestation treatments or by sourcing fruit from pest free areas.

In 2000, the APEDA of India proposed the use of VHT for the disinfestation of fruit flies. APEDA, in collaboration with the IMOA also provided reports in 2002 and 2003 on the efficacy of using VHT and HWT for the disinfestation of fruit flies.

Biosecurity Australia therefore proposes the following phytosanitary risk management options to mitigate the risk posed by fruit flies of quarantine concern associated with mangoes from India: [1a] vapour heat treatment (VHT) or [1b] hot water treatment (HWT).

Both measures are known to reduce the risk associated with the identified fruit fly species of quarantine concern to an acceptable level due to the proven efficacy of the treatment. Biosecurity Australia considers that this measure is appropriate to reduce the risk associated with fruit flies to very low, which is below Australia's ALOP.

[1a] Vapour heat treatment (VHT)

VHT efficacy trial data for fruit flies in mangoes was provided by India. Eggs and larvae of *Bactrocera dorsalis* and *B. cucurbitae* (the two most heat tolerant species) were killed when the mango fruit pulp temperature was maintained at 47.5°C for 20 minutes.

Biosecurity Australia accepts the use of VHT to mitigate the risk of fruit fly species of quarantine concern associated with imported mango fruit from Guimaras Island (Philippines). Australia also uses VHT to mitigate the risk of fruit flies for the export of Australian mangoes to Japan.

It has been demonstrated that VHT adequately mitigates the risk posed by fruit fly species of quarantine concern associated with mango fruit from India to a level that is below Australia's ALOP.

Biosecurity Australia proposes an option of a pre-export VHT of 47.5°C (fruit pulp temperature) for 20 minutes for all mango varieties. Treatment time will be for a minimum time of two hours, including the warming and cooling periods to bring the fruit pulp to temperature. Treatment commences when the pulp core temperature of all monitored fruit reaches, or is above, the required temperature and this temperature is maintained for the required period.

Temperature values need to be recorded to standards agreed between the IMOA and Biosecurity Australia/AQIS and monitored by the IMOA.

The phytosanitary security of the product must be maintained after the vapour heat treatment to prevent reinfestation by fruit flies. Phytosanitary inspection of the treated fruit would be conducted by IMOA and the details of the treatment included on the Phytosanitary Certificate (see measure 4).

[1b] Hot water treatment (HWT)

India has developed and standardised an alternative heat disinfestation treatment for fruit fly in mango fruit using hot water and has provided relevant efficacy data to Biosecurity Australia. Eggs and larvae were killed when mango fruit were submerged in hot water at

48°C for 60 minutes. This treatment is in commercial use in India and is the protocol required for the export of Indian mangoes to China since 2003.

Hot water is used as an effective disinfestation treatment for certain fruit fly species in certain fruits in international trade. Treatment schedules are generally specific to particular combinations of pest species and commodity. For example, the USDA use treatment schedule T102-a *Hot water dip* against Mediterranean fruit fly and Mexican fruit fly in mangoes at a temperature of 115°F (46.1°C) for 65-110 minutes depending upon the size (375-900g) and shape (flat, elongated vs rounded varieties) (USDA, 2004). The literature indicates that the efficacy of the treatment is dependent upon the size and shape of the mango fruit. Biosecurity Australia accepts this treatment against fruit flies for mangoes from Mexico.

Biosecurity Australia proposes an option of a pre-export hot water treatment of 48°C or above for 60 minutes. Mangoes would be treated with a hot water submersion treatment in accordance with the following schedule:

1. Fruit pulp temperature would be 21°C or above prior to commencing treatment.
2. Fruit would be submerged at least 10 cm below the water surface.
3. Water would circulate constantly and be kept at 48°C throughout the treatment period, with the following tolerances:
    a) During the first five minutes of the treatment – temperatures may fall as low as 47.4°C provided the temperature is at least 48°C at the end of the five minute period.
    b) Temperatures may fall as low as 47.4°C for no more than 10 minutes.
4. The dip time must be extended for an additional 10 minutes if hydrocooling starts immediately after the hot water immersion treatment.

Hot water treatment would be conducted in India in packinghouse facilities registered with and audited by IMOA. Temperature values need to be recorded to standards agreed between IMOA and Biosecurity Australia/AQIS and monitored by IMOA.

The phytosanitary security of the product would be maintained after hot water treatment to prevent reinfestation by fruit flies. Phytosanitary inspection of the treated fruit would be conducted by IMOA and the details of the treatment included on the Phytosanitary Certificate (see measure 4).

[2] Designated pest free places of production or pest free production sites for the management of mango pulp and mango seed weevils

Sternochetus frigidus (mango pulp weevil, MPW) and *S. mangiferae* (mango seed weevil, MSW) have been assessed to have an unrestricted risk estimate of low and therefore measures are required to mitigate the risk.

The mango pulp and mango seed weevil enter the developing mango and feed internally on the seed and/or pulp. As there are no clear visual signs of infestation, visual inspection alone is not considered to be an appropriate risk management option. If infested fruit was not detected at inspection, these weevils may enter, establish and spread in Australia.

The APEDA of India proposed the use of designated pest free places of production or pest free production sites as a risk management measure for these internal feeding weevils and sent survey data on pest free places of production or pest free production sites in 2003 and 2004. Biosecurity Australia therefore proposes this as a phytosanitary risk management option for these pests.

The IMOA would be responsible for establishing, maintaining and verifying pest freedom for MPW and MSW in “Pest free places of production and pest free production sites”, as defined by the International Standards for Phytosanitary Measures (ISPM), Food and Agriculture Organization (FAO), Publication No. 10 *Requirements for the establishment of pest free places of production and pest free production sites*.

The IMOA would be responsible for the establishment of production area pest freedom by verification of pest free places of production or pest free production sites by official surveys and monitoring. Monitoring would involve field inspections and fruit cutting done at least once during the growing season and before harvest. These monitoring surveys would be conducted during each year of mango production for each pest free area before consignments would be permitted for export to Australia. The results would be submitted to Biosecurity Australia/AQIS before access can be considered.

The IMOA would maintain production area pest freedom and specify the measures in place to prevent the introduction of the pest into the place of production or production site or to destroy previously undetected infestations. The IMOA would advise Biosecurity Australia/AQIS of the nominated orchards within the designated pest free places of production/pest free production sites. The IMOA is required to notify Biosecurity Australia/AQIS of any pest detected during routine monitoring and surveys conducted during the production season.

Based on the survey data provided by the IMOA, for the 2004 season, designated pest free areas have been established for the production areas of Barabanki, Malihabad, Saharanpur in the Lucknow region, Uttar Pradesh, the areas of Navsari and Valsad in Gujarat and the areas of Devgad, Kudal, Malvan, Sawantwadi and Vengurla in Maharashtra.

The phytosanitary security of the product from these quarantine pests would be maintained after harvest and phytosanitary inspection of the harvested fruit would be conducted by IMOA (see measure 4). A Phytosanitary Certificate confirming that MPW and MSW are not known to occur in the designated places of production or pest free production sites and that the product is free from this pest would be issued by the IMOA.

The objective of the proposed measure is to ensure that fruit is sourced from designated areas or a place of production where the pest is not known to be present nor likely to occur, thus reducing the risk of the weevils being present in export consignments of mangoes from India.

Biosecurity Australia considers that this measure, supported by measures 4a, c and e is appropriate to reduce the risk associated with MPW and MSW to very low, which is below Australia's ALOP.

[3] Inspection and remedial action for other identified quarantine pests such as red-banded mango caterpillar, mealybugs and scale insects

Deanolis sublimbalis (red-banded mango caterpillar, RBMC), mealybugs (*Ferrisia virgata*, *Nipaecoccus nipae*, *Planococcus ficus*, *P. lilacinus*, *P. minor*, *Rastrococcus iceryoides*, *R. invadens*, *Rastrococcus spinosus*) and scale insects (*Abgrallaspis cyanophylli*, *Aspidiotus nerii*, *Ceroplastes actiniformis*, *Coccus longulus*, *Hemiberlesia rapax*, *Lepidosaphes beckii*, *L. gloverii*, *Milviscutulus mangiferae*) were assessed to have an unrestricted risk estimate of low, and measures are therefore required to mitigate that risk.

Biosecurity Australia considers that targeted visual inspection for freedom from RBMC, mealybugs and scale insects is an appropriate risk management measure in view of the level of risk identified. If infested fruit was not inspected and detected, these pests may enter, establish and spread. Inspection would need to be completed prior to vapour heat treatment/hot water treatment.

Larvae of RBMC feed on the mango pulp and seed. Visual inspection is considered to be an appropriate risk management option as infested fruit can be detected by the presence of a dark brown ring and caterpillar frass at the entry point on the surface of the mango fruit. Visual inspection for freedom from mealybugs and scale insects is considered to be an appropriate risk management option for these pests because they are easily detected on the surface of mango fruit.

This phytosanitary measure is based on the current risk management measures for mangoes from the Philippines (Guimaras Island) and Mexico. Biosecurity Australia considers that this measure is appropriate to reduce the risk associated with RBMC, mealybugs and scale insects to very low, which is below Australia's ALOP.

[4] Supporting operational systems to maintain and verify phytosanitary status

It is necessary to have a system of operational procedures in place to ensure that the phytosanitary status fresh mangoes from India is maintained and verified during the process of production and export to Australia. This is to ensure that the objectives of the risk mitigation measures previously identified have been met and are being maintained.

Biosecurity Australia proposes a system for that purpose which is equivalent to the system currently in place for the importation of fresh mangoes from Guimaras Island, the Philippines.

Details of this system, or of an equivalent one, will be determined by agreement with the IMOA. This is to ensure that requirements are appropriate to the circumstances of India for fresh mango production and export.

The proposed system of operational procedures for the production and export of fresh mangoes to Australia from India consists of:

4a. Registration of export orchards;

4b. Registration of packinghouses and auditing of procedures;

4c. Pre-export inspection and remedial action by IMOA;

4d. Packaging and labelling;

4e. Phytosanitary certification by IMOA;

4f. Specific conditions for storage and movement; and

4g. On-arrival phytosanitary inspection and clearance by AQIS.

[4a] Registration of export orchards

All mango fruit for export to Australia must be sourced from export orchards and growers registered with IMOA. Copies of the registration records must be made available to AQIS if requested. The IMOA is required to register all export orchards prior to commencement of exports.

All export orchards are expected to produce mango fruit under standard commercial cultivation, harvesting and packing activities.

The objective of this procedure is to ensure that orchards from which mangoes are sourced can be identified. This is to allow trace back to individual orchards and growers in the event of non-compliance. For example, if live pests are intercepted, the ability to identify a specific orchard/grower allows the investigation and corrective action to be targeted rather than applying to all possible orchards/growers.

[4b] Registration of packinghouses and auditing of procedures

All packinghouses intending to export mango fruit to Australia need to be registered with the IMOA.

Vapour heat treatment (VHT)/hot water treatment (HWT) for pre-export disinfestation of fruit flies is to be done within the registered packinghouses/treatment facilities in India. AQIS will only approve designated and identified VHT/HWT facilities that are registered by the IMOA.

The targeted inspection for freedom from RBMC, mealybugs and scale insects would be carried out within the registered packinghouses.

Packinghouses would be required to identify the individual orchard with a numbering system and identify fruit from individual orchards by marking boxes or pallets (i.e. one orchard per pallet) with the unique orchard number. The list of registered packinghouses must be kept by IMOA and provided to AQIS if requested, with updates provided if packinghouses are added or removed from the list.

Registration of packinghouses is to include an audit program conducted by AQIS in the initial export season prior to the commencement of exports. After the initial season approval of the registered treatment centres, AQIS will require the IMOA to audit the facilities at the beginning of each season to ensure that packinghouses are suitably equipped to carry out the specified phytosanitary treatments.

The objective of this procedure is to ensure that packinghouses at which the VHT/HWT and inspections are conducted can be identified. This is to allow trace back to individual packinghouses and orchards/growers in the event of non-compliance.

[4c] Pre-export inspection and remedial action by IMOA

The IMOA would inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and trash using sampling rates developed by the IMOA in consultation with Biosecurity Australia/AQIS.

If actionable mealybugs, scale insects or RBMC are found during these inspections, then remedial action must be taken as outlined in the 'Introduction' to this section.

Records of interceptions made during these inspections (live or dead quarantine pests, and trash) would be maintained by IMOA and made available to Biosecurity Australia as requested. This information will assist in future reviews of this import pathway and consideration of the appropriateness of the phytosanitary measures that have been applied.

The objective of this procedure is to verify the effectiveness of orchard and packing house controls and to ensure that mango fruit exported to Australia do not contain quarantine pests or trash, are clean of any extraneous organic material on the surface of the fruit, and complies with packing and labelling requirements.

[4d] Packing and labelling

All packages of mangoes for export would be free from contaminated plant material including trash and weed seeds and would meet Australia's general import conditions for fresh fruits and vegetables (C6000 General Requirements for All Fruit and Vegetables, available at http://www.aqis.gov.au/icon/). Trash refers to soil, splinters, twigs, leaves and other plant materials but excludes the mango calyx.

Inspected and treated fruits would be required to be packed in new boxes. The fruit should be packed in boxes that have had any openings either screened with mesh or covered with tape. Packing material would be synthetic or highly processed if of plant origin. No unprocessed packing material of plant origin, such as straw, will be allowed. All wood material used in packaging of mango fruit must comply with the AQIS conditions (e.g. those in "Cargo containers: Quarantine aspects and procedures" (AQIS, 2003)).

All boxes would be labelled with the orchard registration number and packinghouse registration number for the purposes of trace back in the event that this is necessary. The pallets should be securely strapped only after phytosanitary inspection has been carried out following mandatory post-harvest treatments. Palletised product is to be identified by attaching a uniquely numbered pallet card to each pallet or part pallet to enable trace back to registered orchards.

The objectives of this procedure are to ensure that:

- The mango fruit exported to Australia is not contaminated by weeds or trash.
- Unprocessed packing material (which may vector pests identified as not on the pathway and pests not known to be associated with mango) is not imported with the mango.
- The packaged mango fruit are labelled in such a way to identify the orchard and packinghouse (see measures 4a, b).

[4e] Phytosanitary certification by IMOA

The IMOA would be required to issue a Phytosanitary Certificate for each consignment upon completion of pre-export treatment and inspection. The objective of this procedure is to provide formal documentation to AQIS verifying that the relevant measures have been undertaken offshore. Each Phytosanitary Certificate would contain the following information:

Additional declarations

"*The mangoes in this consignment have been produced in India in accordance with the conditions governing entry of fresh mangoes to Australia and inspected and found to be free of quarantine pests*".

AND

"Mangoes have been produced in [name of area, region and State] which is free of mango pulp weevil (Sternochetus frigidus) and mango seed weevil (S. mangiferae)."

Distinguishing marks

The orchard registration number, packinghouse registration number, number of boxes per consignment, and container and seal numbers (as appropriate); to ensure trace back to the orchard in the event that this is necessary.

Treatments

Details of vapour heat treatment or hot water treatment (i.e. temperature, duration and packing house/facility number), where relevant, must be included in the treatment section on the Phytosanitary Certificate.

A consignment is the quantity of mango fruit covered by one Phytosanitary Certificate that arrives at one port in one shipment. Consignments need to be shipped directly from one port or city in India to a designated port or city in Australia.

[4f] Specific conditions for storage and movement

Packed product and packaging is to be protected from pest contamination during and after packing, during storage and during movement between locations (e.g. packinghouse to cool storage/depot, to inspection point, to export point).

Product for export to Australia that has been inspected and certified by the IMOA would be maintained in secure conditions that will prevent mixing with fruit for export to other destinations.

Security of the consignment is to be maintained until release from quarantine in Australia.

The objective of this procedure is to ensure that the phytosanitary status of the product is maintained during storage and movement.

[4g] On-arrival phytosanitary inspection and clearance by AQIS

On arrival in Australia, each consignment would be inspected by AQIS. AQIS would undertake a documentation compliance examination for consignment verification purposes at the port of entry in Australia prior to release from quarantine. Fruit from each consignment would be randomly sampled for inspection. Such sampling methodology would provide 95% confidence that there is not more than 0.5% infestation in a consignment.

The objective of this procedure is to verify that the required measures have been undertaken.

Action for non-complying lots

Where consignments are found to be non-compliant with import requirements at AQIS on-arrival inspection due to the presence of live quarantine pests or trash, the importer will be given the option to treat (if suitable treatments for the pests detected can be applied), re-export or destroy the consignment.

If product continually fails inspection, Biosecurity Australia/AQIS reserves the right to suspend the export program and conduct an audit of the fresh mango risk management systems that are in place. The program will continue only once Biosecurity Australia/AQIS is satisfied that appropriate corrective action has been taken.

Uncategorised pests

If an organism that is detected on mango from India that has not been categorised, it will require assessment to determine its quarantine status and if phytosanitary action is required. The detection of any significant pests of quarantine concern not already identified in the analysis may result in the suspension of the trade while a review is conducted to ensure that the existing measures continue to provide the appropriate level of phytosanitary protection for Australia.

DRAFT IMPORT CONDITIONS

The components of the draft import conditions are summarised in dot point format below. The proposed risk management measure that links with each component is given in brackets ( ).

Biosecurity Australia considers that the risk management measures identified in the previous section, upon which these import conditions are based, are commensurate with the identified risks and invites comments on their technical and economic feasibility. In particular, comments are welcome on the appropriateness of the measures and associated import conditions and any alternatives that stakeholders consider to be equivalent in achieving the identified objectives. Note that Biosecurity Australia regards the import conditions listed below to be consistent with, and equivalent to, those currently in place for the importation of fresh mangoes from Mexico and the Philippines (Guimaras Island).

- Import Condition 1. Registration of export orchards (links with risk management measure 4a)
- Import Condition 2. Packinghouse registration and auditing of procedures (4b)
- Import Condition 3. Pre-export vapour heat treatment for fruit flies (1a)
- Import Condition 4. Pre-export hot water treatment for fruit flies (1b)
- Import Condition 5. Pest free places of production or pest free production sites for mango pulp and seed weevils (2, 4a, c, e)
- Import Condition 6. Targeted pre-export inspection by IMOA (3, 4c)
- Import Condition 7. Packing and labelling (4d)
- Import Condition 8. Phytosanitary certification by IMOA (4e)
- Import Condition 9. Storage and movement (4f)
- Import Condition 10. Targeted on-arrival quarantine inspection and clearance by AQIS (3, 4g)
- Import Condition 11. Audit and review of policy.

IMPORT CONDITION 1. REGISTRATION OF EXPORT ORCHARDS

All mango fruit for export to Australia must be sourced from export orchards and growers registered with IMOA. Copies of the registration records must be made available to AQIS if requested. The IMOA is required to register all export orchards prior to commencement of exports.

All export orchards are expected to produce commercial mango fruit under standard cultivation (including crop monitoring, integrated pest management, crop hygiene), harvesting and packing activities.

IMPORT CONDITION 2. PACKINGHOUSE REGISTRATION AND AUDITING OF PROCEDURES

All packinghouses intending to export mango fruit to Australia must be registered with the IMOA.

Vapour heat treatment (VHT)/hot water treatment (HWT) for pre-export disinfestation is to be conducted within the registered packinghouses/treatment facilities in India.

AQIS will only approve designated and identified VHT/HWT facilities that are registered by IMOA. These facilities must be designed to prevent the entry of fruit flies into areas where unpacked treated fruit is held. This will include a provision for treated fruit to be discharged directly into insect proof and secure packing rooms.

The management of the treatment facility will be required to provide details of systems that are in place to ensure isolation and segregation from other fruit throughout the treatment, packing, storage and transport stages before exports commence. This will be audited for compliance with AQIS requirements in the initial export season by AQIS before exports will be permitted.

After the initial season approval of the registered treatment centres, AQIS will require IMOA to audit the facilities at the beginning of each season to ensure that they comply with AQIS requirements before registration is renewed. IMOA would then monitor the treatment centres on an ongoing basis during their operational season to ensure continued compliance with AQIS requirements. Reports of audits noting any non-conformities together with appropriate corrective action will be submitted to AQIS.

IMOA officers will ensure the following:

- registered treatment facilities are maintained in a condition that will provide efficacy in treatment programs
- all areas are hygienically maintained (cleaned daily of damaged, blemished, infested fruit) the premises are maintained to exclude the entry of pests from outside and between treated and untreated fruit
- all measurement instruments are regularly calibrated and records retained for verification
- the movement of fruit from the time of arrival at the registered treatment centre through to the time of export are recorded and
- the security of fruit is maintained at all times that fruit is on the premises.

Should IMOA officers find that any one of the above requirements are not being undertaken the registered facility will be suspended until corrective action has been completed and AQIS agreement to the reinstatement obtained.

The targeted inspection for freedom from RBMC, mealybugs and scale insects is to be carried out within the registered packinghouses.

Packinghouses will be required to identify the individual orchard with a numbering system and identify fruit from individual orchards by marking boxes or pallets (i.e. one orchard per pallet) with the unique orchard number. The list of registered packinghouses must be kept by IMOA and provided to AQIS if requested, with updates provided if packinghouses are added or removed from the list.

Registration of orchards and packinghouses is to include an audit program conducted by the IMOA to ensure that orchards and packinghouses are suitably equipped to carry out the specified control measures and phytosanitary treatments. An audit is to be conducted prior to registration and then conducted at least annually.

IMPORT CONDITION 3. PRE-EXPORT VAPOUR HEAT TREATMENT

If vapour heat treatment is adopted by the IMOA for fruit fly disinfestation, the following procedures must be followed:

Vapour heat treatment must be conducted in India in VHT facilities registered with, and audited by IMOA, to ensure that they are suitably equipped to carry out the requirements for VHT stipulated in this document. Mango fruit must be be treated at 47.5°C (pulp core temperature) for 20 minutes.

Treatment time will be for a minimum of two hours, including the warming and cooling periods to bring the fruit pulp to temperature. Treatment commences when the pulp core temperature of all probe-monitored fruit reaches, or is above, the required temperature. This temperature must be maintained for the required period.

Temperature values need to be recorded to a standard agreed between IMOA and Biosecurity Australia/AQIS and monitored by IMOA.

The phytosanitary security of the product must be maintained after the vapour heat treatment to prevent reinfestation by fruit flies. Phytosanitary inspection of the treated fruit must be conducted by IMOA and the details of the treatment included on the Phytosanitary Certificate.

IMPORT CONDITION 4. PRE-EXPORT HOT WATER TREATMENT

If hot water treatment is adopted by the IMOA for fruit fly disinfestation, the following procedures must be followed:

Mangoes must be treated with a hot water submersion treatment of 48°C or above for 60 minutes in accordance with the following schedule:

1. Fruit pulp temperature must be 21°C or above prior to commencing treatment.
2. Fruit must be submerged at least 10 cm below the water surface.
3. Water must circulate constantly and be kept at 48°C throughout the treatment period, with the following tolerances:
   a. During the first five minutes of the treatment – temperatures may fall as low as 45.4°C provided the temperature is at least 46°C at the end of the five minute period.
   b. For treatments lasting 65 to 70 minutes – temperatures may fall as low as 45.4°C for no more than 10 minutes.
4. The dip time must be extended for an additional 10 minutes if hydrocooling starts immediately after the hot water immersion treatment.

Hot water treatment must be conducted in India in packinghouse facilities registered with, and audited by, IMOA. Temperature values need to be recorded to a standard agreed between IMOA and Biosecurity Australia/AQIS and monitored by IMOA.

The phytosanitary security of the product must be maintained after the hot water treatment to prevent reinfestation by fruit flies. Phytosanitary inspection of the treated fruit must be conducted by IMOA and the details of the treatment included on the Phytosanitary Certificate.

IMPORT CONDITION 5. PEST FREE PLACES OF PRODUCTION OR PEST FREE PRODUCTION SITES FOR MANGO PULP AND SEED WEEVILS

The IMOA is responsible for establishing, maintaining and verifying pest freedom for MPW and MSW in "Pest free places of production and pest free production sites", as defined by the International Standards for Phytosanitary Measures (ISPM), Food and Agriculture Organization (FAO), Publication No. 10 *Requirements for the establishment of pest free places of production and pest free production sites*.

The IMOA is responsible for the establishment of production area pest freedom by verification of pest free places of production or pest free production sites by official surveys and monitoring. Monitoring must involve field inspections and fruit cutting done at least once during the growing season and before harvest. These monitoring surveys must be conducted during each year of mango production for each pest free area before consignments will be permitted for export to Australia. The results must be submitted to Biosecurity Australia/AQIS before access can be considered.

The IMOA must maintain production area pest freedom and specify the measures in place to prevent the introduction of the pest into the place of production or production site or to destroy previously undetected infestations. The IMOA must advise Biosecurity Australia/AQIS of the nominated orchards within the designated pest free places of production/pest free production sites. The IMOA must notify Biosecurity Australia/AQIS of any pest detected during routine monitoring and surveys conducted during the production season.

For the 2004 season, designated pest free areas have been established for the production areas of Barabanki, Malihabad, Saharanpur in the Lucknow region, in the State of Uttar Pradesh.

The phytosanitary security of the product from these quarantine pests must be maintained after harvest. Phytosanitary inspection of the harvested fruit must be conducted by IMOA. A Phytosanitary Certificate confirming that MPW and MSW are not known to occur in the designated places of production or pest free production sites and that the product is free from this pest would be issued by the IMOA.

IMPORT CONDITION 6. TARGETED PRE-EXPORT INSPECTION BY IMOA

The IMOA will inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and trash using sampling rates developed by the IMOA in consultation with Biosecurity Australia/AQIS.

The inspection procedures will ensure that fresh mango fruit are free from all pests of quarantine concern to Australia and are free from any contaminant plant material (leaves, twigs, seed, etc.) and soil. The targeted inspection will ensure freedom from actionable mealybugs, scale insects and RBMC. Inspection must be completed in packinghouses that are registered with, and audited by, IMOA. Consignments that do not comply with the above requirements will be rejected for export to Australia.

During inspection, the produce is to be examined directly with a lens or binocular microscope. Any pests or debris may be brushed onto a white sheet of paper for inspection under a lens or microscope.

Records of interceptions made during these inspections (live or dead quarantine pests, and trash) are to be maintained by the IMOA and made available to Biosecurity Australia as requested. This information will assist in future reviews of this import pathway and consideration of the appropriateness of the phytosanitary measures that have been applied.

IMPORT CONDITION 7. PACKING AND LABELLING

All packages of mangoes for export must be free from contaminated plant materials including trash and weed seeds and must meet Australia's general import conditions for fresh fruits and vegetables (C6000 General Requirements for All Fruit and Vegetables, available at http://www.aqis.gov.au/icon/). Trash refers to soil, splinters, twigs, leaves and other plant materials but excludes the mango calyx.

Inspected and treated fruits will be required to be packed in new boxes. The fruit must be packed in boxes that have had any openings either screened with mesh or covered with tape. Packing material would be synthetic or highly processed if of plant origin. No unprocessed packing material of plant origin, such as straw, will be allowed. All wood material used in packaging of mango fruit must comply with the AQIS conditions (e.g. those in "Cargo containers: Quarantine aspects and procedures" (AQIS, 2003)).

All boxes will be labelled with the orchard registration number and packinghouse registration number for the purposes of trace back in the event that this is necessary. The pallets should be securely strapped only after phytosanitary inspection has been carried out following mandatory post-harvest treatments. Palletised product is to be identified by attaching a uniquely numbered pallet card to each pallet or part pallet to enable trace back to registered orchards.

IMPORT CONDITION 8. PHYTOSANITARY CERTIFICATION BY IMOA

The IMOA is required to issue a Phytosanitary Certificate for each consignment upon completion of pre-export treatment and inspection. Each Phytosanitary Certificate is to contain the following information:

Additional declarations

"*The mangoes in this consignment have been produced in India in accordance with the conditions governing entry of fresh mangoes to Australia and inspected and found to be free of quarantine pests*".

AND

"Mangoes have been produced in [name of area, region and State] which is free of mango pulp weevil (Sternochetus frigidus) and mango seed weevil (S. mangiferae)."

Distinguishing marks

The orchard registration number, packinghouse registration number, number of boxes per consignment, and container and seal numbers (as appropriate); to ensure trace back to the orchard in the event that this is necessary.

A consignment is the quantity of mango fruit covered by one Phytosanitary Certificate that arrives at one port in one shipment. Consignments need to be either shipped directly from one port or city in India to a designated port or city in Australia, or if transhipped, sealing of containers must be maintained.

Treatments

Details of vapour heat treatment or hot water treatment (i.e. temperature, duration and packing house/facility number), where relevant, must be included in the treatment section on the Phytosanitary Certificate.

IMPORT CONDITION 9. STORAGE AND MOVEMENT

Packed product and packaging is to be protected from pest contamination during and after packing, during storage and during movement between locations (e.g., packing house to cool storage/depot, to inspection point, to export point).

Product for export to Australia that has been inspected and certified by the IMOA must be maintained in secure conditions that will prevent mixing with fruit for export to other destinations. This can be achieved through segregation of fruit for export to Australia in separate storage facilities, netting or shrink-wrapping pallets in plastic, or by placing sealed cartons in the low temperature cold storage before loading into a shipping container. Alternatively, packed fruit can be directly transferred at the packinghouse into a shipping container, which is to be sealed and not opened until the container reaches Australia.

Security of the consignment is to be maintained until release from quarantine in Australia.

IMPORT CONDITION 10. ON-ARRIVAL QUARANTINE CLEARANCE BY AQIS

On arrival, each consignment must be inspected by AQIS and documentation examined for consignment verification purposes at the port of entry in Australia prior to release from quarantine. Sampling methodology would provide 95% confidence that there is not more than 0.5% infestation in a consignment.

An example of a sampling size for inspection of mangoes is given below. The unit is defined as a single mango.

Consignment size (Units)	Sample size (Units)
For 'consignments' of fruit of less than 1000 units	either 450 units or 100% of consignment (whichever is smaller)
For 'consignments' of fruit of greater than or equal to 1000 units	600 units

Action for non-complying lots

Where consignments are found to be non-compliant with import requirements at AQIS on-arrival inspection, the importer will be given the option to treat (if suitable treatments for the pests detected can be applied), re-export or destroy the consignment.

If product continually fails inspection, AQIS reserves the right to suspend the export program and conduct an audit of the fresh mango risk management systems that are in place. The program will continue only once Biosecurity/AQIS is satisfied that appropriate corrective action has been taken.

Uncategorised pests

If an organism that is detected on mango from India has not been categorised, it will require assessment to determine its quarantine status and if phytosanitary action is required. The detection of any pests of quarantine concern not already identified in the analysis may result in the suspension of the trade while a review is conducted to ensure that the existing measures continue to provide the appropriate level of phytosanitary protection for Australia.

IMPORT CONDITION 11. AUDIT AND REVIEW OF POLICY

Biosecurity Australia reserves the right to review the adopted policy at any time after significant trade has occurred or where there is reason to believe that the phytosanitary status of the exporting country has changed.

CONCLUSIONS

The findings of this draft revised import policy are based on a comprehensive analysis of relevant scientific literature and existing import requirements for fresh mangoes into Australia.

Biosecurity Australia considers that the import conditions specified will provide an appropriate level of protection against the pests identified in the risk assessment.

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APPENDICES

APPENDIX 1: PESTS ASSOCIATED WITH MANGOES (*MANGIFERA INDICA* L.) FROM INDIA

Shaded text indicates the species was also considered under the same name or indicated synonym in the Philippines mango IRA.

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Arthropoda						
Abgrallaspis cyanophylli (Signoret, 1869) [Syn. = *Aspidiotus cyanophylli* Signoret; *Fucaspis cyanophylli* (Signoret); *Hemiberlesia cyanophylli* (Signoret)]	Cyanophyllum scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	Yes – NSW, QLD, TAS (AICN, 2004)	Yes – fruit, leaf, stem (Srivastava, 1997); bark (Kessing & Mau, 1993)	**Yes (for WA only)**
Acanthocoris scabrator (Fabricius) [Syn. = *Coreus scabrator* Fabricius; *Crinocerus scabripes* Herr.-Sch.]	Coreid bug; squash bug	Hemiptera: Coreidae	Yes – (Koshy *et al*., 1977)	No – (CAB International, 2003)	No – branch, young or unripe fruit, leaf, stem (CAB International, 2003); inflorescence (DPP, 2001)	No
Acanthophorus serraticornis Olivier	Longicorn beetle; stem borer	Coleoptera: Cerambycidae	Yes – (Butani, 1993)	No	No – root, stem (Srivastava, 1997)	No
Aceria mangiferae Sayed, 1946 [Syn. = *Eriophyes mangiferae* (Sayed)]	Mango bud mite; rust mite	Acarina: Eriophyidae	Yes – (DPP, 2000)	Yes – QLD (Cunningham, 1989)	No – bud, inflorescence, leaf (Cunningham, 1989)	No
Achaea janata (Linnaeus, 1758) [Syn. = *Ophiusa melicerta*; *Phalaena* (*Noctua*) *melicerta* Drury; *Noctua tigrina* Fabricius; *Ophiusa ekeikei* Bethune-Baker; *Catocala traversii* Fereday; *Achaea melicerta*; *Ophiusa janata*; *Phalaena* (*Geometra*) *janata* Linnaeus]	Castor oil looper; croton caterpillar	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – QLD (CAB International, 2003)	No – fruit piercing (Srivastava, 1997); inflorescence, leaf (CAB International, 2003)	No
Acherontia styx (Westwood, 1847) [Syn. = *Acherontia atropos* var. *styx*	Indian death's head hawkmoth	Lepidoptera: Sphingidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (CAB International, 2003)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
(Westwood); *Acherontia medusa* Moore; *Acherontia styx crathis* Rothschild & Jordan; *Manduca styx* (Westwood); *Sphinx styx* Westwood]						
Acrocercops cathedraea Meyrick	Leafminer	Lepidoptera: Gracillariidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf, stem (Butani, 1993)	No
Acrocercops isonoma Meyrick	Leafminer	Lepidoptera: Gracillariidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf, stem (Butani, 1993)	No
Acrocercops pentalocha Meyrick	Leafminer	Lepidoptera: Gracillariidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf, stem (Butani, 1993)	No
Acrocercops syngramma Meyrick, 1914 [Syn. = *Conopomorpha syngramma* (Meyrick)]	Cashew leafminer; mango leafminer	Lepidoptera: Gracillariidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf, stem (Butani, 1993)	No
Acrocercops zygonoma Meyrick	Leafminer	Lepidoptera: Gracillariidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf, stem (DPP, 2001); shoot (Srivastava, 1997)	No
Adoretus bicaudatus Arrow	Chafer beetle	Coleoptera: Scarabaeidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Adoretus lasiopygus Burmeister, 1855	Grapevine chafer	Coleoptera: Scarabaeidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Aeolesthes holosericea Fabricius, 1787 [Syn. = *Pachydissus velutinus* Thompson; *Pachydissus similus* Gahan; *Neocerambyx holoseriecus* (Cotes)]	Cherry stem borer	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No	No – bark, stem, wood (Srivastava, 1997)	No
Aeolothrips collaris Priesner, 1919	Thrips	Thysanoptera: Aeolothripidae	Yes – (DPP, 2001)	No – (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No
Aetheomorpha suturata Jacoby	Beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Agrius convolvuli (Linnaeus, 1758) [Syn. = *Sphinx convolvuli* Linnaeus; *Sphinx abadonna* Fabricius; *Herse patatas* Ménétriés (nomen nudum); *Sphinx roseafasciata* Koch; *Sphinx pseudoconvolvuli* Schaufuss; *Protoparce distans* Butler; *Protoparce orientalis* Butler; *Sphinx batatae* Christ; *Sphinx nigricans* Cannaviello; *Chaerocampa convolvuli* (Linnaeus); *Herse convolvuli* (Linnaeus); *Protoparce convolvuli* (Linnaeus)]	Sweet potato moth; convolvulus hawkmoth; sweet potato hawkmoth	Lepidoptera: Sphingidae	Yes – (DPP, 2001)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (CAB International, 2003)	No – leaf, shoot (CAB International, 2003)	No
Alcidodes frenatus (Faust.)	Weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Aleurocanthus mangiferae Quaintance & Baker, 1917	Mango blackfly	Hemiptera: Aleyrodidae	Yes – (DPP, 2000)	No – (Martin, 1999)	No – leaf, shoot (DPP, 2000)	No
Aleurocanthus woglumi Ashby, 1915 [Syn. = *Aleurocanthus punjabensis* Corbett; *Aleurocanthus woglumi* var. *formosana* Takahashi; *Aleurodes woglumi* (Ashby)]	Citrus blackfly; blue grey fly; citrus spring whitefly; spiny citrus whitefly	Hemiptera: Aleyrodidae	Yes – (Butani, 1993; IIE, 1995a)	No – (Martin, 1999)	No – leaf (CAB International, 2003)	No
Aleurodicus dispersus Russell, 1965	Spiralling whitefly; coconut whitefly	Hemiptera: Aleyrodidae	Yes – (CAB International, 2003)	Yes – QLD (Martin, 1999)	No – leaf (CAB International, 2003)	No
Aleurothrixus floccosus (Maskell, 1895) [Syn. = *Aleurodes floccosa* Maskell; *Aleyrodes horridus* Hempel; *Aleyrodes howardi* Quaintance; *Aleurothrixus horridus* (Hempel); *Aleurothrixus howardi* (Quaintance)]	Citrus whitefly; flocculent whitefly; woolly whitefly	Hemiptera: Aleyrodidae	Yes – (CAB International, 2003)	No – (Martin, 1999)	No – leaf (CAB International, 2003)	No
Allassomyia tenuispatha (Kieffer, 1909) [Syn. = *Oligotrophus tenuispatha* Kieffer; *Amradiplosis tenuispatha* (Kieffer); *Procontarinia tenuispatha* (Kieffer)]	Gall midge; mango midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Altica caerulea (Olivier) [Syn. = *Haltica caerulea* Olivier]	Flea beetle; flower eating beetle; jumping beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Amaraemyia spp.	Psyllid	Hemiptera: Psyllidae	Yes – (USDA, 2001)	No	No – leaf (USDA, 2001)	No
Amblyrrhinus poricollis Boheman [Syn. = *Amblyrhinus poricollis* Schönherr]	Leaf cutter; weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Amrasca splendens Ghauri, 1967	Mango leaf hopper; mango jassid	Hemiptera: Cicadellidae	Yes – (Srivastava, 1997)	No – (CAB International, 2003)	No – flower, leaf (Dalvi & Dumbre, 1994)	No
Amritodus atkinsoni Lethierry, 1889 [Syn. = *Idiocerus atkinsoni* Lethierry; *Idiocerus quingnepunctatus* Melichar; *Idiocerus atkinsoni* (Lethierry); *Idioscopus atkinsoni* Lethierry]	Mango hopper	Hemiptera: Cicadellidae	Yes – (DPP, 2000)	No – (CAB International, 2003)	No – inflorescence, leaf, shoot (Srivastava, 1997)	No
Amritodus brevistylus Viraktamath, 1976	Mango leafhopper	Hemiptera: Cicadellidae	Yes – (Viraktamath, 1976)	No – (Fletcher, 2003)	No – inflorescence, leaf (USDA, 2001)	No
Amritodus mudigerensis Viraktamath, 1976	Leafhopper	Hemiptera: Cicadellidae	Yes – (Viraktamath, 1976)	No – (Fletcher, 2003)	No – leaf (Viraktamath, 1976)	No
Amsacta lactinea (Cramer) [Syn. = *Estigmene lactinea* Cramer]	Red tiger moth; black hairy caterpillar	Lepidoptera: Arctiidae	Yes – (Butani, 1993)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Anaphothrips sudanensis Trybom, 1911 [Syn. = *Euthrips flavicinctus* Karny; *Anaphothrips speciosus* Hood; *Anaphothrips flavicinctus* (Karny); *Neophysopus flavicinctus* (Karny)]	Thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	Yes – ACT, NSW, NT, QLD (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No
Anarsia epotias Meyrick	Leaf eating caterpillar	Lepidoptera: Gelechiidae	Yes – (Bhumannavar, 1990)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Anarsia lineatella Zeller [Syn. = *Anarsia pruniella* Clemens]	Peach twig borer	Lepidoptera: Gelechiidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf, stem (DPP, 2001); shoot (Srivastava, 1997)	No
Anarsia melanoplecta Meyrick	Shoot borer	Lepidoptera: Gelechiidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – inflorescence, leaf, stem (DPP, 2001); shoot (Srivastava, 1997)	No
Anomala dussumieri (Blanchard, 1850)	Chafer beetle	Coleoptera: Scarabaeidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Anomala varicolor Arrow, 1911 [Syn. = *Anomala varicolor* (Gyllenhal)]	Chafer beetle	Coleoptera: Scarabaeidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Anoplolepis gracilipes (Smith, 1857) [Syn. = *Formica longipes* Jerdon; *Formica gracilipes* Smith; *Formica trifasciata* Smith; *Prenolepis gracilipes* (Smith); *Plagiolepis gracilipes* (Smith); *Plagiolepis longipes* (Jerdon); *Plagiolepis* (*Anoplolpeis*) *longipes* (Jerdon); *Anoplolepis longipes* (Jerdon)]	Crazy ant; long legged ant	Hymenoptera: Formicidae	Yes – (Srivastava, 1997)	Yes – NT (Shattuck & Barnett, 2001)	No – builds nest in foliage (Srivastava, 1997)	No
Anoplophora versteegii (Ritsema)	Longicorn beetle; stem borer	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Antestiopsis cruciata (Fabricius) [Syn. = *Antestia cruciata* Fabricius; *Antestictsis cruciata* Fabricius]	Indian coffee bug	Hemiptera: Pentatomidae	Yes – (DPP, 2001)	No	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Aonidiella aurantii (Maskell, 1879) [Syn. = *Aspidiotus aurantii* Maskell; *Chrysomphalus aurantii* (Maskell); *Aspidiotus citri* Comstock; *Aonidiella citri* (Comstock); *Aspidiotus coccineus* Gennadius; *Aonidiella gennadi* McKenzie; *Aonidia aurantii* (Maskell); *Chrysomphalus citri* (Comstock)]	California red scale; citrus red scale; orange scale; red scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (IIE, 1996a)	Yes – fruit, leaf, stem (CAB International, 2003)	No
Aonidiella citrina (Craw, 1890) [Syn. = *Aspidiotus citrinus* Craw; *Chrysomphalus aurantii citrinus* (Craw); *Chrysomphalus citrinus* (Craw)]	Citrus yellow scale; yellow scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – NSW, SA, VIC, WA (CABI/EPPO, 1997a)	Yes – fruit, leaf, stem (CAB International, 2003)	No
Aonidiella inornata McKenzie, 1938	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Gupta & Singh, 1988a)	No	No – leaf (Gupta & Singh, 1988a)	No
Aonidiella orientalis (Newstead, 1894) [Syn. = *Aspidiotus orientalis* Newstead; *Aspidiotus osbeckiae* Green; *Evaspidiotus orientalis* (Newstead); *Aspidiotus pedronis* Green; *Aspidiotus taprobanus* Green; *Chrysomphalus pedronis* (Green); *Aspidiotus cocotiphagus* Marlatt; *Chrysomphalus*	Oriental red scale; Oriental scale; Oriental yellow scale; red scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	Yes – NT, QLD (CAB International, 2003)	No – leaf (Peña & Mohyuddin, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
orientalis (Newstead); *Chrysomphalus pedroniformis* Cockerell & Robinson; *Furcaspis orientalis* (Newstead); *Aonidiella taprobana* (Green); *Aonidiella cocotiphagus* (Marlatt)]						
Aphis gossypii Glover, 1877 [Syn. = *Aphis solanina* Passerini; *Aphis circezandis* Fitch; *Aphis convolvulicola* Ferrari; *Aphis cucurbiti* Buckton; *Aphis calendulicola* Monell; *Aphis oxalis* Macchiati; *Aphis heliotropii* Macchiati; *Aphis monardae* Oestlund; *Aphis citrulli* Ashmead; *Aphis cucumeris* Forbes; *Aphis lilicola* Williams; *Aphis minuta* Wilson; *Aphis affinis* var. *gardeniae* del Guercio; *Aphis ligustriella* Theobald; *Aphis parvus* Theobald; *Aphis hederella* Theobald; *Aphis helianthi* del Guercio; *Aphis pomonella* Theobald; *Aphis tectonae* van der Goot; *Toxoptera aurantii* var. *limonii* del Guercio; *Aphis colocasiae* Matsumura; *Aphis malvoides* Das; *Aphis bauhiniae* Theobald; *Aphis ficus* Theobald; *Aphis malvacearum* van der Goot; *Aphis pruniella* Theobald; *Aphis citri* Ashmead ex Essig; *Toxoptera leonuri* Takahashi; *Aphis gossypii* var. *callicarpae* Takahashi; *Aphis shirakii* Takahashi; *Aphis bryophyllae* Shinji; *Aphis commelinae* Shinji; *Aphis hibiscifoliae* Shinji; *Aphis inugomae* Shinji; *Aphis perillae* Shinji; *Aphis vitifoliae* Shinji; *Aphis chloroides* Nevsky; *Aphis flava* Nevsky; *Aphis gossypii* var. *lutea* Nevsky; *Aphis gossypii* var. *obscura* Nevsky; *Aphis gossypii* var. *viridula* Nevsky; *Aphis tridacis* Theobald; *Doralina frangulae* (Kaltenbach); *Doralis frangulae* (Kaltenbach); *Cerosipha gossypii*	Cotton aphid; betelvine aphid cucurbit aphid; green aphid; melon aphid	Hemiptera: Aphididae	Yes – (DPP, 2001)	Yes – NSW, NT, QLD, VIC, SA, TAS, WA (CAB International, 2003)	No – inflorescence, leaf, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
(Glover); *Doralina gossypii* (Glover); *Doralis gossypii* (Glover)]						
Aphis praeterita Walker, 1849 [Syn. = *Aphis diphaga* Walker; *Aphis epilobiina* Walker; *Aphis epillobina*]	Aphid	Hemiptera: Aphididae	Yes – (DPP, 2001)	No	No – inflorescence, leaf, stem (Butani, 1993)	No
Apoderus tranquebaricus Fabricius	Leaf twisting weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Apsylla cistellata (Buckton, 1892) [Syn. = *Psylla cistellata* Buckton]	Mango shoot gall psylla; mango shoot psyllid	Hemiptera: Psyllidae	Yes – (DPP, 2000)	No – (CAB International, 2003)	No – bud, leaf, shoot, twig (Srivastava, 1997); inflorescence (Peña & Mohyuddin, 1997)	No
Araecerus suturalis Boheman	Weevil	Coleoptera: Anthribidae	Yes – (Butani, 1993)	No	No	No
Arytania obscura Crawford	Psyllid	Hemiptera: Psyllidae	Yes – (Butani, 1993)	No	No	No
Aspidiotus destructor Signoret, 1869 [Syn. = *Aspidiotus transparens* Green; *Aspidiotus cocotis* Newstead; *Aspidiotus lataniae* Green; *Aspidiotus simillimus translucens* Fernald; *Aspidiotus translucens* Cockerell & Robinson; *Aspidiotus vastatrix* Leroy; *Temnaspidiotus destructor* (Signoret)]	Coconut scale; bourbon aspidiotus; bourbon scale; transparent scale	Hemiptera: Diaspididae	Yes – (Gupta & Singh, 1988a)	Yes – NT (CIE, 1966a)	No – leaf (Peña & Mohyuddin, 1997)	No
Aspidiotus nerii Bouché, 1833 [Syn. = *Aspidiotus aloes* Signoret; *Aspidiotus limonii* Signoret; *Aspidiotus genistae* Westwood; *Aspidiotus bouchei* (Targioni Tozzetti); *Aspidiotus affinis* Targioni Tozzetti; *Aspidiotus caldesii* Targioni Tozzetti; *Aspidiotus denticulatus* Targioni Tozzetti; *Aspidiotus villosus* Targioni Tozzetti; *Aspidiotus budleiae* Signoret; *Aspidiotus ceratoniae* Signoret; *Aspidiotus cycadicola* (Boisduval); *Aspidiotus epidendri* Signoret; *Aspidiotus ericae* (Boisduval); *Aspidiotus gnidii* Signoret; *Aspidiotus ilicis* Signoret;	Oleander scale; aucuba scale; ivy scale; white scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – NSW, QLD, TAS (CAB International, 2003)	Yes – fruit, leaf, stem, whole plant (CAB International, 2003)	**Yes (for WA only)**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Aspidiotus myricinae Signoret; *Aspidiotus ulicis* Signoret; *Aspidiotus uriesciae* Signoret; *Aspidiotus lentisci* Signoret; *Aspidiotus capparis* Signoret; *Aspidiotus myrsinae* Signoret; *Aspidiotus budlaei* Maskell; *Aspidiotus atherospermae* Maskell; *Aspidiotus oleae* Colvée; *Aspidiotus corynocarpi* Colvée; *Aspidiotus oleastin* Colvée; *Aspidiotus offinis* Comstock; *Aspidiotus sophorae* Maskell; *Aspidiotus carpodeti* Maskell; *Aspidiotus transpareus* var. *simillimus* Cockerell; *Aspidiotus vagabundus* Cockerell; *Aspidiotus simillimus* (Cockerell); *Aspidiotus transvaalensis* Leonardi; *Aspidiotus confusus* Froggatt; *Aspidiotus tasmaniae* Green; *Aspidiotus viresciae* Leonardi; *Aspidiotus transpareus* var. *rectangulatus* Lindinger; *Aspidiotus rectangulatus* (Lindinger); *Aspidiosus unipectinatus* Ferris; *Aspidiotus hederae* var. *urenae* Hall; *Aspidiotus urenae* (Hall); *Octaspidiotus anthospermae* Balachowsky; *Aspidiotus hederae* Signoret; *Aspidiotus hederae hederae* Schmutterer; *Aspidiotus hederae* ssp. *unisexualis* Schmutterer; *Chermes aloes* Boisduval; *Chermes ericae* Boisduval; *Chermes cycadicola* Boisduval; *Chermes genistae* (Westwood); *Chermes hederae* (Signoret); *Chermes nerii* Boisduval; *Chermes osmanthi* Ferris; *Diaspis bouchei* Targioni Tozzetti; *Octaspidiotus atherospermae* (Maskell)]						
Aspidolopha melanophthalma Lacordaire	Beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf, stem (Butani, 1993)	No
Atmetonychus perigrinus Oliver	Weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Attacus atlas (Linnaeus, 1758)	Atlas moth; giant	Lepidoptera:	Yes – (CAB	No – (Nielsen *et al.*,	No – leaf (CAB International,	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Phalaena atlas* Linnaeus; *Attacus atlas sumatranus* Fruhstorfer; *Attacus atlas baliensis* Jurriaanse & Lindemans; *Attacus atlas chinensis* Bouvier; *Attacus atlas gladiator* Fruhstorfer; *Attacus atlas simalurana* Watson; *Attacus atlas burmaensis* Jurriaanse & Lindemans; *Phalaena arcuata vitrea* Perry; *Samia atlas* Kawada; *Saturnia silhetica* Helfer]	Indian silkworm; snake head moth	Saturniidae	International, 2003)	1996)	2003)	
Aulacaspis martini Williams & Watson, 1988	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (DPP, 2001)	No – (Ben-Dov *et al*., 2001)	No – leaf (DPP, 2001)	No
Aulacaspis rosae (Bouché, 1833) [Syn. = *Aspidiotus rosae* Bouché; *Chermes rosae* (Bouché); *Diaspis rosae* (Bouché); *Aulacaspis* (*Diaspis*) *rosae* (Bouché); *Diaspis* (*Aulacaspis*) *rosae* (Bouché); *Anamaspis rosae* (Bouché)]	Mango snow scale; rosa scale; rose hard scale; rose scale; scurfy scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – TAS (Ben-Dov *et al*., 2001)	No – bark, root, stem (Ben-Dov *et al*., 2001); leaf (USDA, 2001)	No
Aulacaspis tubercularis Newstead, 1906 [Syn. = *Aulacaspis* (*Diaspis*) *tubercularis* Newstead; *Aulacaspis cinnamomi* Newstead; *Aulacaspis tubercularis* (Newstead); *Diaspis* (*Aulacaspis*) *cinnamomi mangiferae* Newstead; *Aulacaspis cinnamomi mangiferae* (Newstead); *Diaspis mangiferae* (Newstead); *Diaspis cinnamomi-mangiferae* (Newstead); *Diaspis* (*Aulacaspis*) *cinnamomi* (Newstead); *Diaspis* (*Aulacaspis*) *tubercularis* (Newstead)]	Mango scale; white mango scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – QLD (Cunningham, 1989); WA (Johnson & Parr, 1999)	Yes – fruit, leaf, twig (Cunningham, 1989)	No
Aulacaspis vitis (Green, 1896) [Syn. = *Chionaspis vitis* Green; *Trichomytilus vitis* (Green); *Phenacaspis vitis* (Green); *Poliaspis vitis* (Green); *Aulacaspis vitis* (Green)]	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf (DPP, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Aulacophora foveicollis (Lucas, 1849) [Syn. = *Allocophora foveicollis* Lucas; *Aulacophora africana* (Weise); *Galeruca foveicollis* Lucas; *Raphidopalpa foveicollis* Lucas; *Rhaphidopalpa africana* Weise; *Rhaphidopalpa foveicollis* (Lucas)]	Red pumpkin beetle; hamra beetle; red leaf beetle; red melon beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – leaf (Butani, 1993)	No
Aularches miliaris (Linnaeus, 1758) [Syn. = *Aularches punctatus*; *Aularches scabiosus* Fabricius]	Spotted grasshopper; spotted locust	Orthoptera: Acrididae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – leaf (Butani, 1993)	No
Azteca schimperi Emery, 1893	Ant	Hymenoptera: Formicidae	Yes – (Srivastava, 1997)	No – (Shattuck & Barnett, 2001)	No – builds nest in foliage (Srivastava, 1997)	No
Bactrocera caryeae (Kapoor) [Syn. = *Dacus caryeae* Kapoor, *Dacus poonensis* Kapoor]	Fruit fly	Diptera: Tephritidae	Yes – (IIE, 1994a)	No – (IIE, 1994a)	Yes – fruit (Peña & Mohyuddin, 1997)	**Yes**
Bactrocera correcta (Bezzi) [Syn. = *Chaetodacus correctus* Bezzi; *Dacus bangaloriensis* Agarwal & Kapoor; *Dacus dutti* Kapoor; *Strumeta paratuberculatus* Philip; *Dacus correctus* (Bezzi)]	Guava fruit fly	Diptera: Tephritidae	Yes – (DPP, 2000; Kumar *et al*., 1994)	No – (CAB International, 2003)	Yes – fruit (DPP, 2000; Peña & Mohyuddin, 1997)	**Yes**
Bactrocera cucurbitae (Coquillett, 1899) [Syn. = *Dacus cucurbitae* Coquillett; *Dacus yuiliensis* Tseng & Chu; *Dacus aureus* Tseng & Chu; *Chaetodacus cucurbitae* (Coquillett); *Strumeta cucurbitae* Coquillett; *Zeugodacus cucurbitae* (Coquillett); *Bactrocera* (*Zeugodacus*) *cucurbitae* (Coquillett); *Dacus yayeyamanus*]	Melon fruit fly; melon fly	Diptera: Tephritidae	Yes – (DPP, 2000; IIE, 1995b)	No – (IIE, 1995b)	Yes – fruit (DPP, 2000; Peña & Mohyuddin, 1997)	**Yes**
Bactrocera diversa (Coquillett) [Syn. = *Dacus diversus* Coquillett; *Dacus citronellae* Kapoor & Katiyar, *Dacus quadrifidus* Hendel]	Three striped fruit fly	Diptera: Tephritidae	Yes – (DPP, 2001)	No – (Carroll *et al*., 2002)	Yes – fruit (Srivastava, 1997)	**Yes**
Bactrocera dorsalis (Hendel, 1912)	Oriental fruit fly	Diptera: Tephritidae	Yes – (DPP, 2000;	No – (CAB	Yes – fruit (Srivastava,	**Yes**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Dacus dorsalis* Hendel; *Bactrocera conformis* Doleschall (preocc.); *Bactrocera ferrugineus* (Fabricius); *Chaetodacus dorsalis* (Hendel); *Chaetodacus ferrugineus* (Fabricius); *Chaetodacus ferrugineus dorsalis* (Hendel); *Chaetodacus ferrugineus okinawanus* Shiraki; *Dacus ferrugineus* Fabricius; *Dacus ferrugineus* var. *dorsalis* Fabricius; *Dacus ferrugineus dorsalis* Fabricius; *Dacus ferrugineus okinawanus* (Shiraki); *Musca ferruginea* Fabricius (preocc.); *Musca ferruginea* (Fabricius); *Strumeta dorsalis* (Hendel); *Chaetodacus ferrugineus* (Fabricius); *Strumeta ferrugineus* (Fabricius)]			Srivastava, 1997)	International, 2003)	1997)	
Bactrocera tau (Walker) [Syn. = *Bactrocera hageni* (Hendel); *Bactrocera* (*Zeugodacus*) *tau* (Walker); *Dacus hageni* (de Meijere); *Chaetodacus tau* (Walker); *Dacus caudatus* var. *nubilus* (Hendel); *Dacus nubilus* (Hendel); *Dasyneura tau* (Walker); *Dacus tau* Walker; *Zeugodacus nubilus* (Hendel)]	Fruit fly	Diptera: Tephritidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit (Peña & Mohyuddin, 1997)	**Yes**
Bactrocera zonata (Saunders, 1841) [Syn. = *Dasyneura zonatus* Saunders; *Dacus ferrugineus* var. *mangiferae* Cotes; *Rivellia persicae* Bigot; *Chaetodacus zonatus* (Saunders); *Dacus* (*Strumeta*) *zonatus* (Saunders); *Dacus mangiferae* Cotes; *Dacus persicae* (Bigot); *Dacus zonatus* (Saunders); *Strumeta zonata* (Saunders); *Dasyneura zonata* Saunders; *Dacus persicus* (Biggott); *Strumeta zonatus* (Saunders)]	Peach fruit fly; guava fruit fly	Diptera: Tephritidae	Yes – (DPP, 2000; Srivastava, 1997)	No – (IIE, 1996b)	Yes – fruit (DPP, 2000; Srivastava, 1997)	**Yes**
Bagrada hilaris (Burmeister, 1835)	Painted bug; bagrada bug; harlequin bug	Hemiptera: Pentatomidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
[Syn. = *Bagrada cruciferarum* Kirkaldy; *Bagrada picta* Fabricius]						
Basitropis nitidicutis Jekel, 1855	Weevil	Coleoptera: Anthribidae	Yes – (USDA, 2001)	No	No	No
Batocera numitor (Newman)	Stem borer	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Batocera roylei Hope, 1833	Stem borer	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Batocera rubus (Linnaeus, 1758) [Syn. = *Batocera albofasciata* De Geer; *Batocera rubra* (Linnaeus); *Cerambyx rubus* Linnaeus; *Batocera albomaculatus* Retz.]	Lateral-banded mango longhorn; mango root borer; rubber root borer	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – bark (Peña & Mohyuddin, 1997); leaf, stem, trunk (CAB International, 2003)	No
Batocera rufomaculata (De Geer, 1775) [Syn. = *Cerambyx rufomaculata* De Geer]	Mango stem borer; mango tree borer; tropical fig borer; violin beetle	Coleoptera: Cerambycidae	Yes – (DPP, 2001; IIE, 1994b)	No – (CAB International, 2003)	No – bark, branch, root, stem, twig (Srivastava, 1997)	No
Batocera titana (Thompson)	Stem borer	Coleoptera: Cerambycidae	Yes – (Butani, 1993)	No	No – stem (Srivastava, 1997)	No
Belionota prasina (Thunberg, 1789) [Syn. = *Buprestis prasina* Thunberg]	Mango buprestid; stem borer	Coleoptera: Buprestidae	Yes – (DPP, 2001)	Yes – (Hawkeswood, 2002)	No – stem (Srivastava, 1997)	No
Biston suppressaria Guenée, 1858 [Syn. = *Buzura suppressaria* (Guenée)]	Tea looper moth; looper caterpillar; tung oil tree looper	Lepidoptera: Geometridae	Yes – (Gupta & Singh, 1988b)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Brevipalpus californicus (Banks, 1904) [Syn. = *Tenuipalpus californicus* Banks; *Brevipalpus australis* Baker; *Brevipalpus browningi* Baker; *Brevipalpus confusis* Baker; *Brevipalpus woglumi* McGregor; *Hystripalpus californicus* Mitrofanov & Strunkova; *Tenuipalpus australis* Tucker; *Tenuipalpus vitis* Womersley]	Citrus flat mite; bunch mite; scarlet tea mite; red flat mite; silver mite	Acarina: Tenuipalpidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, SA, VIC, WA (CAB International, 2003)	Yes – fruit, leaf, stem (CAB International, 2003)	No
Brevipalpus phoenicis (Geijskes, 1939) [Syn. = *Tenuipalpus phoenicis* Geijskes; *Brevipalpus pseudocuneatus* Baker; *Brevipalpus yothersi* Baker; *Brevipalpus*	False spider mite; passion vine mite; red and black flat mite; red crevice mite; scarlet mite	Acarina: Tenuipalpidae	Yes – (CIE, 1970)	Yes – NSW, QLD, WA (AICN, 2004)	Yes – leaf, stem, whole plant (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
macbridei Baker; *Brevipalpus papayensis* Baker]						
Bruchus sp.	Weevil	Coleoptera: Bruchidae	Yes – (USDA, 2001)	? – Genus is present in Australia (AICN, 2004)	No – overripe fruit (USDA, 2001)	No
Busoniomimus manjunathi Viraktamath & Viraktamath, 1985	Mango hopper	Hemiptera: Cicadellidae	Yes – (Viraktamath & Viraktamath, 1985)	No – (Fletcher, 2003)	No – inflorescence, leaf, shoot (Srivastava, 1997)	No
Cadra cautella (Walker, 1863) [Syn. = *Pempelia cautella* Walker; *Cadra defectella* Walker; *Ephestia passulella* Barrett; *Cryptoblabes formosella* Wileman & South; *Ephestia rotundatella* Turati; *Ephestia pelopis* Turner; *Ephestia irakella* Amsel; *Ephestia cautella* (Walker); *Ephestia cahiritella* Zeller; *Etiella cautella* (Walker)]	Almond moth; dried currant moth; fig moth; tropical warehouse moth	Lepidoptera: Pyralidae	Yes – (CAB International, 2003)	Yes – (Nielsen *et al*., 1996)	Yes – fruit, seed (CAB International, 2003)	No
Caliothrips impurus Priesner, 1928	Thrips	Thysanoptera: Thripidae	Yes – (Patel *et al*., 1997)	No – (Mound, 1996)	No – leaf, root (Patel *et al*., 1997)	No
Caliothrips indicus (Bagnall, 1913) [Syn. = *Heliothrips indicus* Bagnall; *Hercothrips indicus* (Bagnall)]	Groundnut thrips; black thrips; onion thrips; pea thrips	Thysanoptera: Thripidae	Yes – (DPP, 2001)	No – (Mound, 1996)	No – leaf (Butani, 1993)	No
Calophya brevicornis (Crawford, 1919) [Syn. = *Pauropsylla brevicornis* Crawford; *Microceropsylla brevicornis* (Crawford)]	Gall psyllid; mango shoot gall psylla	Hemiptera: Calophyidae	Yes – (Srivastava, 1997)	No – (Burckhardt & Basset, 2000)	No – leaf, stem (Srivastava, 1997)	No
Calophya maculata (Mathur, 1975) [Syn. = *Pauropsylla maculata* Mathur; *Microceropsylla maculata* (Mathur)]	Mango hopper	Hemiptera: Calophyidae	Yes – (Dalvi *et al*., 1992)	No – (Burckhardt & Basset, 2000)	No	No
Calophya nigra Kuwayama, 1908 [Syn. = *Calophya viridiscutellata* Kuwayama; *Calophya viridis* Kuwayama; *Pauropsylla nigra* (Kuwayama); *Microceropsylla nigra* (Crawford)]	Mango psyllid	Hemiptera: Calophyidae	Yes – (Davli *et al*., 1992)	No – (Burckhardt & Basset, 2000)	No – leaf (Peña & Mohyuddin, 1997)	No
Camponotus compressus (Fabricius, 1787)	Ant	Hymenoptera: Formicidae	Yes – (Kishun & Chand, 1989)	No – (Shattuck & Barnett, 2001)	No – mechanical transmission of	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
					Xanthomonas campestris pv. *mangiferaeindicae* (Kishun & Chand, 1989)	
Camponotus sericeus (Fabricius, 1798) [Syn. = *Formica sericea* Fabricius]	Ant	Hymenoptera: Formicidae	Yes – (Kishun & Chand, 1989)	No – (Shattuck & Barnett, 2001)	No – mechanical transmission of *Xanthomonas campestris* pv. *mangiferaeindicae* (Kishun & Chand, 1989)	No
Camptorrhinus mangiferae Marshall	Weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Carpomyia vesuviana Costa, 1854 [Syn. = *Orellia bucchichi* Frauenfeld; *Carpomyia zizyphae* Agarwal & Kapoor 1985; *Carpomyia buchicchii* Rondani; *Carpomyia bucchichi* Frauenfeld]	Ber fruit fly	Diptera: Tephritidae	Yes – (Grewal & Kapoor, 1986)	No – (Evenhuis, 1996)	No – ripening fruit (Grewal & Kapoor, 1986)	No
Carpophilus dimidiatus (Fabricius, 1792) [Syn. = *Nitidula dimidata* Fabricius]	Corn sap beetle; dried fruit beetle; pineapple sap beetle; souring beetle	Coleoptera: Nitidulidae	Yes – (DPP, 2001)	Yes – (CAB International, 2003)	No – leaf, overripe fruit (USDA, 2001)	No
Ceroplastes actiniformis Green, 1896 [Syn. = *Ceroplastes actiniformes* (Green)]	Soft scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	No – (Ben-Dov, 1993)	Yes – fruit (USDA, 2001); leaf (Srivastava, 1997)	**Yes**
Ceroplastes ceriferus (Fabricius, 1798) [Syn. = *Coccus ceriferus* Fabricius; *Coccus* (*Ceroplastes*) *chilensis* Gray; *Ceroplastes australiae* Walker; *Columnea cerifera* (Fabricius); *Columnea chilensis* (Gray); *Ceroplastes ceriferus* (Anderson); *Lacca alba* Signoret (nomen nudum); *Ceroplastes ceriferus* (Anderson); *Ceroplastes ceriferus* (Anderson); *Ceroplastes vayssierei* Mahdihassan; *Gascardia cerifera* (Anderson); *Ceroplastes ceriferens* (Fabricius); *Ceroplastes ceriferens* (Fabricius); *Ceroplastes cerifera* Gill]	Indian wax scale; Indian white wax scale; Japanese wax scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	Yes – NSW, QLD, WA (CAB International, 2003)	No – bark, branch, leaf, stem (CAB International, 2003)	No
Ceroplastes floridensis Comstock, 1881	Florida wax scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	Yes – NSW, QLD (CAB International,	No – branch, leaf, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Ceroplastes vinsonii* Signoret; *Ceroplastes floridensis* Comstock; *Ceroplastes floridensis* (Maskell); *Cerostegia floridensis* (Comstock); *Paracerostegia floridensis* (Comstock)]				2003)		
Ceroplastes pseudoceriferus Green, 1935 [Syn. = *Ceroplastes ceriferus* (misidentification)]	Ceriferous wax scale; horned wax scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov, 1993)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Ceroplastes rubens Maskell, 1893 [Syn. = *Ceroplastes rubens minor* Maskell]	Pink wax scale; red wax scale; ruby wax scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	Yes – NSW, QLD (CAB International, 2003); NT, SA, VIC, WA (Qin & Gullan, 1994); WA (Johnson & Parr, 1999)	Yes – fruit, leaf, stem (CAB International, 2003)	No
Ceroplastes rusci (Linnaeus, 1758) [Syn. = *Coccus rusci* Linnaeus; *Coccus caricae* Fabricius; *Coccus artemisiae* Rossi; *Calypticus radiatus* Costa; *Calypticus testudineus* Costa; *Coccus hydatis* Costa; *Lecanium rusci* (Linnaeus); *Lecanium radiatum* (Costa); *Lecanium testudineum* (Costa); *Columnea testudiniformis* Targioni Tozzetti; *Columnea caricae* (Fabricius); *Chermes caricae* (Bernard); *Columnea testudinata* Targioni Tozzetti; *Calypticus hydatis* (Costa); *Ceroplastes rusci* (Linnaeus); *Lecanium artemisiae* (Rossi); *Ceroplastes denudatus* Cockerell; *Ceroplastes nerii* Newstead; *Coccus caricae* Bernard; *Ceroplastes tenuitectus* Green; *Ceroplastes rusci* Borg]	Fig wax scale	Hemiptera: Coccidae	Yes – (IIE, 1993a)	Yes – NT (AICN, 2004)	No – leaf (Peña & Mohyuddin, 1997)	No
Chaetocnema cognatata Baly	Flea beetle	Coleoptera: Alticidae	Yes – (USDA, 2001)	No	No	No
Chaetocnema concinnipennis Baly	Flea beetle	Coleoptera: Alticidae	Yes – (USDA, 2001)	No	No	No
Chalcoscelides castaneipars (Moore,	Moth	Lepidoptera:	Yes – (USDA,	No – (Nielsen *et al.*,	No	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
1866) [Syn. = *Miresa castaneipars* Moore; *Altha castaneipars* Moore]		Limacodidae	2001)	1996)		
Cheromettia laleana Moore [Syn. = *Belippa laleana* (Moore)]	Leaf eating caterpillar	Lepidoptera: Limacodidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Chlorida festiva (Linnaeus, 1758)	Stem borer	Coleoptera: Cerambycidae	Yes – (USDA, 2001)	No	No – wood (Carrasco, 1978)	No
Chlumetia alternans Moore	Shoot borer	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – inflorescence, shoot (USDA, 2001); leaf, stem (Butani, 1993)	No
Chlumetia transversa (Walker, 1863) [Syn. = *Nachaba transversa* Walker; *Chlumetia guttivenris* Walker; *Ariola corticea* Snellen; *Chlumetia guangxiensis* Wu & Zhu; *Salagena transversa* (Walker); *Sholumetia transversa* (Walker)]	Mango shoot borer; mango shoot caterpillar; mango tip borer	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – (Nielsen *et al*., 1996)	No – inflorescence, leaf, shoot (Srivastava, 1997); stem (Butani, 1993)	No
Chrysocoris patricius (Fabricius)	Bug	Hemiptera: Pentatomidae	Yes – (Kishun & Chand, 1989)	No	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Chrysomphalus aonidum (Linnaeus, 1758) [Syn. = *Coccus aonidum* Linnaeus; *Chrysomphalus ficus* Ashmead; *Aspidiotus aonidum* (Linnaeus); *Aonidiella ficorum* Ashmead; *Aspidiotus* (*Chrysomphalus*) *aonidum* (Linnaeus); *Aspidiotus* (*Chrysomphalus*) *ficus* (Ashmead); *Aspidiotus ficorum* Ashmead; *Aspidiotus ficus* (Ashmead); *Chrysomphalus aonidum* (Linnaeus)]	Black scale; circular black scale; circular purple scale; circular scale; citrus black scale; Egyptian black scale; Florida red scale; purple scale; red spotted scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – NSW, NT, QLD, TAS (CAB International, 2003); WA (Woods, 2001)	Yes – fruit, leaf, stem (USDA, 2001)	No
Chrysomphalus dictyospermi (Morgan, 1889) [Syn. = *Aspidiotus dictyospermi* Morgan; *Aspidiotus* (*Chrysomphalus*) *dictyospermi*	Spanish red scale; dictyosperm scale; palm scale; red citrus scale; western red scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – QLD (CAB International, 2003)	No – leaf (Peña & Mohyuddin, 1997)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
(Morgan); *Aspidiotus agrumicula* De Gregorio; *Aspidiotus dictyospermi* var. *arecae* Newstead; *Aspidiotus arecae* (Newstead); *Aspidiotus dictyospermi* var. *jamaicensis* Cockerell; *Aspidiotus jamaicensis* (Cockerell); *Aspidiotus mangiferae* Cockerell; *Chrysomphalus arecae* (Newstead); *Chrysomphalus castigatus* Mamet; *Chrysomphalus dictyospermatis* Lindinger; *Chrysomphalus jamaicensis* (Cockerell); *Chrysomphalus mangiferae* (Cockerell); *Chrysomphalus minor* Berlese]						
Chrysomphalus pinnulifer (Maskell, 1891) [Syn. = *Diaspis pinnulifera* Maskell]	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (USDA, 2001)	No	No	No
Cisaberoptus kenyae Keifer	Mango leaf mite; false spider mite; gall mite; mango leaf-coating mite	Acarina: Eriophyidae	Yes – (DPP, 2001; Rai *et al*., 1993)	No – (Halliday, 1998)	No – leaf (Rai *et al*., 1993)	No
Citripestis eutraphera (Meyrick) [Syn. = *Philotroctis eutraphera* Meyrick]	Fruit borer	Lepidoptera: Pyralidae	Yes – (Bhumannavar, 1991a; DPP, 2001)	No – (Nielsen *et al*., 1996)	No – premature dropping of fruit (Bhumannavar, 1991a)	No
Clitea picta Baly, 1877	Flea beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No – leaf (USDA, 2001)	No
Clovia sp.	Spittlebug	Hemiptera: Aphrophoridae	Yes – (Davli *et al*., 1992)	No – (Fletcher, 2003)	No	No
Coccus almoraensis Avasthi & Shafee, 1984	Soft scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No	No
Coccus colemani Kannan, 1918 [Syn. = *Coccus viridis colemani* (Kannan); *Chloropulvinaria colemani* (Kannan)]	Soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No	No
Coccus discrepans (Green, 1904) [Syn. = *Lecanium discrepans* Green; *Saissetia discrepans* (Green)]	Soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf (USDA, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Coccus formicarii (Green, 1896) [Syn. = *Lecanium formicarii* Green; *Lecanium globulosum* Maskell; *Lecanium* (*Saissetia*) *formicarii* (Green); *Saissetia formicarii* (Green); *Taiwansaissetia formicarii* (Green)]	Soft scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – leaf (USDA, 2001)	No
Coccus hesperidum Linnaeus, 1758 [Syn. = *Calypticus laevis* Costa; *Calypticus hesperidum* (Linnaeus); *Lecanium hesperidum* (Linnaeus); *Coccus patellaeformis* Curtis; *Chermes lauri* Boisduval; *Lecanium angustatus* Signoret; *Lecanium lauri* (Boisduval); *Lecanium maculatum* Signoret; *Kermes aurantj* Alfonso; *Lecanium alienum* Douglas; *Lecanium depressum simulans* Douglas (nomen nudum); *Lecanium minimum* Newstead; *Lecanium assimile amaryllidis* Cockerell; *Lecanium assimile amaryllidis* Cockerell (nomen nudum); *Lecanium terminaliae* Cockerell; *Lecanium ceratoniae* Gennadius; *Lecanium hesperidum lauri* (Boisduval); *Lecanium nanum* Cockerell; *Lecanium minimum pinicola* Maskell; *Lecanium flaveolum* Cockerell; *Lecanium ventrale* Ehrhorn; *Lecanium hesperidum alienum* (Douglas); *Lecanium* (*Calymnatus*) *hesperidum pacificum* Kuwana; *Coccus angustatus* (Signoret); *Chermes aurantii* (Alfonso); *Lecanium hesperidum minimum* (Newstead); *Coccus* (*Lecanium*) *minimus* (Newstead); *Coccus flaveolus* (Cockerell); *Coccus patelliformis* (Curtis); *Coccus hesperidum alienus* (Douglas); *Coccus hesperidum lauri* (Boisduval); *Coccus hesperidum pacificus* (Kuwana); *Coccus maculatus* (Signoret);	Brown soft scale; common shield scale; soft brown scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	Yes – NSW, NT, QLD, SA, TAS, WA (CAB International, 2003)	No – leaf, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Coccus minimus (Newstead); *Coccus minimus pinicola* (Maskell); *Coccus nanus* (Cockerell); *Coccus terminaliae* (Cockerell); *Coccus ventralis* (Ehrhorn); *Eulecanium assimile amaryllidis* (Cockerell); *Lecanium signiferum* Green; *Lecanium punctuliferum* Green; *Saissetia punctulifera* (Green); *Coccus signiferus* (Green); *Lecanium hesperidum* (Linnaeus); *Lecanium* (*Coccus*) *hesperidum* (Linnaeus); *Coccus* (*Lecanium*) *hesperidum* (Linnaeus); *Coccus jungi* Chen; *Lecanium mauritiense* Mamet; *Lecanium* (*Coccus*) *hesperidum* (Linnaeus); *Lecanium* (*Coccus*) *signiferum* (Green); *Coccus mauritiensis* (Mamet)]						
Coccus kosztarabi Avasthi & Shafee, 1984	Soft scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No	No
Coccus latioperculatum (Green, 1922) [Syn. = *Lecanium latioperculatum* Green; *Lecanium latioperculum* (Green); *Coccus lateroperculatus* (Green)]	Soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf (USDA, 2001)	No
Coccus longulus (Douglas, 1887) [Syn. = *Lecanium longulum* Douglas; *Lecanium chirimoliae* Maskell; *Lecanium ficus* Maskell; *Coccus longulum* (Douglas); *Coccus ficus* (Maskell); *Lecanium frontale* Green; *Coccus frontalis* (Green); *Coccus elongatus* (incorrect synonymy); *Lecanium* (*Coccus*) *celtium* Kuwana; *Coccus celtium* (Kuwana); *Lecanium* (*Coccus*) *longulus* (Douglas); *Lecanium wistariae* Brain; *Coccus* (*Lecanium*) *longulus* (Douglas); *Lecanium kraunhianum* Lindinger; *Lecanium* (*Coccus*) *frontale* (Green); *Coccus frontalis* (Green); *Coccus*	Long soft scale; long brown scale; long shell scale; long shield scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, NT, QLD, SA (Ben-Dov *et al*., 2001)	Yes – fruit, leaf, twig (Smith *et al*., 1997)	**Yes (for WA only)**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
celticum (Kuwana); *Parthenolecanium wistaricola* Borchsenius]						
Coccus viridis (Green, 1889) [Syn. = *Lecanium viride* Green; *Lecanium* (*Trechocorys*) *hesperidum africanum* Newstead (nomen nudum); *Lecanium* (*Coccus*) *viride* (Green); *Coccus viridis bisexualis* Köhler (nomen nudum); *Coccus viridis viridis* Köhler (nomen nudum); *Eulecanium viridis* (Green); *Lecanium viridis* (Green)]	Green coffee scale; green scale; green shield scale; soft green scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	Yes – QLD (Smith *et al*., 1997)	No – bud, leaf (Peña & Mohyuddin, 1997)	No
Conogethes punctiferalis (Guenée, 1854) [Syn. = *Astura punctiferalis* Guenée; *Deiopeia detracta* (Walker); *Botys nicippealis* (Walker); *Astura guttatalis* (Walker); *Dichocrocis punctiferalis* (Guenée)]	Castor seed caterpillar; castor capsule borer; castor borer; corn moth; peach pyralid moth; shoot borer; yellow peach moth	Lepidoptera: Pyralidae	Yes – (Srivastava, 1997)	Yes – ACT, NSW, NT, QLD, SA, VIC (AICN, 2004); WA (DAWA, 2003)	Yes – fruit, leaf, stem (CAB International, 2003); inflorescence, seed, shoot (Srivastava, 1997)	No
Contarinia moringae (Mani, 1936) [Syn. = *Stictodiplosis moringae* Mani]	Gall midge	Diptera: Cecidomyiidae	Yes – (USDA, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Coptosoma nazirae Atkinson	Dwarf shield bug	Hemiptera: Plataspidae	Yes – (DPP, 2001)	No	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Coptotermes formosanus Shiraki, 1909 [Syn. = *Coptotermes formosae* Holmgren; *Coptotermes hongkongensis* Oshima; *Cryptotermes hongkongensis* Campbell; *Coptotermes intrudens* Oshima; *Termes raffrayi* Matsumura; *Coptotermes remotus* Silvestri]	Formosan subterranean termite; Oriental subterranean termite	Isoptera: Rhinotermitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – branch, trunk (Peña & Mohyuddin, 1997); root, wood (Srivastava, 1997)	No
Coptotermes gestroi (Wasmann, 1896)	Subterranean termite	Isoptera: Rhinotermitidae	Yes – (Butani, 1993)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Coptotermes heimi (Wasmann, 1902)	Termite	Isoptera: Rhinotermitidae	Yes – (DPP, 2001)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Corticarnia gibbosa Herbst	Beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No	No
Costalimaita ferruginea (Fabricius, 1801)	Yellow eucalyptus beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No – leaf (Butani, 1993)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
[Syn. = *Costalimaita ferruginea vulgata* (Fabricius); *Colaspoides iglesiasi* (Costa Lima); *Costalimaita ferruginea vulgata* Lefèvre; *Costalimaita vulgata* (Lefèvre); *Melinophora iglesiasi*; *Costalimaita ferruginea* (Klug)]						
Cricula trifenestrata (Helfer, 1837) [Syn. = *Saturnia trifenestrata* Helfer; *Cricula trifenestrata javana* (Watson); *Cricula trifenestrata kransi* (Jurriaanse & Lindemans); *Cricula andrei*]	Mango hairy caterpillar; tea flush worm; wild silk moth	Lepidoptera: Saturniidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Singh, 1992)	No
Crinorrhinus crassirostris Faust	Weevil	Coleoptera: Curculionidae	Yes – (Patel *et al*., 1997)	No	No – leaf (Patel *et al*., 1997)	No
Crossotarsus saundersi Chapius, 1865	Stem borer	Coleoptera: Platypodidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Cryptoblabes gnidiella (Millière, 1867) [Syn. = *Ephestia gnidiella* Millière; *Albinia casazzar* Briosi; *Albinia wockiana* Briosi; *Albinia gnidiella* (Millière); *Cryptoblabes aliena* Swezey; *Cryptoblabes wockeana* (Briosi)]	Honeydew moth; citrus pyralid; christmasberry webworm; earhead caterpillar; rind-boring orange moth	Lepidoptera: Pyralidae	Yes – (CAB International, 2003)	No – (Nielsen *et al*., 1996)	Yes – fruit, leaf, stem (CAB International, 2003)	**Yes**
Cryptocephalus insubidus Suffrain	Leaf beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf (Ramamurthy *et al*., 1982)	No
Cryptocephalus suillus Suffrain	Leaf beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf (Ramamurthy *et al*., 1982)	No
Ctenomeristis ebriola Meyrick	Mango caterpillar; mango fruit borer	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	Yes – fruit (DPP, 2001)	**Yes**
Dasineura amaramanjarae Grover, 1965	Inflorescence gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2000)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Dasineura citri Rao & Grover, 1960	Citrus blossom midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Deanolis sublimbalis Snellen [Syn. = *Noorda albizonalis* Hampson, 1903; *Deanolis albizonalis* (Hampson); *Autocharis albizonalis* (Hampson)]	Red-banded mango caterpillar; mango seed borer; red banded borer	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	Yes – under official control in QLD (QDPIF, 2004)	Yes – fruit (Srivastava, 1997; Zaheruddeen & Sujatha, 1993)	**Yes**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Deporaus marginatus (Pascoe, 1883) [Syn. = *Eugnamptus marginatus* Pascoe; *Deporaus marginellus* Faust]	Mango leaf cutting weevil; mango leaf weevil; mango-funnel rolling leaf weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – leaf, shoot (CAB International, 2003); stem (Zaman & Maiti, 1994)	No
Desmidophorus hebes Fabricius, 1781	Large black weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – leaf (Butani, 1993)	No
Deudorix isocrates (Fabricius, 1793) [Syn. = *Hesperia isocrates* Fabricius; *Virachola isocrates* (Fabricius)]	Pomegranate fruit borer; anar caterpillar; pomegranate butterfly	Lepidoptera: Lycaenidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al*., 1996)	Yes – fruit (Srivastava, 1997)	**Yes**
Diapromorpha melanoppus Lacordaire	Beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No – leaf (Butani, 1993)	No
Diapromorpha pallens Olivier, 1808	Beetle	Coleoptera: Chrysomelidae	Yes – (Zaman & Maiti, 1994)	No	No – leaf, stem (Zaman & Maiti, 1994)	No
Dictyophara sp.	Mango hopper	Hemiptera: Dictyopharidae	Yes – (Dalvi *et al*., 1992)	? – Genus is present in Australia (Fletcher, 2003)	No	No
Dinoderus distinctus Lesne, 1897	False powder post beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Dorylus orientalis Westwood, 1835	Oriental army ant; brown ant; red ant	Hymenoptera: Formicidae	Yes – (Menon & Srivastava, 1976)	No – (Shattuck & Barnett, 2001)	No – builds nest in foliage (Srivastava, 1997)	No
Drosicha contrahens (Walker)	Mango mealybug	Hemiptera: Margarodidae	Yes – (DPP, 2001)	No	Yes –fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Drosicha dalbergiae (Green)	Mealybug	Hemiptera: Margarodidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Drosicha mangiferae Green	Giant mealybug; giant mango mealybug; mango mealybug	Hemiptera: Margarodidae	Yes – (DPP, 2000)	No – (CAB International, 2003)	No – fruit peduncle (Tandon, 1998); inflorescence, shoot (Srivastava, 1997); leaf, stem (Butani, 1993) Affects fruit set and causes fruit drop (Tandon, 1998).	No
Drosicha stebbingi (Green, 1903) [Syn. = *Monophlebus stebbingi* Green; *Monophlebus stebbingi* var. *mangiferae*	Mango mealybug; giant mealybug	Hemiptera: Margarodidae	Yes – (DPP, 2000)	No – (CAB International, 2003)	No – fruit peduncle, inflorescence, leaf, shoot (Tandon, 1998)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Green; *Monophlebus stebbingi* var. *octocaudata* Green; *Drosicha octocaudata* (Green)]					Affects fruit set and causes fruit drop (Tandon, 1998).	
Dudua aprobola (Meyrick, 1886) [Syn. = *Eccopsis aprobola* Meyrick; *Temnolopha metallota* Lower; *Argyroploce aprobola* (Meyrick); *Platypeplus aprobola* (Meyrick)]	Moth	Lepidoptera: Tortricidae	Yes – (DPP, 2001)	Yes – (Nielsen *et al*., 1996)	No – inflorescence (Verghese & Jayanthi, 1999); leaf, stem (Butani, 1993); shoot (Srivastava, 1997)	No
Dysdercus koenigii (Fabricius) [Syn. = *Cimex koenigii*]	Red cotton bug	Hemiptera: Pyrrhocoridae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem (DPP, 2001); seed (Schaefer & Ahmad, 2000)	**Yes**
Dysmicoccus brevipes (Cockerell, 1893) [Syn. = *Dactylopius brevipes* Cockerell; *Pseudococcus brevipes* (Cockerell); *Dactylopius* (*Pseudococcus*) *ananassae* Kuwana; *Pseudococcus missionum* Cockerell; *Pseudococcus palauensis* Kanda; *Pseudococcus cannae* Green; *Pseudococcus longirostralis* James; *Pseudococcus pseudobrevipes* Mamet]	Pineapple mealybug	Hemiptera: Pseudococcidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, NT, QLD, WA (CAB International, 2003)	Yes – fruit, leaf, root, stem, whole plant (CAB International, 2003)	No
Ectatorhinus adamsi Pascoe, 1872	Twig boring weevil	Coleoptera: Curculionidae	Yes – (Pathak *et al*., 2000)	No	No – twig (Pathak *et al*., 2000)	No
Epepeotes ficicola Fisher	Longicorn beetle; stem borer	Coleoptera: Cerambycidae	Yes – (Butani, 1993)	No	No – stem (Srivastava, 1997)	No
Epepeotes luscos (Fabricius)	Longicorn beetle; stem borer	Coleoptera: Cerambycidae	Yes – (Butani, 1993)	No	No – stem (Srivastava, 1997)	No
Erosomyia mangiferae (Felt, 1911) [Syn. = *Mangodiplosis mangiferae* Tavares; *Procystiphora mangiferae* (Felt); *Erosomyia indica* Grover & Prasad]	Mango blossom midge; mango blister midge; mango gall midge; inflorescence gall midge; mango inflorescence midge; mango midge	Diptera: Cecidomyiidae	Yes – (Abbas *et al*., 1989; DPP, 2001)	No – (Evenhuis, 1996)	No – bud, shoot, young fruit (CAB International, 2003); inflorescence, leaf, stem (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Erosomyia margicola Dastan, 1980	Midge	Diptera: Cecidomyiidae	Yes – (Srivastava, 1997)	No – (Evenhuis, 1996)	No – leaf (Srivastava, 1997)	No
Eublemma angulifera Moore	Flower feeding caterpillar; small shoot boring caterpillar	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – inflorescence (Butani, 1993)	No
Eublemma silicula Swinhoe	Earhead caterpillar; flower feeding caterpillar	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – inflorescence (Butani, 1993)	No
Eublemma versicolor Walker	Flower webber	Lepidoptera: Noctuidae	Yes – (DPP, 2000)	No – (Nielsen *et al*., 1996)	No – inflorescence (DPP, 2000)	No
Eucalymnatus hempeli Costa Lima, 1923	Soft scale	Hemiptera: Coccidae	Yes – (USDA, 2001)	No – (Ben-Dov *et al*., 2001)	No	No
Eucalymnatus tessellatus (Signoret, 1873) [Syn. = *Lecanium tessellatum* Signoret; *Lecanium perforatum* Newstead; *Lecanium tessellatum perforatum* (Newstead); *Lecanium tessellatum swainsonae* Cockerell; *Lecanium* (*Eucalymnatus*) *tessellatum* (Signoret); *Coccus tessellatum* (Signoret); *Eucalymnatus perforatus* (Newstead);	Palm scale; tessellated scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	Yes – NSW (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Eucalymnatus tessellatus swainsonae (Cockerell); *Lecanium subtessellatum* Green; *Eucalymnatus subtessellatus* (Green); *Lecanium* (*Eucalymnatus*) *tessellatum perforatum* (Newstead); *Lecanium* (*Eucalymnatus*) *perforatum* (Newstead); *Lecanium tessellatum obsoletum* Green]						
Eucorynus crassicornis (Fabricius, 1801) [Syn. = *Araecerus crassicornis* Fabricius; *Araeocerus crassicornis* (Fabricius)]	Tephrosia seed weevil	Coleoptera: Anthribidae	Yes – (USDA, 2001)	No	No	No
Eucrostes sp.	Moth	Lepidoptera: Geometridae	Yes – (Verghese & Jayanthi, 1999)	? – Genus is present in Australia (Nielsen *et al*., 1996)	No – inflorescence (Verghese & Jayanthi, 1999)	No
Eudocima fullonia (Clerck, 1764) [Syn. = *Phalaena fullonia* Clerck; *Phalaena Noctua phalonia* (Linnaeus); *Phalaena Noctua fullonica* (Linnaeus); *Noctua dioscoreae* (Fabricius); *Phalaena pomona* (Cramer); *Ophideres obliteraus* (Walker); *Eudocima dioscoreae* (Fabricius); *Eudocima obliterans* (Walker); *Eudocima phalonia* (Linnaeus); *Eudocima pomona* (Cramer); *Ophideres fullonia* (Clerck); *Ophideres fullonica* (Linnaeus); *Othreis fullonia* (Clerck); *Othreis fullonica* (Linnaeus); *Othreis pomona* Hübner; *Phalaena* (*Attacus*) *fullonica* (Linnaeus)]	Fruit piercing moth; fruit sucking moth; orange-piercing moth	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – NSW, NT, QLD (CAB International, 2003)	No – fruit piercing (CAB International, 2003; Srivastava, 1997)	No
Eudocima homaena (Hübner, 1816) [Syn. = *Othreis homaena* Hübner; *Ophideres ancilla* Cramer; *Othreis ancilla* (Cramer)]	Fruit piercing moth	Lepidoptera: Noctuidae	Yes – (Atwal, 1976)	No – (Nielsen *et al*., 1996)	No – fruit piercing (Atwal, 1976)	No
Eudocima materna (Linnaeus, 1767) [Syn. = *Phalaena Noctua materna*	Fruit piercing moth; fruit sucking moth	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – (Nielsen *et al*., 1996)	No – fruit piercing (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Linnaeus; *Noctua hybrida* (Fabricius); *Ophideres apta* (Walker); *Ophideres chalcogramma* (Walker); *Argadesa materna* (Linnaeus); *Eudocima apta* (Walker); *Eudocima chalcogramma* (Walker); *Eudocima hybrida* (Fabricius); *Ophideres materna* (Linnaeus); *Othreis materna* (Linnaeus)]						
Eupithecia sp.	Moth	Lepidoptera: Geometridae	Yes – (Singh *et al*., 1976)	No – (Nielsen *et al*., 1996)	No – leaf, shoot (Singh *et al*., 1976)	No
Euproctis flava Bremer	Oriental tussock moth	Lepidoptera: Lymantriidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Euproctis fraterna Moore	Coffee hairy caterpillar; plum hairy caterpillar; tussock caterpillar	Lepidoptera: Lymantriidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – inflorescence (Verghese & Jayanthi, 1999); leaf (Butani, 1993)	No
Euproctis lunata Walker	Castor hairy caterpillar	Lepidoptera: Lymantriidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Euproctis scintillans (Walker, 1856) [Syn. = *Somena scintillans* Walker; *Porthesia scintillans* (Walker); *Nygmia scintillans* (Walker)]	Tussock caterpillar	Lepidoptera: Lymantriidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No
Euproctis xanthosticha Hampson	Leaf eating caterpillar	Lepidoptera: Lymantriidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Euthalia aconthea garuda (Moore, 1858) [Syn. = *Adolias garuda* Moore; *Euthalia garuda* (Moore)]	Common baron	Lepidoptera: Nymphalidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No
Euthalia nais (Forster, 1771) [Syn. = *Papilio nais* Forster; *Symphaedra alcandra* Hübner; *Symphaedra nais* (Forster)]	Baronet	Lepidoptera: Nymphalidae)	Yes – (Singh & Satyanarayana, 2000)	No – (Nielsen *et al*., 1996)	No – leaf (Singh & Satyanarayana, 2000)	No
Ferrisia virgata (Cockerell, 1893) [Syn. = *Dactylopius segregatus* Cockerell; *Dactylopius virgatus* Cockerell; *Dactylopius virgatus farinosus* Cockerell; *Dactylopius virgatus humilis* Cockerell;	Striped mealybug; grey mealybug; spotted mealybug; tailed coffee mealybug; tailed mealybug; white-	Hemiptera: Pseudococcidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NT, QLD (CAB International, 2003)	Yes – fruit, leaf, shoot, stem (CAB International, 2003)	**Yes (for WA only)**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Dactylopius ceriferus Newstead; *Dactylopius talini* Green; *Dactylopius dasylirii* Cockerell; *Dactylopius setosus* Hempel; *Pseudococcus virgatus* (Cockerell); *Dactylopius magnolicida* King; *Pseudococcus magnolicida* (King); *Pseudococcus virgatus farinosus* (Cockerell); *Pseudococcus dasylirii* (Cockerell); *Pseudococcus segregatus* (Cockerell); *Pseudococcus virgatus humilis* (Cockerell); *Dactylopius virgatus madagascariensis* Newstead; *Pseudococcus marchali* Vayssière; *Pseudococcus virgatus madagascariensis* (Newstead); *Pseudococcus bicaudatus* Keuchenius; *Ferrisiana virgata* (Cockerell); *Heliococcus malvastrus* McDaniel; *Ferrisiana setosus* (Hempel)]	tailed mealybug					
Fiorinia fioriniae (Targioni Tozzetti, 1867) [Syn. = *Diaspis fioriniae* Targioni Tozzetti; *Chermes arecae* Boisduval; *Fiorinia pellucida* Targioni Tozzetti; *Fiorinia camelliae* Comstock; *Uhleria camelliae* (Comstock); *Uhleria fioriniae* (Targioni Tozzetti); *Fiorinia fioriniae* (Targioni Tozzetti); *Fiorinia palmae* Green; *Parlatoria fioriniae* (Targioni Tozzetti); *Parlatoreopsis camelliae* (Comstock)]	Avocado scale; camellia scale; European fiorinia scale; fiorinia scale; palm fiorinia scale; ridged scale	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, WA (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Flata spp.	Mango hopper	Hemiptera: Flatidae	Yes – (Dalvi *et al*., 1992)	No – (Fletcher, 2003)	No	No
Frankliniella occidentalis (Pergande, 1895) [Syn. = *Euthrips occidentalis* Pergande; *Frankliniella californica* Moulton; *Euthrips helianthi* Moulton; *Euthrips tritici* var. *californicus* Moulton; *Frankliniella tritici* var. *moultoni* Hood; *Frankliniella*	Western flower thrips; alfalfa thrips; flower thrips; western grass thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	Yes – NSW, QLD, SA, TAS, VIC, WA (restricted) (CAB International, 2003)	No – bud, inflorescence, leaf (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
canadensis Morgan; *Frankliniella claripennis* Morgan; *Frankliniella occidentalis* f. *brunnescens* Priesner; *Frankliniella occidentalis* f. *dubia* Priesner; *Frankliniella nubila* Treherne; *Frankliniella tritici maculata* Priesner; *Frankliniella venusta* Moulton; *Frankliniella conspicua* Moulton; *Frankliniella chrysanthemi* Kurosawa; *Frankliniella dahliae* Moulton; *Frankliniella dianthi* Moulton; *Frankliniella syringae* Moulton; *Frankliniella umbrosa* Moulton; *Frankliniella helianthi* (Moulton); *Frankliniella moultoni* Hood; *Frankliniella trehernei* Morgan]						
Gastropacha pardale (Walker, 1855)	Lappet moth	Lepidoptera: Lasiocampidae	Yes – (Haseeb *et al*., 1998)	No – (Nielsen *et al*., 1996)	No – leaf (Haseeb *et al*., 1998)	No
Gatesclarkeana erotias (Meyrick) [Syn. = *Argyroploce erotias* Meyrick]	Shoot borer	Lepidoptera: Tortricidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf, stem (Butani, 1993); shoot (Srivastava, 1997)	No
Geococcus coffeae Green, 1933	Coffee root mealybug	Hemiptera: Pseudococcidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NT (Williams, 1985)	No – root (USDA, 2001)	No
Glenea multiguttata Guérin-Méneville	Longicorn beetle; stem borer	Coleoptera: Cerambycidae	Yes – (Butani, 1993)	No	No – stem (Srivastava, 1997)	No
Greenidea mangiferae Takahashi, 1925	Aphid	Hemiptera: Aphididae	Yes – (DPP, 2001)	No	No – inflorescence, leaf, stem (DPP, 2001)	No
Gryllus viator Kirby	Grasshopper	Orthoptera: Gryllidae	Yes – (Butani, 1993)	No	No – leaf (Butani, 1993)	No
Gynadrophthalma sp.	Beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No	No
Halys dentata (Fabricius) [Syn. = *Halys dentatus* Fabricius]	Bark bug	Hemiptera: Pentatomidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Haplothrips ganglbaueri Schmutz, 1913 [Syn. = *Haplothrips ceylonicus* var. *vernoniae*]	Thrips	Thysanoptera: Phlaeothripidae	Yes – (DPP, 2001)	No – (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No
Haplothrips tenuipennis Bagnall [Syn. = *Haplothrips ceylonicus*]	Black tea thrips; black thrips; cereal thrips	Thysanoptera: Phlaeothripidae	Yes – (Srivastava, 1997)	No – (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
Helicoverpa armigera (Hübner, 1805) [Syn. = *Noctua armigera* Hübner; *Noctua barbara* (Fabricius) suppr.; *Heliothis conferta* (Walker); *Heliothis pulverosa* (Walker); *Heliothis uniformis* (Wallengren); *Heliothis fusca* Cockerell; *Helicoverpa commoni* Hardwick; *Heliothis rama* Bhattacherjee & Gupta; *Heliothis armigera* (Hübner); *Chloridea armigera* Hübner; *Heliothis obsoleta* auct.; *Helicoverpa obsoleta* auct.; *Chloridea obsoleta*]	Cotton bollworm; African cotton bollworm; corn earworm; fruit borer; gram pod borer; old world bollworm; tobacco budworm; tomato grub	Lepidoptera: Noctuidae	Yes – (IIE, 1993b)	Yes – NSW, NT, QLD, WA (IIE, 1993b)	No – inflorescence, leaf, shoot, young fruit (CAB International, 2003)	No
Heliothrips haemorrhoidalis (Bouché, 1833) [Syn. = *Thrips haemorrhoidalis* Bouché; *Heliothrips semiaureus* Girault; *Dinurothrips rufiventris* Girault; *Heliothrips ceylonicus*; *Heterothrips haemorrhoidalis* (Bouché); *Heliothrips adonium* Haliday; *Heliothrips haemorrhoidalis* var. *abdominalis* Reuter; *Heliothrips haemorrhoidalis* var. *ceylonicus* Schmutz; *Heliothrips haemorrhoidalis* var. *andustior* Priesner; *Heliothrips ceylonicus* (Schmutz)]	Greenhouse thrips	Thysanoptera: Thripidae	Yes – (CAB International, 2003)	Yes – ACT, NSW, NT, QLD, SA, VIC, WA (Mound, 1996)	Yes – fruit, leaf (CAB International, 2003); bud (Peña & Mohyuddin, 1997); flower (Mound, 1996)	No
Hemiberlesia lataniae (Signoret, 1869) [Syn. = *Aspidiotus lataniae* Signoret; *Aspidiotus cydoniae* Cockerell; *Aspidiotus greenii* Cockerell; *Diaspidiotus lataniae* (Signoret); *Euaspidiotus lataniae* (Signoret); *Hemiberlesia cydoniae* (Cockerell); *Hemiberlesia greenii* (Cockerell); *Aspidiotus punicae* Cockerell; *Aspidiotus tectus* Ferris; *Aspidiotus aspleniae* Ferris; *Aspidiotus askleniae* Sasaki; *Aspidiotus crawii* Cockerell]	Latania scale; palm scale; grape vine Aspidiotus; grape vine scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	Yes – QLD (CAB International, 2003); WA (Szito, 2001)	Yes – bark, fruit, leaf, stem, twig (CAB International, 2003)	No
Hemiberlesia palmae (Cockerell, 1892)	Armoured scale; hard	Hemiptera:	Yes – (Srivastava,	No – (CAB	No – bark, flower, root,	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Aspidiotus rapax* var. *palmae* Cockerell; *Abragallaspis palmae* (Cockerell); *Borchseniaspis palmae* (Cockerell); *Aspidiotus palmae* Morgan & Cockerell]	scale	Diaspididae	1997)	International, 2003)	stem, twig (Srivastava, 1997)	
Hemiberlesia rapax (Comstock, 1881) [Syn. = *Aspidiotus rapax* Comstock; *Aspidiotus camelliae* Signoret; *Aspidiotus convexus* Comstock; *Aspidiotus lucumae* Cockerell; *Aspidiotus tricolor* Cockerell; *Hemiberlesia argentina* Leonardi]	Greedy scale; camellia scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – SA, TAS, VIC (CAB International, 2003)	Yes – bark, fruit, leaf, stem (CAB International, 2003)	**Yes (for WA only)**
Heterobostrychus aequalis (Waterhouse, 1884) [Syn. = *Bostrychus uncipennis* Lesne, 1895]	False powderpost beetle; kapok borer; lesser auger beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – stem (Srivastava, 1997)	No
Heterobostrychus hamatipennis Lesne, 1895	False powderpost beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Heterobostrychus pileatus Lesne	False powderpost beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Butani, 1993)	No
Heterotermes indicola (Wasmann, 1902)	Termite	Isoptera: Rhinotermitidae	Yes – (DPP, 2001)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Holotrichia consanguinea Blanchard [Syn. = *Lachnosterna consanguinea* Blanchard]	Chafer beetle; white grub	Coleoptera: Scarabaeidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – leaf (Butani, 1993)	No
Holotrichia insularis Brenske	Chafer beetle; white grub	Coleoptera: Scarabaeidae	Yes – (Butani, 1993)	No	No – root (Butani, 1993)	No
Holotrichia reynaudi Blanchard	Chafer beetle; white grub	Coleoptera: Scarabaeidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Holotrichia serrata (Fabricius, 1787) [Syn. = *Melolontha serrata* Fabricius; *Lachnosterna serrata* (Fabricius); *Phyllophaga serrata* (Fabricius)]	Chafer beetle; cock chafer; leaf chafer; May or June beetle; white grub	Coleoptera: Scarabaeidae	Yes – (Butani, 1993)	No – (CAB International, 2003)	No – leaf, root (CAB International, 2003)	No
Homona coffearia (Nietner, 1861) [Syn. = *Tortrix coffearia* Nietner;	Coffee tortrix; tea flushworm; tea tortricid; tea tortrix	Lepidoptera: Tortricidae	Yes – (USDA, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Capua coffearia (Nietner); *Homona fasciculana* Walker; *Homona menciana* (Walker); *Godana simulana* Walker; *Homona fimbriana* Walker; *Homona socialis* Meyrick]						
Homona permutata Meyrick	Leaf eating caterpillar	Lepidoptera: Tortricidae	Yes – (Bhumannavar, 1991b)	No – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No
Hypatima spathota (Meyrick, 1913) [Syn. = *Chelasia spathota* Meyrick]	Shoot borer	Lepidoptera: Gelechiidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993; Patel *et al*., 1997)	No
Hypocryphalus eupholyphagus Beeson	Shot-hole beetle	Coleoptera: Scolytidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Hypocryphalus mangiferae (Stebbing, 1914) [Syn. = *Cryphalus mangiferae* Stebbing; *Dacryphalus mangiferae* (Stebbing)]	Mango bark beetle; shoot gun perforator; shot-hole beetle	Coleoptera: Scolytidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – branch, root, trunk (Peña & Mohyuddin, 1997); leaf (DPP, 2001)	No
Hypomeces squamosus (Fabricius, 1792) [Syn. = *Atemtonychus gossipi* Matsumura; *Atemtonychus peregrinus* Matsumura; *Curculio pulverulentus* Fabricius; *Curculio aurulentus* Herbst; *Curculio orientalis* Olivier]	Green weevil; gold-dust beetle; gold-dust weevil	Coleoptera: Curculionidae	Yes – (CAB International, 2003)	No – (CAB International, 2003)	No – leaf, root (CAB International, 2003)	No
Hypophrictis plana Meyrick	Moth	Lepidoptera: Tineidae	Yes – (USDA, 2001)	No – (Nielsen *et al*., 1996)	No	No
Hyposidra talaca (Walker, 1860) [Syn. = *Lagyra talaca* Walker; *Lagyra successaria* (Walker); *Chizala deceptatura* (Walker); *Lagyra humiferata* (Walker); *Lagyra rigusaria* (Walker); *Lagyra bombycaria* (Walker); *Hyposidra vampyraria* Snellen; *Lagyra myciterna* (Druce); *Lagyra flaccida* (Lucas); *Hyposidra khasiana* Warren; *Hyposidra schistacea* Warren; *Hyposidra grisea* Warren; *Hyposidra janiaria* Guenée; *Hyposidra successaria* Walker]	Black inch worm; inch worm moth	Lepidoptera: Geometridae	Yes – (DPP, 2001)	Yes – (Nielsen *et al*., 1996)	No – inflorescence (DPP, 2001); leaf (USDA, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Hypsopygia mauritialis (Boisduval, 1833) [Syn. = *Asopica mauritialis* Boisduval; *Pyralis lucillalis* (Walker); *Pyralis regalis* (Walker); *Pyralis ducalis* (Walker); *Endotricha crobulus* (Lucas); *Hypsopygia laticilialis* Ragonot; *Hypsopygia atralis* Caradja; *Hypsopygia pfeifferi* Amsel]	Moth	Lepidoptera: Pyralidae	Yes – (USDA, 2001)	Yes – (Nielsen *et al*., 1996)	No – inflorescence (USDA, 2001)	No
Icerya aegyptiaca (Douglas, 1890)	Egyptian fluted scale; Egyptian mealybug; breadfruit mealybug; giant mealybug	Hemiptera: Margarodidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD (CIE, 1966b)	No – leaf, stem (CAB International, 2003)	No
Icerya minor Green	Fluted scale	Hemiptera: Margarodidae	Yes – (Butani, 1993)	No	No – leaf, stem (USDA, 2001)	No
Icerya pulchra (Leonardi) [Syn. = *Icerya pulcher* Leonardi]	Fluted scale	Hemiptera: Margarodidae	Yes – (Butani, 1993)	No – (CAB International, 2003)	No – leaf, stem (USDA, 2001)	No
Icerya purchasi Maskell, 1879 [Syn. = *Pericerya purchasi* (Maskell)]	Cottony cushion scale; Australian bug; mealy scale; white scale	Hemiptera: Margarodidae	Yes – (Srivastava, 1997)	Yes – NSW, QLD, SA, TAS, VIC (CIE, 1971)	No – leaf, shoot, stem (CAB International, 2003; Srivastava, 1997)	No
Icerya seychellarum (Westwood, 1855) [Syn. = *Dorthesia seychellarum* Westwood, 1855; *Icerya okadae*]	Seychelles scale; Okada cottony-cushion scale; silvery cushion scale	Hemiptera: Margarodidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD (CAB International, 2003)	No – leaf, stem (CAB International, 2003)	No
Idioscopus anasuyae Viraktamath & Viraktamath, 1985	Mango hopper	Hemiptera: Cicadellidae	Yes – (Viraktamath & Viraktamath, 1985)	No	No – inflorescence, leaf (USDA, 2001)	No
Idioscopus clypealis (Lethierry, 1889) [Syn. = *Idiocerus clypealis* Lethierry; *Idiocerus nigroclypeatus* Melichar; *Idiocerus nigroclypeatus* Kirkaldy; *Idioscopus nigroclypealis*; *Idioscopus nigroclypeatus* (Melichar)]	Mango leafhopper; mango hopper	Hemiptera: Cicadellidae	Yes – (DPP, 2001)	Yes – QLD (Fletcher, 2000)	No – inflorescence, leaf, shoot (Srivastava, 1997) Affects fruit setting (CAB International, 2003).	No
Idioscopus decoratus Viraktamath, 1976	Leafhopper	Hemiptera: Cicadellidae	Yes – (Viraktamath, 1976)	No – (Fletcher, 2000)	No – inflorescence, leaf (USDA, 2001)	No
Idioscopus fasciolatus (Distant, 1908)]Syn. = *Idiocerus fasciolatus* Distant]	Leafhopper	Hemiptera: Cicadellidae	Yes – (Srivastava, 1997)	No – (Fletcher, 2000)	No – inflorescence, leaf, shoot (Srivastava, 1997)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
Idioscopus incertus (Baker, 1924) [Syn. = *Idiocerus incertus* Baker; *Idiocerus maculatus* Distant]	Leafhopper	Hemiptera: Cicadellidae	Yes – (Srivastava, 1997)	No – (Fletcher, 2000)	No – inflorescence, leaf, shoot (Srivastava, 1997)	No
Idioscopus jayashriae Viraktamath & Viraktamath, 1985	Mango hopper	Hemiptera: Cicadellidae	Yes – (Viraktamath & Viraktamath, 1985)	No – (Fletcher, 2000)	No – inflorescence, leaf, shoot (Srivastava, 1997)	No
Idioscopus nagpurensis Pruthi, 1930 [Syn. = *Idiocerus nagpurensis* Pruthi]	Mango leafhopper	Hemiptera: Cicadellidae	Yes – (Dalvi *et al*., 1992)	No – (CAB International, 2003)	No – flower, leaf (Dalvi & Dumbre, 1994) Affects fruit setting (CAB International, 2003).	No
Idioscopus nitidulus (Walker, 1870) [Syn. = *Idioscopus niveosparsus* (Lethierry); *Idiocerus basilis* Melichar; *Idiocerus niveosparsus* (Lethierry); *Chunra niveosparsa* (Lethierry); *Chunra niveosparsus* (Lethierry); *Chunrocerus niveosparsus* (Lethierry); *Idiocerus nitidulus* Walker]	Mango brown leafhopper; mango hopper	Hemiptera: Cicadellidae	Yes – (DPP, 2001)	Yes – NT, QLD (Fletcher, 2000)	No – inflorescence, leaf, shoot, twig (Srivastava, 1997); stem (Butani, 1993) Affects fruit setting (CAB International, 2003).	No
Idioscopus scutellatus (Distant, 1908) [Syn. = *Idiocerus scutellatus* Distant]	Leafhopper	Hemiptera: Cicadellidae	Yes – (Srivastava, 1997)	No – (Fletcher, 2000)	No – inflorescence, leaf, shoot (Srivastava, 1997)	No
Idioscopus shillongensis Viraktamath, 1976	Leafhopper	Hemiptera: Cicadellidae	Yes – (Viraktamath, 1976)	No – (Fletcher, 2000)	No	No
Idioscopus spectabilis Viraktamath, 1976	Leafhopper	Hemiptera: Cicadellidae	Yes – (Rajak, 1986)	No – (Fletcher, 2000)	No – leaf (USDA, 2001)	No
Indarbela dea (Swinhoe) [Syn. = *Arbela dea* Swinhoe; *Lepidarbela dea* (Swinhoe)]	Bark borer; bark eating caterpillar; litchi stem borer	Lepidoptera: Metarbelidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – bark, branch, stem (CAB International, 2003); twig (DPP, 2000)	No
Indarbela quadrinotata (Walker, 1856) [Syn. = *Arbela quadrinotata* Walker; *Cossus abruptus* Walker; *Lepidarbela quadrinotata* Walker; *Squamura quadrinotata* Walker]	Bark brown borer; bark borer; bark caterpillar; bark eating caterpillar; bark miner; orange stem borer; poplar borer	Lepidoptera: Metarbelidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – bark, branch, trunk (Srivastava, 1997); stem (Butani, 1993)	No
Indarbela tetraonis (Moore)	Orange shoot borer	Lepidoptera:	Yes – (DPP, 2001)	No – (Nielsen *et al*.,	No – bark (Srivastava,	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Arbela tetraonis* Moore]		Metarbelidae		1996)	1997); stem (Butani, 1993)	
Indarbela theivora (Hampson)	Bark eating caterpillar	Lepidoptera: Metarbelidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – bark (Srivastava, 1997); stem (Butani, 1993)	No
Ischnaspis longirostris (Signoret, 1882) [Syn. = *Mytilaspis longirostris* Signoret; *Ischnaspis filiformis* Douglas; *Mytilaspis Ritzemae Bosi* Leonardi; *Lepidosaphes ritsemabosi* (Leonardi)]	Black thread scale; black-thread scale; black line scale	Hemiptera: Diaspididae	Yes – (DPP, 2001)	Yes – SA (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Kerria lacca (Kerr, 1782) [Syn. = *Coccus gummilaccae* Goeze (nomen nudum); *Coccus lacca* Kerr; *Coccus ficus* Fabricius; *Chermes lacca* (Kerr); *Carteria lacca* (Kerr); *Tachardia lacca* (Kerr); *Lakshadia indica* Mahdihassan; *Laccifer lacca* (Kerr)]	Lac insect	Hemiptera: Kerriidae	Yes – (Srivastava, 1997)	No – (Ben-Dov *et al*., 2001)	No – leaf, stem, twig (Butani & Lele, 1976)	No
Ketumala sp.	Mango hopper	Hemiptera: Flatidae	Yes – (Davli *et al*., 1992)	No – (Fletcher, 2003)	No	No
Kilifia acuminata (Signoret, 1873) [Syn. = *Lecanium acuminatum* Signoret; *Coccus acuminatum* (Signoret); *Coccus acuminatus* (Signoret); *Calymmata acuminatum* (Signoret); *Protopulvinaria acuminata* (Signoret); *Lecanium* (*Coccus*) *acuminatum* (Signoret); *Platycoccus acuminatus* (Signoret); *Habibius acuminatus* (Signoret)]	Acuminate scale; mango shield scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	No – (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997); stem (USDA, 2001)	No
Labioproctus polei (Green)	Mealybug	Hemiptera: Margarodidae	Yes – (DPP, 2001)	No	No	No
Laelia sp.	Moth	Lepidoptera: Lymantriidae	Yes – (Bhole *et al*., 1987)	? – Genus is present in Australia (Nielsen *et al*., 1996)	No	No
Lamida carbonifera Meyrick	Mango leaf webber	Lepidoptera: Pyralidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No
Lamida moncusalis Walker, 1859	Cashew leaf webber	Lepidoptera: Pyralidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Macalla moncusalis* (Walker)]						
Lamida sordidalis Hampson [Syn. = *Spectrotrota sordidalis* Hampson]	Leaf webber	Lepidoptera: Pyralidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al*., 1996)	No – leaf, shoot (Srivastava, 1997)	No
Lasioptera mangiflorae (Grover, 1968) [Syn. = *Meunieriella mangiflorae* Grover]	Blossom midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Lepidosaphes beckii (Newman, 1869) [Syn. = *Coccus beckii* Newman; *Aspidiotus citricola* Packard; *Coccus anguinis* Boisduval; *Mytilaspis flavescens* Targioni Tozzetti; *Mytilaspis citricola* (Packard); *Mytilaspis citricola tasmaniae* Maskell; *Mytilaspis tasmaniae* (Maskell); *Mytilaspis beckii* (Newman); *Mytilaspis* (*Lepidosaphes*) *beckii* (Newman); *Lepidosaphes citricola* (Packard); *Lepidosaphes* (*Mytilaspis*) *beckii* (Newman); *Mytilaspis anguineus* (Boisduval); *Mytilococcus piniformis*; *Mytilococcus beckii* (Newman); *Cornuaspis beckii* (Newman); *Parlatoria beckii* (Newman)]	Mussel scale; purple scale; citrus mussel scale; common mussel scale; comma scale; orange scale	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, QLD, SA, TAS, VIC (Ben-Dov *et al*., 2001); NT (CAB International, 2003)	Yes – branch, fruit, leaf, stem, whole plant (CAB International, 2003)	**Yes (for WA only)**
Lepidosaphes gloverii (Packard, 1869) [Syn. = *Aspidiotus gloverii* Packard; *Mytilaspis gloverii* (Packard); *Mytilaspis* (*Aspidiotus*) *gloverii* (Packard); *Mytiella sexspina* Hoke; *Coccus gloverii* (Packard); *Mytilococcus gloverii* (Packard); *Opuntiaspis sexspina* (Packard); *Insulaspis gloverii* (Packard); *Cornuaspis gloverii* (Packard)]	Glover's scale; citrus long scale; Glover scale; Glover's mussel scale; long mussel scale; long scale; mussel-shell scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – NSW, QLD, VIC (Ben-Dov *et al*., 2001)	Yes – fruit, leaf, stem (CAB International, 2003)	**Yes (for WA only)**
Lepidosaphes mcgregori Banks, 1906 [Syn. = *Insulaspis mcgregori* (Banks)]	McGregor scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Lepidosaphes pallidula (Williams, 1969) [Syn. = *Mytilaspis pallida* Green; *Mytilaspis gloverii pallida* (Green); *Lepidosaphes pallida* (Green); *Lepidosaphes pallidus* (Green); *Lepidosaphes gloverii pallida* (Green); *Mytilaspis* (*Lepidosaphes*) *pallida* (Green); *Mytilococcus pallidus* (Green); *Insulaspis pallida* (Green); *Insulaspis pallidula* Williams]	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	Yes – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Lepidosaphes shikohabadensis Dutta, 1990	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Lepidosaphes tapleyi Williams, 1960 [Syn. = *Insulaspis tapleyi* (Williams)]	Guava long scale; oyster scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf, stem (USDA, 2001)	No
Lepropus lateralis (Fabricius, 1792) [Syn. = *Astycus lateralis* Fabricius]	Weevil	Coleoptera: Curculionidae	Yes – (Zaman & Maiti, 1994)	No – (CAB International, 2003)	No – leaf, stem (Zaman & Maiti, 1994)	No
Leptocentrus obliquis Walker	Tree hopper	Hemiptera: Membracidae	Yes – (DPP, 2001)	No	No – leaf, stem (Butani, 1993	No
Leptocorisa acuta (Thunberg, 1783) [Syn. = *Cimex acutus* Thunberg; *Cimex angustata* Fabricius; *Leptocorisa varicornis* (Fabricius); *Leptocorisa flavida* Guer.; *Gerris varicornis* Fabricius]	Paddy bug; Asian rice bug; rice bug; rice earhead bug; rice Gandhi bug; rice seed bug; slender rice bug	Heteroptera: Alydidae	Yes – (CAB International, 2003)	Yes – QLD, NT (AICN, 2004)	No – leaf, seed (USDA, 2001)	No
Leuronota minuta (Crawford)	Psyllid	Hemiptera: Psyllidae	Yes – (Butani, 1993)	No	No	No
Lindingaspis floridana Ferris	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No	No – leaf (Peña & Mohyuddin, 1997)	No
Lindingaspis greeni	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No	No	No
Lindingaspis rossi (Maskell, 1891)	Circular black scale; grey scale; Ross's	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – ACT, NSW, QLD, SA, TAS,	Yes – fruit, leaf (Charles & Henderson, 2002)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Aspidiotus rossi* Maskell; *Chrysomphalus rossi* (Maskell); Aspidiotus (*Chrysomphalus*) *rossi* (Maskell)]	black scale; rose scale			VIC, WA (AICN, 2004)		
Luperomorpha weisi Jacoby	Flea beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No	No
Lyctoxylon convixtor Lesne	False powderpost beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Lyctus africanus Lesne, 1907	African powder-post beetle	Coleoptera: Lyctidae	Yes – (DPP, 2001)	No – (CAB International, 2000)	No – stem (Butani, 1993)	No
Lyctus malayanus Lesne	Powder-post beetle	Coleoptera: Lyctidae	Yes – (USDA, 2001)	No	No – stem (Butani, 1993)	
Lymantria ampla (Walker, 1855) [Syn. = *Enome ampla* Walker]	Leaf eating caterpillar	Lepidoptera: Lymantriidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Lymantria beatrix Stoll [Syn. = *Porthesia beatrix* (Stoll)]	Tussock moth	Lepidoptera: Lymantriidae	Yes – (Singh & Kumar, 1991)	No – (Nielsen *et al.*, 1996)	No – leaf (Singh & Kumar, 1991)	No
Lymantria marginata Walker	Mango defoliator	Lepidoptera: Lymantriidae	Yes – (Singh, 1989)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Lymantria mathura Moore, 1865	Rosy (pink) gypsy moth; rosy Russian gypsy moth	Lepidoptera: Lymantriidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – inflorescence, stem (DPP, 2001); leaf (Srivastava, 1997)	No
Maacoccus bicruciatus (Green, 1904) [Syn. = *Lecanium bicruciatus* Green; *Coccus bicruciatus* (Green); *Coccus bicurciatus* (Green); *Sharanococcus bicruciatus* (Green)]	Soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al.*, 2001)	No – leaf (USDA, 2001)	No
Maacoccus piperis namunakuli (Green, 1922) [Syn. = *Lecanium piperis namunakuli* Green; *Coccus namunakuli* (Green); *Coccus piperis namunakuli* (Green); *Coccus piperis* (Green); *Lecanium piperis* (Green)]	Soft scale	Hemiptera: Coccidae	Yes – (DPP, 2001)	No – (Ben-Dov *et al.*, 2001)	No – leaf (DPP, 2001)	No
Maconellicoccus hirsutus (Green, 1908) [Syn. = *Phenacoccus hirsutus* Green;	Pink hibiscus mealybug; hirsutus mealybug; pink	Hemiptera: Pseudococcidae	Yes – (Ben-Dov *et al.*, 2001)	Yes – NT, QLD, SA, WA (CAB International, 2003)	Yes – branch, fruit, inflorescence, leaf, shoot, stem, trunk, twig (CAB	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
Pseudococcus hibisci Hall (nomen nudum); *Phenacoccus quarternus* Ramakrishna Ayyar (nomen nudum); *Phenacoccus glomeratus* Green; *Spilococcus perforatus* De Lotto; *Paracoccus pasaniae* Borchsenius; *Maconellicoccus perforatus* (De Lotto); *Phenacoccus quarternus* (nomen nudum); *Maconellicoccus pasaniae* (Borchsenius)]	mealybug				International, 2003)	
Macrosiphum euphorbiae (Thomas, 1878) [Syn. = *Siphonophora euphorbiae* Thomas; *Siphonophora asclepiadifolii* Thomas; *Siphonophora euphorbicola* Thomas; *Siphonophora cucurbitae* Middleton ex Thomas; *Siphonophora tulipae* Monell; *Siphonophora citrifolii* Ashmead; *Siphonophora solanifolii* Ashmead; *Nectarophora asclepiadis* Cowen; *Nectarophora tabaci* Pergande; *Nectarophora heleniella* Cockerell; *Nectarophora lycopersici* Clarke; *Macrosiphum cyparissiae* var. *cucurbitae* del Guercio; *Macrosiphum euphorbiellum* Theobald; *Macrosiphum koehleri* Börner; *Macrosiphum solanifolii* (Ashmead); *Illinoia solanifolii* (Ashmead); *Macrosiphum amygdaloides*; *Macrosiphum tabaci* (Pergande); *Macrosiphum solani* (Kittel)]	Potato aphid; pink and green potato aphid; tomato aphid	Hemiptera: Aphididae	Yes – (DPP, 2001)	Yes – ACT, NSW, QLD, SA, TAS, VIC, WA (AICN, 2004)	No – inflorescence, leaf, stem (Butani, 1993)	No
Macrotoma crenata Fabricius	Stem borer	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	No	No – branch, trunk (Peña & Mohyuddin, 1997); stem (Srivastava, 1997)	No
Mangaspis bangalorensis Takagi & Kondo, 1997	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Takagi *et al*., 1997)	No	No – bud, leaf, twig (Takagi *et al*., 1997)	No
Maruca vitrata (Fabricius, 1787) [Syn. = *Phalaena vitrata* Fabricius;	bean pod borer; flower feeding caterpillar; legume	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	Yes – ACT, NSW, NT, QLD, SA, TAS, VIC, WA (AICN,	No – inflorescence (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Crochiphora testulalis (Geyer); *Hydrocampe aquitilis* (Guérin-Méneville); *Botys bifenestralis* (Mabille); *Maruca testulalis* (Geyer)]	pod borer; lima bean pod borer; mung moth			2004)		
Megalurothrips distalis (Karny, 1913) [Syn. = *Taeniothrips distalis* Karny; *Taeniothrips ditissimus* Anantha. & Jagd.; *Physothrips brunneicarnis* Bagnall; *Taeniothrips brunneicornis* Hood; *Taeniothrips morosus* Priesner; *Megalurothrips morosus* Bhatti; *Taeniothrips infernalis* Priesner; *Taeniothrips nigricornis* Priesner]	Blossom thrips	Thysanoptera: Thripidae	Yes – (Ramasubbarao & Thammiraju, 1994)	No – (Mound, 1996)	No – fruit drop, inflorescence, leaf (CAB International, 2003)	No
Melanitis leda ismene (Cramer, 1775) [Syn. = *Papilio ismene* Cramer; *Melanitis determinata* Butler]	Rice butterfly; rice green-horned caterpillar	Lepidoptera: Nymphalidae	Yes – (CAB International, 2003)	Yes – (CAB International, 2003)	No – leaf (CAB International, 2003)	No
Metaculus mangiferae (Attiah) [Syn. = *Vasates mangiferae* Attiah]	Mango rust mite	Acarina: Eriophyidae	Yes – (Jeppson *et al*., 1975)	No – (Halliday, 1998)	No – bud, inflorescence, leaf (Abou-Awad, 1981; Jeppson *et al*., 1975)	No
Micrapate simplicipennis Lesne	False powderpost beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Microcerotermes beesoni Snyder [Syn. = *Microcerotermes championi* Snyder; *Microcerotermes lanceolatus* Mathur & Thapa]	Termite	Isoptera: Termitidae	Yes – (Pradeep *et al*., 1998)	No – (Watson & Abbey, 1993)	No – wood (Pradeep *et al*., 1998)	No
Microtermes edentatus (Wasmann)	Termite	Isoptera: Termitidae	Yes – (DPP, 2001)	No – (Watson & Abbey, 1993)	No – branch, trunk (Peña & Mohyuddin, 1997); root, stem (Butani, 1993)	No
Microtermes obesi Holmgren [Syn. = *Odontotermes obesus* Rambur; *Microtermes anandi* Holmgren; *Microtermes anandi* f. *curvignathus* Holmgren; *Microcerotermes obesi* Holmgren; *Neotermes obesi*; *Cyclotermes obesus*; *Odontotermes assamensis*; *Odontotermes flavomaculatus*;	Termite	Isoptera: Termitidae	Yes – (DPP, 2001)	No – (Watson & Abbey, 1993)	No – branch, trunk (Peña & Mohyuddin, 1997); root, stem (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Odontotermes vaishno; *Termes obesi*; *Termes obesus* Rambur]						
Milviscutulus mangiferae (Green, 1889) [Syn. = *Lecanium mangiferae* Green; *Coccus mangiferae* (Green); *Lecanium psidii* Green; *Saissetia psidii* (Green); *Lecanium wardi* Newstead; *Coccus wardi* (Newstead); *Lecanium desolatum* Green; *Lecanium ixorae* Green; *Protopulvinaria mangiferae* (Green); *Coccus ixorae* (Green); *Coccus kuraruensis* Takahashi; *Protopulvinaria ixorae* (Green); *Coccus desolatum* (Green); *Kilifia mangiferae* (Green); *Udinia psidii* (Green)]	Mango shield scale; mango soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	Yes – branch, fruit, leaf, trunk (Peña & Mohyuddin, 1997)	**Yes**
Minthea rugicollis (Walker, 1858) [Syn. = *Ditoma rugicollis* Walker; *Lyctopholis rugicollis* (Walker)]	Hairy powderpost beetle	Coleoptera: Lyctidae	Yes – (DPP, 2001)	Yes – QLD, SA (AICN, 2004)	No – stem (Srivastava, 1997)	No
Monolepta signata Olivier, 1808	Leaf beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Monopis leuconeurella (Ragonot) [Syn. = *Hyalospila leuconeurella* Ragonot; *Phycita leuconeurella* Ragonot]	Fruit borer	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	Yes – fruit (Ponnuswami, 1971)	**Yes**
Morganella longispina (Morgan, 1889) [Syn. = *Aspidiotus longispina* Morgan; *Aspidiotus* (*Morganella*) *maskelli* Cockerell; *Morganella maskelli* (Cockerell); *Hemiberlesia longispina* (Morgan); *Hemiberlesia maskelli* (Cockerell)]	Maskell scale; plumose scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	No – (CAB International, 2003)	No – branch, bud, leaf, trunk (Peña & Mohyuddin, 1997)	No
Mycetaspis personata (Comstock) [Syn. = *Aspidiotus personatus* Comstock; *Aonidiella personata* (Comstock); *Chrysomphalus personatus* (Comstock); *Mycetaspis personatus* (Comstock)]	Masked scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	No – (CAB International, 2003)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Myllocerus dentifer Fabricius, 1792	Weevil	Coleoptera	Yes – (Kishun &	No	No – mechanical	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
			Chand, 1989)		transmission of *Xanthomonas campestris* pv. *mangiferaeindicae* (Kishun & Chand, 1989)	
Myllocerus discolor Boheman [Syn. = *Myllocerus discolor* var. *variegatus* Boheman]	Grey weevil	Coleoptera: Curculionidae	Yes – (Srivastava, 1997)	No	No – inflorescence, leaf, shoot (Srivastava, 1997)	No
Myllocerus laetivirens Marshall	Plum ash weevil	Coleoptera: Curculionidae	Yes – (Srivastava, 1997)	No	No – leaf, root (Srivastava, 1997)	No
Myllocerus sabulosus Marshall, 1916	Mango leaf weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Myllocerus undecimpustulatus Faust [Syn. = *Myllocerus undecimpustulatus maculosus* Desbrochers des Loges; *Myllocerus maculosus* Desbrochers]	Cotton grey weevil; grey weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Neocalacarus mangiferae ChannaBasavanna	Mite	Acarina: Eriophyidae	Yes – (USDA, 2001)	Yes – (Knihinicki & Boczek, 2002)	No – leaf, stem (Jeppson *et al*., 1975)	No
Neoheegeria mangiferae (Priesner)	Thrips	Thysanoptera: Phlaeothripidae	Yes – (Srivastava, 1997)	No – (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No
Neoplatylecanium adersi (Newstead, 1917) [Syn. = *Lecanium adersi* Newstead; *Coccus adersi* (Newstead); *Varshneococcus adersi* (Newstead); *Lepidosaphes adersi* (Newstead)]	Soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Neotermes mangiferae Roonwal & Sen-Sarma, 1960	Termite	Isoptera: Kalotermitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Neotermes megaoculatus Roonwal & Sen-Sarma, 1960 [Syn. = *Neotermes megaoculatus lakhimpuri* Roonwal & Sen-Sarma; *Neotermes megaoculatus magnoculus* Roonwal & Sen-Sarma]	Termite	Isoptera: Kalotermitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Nezara viridula (Linnaeus, 1758) [Syn. = *Cimex viridulus* Linnaeus; *Cimex*	Green vegetable bug; green shield bug; green stink bug;	Hemiptera: Pentatomidae	Yes – (DPP, 2001)	Yes – ACT, NSW, NT, QLD, SA, TAS, VIC, WA (AICN,	No – inflorescence, leaf, stem, young and overripe fruit (CAB International,	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
torquatus Fabricius; *Cimex smaragdulus* Fabricius; *Rhaphigaster viridulus* (Fabricius); *Nezara viridula* var. *smaragdula* (Fabricius); *Nezara viridula* var. *torquata* (Fabricius)]	southern green stink bug; tomato and bean bug			2004)	2003)	
Nipaecoccus nipae (Maskell, 1893) [Syn. = *Dactylopius nipae* Maskell; *Dactylopius pseudonipae* Cockerell; *Ripersia serrata* Tinsley; *Pseudococcus nipae* (Maskell); *Dactylopius dubia* Maxwell-Lefroy (nomen nudum); *Pseudococcus pseudonipae* (Cockerell); *Ceroputo nipae* (Maskell); *Pseudococcus magnoliae* Hambleton; *Ripersia nipae* (Maskell); *Nipaecoccus pseudonipae* (Cockerell); *Trechocorys nipae* (Maskell)]	Coconut mealybug; avocado mealybug; kentia mealybug; nipa mealybug; spiked mealybug; sugarapple mealybug	Hemiptera: Pseudococcidae	Yes – (CIE, 1966c)	No – (CAB International, 2003)	Yes – fruit, leaf, stem (CAB International, 2003)	**Yes**
Nipaecoccus viridis (Newstead, 1894) [Syn. = *Dactylopius viridis* Newstead; *Dactylopius vastator* Maskell; *Pseudococcus vastator* (Maskell); *Pseudococcus viridis* (Newstead); *Dactylopius perniciosus* Newstead & Willcocks; *Pseudococcus solitarius* Brain; *Ripersia theae* Rutherford; *Pseudococcus perniciosus* Newstead; *Pseudococcus filamentosus corymbatus* Green; *Trionymus sericeus* James; *Pseudococcus theae* (Rutherford); *Nipaecoccus vastator* (Maskell)]	Spherical mealybug; coffee mealybug; cotton mealybug; globular mealybug; karoo thorn mealybug; Lebbeck mealybug	Hemiptera: Pseudococcidae	Yes – (Srivastava, 1997)	Yes – QLD, NT (Williams, 1985)	No – leaf, stem, twig (CAB International, 2003)	No
Nodostoma dimidiatipes Jacoby	Beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	No	No	No
Odontotermes assmuthi Holmgren [Syn. = *Termes assmuthi*]	Termite	Isoptera: Termitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Odontotermes feae (Wasmann) [Syn. = *Termes feae* Wasmann; *feae* (Wasmann); *Odontotermes indicus*	Termite	Isoptera: Termitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Thakur]						
Odontotermes horni (Wasmann) [Syn. = *Termes horni* Wasmann; *Termes paradeniyae* Holmgren; *Odontotermes horni* var. *hutsoni* Kemner; *Odontotermes horni* var. *minor* Kemner]	Termite	Isoptera: Termitidae	Yes – (Thakur, 1981)	No – (Watson & Abbey, 1993)	No – root, stem (USDA, 2001)	No
Odontotermes obesus (Rambur) [Syn. = *Cyclotermes obesus* Rambur; *Odontotermes assamensis* Holmgren; *Odontotermes flavomaculatus* Holmgren; *Termes* (*Cyclotermes*) *orissae* (Snyder); *Odontotermes obesus* var. *oculatus* Silvestri; *Odontotermes vaishno* Bose]	Termite	Isoptera: Termitidae	Yes – (DPP, 2000; Thakur, 1981)	No – (Watson & Abbey, 1993)	No – branch, root, stem, trunk (Srivastava, 1997)	No
Odontotermes wallonensis (Wasmann) [Syn. = *Odontotermes brunneus kushwahai* Roonwal & Bose]	Termite	Isoptera: Termitidae	Yes – (Veeresh *et al*., 1989)	No – (Watson & Abbey, 1993)	No – branch, root, stem (Srivastava, 1997); trunk (Tandon & Srivastava, 1982)	No
Oecophylla longinoda (Latreille, 1802) [Syn. = *Formica longinoda* Latreille; *Oecophylla brevinodis* André; *Oecophylla longinoda* (Latreille)]	Maji moto ant; weaver ant	Hymenoptera: Formicidae	Yes – (Butani, 1993)	No – (Shattuck & Barnett, 2001)	No – builds nest in foliage (Srivastava, 1997)	No
Oecophylla smaragdina (Fabricius, 1775) [Syn. = *Formica smaragdina* Fabricius; *Formica virescens* Fabricius; *Formica viridis* Kirby; *Oecophylla subnitida*]	Green ant; red tree ant; tailor ant; weaver ant; yellow citrus ant	Hymenoptera: Formicidae	Yes – (DPP, 2000)	Yes – NT, QLD, WA (Shattuck & Barnett, 2001)	No – builds nest in foliage (Srivastava, 1997)	No
Olene mendosa Hübner, 1823 [Syn. = *Antipha basalis* (Walker); *Rilia lanceolata* (Walker); *Nioda fusiformis* (Walker); *Dasychira sawanta* (Moore); *Dasychira basigera* (Walker); *Rilia distinguenda* (Walker); *Dasychira basalis* (Walker); *Rilia basivitta* (Walker); *Turriga invasa* (Walker); *Orgyia mendosa* (Hübner); *Dasychira mendosa* (Hübner); *Dasychira mendosa basivitta* (Hübner)]	Tussock caterpillar	Lepidoptera: Lymantriidae	Yes – (Zaman & Maiti, 1994)	Yes – (Nielsen *et al*., 1996)	No – leaf (Zaman & Maiti, 1994)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Olenecamptus bilobus (Fabricius, 1801)	Round-head borer	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	Yes – (Storey, 1998-2002)	No – branch, leaf, shoot, stem (Srivastava, 1997)	No
Oliarus sp.	Mango hopper	Hemiptera: Cixiidae	Yes – (Dalvi *et al*., 1992)	No – (Fletcher, 2003)	No	No
Oligonychus coffeae (Nietner, 1861) [Syn. = *Acarus coffeae* Nietner; *Tetranychus bioculatus* Wood-Mason; *Metatetranychus bioculatus* (Wood-Mason); *Oligonychus bioculatus* (Wood-Mason); *Oligonychus merwei* Tucker; *Paratetranychus bioculatus* (Wood-Mason); *Paratetranychus terminalis* Sayed]	Tea red spider mite; red coffee mite; red tea mite	Acarina: Tetranychidae	Yes – (USDA, 2001)	Yes – NSW, QLD (Rand & Schicha, 1981); TAS (Gutierrez & Schicha, 1985)	No – leaf (Jeppson *et al*., 1975)	No
Oligonychus mangiferus (Rahman & Sapra, 1940) [Syn. = *Paratetranychus mangiferus* Rahman & Sapra; *Paratetranychus insularis* McGregor; *Paratetranychus terminalis* Sayed; *Oligonychus terminalis* (Sayed)]	Mango red spider mite	Acarina: Tetranychidae	Yes – (Zaman & Maiti, 1994)	Yes – (Halliday, 1998)	No – leaf, stem (Zaman & Maiti, 1994)	No
Oligotrophus mangiferae Kieffer, 1909	Mango stem gall midge	Diptera: Cecidomyiidae	Yes – (Butani, 1993)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Oncideres repandator	Beetle	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Oraesia emarginata (Fabricius, 1794) [Syn. = *Noctua emarginata* Fabricius; *Oraesia metallescens* Guenée; *Oraesia alliciens* Walker; *Oraesia tentans* Walker; *Calpe emarginata* (Fabricius); *Calyptra emarginata* (Fabricius)]	Fruit piercing moth; fruit sucking moth	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – (Nielsen *et al*., 1996)	No – fruit piercing (DPP, 2001)	No
Orgyia postica (Walker, 1885) [Syn. = *Lacida postica* (Walker); *Notolophus australis posticus* (Walker); *Notolophus postica* (Walker); *Notolophus posticus* (Walker); *Orgyia australis*	Cocoa tussock moth; Oriental tussock moth; small tussock moth	Lepidoptera: Lymantriidae	Yes – (DPP, 2001; Fasih *et al*., 1989)	No – (Nielsen *et al*., 1996)	Yes – fruit, leaf, panicle, shoot (Fasih *et al*., 1989); stalk (Gupta & Singh, 1986)	**Yes**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
postica (Walker); *Orgyia ceylanica* Nietner; *Orgyia ocularis* Moore; *Orgyia posticus* (Walker)						
Orseolia sp. [Syn. = *Dyodiplosis* sp.]	Leaf gall midge	Diptera: Cecidomyiidae	Yes – (Anon., 1967)	No – (Evenhuis, 1996)	No	No
Orthaga euadrusalis Walker [Syn. = *Orthaga acontialis* (Walker)]	Tent caterpillar; mango leaf webber	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf, shoot (Tandon & Srivastava, 1982)	No
Orthaga exvinacea (Hampson, 1891) [Syn. = *Balanotis exvinacea* Hampson]	Mango leaf webber; shoot webbing caterpillar	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	Yes – (Nielsen *et al.*, 1996)	No – inflorescence (CAB International, 2003); leaf, shoot (DPP, 2000)	No
Orthaga mangiferae Mishra	Leaf webber	Lepidoptera: Pyralidae	Yes – (Gupta & Rai, 1982)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Oryzaephilus mercator (Fauvel,. 1889) [Syn. = *Silvanus mercator* Fauvel; *Silvanus gossypii*]	Merchant grain beetle	Coleoptera: Silvanidae	Yes – (CAB International, 2003)	Yes – ACT, NSW, NT, QLD, SA, VIC, WA (AICN, 2004)	No – seed/stored product pest (CAB International, 2003)	No
Otinotus oneratus (Walker) [Syn. = *Otinotus lignicola*]	Cow bug; tree hopper	Hemiptera: Membracidae	Yes – (DPP, 2001)	No	No – leaf, stem (DPP, 2001)	No
Oxyrhachis serratus Ahmad & Abrar	Bug	Hemiptera: Membracidae	Yes – (USDA, 2001)	No	No – leaf, stem (USDA, 2001)	No
Oxyrhachis tarandus (Fabricius)	Tree hopper	Hemiptera: Membracidae	Yes – (DPP, 2001)	No	No – leaf, stem (Butani, 1993)	No
Pagria sp.	Leaf beetle	Coleoptera: Chrysomelidae	Yes – (USDA, 2001)	? – Genus is present in Australia (AICN, 2004)	No	No
Panonychus ulmi Koch [Syn. =*Metatetranychus mali; Metatetranychus pilosus* (Canestrini & Fanzago); *Oligonychus ulmi; Paratetranychus pilosus occidentalis*; *Paratetranychus ulmi; Tetranychus pilosus; Tetranychus ulmi; Paratetranychus pilosus* (Canestrini & Fanzago); *Metatetranychus ulmi* Koch]	European red spider mite	Acarina: Tetranychidae	Yes – (CAB International, 2003)	Yes – NSW, QLD, SA, TAS, VIC (CAB International, 2003)	No – leaf (CAB International, 2003)	No
Pantachaetothrips sp.	Thrips	Thysanoptera:	Yes – (Patel *et al.*,	No – (Mound,	No – leaf (Patel *et al.*, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
		Thripidae	1997)	1996)		
Parabostrychus elongata Lesne	Stem borer	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Paralecanium expansum (Green, 1896) [Syn. = *Lecanium expansum* Green; *Lecanium* (*Paralecanium*) *expansum* (Green)]	Flat scale	Hemiptera: Coccidae	Yes – (DPP, 2001)	Yes – QLD (Ben-Dov *et al*., 2001)	Yes – fruit (DPP, 2001)	**Yes (for WA only)**
Parasa lepida (Cramer, 1799) [Syn. = *Noctua lepida* Cramer; *Limacodes graciosa* Westwood; *Neaera media* Walker; *Nyssia latitascia* Walker; *Parasa lepida lepidula* Hering; *Latoia lepida* (Cramer); *Limacodes graciosa* Westwood; *Neaera media* Walker]	Nettle caterpillar; blue striped nettle grub; castor slug caterpillar; green striped nettle grub; slug caterpillar	Lepidoptera: Limacodidae	Yes – (Srivastava, 1997)	No – (Nielsen *et al*., 1996)	No – leaf (CAB International, 2003)	No
Parasaissetia nigra (Nietner, 1861) [Syn. = *Lecanium nigrum* Nietner; *Lecanium depressum* Targioni Tozzetti; *Lecanium depressum simulans* Douglas; *Lecanium begoniae* Douglas; *Lecanium caudatum* Green; *Lecanium nigrum begonia* (Douglas); *Lecanium nigrum depressum* (Douglas); *Lecanium* (*Saissetia*) *nigrum begoniae* (Douglas); *Saissetia nigra* (Nietner); *Coccus nigrum* (Nietner); *Saissetia nigra* (Nietner); *Saissetia depressa* (Targioni Tozzetti); *Lecanium* (*Saissetia*) *pseudonigrum* Kuwana; *Lecanium* (*Saissetia*) *sideroxylium* Kuwana; *Saissetia pseudonigrum* (Kuwana); *Saissetia sideroxylium* (Kuwana); *Saissetia cuneiformis* Leonardi; *Lecanium* (*Saissetia*) *signatum* Newstead; *Coccus signatus* (Newstead); *Lecanium* (*Saissetia*) *nigrum nitidum* Newstead; *Saissetia perseae* Brain; *Saissetia* (*Lecanium*) *nigra* (Nietner); *Saissetia*	Nigra scale; black coffee scale; hibiscus shield scale; pomegranate scale	Hemiptera: Coccidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, VIC, WA (CABI/EPPO, 1997b)	No – leaf, stem (CAB International, 2003)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
nigrum depressum (Cockerell); *Lecanium* (*Saissetia*) *crassum* Green; *Saissetia nigra depressa* (Targioni Tozzetti); *Saissetia nigra depressa* (Douglas); *Lecanium nigrum depressum* (Targioni Tozzetti); *Parasaissetia nigra* (Nietner); *Saissetia crassum* (Green)]						
Paratachardina theae Green, 1907 [Syn. = *Tachardia decorella theae* Green; *Tachardina theae* (Green & Mann); *Laccifer theae* (Green); *Tachardina theae* (Green & Mann)]	Scale insect	Hemiptera: Kerriidae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Parlatoria camelliae Comstock, 1883 [Syn. = *Parlatoria pergandii camelliae* Comstock; *Parlatoria proteus virescens* Maskell; *Parlatoria* (*Euparlatoria*) *Pergandii camelliae* (Comstock)]	Camellia parlatoria scale	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Parlatoria cinerea Hadden, 1909 [Syn. = *Syngenaspis cinerea* (Hadden); *Parlatoria pseudopyri* Kuwana; *Parlatoria fluggeae brasiliensis* Costa Lima; *Parlatoria brasiliensis* (Costa Lima)]	Apple parlatoria; tropical grey chaff scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Parlatoria crypta McKenzie, 1943 [Syn. = *Parlatoria crypta* McKenzie; *Parlatoria morrisoni* McKenzie; *Parlatoria* sp. (?*morrisoni*)]	Mango white scale	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Parlatoria oleae (Colvée, 1880) [Syn. = *Diaspis oleae* Colvée; *Parlatoria calianthina* Berlese & Leonardi; *Parlatoria affinis* Newstead; *Parlatoria* (*Euparlatoria*) *calianthina* (Berlese & Leonardi); *Diaspis squamosus* Newstead & Theobald; *Parlatoria cilianthina* (Berlese & Leonardi); *Parlatoria judaica* Bodenheimer; *Parlatoria iudaica*	Olive scale; olive parlatoria scale; plum scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – QLD (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Lindinger; *Syngenaspis* (*Parlatorea*) *oleae* (Colvée); *Parlatoria morrisoni* Bodenheimer]						
Parlatoria pergandii Comstock, 1881 [Syn. = *Parlatoria sinensis* Maskell; *Parlatoria proteus pergandei* (Comstock); *Parlatoria pergandei* (Comstock); *Parlatoria pergande* (Comstock); *Parlatoria* (*Euparlatoria*) *pergandii* (Comstock); *Parlatorea pergandei* (Comstock); *Syngenaspis pergandei* (Comstock); *Parlatoria pergandi* (Comstock); *Parlatoreopsis pergandii* (Comstock)]	Chaff scale; black parlatoria scale; chaffy scale; Pergande's scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – (CAB International, 2003)	No – leaf (Peña & Mohyuddin, 1997)	No
Parlatoria pseudaspidiotus Lindinger, 1905 [Syn. = *Parlatoria mangiferae* Marlatt; *Leucaspis mangiferae* (Marlatt); *Genaparlatoria mangiferae* (Marlatt); *Genaparlatoria pseudaspidiotus* (Lindinger); *Aonidia pseudaspidiotus* (Lindinger); *Parlatoria* (*Genaparlatoria*) *pseudaspidiotus* (Lindinger); *Pinnaspis pseudaspidiotus* (Lindinger)]	Vanda orchid scale; vanda scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Parthenolecanium persicae (Fabricius, 1776) [Syn. = *Coccus persicorum* Sulzer; *Chermes persicae* Fabricius; *Coccus costatus* Schrank; *Coccus clematidis* Gmelin; *Coccus berberidis* Schrank; *Coccus persicae* (Fabricius); *Lecanium persicae* (Fabricius); *Lecanium berberidis* (Schrank); *Lecanium cymbiformis* Targioni Tozzetti; *Lecanium persicochilense* Targioni Tozzetti; *Lecanium elongatum* Signoret; *Lecanium genistae* Signoret; *Lecanium mori*	European peach scale; greater vine scale; peach scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, QLD, VIC (Ben-Dov *et al*., 2001)	No	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Signoret; *Lecanium sarothamni* Douglas; *Lecanium* (*Eulecanium*) *mori* (Signoret); *Lecanium magnoliarum* Cockerell; *Lecanium berberidis major* Maskell; *Lecanium magnoliarum* Cockerell; *Lecanium* (*Eulecanium*) *magnoliarum* (Cockerell); *Lecanium* (*Eulecanium*) *berberidis* (Maskell); *Coccus mori* (Signoret); *Eulecanium magnoliarum hortensiae* Cockerell; *Lecanium* (*Eulecanium*) *persicae* (Fabricius); *Coccus elongatus* (Signoret); *Coccus genistae* (Signoret); *Eulecanium berberidis major* (Maskell); *Eulecanium cecconi* Leonardi; *Lecanium cecconi* (Leonardi); *Lecanium persicae* (Geoffroy); *Lecanium* (*Parthenolecanium*) *persicae* (Fabricius); *Palaeolecanium costatum* (Schrank); *Palaeolecanium persicae* (Fabricius); *Lecanium* (*Eulecanium*) *spinosum* Brittin; *Parthenolecanium persicae* (Fabricius); *Lecanium persicae goidanichi* Kawecki; *Parthenolecanium thymi* Danzig; *Lecanium persicae persicae* (Fabricius); *Parthenolecanium persicae spinosum* (Brittin)]						
Peltotrachelus cognatus Marshall	Weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Peltotrachelus pubes Fabricius	Weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Penicillaria jocosatrix Guenée, 1952 [Syn. = *Bombotelia jocosatrix* (Guenée)]	Greater mango tip borer; large mango tipborer; mango shoot caterpillar; mango tip borer	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – NT, QLD (CABI/EPPO, 2000b)	No – flower, leaf, shoot (Srivastava, 1997); fruit stalk, young fruit (Cunningham, 1989)	No
Pericallia ricini (Fabricius, 1775)	Leaf eating caterpillar	Lepidoptera: Arctiidae	Yes – (Chockalingam & Krishnan, 1984)	No – (Nielsen *et al.*, 1996)	No – leaf (Chockalingam & Krishnan, 1984)	No
Perina nuda (Fabricius, 1787)	Clear-winged tussock moth	Lepidoptera: Lymantriidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Perissopneumon ferox Newstead	Mealybug	Hemiptera: Margarodidae	Yes – (Srivastava & Verghese, 1985)	No	No – leaf, shoot, stalk (Srivastava, 1997); stem (Srivastava & Verghese, 1985)	No
Pharsatia proxima Gahan	Longicorn beetle; stem borer	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	No	No – stem (Srivastava, 1997)	No
Phocoderma velutina (Kollar, 1844) [Syn. = *Natada velutina* Kollar]	Leaf eating caterpillar	Lepidoptera: Limacodidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Phycita umbratelis Hampson	Moth	Lepidoptera: Pyralidae	Yes – (Anon., 2000)	No – (Nielsen *et al*., 1996)	No – inflorescence (Anon., 2000)	No
Phyllotreta sp.	Flea beetle	Coleoptera: Alticidae	Yes – (USDA, 2001)	? – Genus is present in Australia (AICN, 2004)	No	No
Pinnaspis aspidistrae (Signoret, 1869) [Syn. = *Chionaspis aspidistrae* Signoret; *Chionaspis brasiliensis* Signoret; *Chionaspis latus* Cockerell; *Hemichionaspis aspidistrae* (Signoret); *Hemichionaspis aspidistrae brasiliensis* (Signoret); *Hemichionaspis aspidistrae lata* (Cockerell); *Chionaspis* (*Pinnaspis*) *aspidistrae* (Signoret); *Pinnaspis* (*Hemichionaspis*) *aspidistrae* (Signoret); *Pinnaspis brasiliensis* (Signoret); *Pinnaspis ophiopogonis* Takahashi; *Pinnaspis caricis* Ferris]	Aspidistra scale; Brazilian snow-scale; fern scale; liriope scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – SA, TAS (Ben-Dov *et al*., 2001)	No	No
Pinnaspis strachani (Cooley, 1899) [Syn. = *Hemichionaspis minor strachani* Cooley; *Hemichionaspis Marchali* Cockerell; *Hemichionaspis townsendi* Cockerell; *Chionaspis* (*Hemichionaspis*) *aspidistrae gossypii* Newstead (nomen nudum); *Hemichionaspis aspidistrae gossypii* (Newstead); *Hemichionaspis proxima* Leonardi; *Hemichionaspis* (*Pinnaspis*) *marchali* (Cockerell); *Chionaspis* (*Pinnaspis*) *proxima*	Cotton white scale; hibiscus snow scale; lesser snow scale; small snow scale	Hemiptera: Diaspididae	Yes – (Srivastava, 1997)	Yes – SA (Ben-Dov *et al*., 2001)	No – branch, trunk (Morton, 1987a); leaf (Peña & Mohyuddin, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
(Leonardi); *Pinnaspis minor strachani* (Cooley); *Pinnaspis proxima* (Leonardi); *Pinnaspis* (*Hemichionaspis*) *aspidistrae gossypii* (Newstead); *Pinnaspis temporaria* Ferris; *Pinnaspis aspidistrae gossypii* (Newstead); *Pinnaspis gossypii* (Newstead); *Pinnaspis marchali* (Cockerell); *Hemichionaspis gossypii* (Newstead); *Chionaspis* (*Hemichionaspis*) *gossypii* (Newstead); *Pinnaspis townsendi* (Cockerell); *Chionaspis* (*Hemichionaspis*) *aspidistrae* (Newstead); *Hemichionaspis strachani* (Cockerell)]						
Planococcoides sp. nr. *robustus* Ezzat & McConnell, 1956	Mango root mealybug	Hemiptera: Pseudococcidae	Yes – (USDA, 2001)	No – (Ben-Dov *et al*., 2001)	No – root (Puttarudriah & Eswaramurthy, 1976)	No
Planococcus citri (Risso, 1813) [Syn. = *Dorthesia citri* Risso; *Coccus tuliparum* Bouché; *Coccus citri* (Risso); *Dactylopius alaterni* Signoret; *Dactylopius ceratoniae* Signoret; *Dactylopius citri* (Risso); *Dactylopius citri* (Boisduval); *Dactylopius cyperi* Signoret; *Dactylopius robiniae* Signoret; *Dactylopius tuliparum* (Bouché); *Lecanium phyllococcus* Ashmead; *Dactylopius brevispinus* Targioni Tozzetti; *Dactylopius destructor* Comstock; *Dactylopius secretus* Hempel; *Phenacoccus spiriferus* Hempel; *Phenacoccus spiniferus* (Hempel); *Pseudococcus citri* (Risso); *Pseudococcus cyperi* (Signoret); *Pseudococcus robiniae* (Signoret); *Pseudococcus tuliparum* (Bouché); *Pseudococcus alaterni* (Signoret); *Pseudococcus ceratoniae* (Signoret); *Pseudococcus citri coleorum* Marchal; *Dactylopius* (*Trechocorys*) *citri* (Risso); *Pseudococcus citri phenacocciformis*	Citrus mealybug; common mealybug; dompolan mealybug; grape mealybug	Hemiptera: Pseudococcidae	Yes – (Srivastava, 1997)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (CABI/EPPO, 1999)	Yes – bud, fruit, inflorescence, leaf, root, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Brain; *Pseudo-Coccus citris* (Risso); *Planococcus cubanensis* Ezzat & McConnell; *Planococcus citricus* Ezzat & McConnell; *Planococcus cucurbitae* Ezzat & McConnell; *Pseudococcus brevispinus* (Targioni Tozzetti)]						
Planococcus ficus (Signoret, 1875) [Syn. = *Dactylopius ficus* Signoret; *Dactylopius vitis* Signoret; *Dactylopius subterraneus* Hempel; *Pseudococcus ficus* (Signoret); *Pseudococcus vitis* (Signoret); *Coccus vitis* Niedielski; *Pseudococcus vitis* Leonardi; *Pseudococcus citrioides* Ferris; *Pseudococcus vitis* Bodenheimer; *Coccus vitis* Borchsenius; *Planococcus citrioides* (Ferris); *Planococcus vitis* (Signoret); *Pseudococcus praetermissus* Ezzat (nomen nudum)]	Grapevine mealybug; Mediterranean vine mealybug; subterranean vine mealybug; vine mealybug	Hemiptera: Pseudococcidae	Yes – (DPP, 2001)	No – (Ben-Dov *et al*., 2001)	Yes – bark, bud, fruit, leaf, root, trunk (Bentley *et al*., 2003)	**Yes**
Planococcus lilacinus (Cockerell, 1905) [Syn. = *Pseudococcus lilacinus* Cockerell; *Pseudococcus tayabanus* Cockerell; *Dactylopius crotonis* Green (nomen nudum); *Dactylopius coffeae* Newstead; *Pseudococcus coffeae* (Newstead); *Dactylopius crotonis* Green; *Pseudococcus crotonis* (Green); *Pseudococcus deceptor* Betrem; *Tylococcus mauritiensis* Mamet; *Planococcus crotonis* (Green); *Planococcus tayabanus* (Cockerell)]	Coffee mealybug; cacao mealybug; Oriental cacao mealybug	Hemiptera: Pseudococcidae	Yes – (CAB International, 2003)	No – (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem, whole plant (CAB International, 2003)	**Yes**
Planococcus minor (Maskell, 1897) [Syn. = *Dactylopius calceolariae minor* Maskell; *Pseudococcus calceolariae minor* (Maskell); *Planococcus pacificus* Cox]	Pacific mealybug	Hemiptera: Pseudococcidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, NT, QLD, SA (Ben-Dov *et al*., 2001)	Yes – fruit (USDA, 2001); leaf (Cox, 1981)	**Yes (for WA only)**
Platygryllus melanocephalus (Serville,	Field cricket	Orthoptera: Gryllidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
1839)						
Platymycterus sjostedti Marshall	Mango leaf weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Platypus solidus Walker, 1858	Stem borer	Coleoptera: Platypodidae	Yes – (DPP, 2001)	No	No – bark, stem (Srivastava, 1997)	No
Plocaederus ferrugineus Linnaeus, 1758 [Syn. = *Cerambyx ferrugineus* (Linnaeus)]	Cashew stem borer	Coleoptera: Cerambycidae	Yes – (USDA, 2001)	No	No – branch, root, stem, trunk [of cashew] (Rai, 1983)	No
Plocaederus obesus Gahan, 1890	Cashew stem borer; red cocoon-making longhorn	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	No – (CAB International, 2003)	No – stem (CAB International, 2003)	No
Plocaederus pedestris (White, 1853)	Mango bark borer	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	No – (CAB International, 2003)	No – stem (CAB International, 2003); wood (Srivastava, 1997)	No
Polistes spp.	Paper wasp	Hymenoptera: Vespidae	Yes – (Butani, 1993)	? – Genus is present in Australia (AICN, 2004)	No	No
Polyphagotarsonemus latus (Banks, 1904) [Syn. = *Tarsonemus latus* Banks; *Hemitarsonemus latus* (Banks); *Tarsonemus translucens* Green; *Hemitarsonemus translucens* (Green); *Polyphagotarsonemus translucens* (Green); *Tarsonemus phaseoli*]	Broad mite; chilli mite; citrus silver mite; jute white mite; rubber leaf mite; tropical mite; yellow tea mite	Acarina: Tarsonemidae	Yes – (USDA, 2001)	Yes – NSW, QLD, WA (AICN, 2004)	Yes – bud, fruit, leaf, stem (CAB International, 2003)	No
Popillia sp.	Beetle	Coleoptera: Scarabaeidae	Yes – (Bhole *et al*., 1987)	No	No	No
Privesa sp.	Mango hopper	Hemiptera: Ricaniidae	Yes – (Davli *et al*., 1992)	? – Genus is present in Australia (Fletcher, 2003)	No	No
Prococcus acutissimus (Green, 1896) [Syn. = *Lecanium acutissimum* Green; *Coccus acutissimus* (Green)]	Banana-shaped scale; slender soft scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – leaf (Peña & Mohyuddin, 1997)	No
Procontarinia allahabadensis (Grover, 1962) [Syn. = *Amradiplosis allahabadensis* Grover; *Amraemyia allahabadensis*	Mango shoot gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
(Grover)]						
Procontarinia amraemyia (Rao, 1950) [Syn. = *Amraemyia amraemyia* Rao; *Amradiplosis amraemyia* (Rao)]	Mango shoot gall midge	Diptera: Cecidomyiidae	Yes – (Srivastava, 1997)	No – (Evenhuis, 1996)	No – developing fruit (DPP, 2000); inflorescence, leaf (USDA, 2001)	No
Procontarinia brunneigallicola (Rao, 1950) [Syn. = *Amraemyia brunneigallicola* Rao; *Indodiplosis brunneigallicola*]	Gall midge	Diptera: Cecidomyiidae	Yes – (Srivastava, 1997)	No – (Evenhuis, 1996)	No – leaf (Srivastava, 1997)	No
Procontarinia echinogalliperda (Mani, 1947) [Syn. = *Amradiplosis echinogalliperda* Mani]	Mango leaf gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Procontarinia keshopurensis (Rao, 1952) [Syn. = *Amraemyia keshopurensis* Rao; *Amradiplosis keshopurensis* (Rao)]	Gall midge	Diptera: Cecidomyiidae	Yes – (Srivastava, 1997	No – (Evenhuis, 1996)	No – leaf (Srivastava, 1997)	No
Procontarinia mangiferae (Felt, 1916) [Syn. = *Indodiplosis mangiferae* Felt]	Gall midge; leaf gall midge; mango blossom gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Procontarinia mangifoliae (Grover, 1965) [Syn. = *Indodiplosis mangifoliae* Grover]	Leaf gall midge	Diptera: Cecidomyiidae	Yes – (Srivastava, 1997)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Procontarinia matteina Kieffer & Cecconi, 1906	Leaf gall midge; leaf gall fly; mango leaf gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Procontarinia viridigallicola (Rao, 1950) [Syn. = *Amraemyia viridigallicola* Rao; *Amradiplosis viridigallicola* (Rao)]	Mango shoot gall midge	Diptera: Cecidomyiidae	Yes – (Srivastava, 1997)	No – (Evenhuis, 1996)	No – leaf (Srivastava, 1997)	No
Procystiphora indica Grover & Prasad, 1966	Inflorescence gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Procystiphora mangiferae Felt, 1927 [Syn. = *Dasineura mangiferae* Felt, 1927]	Inflorescence gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – immature fruit, inflorescence, leaf (USDA, 2001)	No
Pseudaonidia trilobitiformis (Green, 1896)	Trilobite scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (CAB International, 2003)	No – leaf (USDA, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Aspidiotus trilobitiformis* Green]						
Pseudaulacaspis barberi (Green, 1908) [Syn. = *Diaspis barberi* Green; *Aulacaspis barberi* (Green)]	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Pseudaulacaspis cockerelli (Cooley, 1897) [Syn. = *Chionaspis cockerelli* Cooley; *Chionaspis aucubae* Cooley; *Chionaspis dilatata* Green; *Phenacaspis natalensis* Cockerell; *Phenacaspis aucubae* (Cooley); *Phenacaspis cockerelli* (Cooley); *Phenacaspis dilatata* (Green); *Chionaspis* (*Phenacaspis*) *dilatata* (Green); *Chionaspis candida* Banks; *Chionaspis inday* Banks; *Phenacaspis inday* (Banks); *Chionaspis* (*Phenacaspis*) *natalensis* (Cockerell); *Aulacaspis dilatata* (Green); *Aulacaspis natalensis* (Cockerell); *Chionaspis* (*Phenacaspis*) *dilatata* (Green); *Phenacaspis eugeniae sandwicensis* Fullaway; *Trichomytilus aucubae* (Cooley); *Trichomytilus cockerelli* (Cooley); *Trichomytilus dilatatus* (Green); *Trichomytilus inday* (Banks); *Trichomytilus natalensis* (Cockerell); *Chionaspis syringae* Borchsenius; *Chionaspis hattorii* Kanda; *Phenacaspis sandwicensis* (Fullaway); *Chionaspis akebiae* Takahashi; *Phenacaspis syringae* (Borchsenius); *Phenacaspis akebiae* (Takahashi); *Phenacaspis cockerelli sandwicensis* (Fullaway); *Phenacaspis ferrisi* Mamet; *Phenacaspis hattorii* (Kanda)]	False oleander scale; Fullaway oleander scale; magnolia white scale; mango scale; oleander scale; oyster scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	Yes – NT, QLD (CAB International, 2003); WA (Johnson & Parr, 1999)	Yes – fruit, leaf, stem, twig (CAB International, 2003)	No
Pseudaulacaspis pentagona (Targioni Tozzetti, 1886) [Syn. = *Diaspis pentagona* Targioni	Mulberry scale; peach scale; West Indian peach scale; West Indian scale; white	Hemiptera: Diaspididae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, QLD (Ben-Dov *et al*., 2001)	No – branch, leaf, root, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Tozzetti; *Diaspis Amygdali* Tryon; *Diaspis lanatus* Morgan & Cockerell; *Diaspis lanatus* (Cockerell); *Diaspis patelliformis* Sasaki; *Aspidiotus vitiensis* Maskell; *Diaspis lanata* (Cockerell); *Diaspis gerannii* Maskell (nomen nudum); *Aulacaspis* (*Diaspis*) *pentagona* (Targioni Tozzetti); *Aulacaspis pentagona* (Targioni Tozzetti); *Diaspis* (*Aulacaspis*) *pentagona* (Targioni Tozzetti); *Sasakiaspis pentagona* (Targioni Tozzetti); *Diaspis rosae geranii* (Maskell); *Epidiaspis vitiensis* (Maskell); *Aspidiotus lanatus* (Cockerell); *Diaspis gerannii* (Maskell); *Pseudaulacaspis pentaggona* (Targioni Tozzetti)]	peach scale; white plum scale; white scale					
Pseudococcus longispinus (Targioni Tozzetti, 1867) [Syn. = *Coccus adonidum* Auctorum (not Linnaeus); *Pseudococcus adonidum* (Linnaeus); *Coccus laurinus* Boisduval; *Dactylopius longispinus* Targioni Tozzetti; *Dactylopius adonidum* (Linnaeus); *Dactylopius hoyae* Signoret; *Dactylopius pteridis* Signoret; *Boisduvalia lauri* (Boisduval); *Dactylopius longifilis* Comstock; *Oudablis lauri* (Boisduval); *Pseudococcus hoyae* (Signoret); *Pseudococcus laurinus* (Boisduval)]	Long-tailed mealybug	Hemiptera: Pseudococcidae	Yes – (Ben-Dov *et al*., 2001)	Yes – NSW, QLD, SA, TAS, VIC, WA (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem (CAB International, 2003)	No
Psoraleococcus sp. nr. *multipori* (Morrison)	Pit scale	Hemiptera: Lecanodiaspididae	Yes – (Bhumannavar & Jacob, 1989)	No	No – branch, leaf, stem (Bhumannavar & Jacob, 1989)	No
Pulvinaria avasthii Yousuf & Shafee, 1988	Pulvinaria scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Pulvinaria iceryi (Signoret, 1869) [Syn. = *Lecanium iceryi* Guérin-Méneville (nomen nudum); *Lecanium iceryi* Signoret	Pulvinaria scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al*., 2001)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
(nomen nudum); *Lecanium iceryi* Signoret; *Lecanium gasteralphe* Signoret (nomen nudum); *Pulvinaria gasteralphe* Signoret (nomen nudum); *Pulvinaria gasteralpha* Signoret; *Pulvinaria iceryi* (Signoret); *Pulvinaria* iceryi (Guérin-Méneville); *Pulvinaria lepida* Brain; *Pulvinaria elongata durbanensis* Munro & Fouche (nomen nudum); *Coccus iceryi* (Signoret); *Saccharipulvinaria iceryi* (Signoret)]						
Pulvinaria ixorae Green, 1909	Pulvinaria scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	No – (Ben-Dov, 1993)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Pulvinaria polygonata Cockerell, 1905 [Syn. = *Pulvinaria cellulosa* Green, 1909; *Pulvinaria nerii* Kanda; *Chloropulvinaria polygonata* (Cockerell); *Chloropulvinaria polygonata* (Green); *Macropulvinaria polygonata* (Cockerell); *Chloropulvinaria nerii* (Kanda)]	Cottony citrus scale	Hemiptera: Coccidae	Yes – (Gupta & Singh, 1988a)	Yes – QLD (Smith *et al*., 1997)	No – leaf, shoot, twig (Srivastava, 1997); stem (USDA, 2001)	No
Pulvinaria psidii Maskell, 1893 [Syn. = *Pulvinaria cupaniae* Cockerell; *Pulvinaria psidii philippina* Cockerell; *Pulvinaria darwiniensis* Froggatt; *Lecanium vacuolatum* Dash (nomen nudum); *Pulvinaria cussoniae* Hall; *Pulvinaria gymnosporiae* Hall; *Chloropulvinaria psidii* (Maskell)]	Green shield scale; guava mealy scale; guava pulvinaria; guava scale; mango scale	Hemiptera: Coccidae	Yes – (Butani, 1993)	Yes – NSW, NT, QLD (CAB International, 2003)	No –inflorescence, leaf, stem (CAB International, 2003)	No
Pyrilla perpusilla Walker, 1851 [Syn. = *Fulgora pallida* Donovan; *Zamila perpusilla* Walker; *Dictyoptera pallida* Stebbing; *Pyrops perpusilla*]	Sugarcane leafhopper; sugarcane plant hopper; Indian sugarcane pyrilla	Hemiptera: Lophopidae	Yes – (USDA, 2001)	No – (CAB International, 2003)	No – bark (Dubey *et al*., 1981); leaf (CAB International, 2003)	No
Pyroderces simplex Walsingham [Syn. = *Anatrachyntis simplex* Walsingham; *Anatrachyntis coriacella*	Flower eating caterpillar	Lepidoptera: Cosmopterigidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – inflorescence (DPP, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Snellen; *Pyroderces coriacella* (Snellen); *Pyroderces gossypiella* Walsingham; *Sathrobrota coriacella* (Snellen); *Sathrobrota simplex* Walsingham; *Stagmatophora gossypiella* Walsingham)]						
Radionaspis indica (Marlatt, 1908) [Syn. = *Leucaspis indica* Marlatt; *Suturaspis indica* (Marlatt); *Leucodiaspis indica* (Marlatt); *Radiaspis indica* (Marlatt); *Leucaspis* (*Radionaspis*) *indica* (Marlatt)]	Mango scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997); branch, bud, leaf, trunk (Peña & Mohyuddin, 1997)	No
Raoiella macfarlanei Pritchard & Baker	False spider mite	Acarina: Tenuipalpidae	Yes – (Butani, 1993)	No – (Halliday, 1998)	No – leaf (Butani, 1993)	No
Rapala iarbus iarbus (Fabricius, 1787) [Syn. = *Rapala ocerta* Fruhstorfer; *Rapala* ab. *chondong* Cowan; *Papilio melampus* Stoll; *Baspa melampus* (Stoll); *Rapala melampus* Cramer]	Indian red flash	Lepidoptera: Lycaenidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Rapala manea (Hewitson, 1863) [Syn. = *Deudorix manea* Hewitson]	Slate flash	Lepidoptera: Lycaenidae	Yes – (Johnson *et al*., 1980)	No – (Nielsen *et al*., 1996)	No – flower (Johnson *et al*., 1980); leaf (Butani, 1993)	No
Rastrococcus iceryoides (Green, 1908) [Syn. = *Phenacoccus iceryoides* Green; *Dactylopius* (*Pseudococcus*) *obtusus* Newstead; *Phenacoccus obtusus* (Newstead); *Ceroputo iceryoides* (Green); *Rastrococcus cappariae* Avasthi & Shafee; *Parlatoria iceryoides* (Green)]	Downey snowline mealybug; mango mealybug	Hemiptera: Pseudococcidae	Yes – (Srivastava, 1997)	No – (CAB International, 2003)	Yes – fruit, leaf, twig (Srivastava, 1997); inflorescence, shoot (CAB International, 2003); stem (DPP, 2001)	**Yes**
Rastrococcus invadens Williams, 1986	Mango mealybug	Hemiptera: Pseudococcidae	Yes – (Narasimham & Chacko, 1991)	No – (CAB International, 2003)	Yes – bud, fruit, leaf (Peña & Mohyuddin, 1997); twig (Narasimham & Chacko, 1991)	**Yes**
Rastrococcus mangiferae (Green, 1896) [Syn. = *Pseudococcus mangiferae* Green; *Phenacoccus mangiferae* (Green); *Phenacoccus ballardi* Newstead; *Puto*	Mango mealybug	Hemiptera: Pseudococcidae	Yes – (Srivastava, 1997)	No – (Williams, 1985)	No – leaf, stem (DPP, 2001)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
mangiferae (Green)]						
Rastrococcus spinosus (Robinson, 1918) [Syn. = *Phenacoccus spinosus* Robinson; *Puto spinosus* (Robinson); *Ceroputo spinosus* (Robinson)]	Philippine mango mealybug	Hemiptera: Pseudococcidae	Yes – (USDA, 2001)	No – (Williams, 1985)	Yes – bud, fruit, leaf (Peña & Mohyuddin, 1997)	**Yes**
Rathinda amor (Fabricius, 1775) [Syn. = *Papilio amor* Fabricius]	Monkey puzzle	Lepidoptera: Lycaenidae	Yes – (USDA, 2001)	No – (Nielsen *et al*., 1996)	No	No
Rectosternum poriolle Faust	Weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No	No – leaf (Butani, 1993)	No
Retithrips syriacus (Mayet, 1890) [Syn. = *Retithrips aegyptiacus* Marchal; *Stylothrips bondari* Morgan; *Heliothrips syriacus* Mayet; *Dictyothrips zanoniana* Del Guercio]	Castor thrips; black vine thrips	Thysanoptera: Thripidae	Yes – (USDA, 2001)	No – (Mound, 1996)	No – leaf (Peña & Mohyuddin, 1997)	No
Rhabdophaga mangiferae Mani, 1938	Inflorescence gall midge	Diptera: Cecidomyiidae	Yes – (DPP, 2001)	No – (Evenhuis, 1996)	No – inflorescence (USDA, 2001); leaf, stem (Butani, 1993)	No
Rhachisphora rutherfordi (Quaintance & Baker)	Whitefly	Hemiptera: Aleyrodidae	Yes – (David & Regu, 1991)	No – (Martin, 1999)	No – leaf	No
Rhipiphorothrips cruentatus Hood, 1919 [Syn. = *Rhipiphorothrips karna* Ramakrishnan]	Grapevine thrips; cashew leaf thrips; mango thrips; rose leaf thrips	Thysanoptera: Thripidae	Yes – (IIE, 1993c)	No – (Mound, 1996)	No – leaf (Lee & Wen, 1982; Srivastava, 1997)	No
Rhynchaenus mangiferae Marshall [Syn. = *Orchestes mangiferae*]	Mango flea weevil; mango flower weevil; mango leaf weevil; mango leaf mining weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – bud, inflorescence, leaf, shoot (Srivastava, 1997); young fruit (Singh & Misra, 1981)	No
Rhytidodera bowringi White	Stem borer	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	No – (Srivastava, 1997)	No – branch, stem (Srivastava, 1997)	No
Rhytidodera simulans White	Mango branch borer; mango shoot borer	Coleoptera: Cerambycidae	Yes – (Srivastava, 1997)	No	No – stem (Srivastava, 1997)	No
Ricania marginalis Walker, 1851 [Syn. = *Ricania speculum* Walker, 1851]	Mango hopper	Hemiptera: Ricaniidae	Yes – (Davli *et al*., 1992)	No – (Fletcher, 2003)	No	No
Saissetia coffeae (Walker, 1852)	Hemispherical scale; black olive scale;	Hemiptera: Coccidae	Yes – (Butani, 1993)	Yes – NSW, NT, QLD, SA, TAS,	No – leaf, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Lecanium coffeae* Walker; *Lecanium hemisphaericum* Targioni Tozzetti; *Chermes anthurii* Boisduval; *Chermes filicum* Boisduval; *Chermes hibernaculorum* Boisduval; *Lecanium hybernaculorum* (Boisduval); *Lecanium filicum* (Boisduval); *Lecanium hibernaculorum* (Boisduval); *Lecanium beaumontiae* Douglas; *Lecanium clypeatum* Douglas; *Lecanium hemisphaericum hibernaculorum* (Boisduval); *Lecanium* (*Saissetia*) *beaumontiae* (Douglas); *Lecanium* (*Saissetia*) *coffeae clypeatum* (Douglas); *Lecanium* (*Saissetia*) *coffeae filicum* (Boisduval); *Lecanium* (*Saissetia*) *coffeae hibernacularum* (Boisduval); *Saissetia beaumontiae* (Douglas); *Coccus coffeae* (Walker); *Lecanium* (*Saissetia*) *hemisphaericum* (Targioni Tozzetti); *Lecanium* (*Saissetia*) *anthurii* (Boisduval); *Lecanium* (*Saissetia*) *filicum* (Boisduval); *Saissetia anthurii* (Boisduval); *Saissetia filicum* (Boisduval); *Saissetia hemisphaerica clypeata* (Douglas); *Saissetia hemisphaerica hibernaculorum* (Boisduval); *Saissetia* (*Lecanium*) *hemisphaerica* (Targioni Tozzetti); *Saissetia hemisphericum* (Targioni Tozzetti)]	brown coffee scale; brown shield scale; coffee helmet scale; helmet scale; hemisphaerical scale; soft brown scale			VIC, WA (CAB International, 2003)		
Saissetia miranda (Cockerell & Parrott, 1899) [Syn. = *Lecanium oleae mirandum* Cockerell & Parrott; *Saissetia oleae miranda* (Cockerell & Parrott); *Saissetia oleae* (misidentification)]	Mexican black scale	Hemiptera: Coccidae	Yes – (Ben-Dov *et al.*, 2001)	No – (Ben-Dov *et al.*, 2001)	No	No
Saissetia oleae (Olivier, 1791) [Syn. = *Coccus oleae* Olivier; *Coccus*	Black scale; black shield scale; brown olive scale; citrus	Hemiptera: Coccidae	Yes – (Ben-Dov *et al.*, 2001)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (CAB	No – leaf, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
palmae Haworth; *Coccus testudo* Curtis; *Chermes cycadis* Boisduval; *Lecanium oleae* (Bernard); *Chermes oleae* (Bernard); *Lecanium testudo* (Curtis); *Lecanium palmae* (Haworth); *Bernardia oleae* (Bernard); *Neobernardia oleae* (Olivier); *Neobernardia oleae* (Bernard); *Lecanium cycadis* (Boisduval); *Lecanium oleae testudo* (Curtis); *Lecanium* (*Saissetia*) *palmae* (Haworth); *Saissetia oleae* (Bernard); *Coccus oleae* (Bernard); *Saissetia oleae testudo* (Curtis); *Saissetia palmae* (Haworth); *Saissetia obae* (Bernard); *Lecanium oleae* (Bernard); *Lecanium pumilum* Brain; *Saissetia* (*Lecanium*) *oleae* (Bernard); *Saissetia oleoe* (Olivier); *Parasaissetia oleae* (Olivier); *Parasaissetia oleae* (Bernard); *Coccus pumilum* (Brain)]	black scale; Mediterranean black scale; olive soft scale; olive scale			International, 2003)		
Saissetia privigna De Lotto, 1965	Soft scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	No – (Ben-Dov *et al*., 2001)	No – bark, flower, root, stem, twig (Srivastava, 1997)	No
Salurnis marginellus Guérin-Méneville	Mango hopper	Hemiptera: Flatidae	Yes – (Davli *et al*., 1992)	No – (Fletcher, 2003)	No	No
Scelodonta strigicollis Motschulsky	Grapevine flea beetle; leaf beetle	Coleoptera: Chrysomelidae	Yes – (DPP, 2001)	No	No – leaf (DPP, 2001)	No
Schistoceros anobiodes (Waterhouse)	Stem borer	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Scirpophaga excerptalis Walker, 1863 [Syn. = *Chilo excerptalis* Walker; *Scirpophaga monostigma* Zeller; *Tipanaea innotata* (Walker); *Scirpophaga sericea* Snellen; *Scirpophaga ochroleuca* Meyrick; *Scirpophaga butyrota* Meyrick; *Tryporyza butyrota* (Meyrick); *Scirpophaga intacta* Snellen; *Topeutis rhodoproctalis* (Hampson); *Schoenobius melanostigmus* (Turner); *Topeutis intacta* (Snellen); *Scirpophaga rhodoproctalis*	Sugarcane top borer; sugarcane top moth borer; white top borer	Lepidoptera: Pyralidae	Yes – (Lewvanich, 1981)	Yes – QLD (Lewvanich, 1981)	No – leaf, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
(Hampson); *Tryporyza intacta* (Snellen); *Tryporyza nivella intacta* Snellen; *Tryporyza monostigma*; *Tryporyza rhodoproctalis*]						
Scirtothrips dorsalis Hood, 1919 [Syn. = *Neophysopus fragariae* Girault]	Strawberry thrips; castor thrips; chilli thrips; yellow tea thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	Yes – (Mound, 1996)	No – inflorescence, leaf, shoot, young fruit (CAB International, 2003)	No
Scirtothrips mangiferae Priesner, 1932	Mango thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	No – (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No
Selenothrips rubrocinctus (Giard, 1901) [Syn. = *Physopus rubrocinctus* Giard; *Brachyurothrips indicus* Bagnall; *Heliothrips* (*Selenothrips*) *decolor* Karny; *Heliothrips* (*Selenothrips*) *mendex* Schmutz; *Heliothrips rubrocinctus* Giard]	Redbanded thrips; red-banded thrips; cacao thrips; cocoa thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	Yes – NT, QLD (Mound, 1996); WA (Johnson & Parr, 1999)	Yes – fruit, inflorescence, leaf (CAB International, 2003)	No
Selepa celtis Moore, 1858 [Syn. = *Subrita curviferella* (Walker); *Selepa celtisella* Gaede; *Plotheia celtis* (Moore)]	Aonla hairy caterpillar	Lepidoptera: Noctuidae	Yes – (DPP, 2001)	Yes – (Nielsen *et al*., 1996)	No – leaf (Butani, 1993)	No
Semilaspidus mangiferae Takahashi	Armoured scale; hard scale	Hemiptera: Diaspididae	Yes – (Butani, 1993)	No	No	No
Sinoxylon anale Lesne, 1897 [Syn. = *Sinoxylon geminatum* Schilsky]	Auger beetle; powder post beetle; feather horned borer	Coleoptera: Bostrichidae	Yes – (Butani, 1993)	Yes – NT, SA (AICN, 2004)	No – stem (Srivastava, 1997)	No
Sinoxylon conigerum Gerstäcker, 1855	Conifer auger beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – branch, leaf, shoot, stem, twig, wood (CAB International, 2003)	No
Sinoxylon crassum Lesne, 1897	Powder post beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Sinoxylon dekhanense Lesne	Powder post beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Sinoxylon indicum Lesne, 1897	Powder post beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Sinoxylon oleare Lesne	Powder post beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Sinoxylon pygmaeum Lesne	Powder post beetle	Coleoptera: Bostrichidae	Yes – (USDA, 2001)	No	No – stem (Butani, 1993)	No

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Sinoxylon sudanicum Lesne, 1895	Powder post beetle	Coleoptera: Bostrichidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Spilosoma obliqua (Walker, 1865) [Syn. = *Diacrisia obliqua* Walker; *Spilarctia obliqua* (Walker)]	Common hairy caterpillar; Bihar hairy caterpillar; hairy jute caterpillar; tiger moth	Lepidoptera: Arctiidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Spilostethus pandurus (Scopoli, 1763) [Syn. = *Cimex pandurus* Scopoli; *Lygaeus pandurus* (Scopoli); *Lygaeus civilis*; *Spilostethus civilis*; *Spilostethus macilentus* (Stål, 1874)]	Indian milkweed bug; dura plant bug; military bug; pistachio shoot-hole borer; soldier bug	Hemiptera: Lygaeidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit, inflorescence, leaf, stem (DPP, 2001)	**Yes**
Stathmopoda auriferella Walker [Syn. = *Stathmopoda adulatrix* Meyrick]	Moth	Lepidoptera: Heliodinidae	Yes – (USDA, 2001)	No – (Nielsen *et al.*, 1996)	No – fruit apex and stalk (Park *et al.*, 1994)	No
Stauropus alternus Walker, 1855 [Syn. = *Neostauropus alternus* (Walker)]	Crab caterpillar; lobster caterpillar; lobster moth	Lepidoptera: Notodontidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf (Srivastava, 1997)	No
Sternochetus frigidus (Fabricius, 1787) [Syn. = *Cryptorhynchus frigidus* Fabricius; *Acryptorhynchus frigidus* (Fabricius); *Curculio frigidus* (Fabricius); *Cryptorhynchus gravis* Fabricius; *Sternochetus gravis* (Fabricius)]	Mango pulp weevil; mango flesh weevil; mango fruit weevil; mango weevil; northern mango weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit (CAB International, 2003; Srivastava, 1997)	**Yes**
Sternochetus mangiferae (Fabricius, 1775) [Syn. = *Cryptorhynchus mangiferae* Fabricius; *Acryptorhynchus mangiferae* (Fabricius); *Curculio mangiferae* (Fabricius); *Sternochetus ineffectus* (Walker); *Sternochetus olivieri* Faust]	Mango seed weevil; mango nut weevil; mango stone weevil; mango weevil	Coleoptera: Curculionidae	Yes – (DPP, 2001)	Yes – NSW, NT, QLD (AICN, 2004) Under official control in WA	Yes – fruit, seed (CAB International, 2003; Srivastava, 1997)	**Yes (for WA only)**
Sthenias grisator Fabricius	Grapevine girdler; long-horned beetle	Coleoptera: Cerambycidae	Yes – (USDA, 2001)	No	No – branch, stem, trunk [of mulberry] (Butani, 1978)	No
Strepsicrates rhothia (Meyrick) [Syn. = *Eucosma rhothia* Meyrick; *Spilonota rhothia* (Meyrick)]	Eucalyptus leafroller; guava leafroller	Lepidoptera: Tortricidae	Yes – (DPP, 2001)	No – (Nielsen *et al.*, 1996)	No – leaf (Butani, 1993)	No
Stromatium barbatum (Fabricius, 1775)	Kulsi teak borer;	Coleoptera:	Yes – (DPP, 2001)	No	No – branch, stem, trunk	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
	longicorn beetle	Cerambycidae			(Srivastava, 1997)	
Stylotermes fletcheri (Holmgren, 1917)	Termite	Isoptera: Rhinotermitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Tarbinskiellus portentosus (Lichtenstein, 1796) [Syn. = *Brachytrupes portentosus* Lichtenstein; *Brachytrupes achatinus* (Stoll)]	Rice field cricket; brown field cricket; large brown cricket	Orthoptera: Gryllidae	Yes – (Butani, 1993)	No – (CAB International, 2003)	No – leaf (USDA, 2001)	No
Tegonotus mangiferae (Keifer) [Syn. = *Oxypleurites mangiferae*]	Mango leaf rust mite	Acarina: Eriophyidae	Yes – (Chakrabarti & Mondal, 1982)	Yes – (Knihinicki & Boczek, 2002)	No – inflorescence (USDA, 2001); leaf (Meyer, 1990)	No
Tetranychus cinnabarinus (Boisduval, 1867) [Syn. = *Acarus cinnabarinus* Boisduval; *Tetranychus cucurbitacearum* (Sayed); *Tetranychus telarius* auct.; *Eutetranychus cinnabarinus* (Boisduval); *Eutetranychus cucurbitacearum*; *Eutetranychus dianthica*; *Tetranychus dianthica*]	Carmine spider mite; common spider mite; common red spider mite; red spider mite; tropical red spider mite	Acarina: Tetranychidae	Yes – (Patel *et al*., 1997)	Yes – (Halliday, 1998)	No – leaf (Peña & Mohyuddin, 1997)	No
Tetranychus neocaledonicus (Andre, 1933) [Syn. = *Eotetranychus neocaledonicus* Andre; *Tetranychus cucurbitae*; *Tetranychus equatorius*]	Vegetable spider mite	Acarina: Tetranychidae	Yes – (USDA, 2001)	Yes – NSW, QLD (AICN, 2004)	No – leaf (Sadana & Chhabra, 1981)	No
Thalassodes dissita (Walker, 1861)	Leaf eating caterpillar	Lepidoptera: Geometridae	Yes – (Jadhav & Dalvi, 1987)	No – (Nielsen *et al*., 1996)	No – leaf (Jadhav & Dalvi, 1987)	No
Thalassodes quadraria Guenée, 1858	Leaf eating caterpillar	Lepidoptera: Geometridae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No
Thalassodes veraria Guenée, 1857	Leaf eating caterpillar	Lepidoptera: Geometridae	Yes – (Zaman & Maiti, 1994)	Yes – (Nielsen *et al*., 1996)	No – leaf (Srivastava, 1997)	No
Thrips hawaiiensis (Morgan, 1913) [Syn. = *Euthrips hawaiiensis* Morgan; *Physothrips emersoni* Girault; *Thrips io* Girault; *Thrips partirufus* Girault; *Physothrips lacteicolor* Girault; *Physothrips marii* Girault; *Physothrips*	Banana flower thrips; Hawaiian flower thrips	Thysanoptera: Thripidae	Yes – (Tandon & Srivastava, 1982)	Yes – NT, QLD (Mound, 1996)	No – developing fruit, inflorescence, leaf (CAB International, 2003)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
mjobergi darci Girault; *Physothrips hawaiiensis* (Morgan); *Physothrips pallipes* Bagnall; *Taeniothrips hawaiiensis* (Morgan); *Taeniothrips eriobotryae* Moulton; *Taeniothrips pallipes* var. *florinatus* Priesner; *Taeniothrips rhodomytri* Priesner; *Thrips albipes* Bagnall; *Thrips hawaiiensis* form *imitator* Priesner; *Thrips nigriflava* Schmutz; *Thrips pallipes* Bagnall; *Thrips sulphurea* Schmutz; *Thrips versicolor* Bagnall]						
Thrips palmi Karny, 1925 [Syn. = *Chloethrips aureus* Ananthrakrishnan & Jagadish; *Thrips clarus* Moulton; *Thrips gossypicola* (Priesner); *Thrips gracilis* Ananthrakrishnan & Jagadish; *Thrips leucadophilus* Priesner; *Thrips nilgiriensis* Ramakrishna]	Melon thrips; Oriental thrips; palm thrips; southern yellow thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	Yes – NT, QLD (Mound, 1996)	No – bud, inflorescence, leaf (Srivastava, 1997)	No
Thrips subnudula (Karny, 1926) [Syn. = *Ramaswamiahiella subnudula* Karny]	Thrips	Thysanoptera: Thripidae	Yes – (Srivastava, 1997)	Yes – QLD (Mound, 2003)	Yes – bud, leaf (Srivastava, 1997); inflorescence and leaves of tamarind (Morton, 1987b)	No
Thrips tabaci Lindeman, 1888 [Syn. = *Thrips seminiveus* Girault; *Thrips shakespearei* Girault; *Thrips indigenus* Girault; *Heliothrips tabaci* (Lindeman); *Limothrips allii* Gillette; *Thrips allii* Sirrine & Lowe; *Thrips hololeucus* Bagnall; *Thrips bremnerii* Moulton; *Thrips dianthi* Moulton]	Onion thrips; cotton seedling thrips; potato thrips; tobacco thrips	Thysanoptera: Thripidae	Yes – (CAB International, 2003)	Yes – QLD, SA, TAS, VIC, WA (Mound, 1996)	No – inflorescence, leaf (CAB International, 2003)	No
Thylacoptila paurosema Meyrick, 1885 [Syn. = *Nephopteryx paurosema* Meyrick]	Fruit borer	Lepidoptera: Pyralidae	Yes – (DPP, 2001)	No – (Nielsen *et al*., 1996)	Yes – fruit (DPP, 2001)	**Yes**
Tirathaba mundella Walker, 1865 [Syn. = *Tirathaba fructivora* Meyrick; *Melissoblaptes fructivora* (Meyrick);	Oil palm bunch moth	Lepidoptera: Pyralidae	Yes – (Bhumannavar & Jacob, 1990)	No – (Nielsen *et al*., 1996)	No – inflorescence (CAB International, 2003); young fruit (Srivastava, 1997)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Melissoblaptes mundella (Walker); *Mucialla fructivora* (Meyrick); *Mucialla mundella* (Walker); *Thirataba mundella*]					This species bores into *Mangifera andamanica* fruit after fruit set and causes premature dropping of fruit (Bhumannavar & Jacob, 1990; Srivastava, 1997).	
Toxoptera aurantii Boyer de Fonscolombe, 1841 [Syn. = *Aphis aurantii* Boyer de Fonscolombe; *Aphis camelliae* Kaltenbach; *Aphis coffeae* Nietner; *Ceylonia theaecola* Buckton; *Aphis alaterna* del Guercio; *Toxoptera clematidis* del Guercio; *Toxoptera theobromae* Schouteden; *Toxoptera variegata* del Guercio; *Toxoptera citrifoliae* Maki; *Toxoptera aphoides* van der Goot; *Toxoptera djarani* van der Goot; *Aphis papaveris* var. *buxi* del Guercio; *Toxoptera coffeae* subsp. *thomensis* Seabra; *Toxoptera schlingeri* Tao; *Bucktonia theaecola* (Buckton); *Toxoptera tarosiphum*; *Toxoptera theaecola* (Buckton); *Toxoptera bradyi* Nietner; *Toxoptera coffeae* (Nietner)]	Black tea aphid; black citrus aphid; black orange aphid; camellia aphid; citrus aphid; soursop aphid	Hemiptera: Aphididae	Yes – (DPP, 2001)	Yes – NSW, QLD, VIC, WA (CAB International, 2003)	No – inflorescence, leaf, shoot (CAB International, 2003); stem (Butani, 1993)	No
Toxoptera odinae (van der Goot, 1917) [Syn. = *Longiunguis odinae* (van der Goot; *Aphis adivae* Shiraki; *Arimakia araliae* Matsumura; *Arimakia taranbonis* Matsumura; *Aphis somei* Essig & Kuwana; *Longiunguis spathodeae* van der Goot; *Aphis ficicola* Takahashi; *Aphis mokulen* Shinji; *Aphis rutae* Shinji; *Thomasia sansho* Shinji; *Longiunguis hameliae* Theobald]	Mango aphid; brown aphid; sapium aphid	Hemiptera: Aphididae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – inflorescence, leaf, shoot (Srivastava, 1997); stem (Butani, 1993)	No
Tricentrus bicolor Distant	Common tree hopper	Hemiptera: Membracidae	Yes – (DPP, 2001)	No	No – leaf, stem (Butani, 1993)	No
Trinervitermes biformis (Wasmann)	Snouted harvester	Isoptera: Termitidae	Yes – (Srivastava,	No – (Watson &	No – root, stem (Butani,	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
[Syn. = *Eutermes heimi* Wasmann; *Nasutitermes* (*Trinervitermes*) *longinotus* Snyder; *Trinervitermes heimi* (Wasmann)]	termite		1997)	Abbey, 1993)	1993)	
Trinervitermes rubidus (Hagen)	Termite	Isoptera: Termitidae	Yes – (Srivastava, 1997)	No – (Watson & Abbey, 1993)	No – root, stem (Butani, 1993)	No
Trioza jambolanae Crawford	Psyllid	Hemiptera: Psyllidae	Yes – (DPP, 2001)	No	No – leaf (USDA, 2001)	No
Trogoxylon spinifrons Lesne	Powder post beetle	Coleoptera: Bostrichidae	Yes – (USDA, 2001)	No	No – stem (Butani, 1993)	No
Tyrolichus casei Oudemans, 1910 [Syn. = *Tyroglyphus casei* (Oudemans; *Tyrophagus casei* (Oudemans)]	Cheese mite	Acarina:	Yes – (Chakrabarti *et al*., 1997)	Yes – ACT, NSW, NT, QLD, SA, TAS, VIC, WA (AICN, 2004)	No – flower (Chakrabarti *et al*., 1997)	No
Tyrophagus longior (Gervais, 1844)	Seed mite, cucumber mite; grain mite; grainstack mite	Acarina: Acaridae	Yes – (Mohanasundaram & Parameswaran, 1991)	Yes – TAS (AICN, 2004)	No – rotting mango fruit (Mohanasundaram & Parameswaran, 1991)	No
Vinsonia stellifera (Westwood, 1871) [Syn. = *Vinsonia pulchella* Signoret (nomen nudum); *Coccus stellifer* Westwood; *Vinsonia pulchella* Signoret; *Ceroplastes stellifer* (Westwood)]	Stellate scale; glassy star scale; glossy scale; glossy star scale; star scale	Hemiptera: Coccidae	Yes – (Srivastava, 1997)	Yes – NT (Qin & Gullan, 1994)	No – leaf (Peña & Mohyuddin, 1997)	No
Xyleborus affinis Eichhoff, 1867 [Syn. = *Xyleborus sacchari* Hopkins; *Xyleborus mascarensis* Eichhoff]	Ambrosia beetle; shot hole borer	Coleoptera: Scolytidae	Yes – (DPP, 2001)	No	No – stem (Butani, 1993)	No
Xyleborus andrewsi Blandford, 1896 [Syn. = *Xyleborus persphenos* Schedl; *Xyleborus isolatus* Bright; *Xyleborus andrewesi*]	Ambrosia beetle	Coleoptera: Scolytidae	Yes – (DPP, 2001)	No	No – stem (Butani, 1993)	No
Xyleborus perforans (Wollaston, 1857) [Syn. = *Anodius denticulus* Motschulsky; *Anodius tuberculatus* Motschulsky; *Bostrichus testaceus* Walker; *Tomicus perforans* (Wollaston); *Xyleborus duponti* Montrouzier; *Xyleborus kraatzi* Eichhoff; *Xyleborus kraatzi philippinensis* Eichhoff;	Island pinhole borer	Coleoptera: Scolytidae	Yes – (DPP, 2001)	Yes – NSW, QLD (CAB International, 2003)	No – bark, shoot, wood (CAB International, 2003); stem (Butani, 1993)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Xyleborus immaturus Blackburn; *Xylopertha hirsutus* Lea; *Xyleborus whitteni* Beeson; *Xyleborus criticus* Schedl]						
Xylodectes ornatus (Lesne, 1897)	Beetle	Coleoptera: Bostrichidae	Yes – (USDA, 2001)	No	No – stem (Butani, 1993)	No
Xylopsocus capucinus (Fabricius, 1781)	False powder-post beetle	Coleoptera: Bostrichidae	Yes – (USDA, 2001)	No	No – stem (Butani, 1993)	No
Xylosandrus compactus (Eichhoff, 1875) [Syn. = *Xyleborus compactus* Eichhoff; *Xyleborus morstatti* Hagedorn; *Xylosandrus morstatti* (Hagedorn)]	Chestnut beetle; black coffee borer; black coffee twig borer; black twig borer; shot-hole borer; tea stem borer	Coleoptera: Scolytidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – branch, stem, twig (CAB International, 2003)	No
Xylosandrus crassiusculus (Motschulsky) [Syn. = *Phloeotrogus crassiusculus* Motschulsky; *Xyleborus bengalensis* Stebbing; *Xyleborus crassiusculus* (Motschulsky); *Xyleborus ebriosus* Niisima; *Xyleborus semiopacus* Eichhoff; *Xyleborus semigranosus* Blandford; *Dryocoetes bengalensis* Stebbing; *Xyleborus mascarenus* Hagedorn; *Xyleborus okoumeensis* Schedl; *Xyleborus declivigranulatus* Schedl; *Xylosandrus semigranosus* (Blandford); *Xylosandrus semiopacus* (Eichhoff)]	Asian ambrosia beetle; granulate ambrosia beetle	Coleoptera: Scolytidae	Yes – (DPP, 2001)	No – (CAB International, 2003)	No – bark, branch, trunk, twig, wood (Atkinson *et al.*, 2000); stem (Butani, 1993)	No
Xylothrips flavipes (Illiger, 1801)	Beetle	Coleoptera: Bostrichidae	Yes – (USDA, 2001)	No	No	No
Xylotrechus smei Laporte & Gory	Stem borer	Coleoptera: Cerambycidae	Yes – (DPP, 2001)	No	No – stem (Srivastava, 1997)	No
Nematoda						
Aphelenchus avenae Bastian, 1865	Nematode	Aphelenchida: Aphelenchidae	Yes – (Reddy, 1975)	Yes – NSW, NT, QLD, SA, VIC (McLeod *et al.*, 1994); WA (DAWA, 2003)	No – root (Reddy, 1975)	No
Basiria graminophila Siddiqi, 1959	Nematode	Tylenchida:	Yes – (Reddy,	Yes – QLD	No – root (Reddy, 1975)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Tylenchus* (*Filenchus*) *graminophilus* (Siddiqi) Goodey, 1963]		Tylenchidae	1975)	(McLeod *et al*., 1994) Not in WA (DAWA, 2003)		
Criconema mangiferum	Nematode	Tylenchida: Criconematidae	Yes – (Reddy, 1975)	No – (DAWA, 2003; McLeod *et al*., 1994)	No – root (Reddy, 1975)	No
Criconema squamosum	Nematode	Tylenchida: Criconematidae	Yes – (Reddy, 1975)	No – (DAWA, 2003; McLeod *et al*., 1994)	No – root (Reddy, 1975)	No
Criconemoides citri	Citrus ring nematode	Tylenchida: Criconematidae	Yes – (Reddy, 1975)	No – (DAWA, 2003; McLeod *et al*., 1994)	No – root (Reddy, 1975)	No
Helicotylenchus dihystera (Cobb, 1893) Sher, 1961 [Syn. = *Aphelenchus dubius* var. *peruensis* Steiner; *Helicotylenchus nannus* Steiner; *Helicotylenchus crenatus* Das; *Helicotylenchus flatus* Roman; *Helicotylenchus punicae* Swarup & Sethi; *Helicotylenchus paraconcavus* Rashid & Khan; *Tylenchus dihystera* Cobb; *Tylenchus olaae* Cobb; *Tylenchus spiralis* Cassidy]	Common spiral nematode; spiral nematode; Steiner's spiral nematode	Tylenchida: Hoplolaimidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, SA, VIC (Khair, 1987); WA (DAWA, 2003)	No – root (CAB International, 2003)	No
Helicotylenchus multicinctus (Cobb, 1893) Golden, 1956 [Syn. = *Anguillulina multicincta* (Cobb) T. Goodey; *Helicotylenchus iperoiguensis* (Carvalho) Andrássy; *Rotylenchus iperoiguensis* Carvalho; *Rotylenchus multicinctus* (Cobb) Filipjev; *Tylenchus multicinctus* Cobb; *Tylenchorhyncus multicinctus* (Cobb) Micoletzky]	Banana spiral nematode; Cobb's spiral nematode; spiral nematode	Tylenchida: Hoplolaimidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, SA (Khair, 1987); WA (DAWA, 2003)	No – root (CAB International, 2003)	No
Hemicriconemoides communis Edward & Misra	Nematode	Tylenchida: Criconematidae	Yes – (Reddy, 1975)	Yes – QLD (McLeod *et al*., 1994)	No – root (Reddy, 1975)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
				Not in WA (DAWA, 2003)		
Hemicriconemoides mangiferae Siddiqi, 1961 [Syn. = *Hemicriconemoides birchfieldi* Edward *et al*.]	Nematode	Tylenchida: Criconematidae	Yes – (CAB International, 2003; Reddy, 1975)	Yes – NSW, NT, QLD (McLeod *et al*., 1994) Not in WA (DAWA, 2003)	No – root (Reddy, 1975)	No
Hoplolaimus indicus Sher, 1963 [Syn. = *Basirolaimus arachidis* (Maharaju & Das, 1982) Siddiqi, 1986; *Basirolaimus indicus* (Sher, 1963) Shamsi, 1979; *Hoplolaimus arachidis* Maharaju & Das, 1982]	Lance nematode	Tylenchida: Hoplolaimidae	Yes – (CAB International, 2002)	No – (CAB International, 2002)	No – root (CAB International, 2002)	No
Hoplolaimus seinhorsti Luc, 1958 [Syn. = *Basirolaimus seinhorsti* (Luc) Shamsi; *Hoplolaimus sheri* Suryawanshi]	Lance nematode	Tylenchida: Hoplolaimidae	Yes – (CAB International, 2003)	Yes – NT, QLD, WA (McLeod *et al*., 1994)	No – root (CAB International, 2003)	No
Hoplolaimus tylenchiformis Daday, 1905	Crown-headed lance nematode	Tylenchida: Hoplolaimidae	Yes – (Reddy, 1975)	No – (McLeod *et al*., 1994)	No – root (Reddy, 1975)	No
Longidorus brevicaudatus Schuurmans Stekhoven, 1951	Nematode	Dorylaimida: Longidoridae	Yes – (Reddy, 1975)	No – (McLeod *et al*., 1994)	No – root (Reddy, 1975)	No
Meloidogyne incognita (Kofoid & White, 1919) Chitwood, 1949 [Syn. = *Meloidogyne incognita acrita* Chitwood; *Meloidogyne acrita* Chitwood; *Oxyuris incognita* Kofoid & White]	Root-knot nematode; root-knot eelworm; southern root-knot nematode	Tylenchida: Meloidogynidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (CAB International, 2003)	No – root (CAB International, 2003)	No
Pratylenchus brachyurus (Godfrey, 1929) Filipjev & Schuurmans Stekhoven, 1941 [Syn. = *Anguillulina* (*Pratylenchus*) *brachyura* (Godfrey) Goodey (W. Schneider); *Anguillulina brachyura* (Godfrey), Goodey; *Pratylenchus pratensis* Thorne; *Pratylenchus leiocephalus* Steiner; *Pratylenchus steineri* Lordello, Zamith & Boock; *Tylenchus brachyurus* Godfrey;	Meadow nematode; Godfrey's meadow nematode; Godfrey's root-lesion nematode; root-lesion nematode; smooth-headed lesion nematode; smooth headed nematode; smooth-headed nematode	Tylenchida: Pratylenchidae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD (Khair, 1987); WA (DAWA, 2003)	No – root (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Tylenchus (*Chitinotylenchus*) *brachyurus* Godfrey (Filipjev)]						
Pratylenchus penetrans (Cobb, 1917) Filipjev & Schuurmans Stekhoven, 1941 [Syn. = *Pratylenchus gulosus* (Kühn) Filipjev & Schuurmans Stekhoven; *Tylenchus penetrans* Cobb; *Tylenchus gulosus* Kühn (nomen oblitum)]	Cobb's root-lesion nematode; meadow nematode; northern root lesion nematode; root-lesion nematode	Tylenchida: Pratylenchidae	Yes – (CAB International, 2003)	Yes – NSW, QLD, VIC, SA, TAS (Khair, 1987); WA (DAWA, 2003)	No – root (CAB International, 2003)	No
Rotylenchulus reniformis Linford & Oliveira, 1940 [Syn. = *Leiperotylenchus leiperi* Das; *Rotylenchulus leiperi* (Das) Loof & Oostenbrunk; *Rotylenchulus queirozi* (Lordello & Cesnik) Sher; *Rotylenchulus stakmani* Husain & Khan; *Spyrotylenchus queirozi* Lordello & Cesnik]	Reniform nematode; kidney-shaped nematode	Tylenchida: Hoplolaimidae	Yes – (Khair, 1987; Reddy, 1975)	Yes – NT, QLD, WA (McLeod *et al*., 1994)	No – root, soil (Reddy, 1975; Saeed & Ashrafi, 1973)	No
Xiphinema americanum Cobb, 1913 [Syn. = *Tylencholaimus americanus* (Cobb) Micoletzky; *Xiphinema taylori* Lamberti *et al*.; *Xiphinema californicum* Lamberti & Bleve-Zaches]	American dagger nematode; dagger nematode; tobacco ring spot nematode	Dorylaimida: Xiphinematidae	Yes – (CAB International, 2003; Reddy, 1975)	Yes – NSW (CAB International, 2003); WA (DAWA, 2003)	No – root, soil (Reddy, 1975; Saeed & Ashrafi, 1973)	No
Algae						
Cephaleuros virescens Kunze [Syn. = *Cephaleuros mycoidea* Karst; *Cephaleuros parasiticus* Karst; *Cephaleuros mycoidea* Karst; *Mycoidea parasitica* Cunn.]	Algal leaf spot; algal spot of coffee; green scurf; red rust	Trentepohliales: Trentepohliaceae	Yes – (Prakash & Singh, 1980)	Yes – (Johnson & Hobman, 1982); NT (Pitkethley, 1998)	No – bark, leaf, twig (Rawal, 1998)	No
Bacteria						
Bacillus subtilis (Ehrenberg, 1835) Cohn, 1872	Soil rot	Bacillales: Bacillaceae	Yes – (DPP, 2001)	Yes – SA (CAB International, 2003) Not in WA (DAWA, 2003)	No – root (CAB International, 2003)	No
Erwinia carotovora subsp. *carotovora* (Jones, 1901) Bergey, Harrison, Breed,	Bacterial rot	Enterobacteriales: Enterobacteriaceae	Yes – (DPP, 2001)	Yes – NSW, NT, QLD, TAS, VIC,	No – leaf, root, stem (CAB International, 2003)	No

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Hammer & Huntoon, 1923 [Syn. = *Aplanobacter cepivorus* (Delacroix) Elliot; *Bacillus alliariae* Omori; *Bacillus apii* (Brizi) Migula; *Bacillus apiovorus* Walmald; *Bacillus aroideae* Townsend; *Bacillus betivorus* Takimoto; *Bacillus carotovorus* Jones; *Bacillus carotovorus* var. *konjac*; *Bacillus cepivorus* Delacroix; *Bacillus croci* Mizusawa; *Bacillus dahliae* Hori & Bokura; *Bacillus hyacinthi* Migula; *Bacillus hyacinthi septicus* Heinz; *Bacillus melonis* Giddings; *Bacillus oleraceae* Harrison; *Bacillus omnivorus* van Hall; *Bacillus papaveris* Ayyar; *Bacillus solanisaprus* Harrison; *Bacterium alliariae* (Omori) Krasil'nikov; *Bacterium apii* Brizi; *Bacterium apiovorum* (Wormald) Burgvits; *Bacterium aroideae* (Townsend) Stapp; *Bacterium betivorum* (Takimoto) Burgvits; *Bacterium carotovorum* (Jones) Lehmann & Neumann; *Bacterium carotovorum* var. *aroideae* (Townsend) Heellmers & Dowson; *Bacterium cepae* Passalacqua; *Bacterium cepivorum* (Delacroix) Stapp; *Bacterium croci* (Mizusawa) Burgvits; *Bacterium dahliae* (Hori & Bokura) Burgvits; *Bacterium destructans* (Potter) Nakata, Nakajima & Takimoto; *Bacterium hyacinthi septicum* (Heinz) Chester; *Bacterium melonis* (Giddings) Lehmann & Neumann; *Bacterium nadsonii* (Lobik) Burgvits; *Bacterium oleraceae* (Harrison) Burgvits; *Bacterium omnivorum* (van Hall) Burgvits; *Bacterium papaveris* (Ayyar) Burgvits; *Bacterium solanisaprum* (Harrison) Lehmann & Neumann; *Chromobacterium cytolyticum* (Chester) Krasil'nikov; *Chromobacterium papaveris*				WA (CAB International, 2003)		

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(Ayyar) Krasil'notthoff; *Erwinia alliariae* (Omori) Magrou; *Erwinia aroideae* (Townsend) Bergey *et al*.; *Erwinia betivora* (Takimoto) Magrou; *Erwinia carotovora* f.sp. *carotovora*; *Erwinia carotovora* var. *carotovora*; *Erwinia carotovora* var. *konjac* Nakata; *Erwinia cepivora* (Delacroix) Oishi; *Erwinia croci* (Mizusawa) Magrou; *Erwinia cytolytica* Chester; *Erwinia dahliae*; *Erwinia destructans* (Potter) Oishi; *Erwinia hyacinthi septica* (Heinz) Magrou; *Erwinia melonis* (Giddings) Bergey *et al*.; *Erwinia oleraceae* (Harrison) Bergey *et al*.; *Erwinia papaveris* (Ayyar) Magrou; *Erwinia solanisapra* (Harrison) Bergey *et al*.; *Pectobacterium aroideae* (Townsend) Waldee; *Pectobacterium betivorum* (Takimoto) Patel & Kulkarni; *Pectobacterium carotovorum* f.sp. *aroideae*; *Pectobacterium carotovorum* var. *aroideae* (Townsend) Dowson; *Pectobacterium cytolyticum* (Chester) Patel & Kulkarni; *Pectobacterium delphinii* Waldee; *Pectobacterium melonis* (Giddings) Waldee; *Phytobacterium destructans* (Potter) Magrou & Prévot; *Phytomonas cepivora* (Delacroix) Magrou; *Phytomonas destructans* (Potter) Bergey *et al*.; *Proteus nadsonii* Lobik; *Pseudomonas destructans* Potter; *Erwinia carotovora* pv. *carotovora* (Jones) Bergey *et al*.; *Erwinia carotovora* var. *aroideae* Volcani; *Pectobacterium carotovorum* (Jones) Waldee]						
Erwinia herbicola (Löhnis, 1911) Dye, 1964 [Syn. = *Bacterium herbicola* Geilinger; *Bacterium typhi-flavum* Breed;	Bacterial grapevine blight; bacterial pin; bacterial rice leaf blight; bacterial rot	Enterobacteriales: Enterobacteriaceae	Yes – (DPP, 2001)	Yes – NT, QLD (CAB International, 2003) Not in WA (DAWA,	No – leaf (DPP, 2001)	No

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Corynebacterium beticola Abdou; *Enterobacter agglomerans* (Beijerinck) Ewing & Fife; *Enterobacter agglomerans* pv. *millettiae* (Kawakami & Yoshida); *Erwinia herbicola* pv. *millettiae* (Kawakami & Yoshida) Goto *et al. Erwinia mangiferae* (Doidge) Bergey *et al*.; *Erwinia millettiae* (Kawakami & Yoshida) Magrou; *Erwinia lathyri* (Manns & Taubenhaus) Magrou; *Erwinia vitivora* (Baccarini) du Plessis; *Flavobacterium herbicola* (Löhnis) Mack; *Flavobacterium rhenanum* (Migula) Bergey *et al*.; *Flavobacterium trifolii* (Huss) Bergey *et al*.; *Kurthia baccarinii* (Macchiati) Pribram; *Pantoea agglomerans* (Beijerinck) Gavini *et al*.; *Pantoea agglomerans* pv. *millettiae* (Kawakami & Yoshida); *Phytomonas itoana* (Tochinai) Magrou; *Pseudomonas herbicola* (Löhnis) de'Rossi; *Pseudomonas itoana* Tochinai; *Pseudomonas trifolii* Huss; *Xanthomonas cosmosicola* Rangaswami & Sanne Gowda; *Xanthomonas indica* Rangaswami, Prasad & Eswaran; *Xanthomonas itoana* (Tochinai) Dowson; *Xanthomonas maydis* Rangaswami, Prasad & Eswaran; *Xanthomonas penniseti* Rajagopalan & Rangaswami; *Xanthomonas tagetis* Rangaswami & Sanne Gowda; *Xanthomonas oryzae* (Uyeda & Ishiyama) Dowson/Swings; *Xanthomonas rubrisorghi* Rangaswami, Prasad & Eswaran; *Xanthomonas translucens* f.sp. *oryzae*; *Xanthomonas trifolii* (Huss) James]				2003)		
Pseudomonas syringae pv. *syringae* van Hall, 1902 [Syn. = *Bacillus cerasi* (Griffin) Holland;	Bacterial canker or blast (stone and pome fruits); bacterial black spot; bacterial	Pseudomonadales: Pseudomonadaceae	Yes – (DPP, 2001)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (CAB International, 2003)	Yes – fruit, inflorescence, leaf, root, seed, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Bacillus gummis (Comes) Trevisan; *Bacillus matthiolae* (Briosi & Pavarino) Stapp; *Bacillus spongiosus* Aderhold & Ruhland; *Bacterium cerasi* (Griffin) Elliott; *Bacterium cerasi* var. *prunicola*; *Bacterium citrarefaciens* Lee; *Bacterium citriputeale* C.O. Smith; *Bacterium gummis* Comes; *Bacterium hibisci* Nakada & Takimoto; *Bacterium holci* Kendrick; *Bacterium matthiolae* Briosi & Pavarino; *Bacterium nectarophilum* Doidge; *Bacterium prunicola* (Wormald) Burgvitz; *Bacterium rimaefaciens* (Koning) Dowson; *Bacterium spongiosum* (Aderhold & Ruhland) Elliott; *Bacterium syringae* (van Hall) Smith; *Bacterium trifoliorum* Jones, Williamson, Wolf & McCulloch; *Bacterium utiformica* (Clara) Burgvits; *Bacterium vignae* Gardner & Kendrick; *Bacterium vignae* var. *leguminophilum* (Burkholder) Burgvits; *Bacterium viridifaciens* Tisdale & Williams; *Chlorobacter syringae* (van Hall) Patel & Kulkarni; *Phytomonas cerasi* (Griffin) Bergey *et al*.; *Phytomonas cerasi* var. *prunicola* (Wilson) Burkholder; *Phytomonas citrarefaciens* (Lee) Bergey *et al*.; *Phytomonas citriputealis* (Smith) Bergey *et al*.; *Phytomonas hibisci* (Nakada & Takomoto) Bergey *et al*.; *Phytomonas holci* (Kendrick) Bergey *et al*.; *Phytomonas matthiolae* (Briosi & Pavarino) Bergey *et al*.; *Phytomonas nectarophila* (Doidge) Bergey *et al*.; *Phytomonas prunicola* Wormald; *Phytomonas rimaefaciens* (Koning) Dowson; *Phytomonas spongiosa* (Aderhold & Ruhland) Magrou; *Phytomonas syringae* (van Hall) Bergey *et al*.; *Phytomonas trifoliorum* (Jones *et*	brown spot (beans); bacterial eye spot; bacterial leaf spot; bacterial sheath rot; blast of citrus; blister spot of apple; peach-tree short-life; pear blossom blight; apoplexy of apricots					

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al.) Burkholder; *Phytomonas utiformica* (Clara) Clara; *Phytomonas vignae* (Gardner & Kendrick) Bergey *et al*.; *Phytomonas vignae* var. *leguminophila* Burkholder; *Phytomonas viridifaciens* (Tisdale & Williams) Bergey *et al*.; *Pseudomonas cerasi* Griffin; *Pseudomonas cerasi* f.sp. *pyri*; *Pseudomonas cerasi* var. *prunicola* Wilson; *Pseudomonas cerasi* var. *pyri*; *Pseudomonas citrarefaciens* (Lee) Stevens; *Pseudomonas citriputealis* (Smith) Stevens; *Pseudomonas hibisci* (Nakada & Takimoto) Stapp; *Pseudomonas matthiolae* (Briosi & Pavarino) Dowson; *Pseudomonas nectarophila* (Doidge) Clara; *Pseudomonas prunicola* Wormald; *Pseudomonas spongiosa* (Aderhold & Ruhland) Kolkwitz; *Pseudomonas syringae* f.sp. *prunicola* (Wormald) Dowson; *Pseudomonas trifoliorum* Jones *et al*.; *Pseudomonas utiformica* Clara; *Pseudomonas vignae* var. *leguminophila* (Burkholder) Magrou & Prévot; *Pseudomonas viridifaciens* Tisdale & Williams; *Pseudomonas vignae* Gardner & Kendrick; *Pseudomonas oryzicola* Klement; *Pseudomonas holci* Kendrick; *Pseudomonas syringae* van Hall; *Pseudomonas syringae* pv. *japonica* (Mukoo) Dye *et al*.]						
Xanthomonas campestris pv. *mangiferaeindicae* (Patel, Moniz & Kulkarni, 1948) Robbs, Ribeiro & Kimura, 1974 [Syn. = *Pseudomonas mangiferae indicae* Patel; *Erwinia mangiferae* var. *indicae* Stapp; *Phytobacterium mangiferae*	Bacterial black spot; bacterial canker; bacterial leaf spot; bacterial mango black spot; bacterial mango rot; black spot; mango canker	Xanthomonadales: Xanthomonadaceae	Yes – (Rawal, 1998)	Yes – NSW, NT, QLD (Bradbury, 1986); WA (Shivas, 1989)	Yes – branch, fruit, leaf, stalk (Shekhawat & Patel, 1975); petiole, stem (Rawal, 1998) Mechanical transmission by insects (Kishun & Chand, 1989)	No

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indicae (Patel *et al*.) Robbs *et al*.; *Pseudomonas mangiferae-indicae* Patel *et al*.; *Xanthomonas mangiferae indicae* (Patel *et al*.) Robbs & Ribeiro]						
Fungi						
Alternaria alternata (Fr.: Fr.) Keissler [Syn. = *Alternaria alternata* f.sp. *fragariae* Dingley; *Alternaria alternata* f.sp. *lycopersici* Grogan *et al*.; *Alternaria fasciculata* (Cooke & Ellis) L. Jones & Grout; *Alternaria tenuis* Nees; *Macrosporium fasciculatum* Cooke & Ellis; *Macrosporium maydis* (Cooke & Ellis)]	Alternaria leaf spot; black spot; fruit rot	Anamorphic fungi	Yes – (Chattannavar *et al*., 1989)	Yes – NT, QLD (CAB International, 2003); WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf, twig (Dodd *et al*., 1997)	No
Alternaria tenuissima (Kunze ex Pers.) Wiltshire	Alternaria leaf spot; tomato nail head spot	Anamorphic fungi	Yes – (CAB International, 2003)	No – (CAB International, 2003)	No – leaf (DPP, 2001)	No
Aspergillus niger van Tieghem [Syn. = *Aspergillus ficuum* (Reichardt) Thom & Church; *Aspergillus phoenicis* (Corda) Thom; *Sterigmatocystis niger* Tiegh.]	Aspergillus ear rot; black mould; black mould rot (post harvest rot); collar rot; fruit rot; kernel rot; onion black mould; seed rot; stem-end rot	Eurotiales: Trichocomaceae	Yes – (CAB International, 2003)	Yes – ACT, NSW, NT, QLD, SA, VIC (APPD, 2004); NT (Pitkethley, 1998); WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf, root, seed, stem (CAB International, 2003)	No
Aspergillus terreus Thom	Stem end rot	Eurotiales: Trichocomaceae	Yes – (Patel *et al*., 1985)	Yes – NSW (APPD, 2004) Not in WA (DAWA, 2003)	Yes – stem (Patel *et al*., 1985)	No
Botryodiplodia theobromae Pat. [anamorph] [Syn. = *Botryodiplodia ananassae* (Sacc.) Petr.; *Botryosphaeria rhodina* (Cooke) Arx [teleomorph]; *Botryodiplodia tubericola* (Ellis & Everh.) Petr.; *Botryodiplodia gossypii* Ellis & Barthol.; *Botryodiplodia elasticae* Petch; *Chaetodiplodia grisea* Petch; *Diplodia*	Bark canker; botrydiplodia rot; dieback; brown pod rot of cocoa; diplodia pod rot; diplodia stem-end rot; gummosis; leaf blight; post-harvest fruit rot; stem end rot	Mitosporic fungi	Yes – (Rawal, 1998)	Yes – NSW, NT, QLD, SA (APPD, 2004); WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf, root, seed, stem (CAB International, 2003)	No

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ananassae Sacc.; *Diplodia cacaoicola* Henn.; *Diplodia gossypina* Cooke; *Diplodia natalensis* Pole-Evans; *Diplodia theobromae* (Pat.) W. Nowell; *Macrophomina vestita* Prillinger & Delacr.; *Diplodia tubericola* (Ellis & Everh.) Taubenh.; *Lasiodiplodia triflorae* B.B. Higgins; *Lasiodiplodia tubericola* Ellis & Everh.; *Lasiodiplodia theobromae* (Pat.) Griffiths & Maubl. [anamorph]; *Physalospora rhodina* (Berk. & M.A. Curtis) Cooke [teleomorph]]						
Botryosphaeria dothidea (Moug.) Ces. & de Not. Syn. = *Botryosphaeria berengeriana* de Not.; *Dothiorella mali* Ellis & Everh.; *Dothiorella dominicana* Petrak & Cif.]	Fruit rot; almond canker; apple bot rot; apple white rot; peach bark gummosis; blackberry cane canker; blueberry gummosis disease; stem-end rot	Dothideales: Botryosphaeriaceae	Yes – (Prasad & Sinha, 1979)	Yes – NSW, QLD, VIC (APPD, 2004)	No – inflorescence, leaf, stem (Johnson *et al*., 1993b) This is a post-harvest disease that affects mango fruit during storage (Johnson *et al*., 1993b).	No (fruit rot)
Capnodium mangiferae Cooke & Brown	Brown pod rot; sooty mould of mango	Capnodiales: Capnodiaceae	Yes – (Sharma & Badiyala, 1991)	No – (CAB International, 2003) Not in WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf (Sharma & Badiyala, 1991)	No[#]
Capnodium ramosum Cooke	Sooty mould of mango	Capnodiales: Capnodiaceae	Yes – (Sharma & Badiyala, 1991)	No – (CAB International, 2003) Not in WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf (Sharma & Badiyala, 1991)	No[#]
Ceratocystis paradoxa (Dade) C. Moreau [teleomorph] [Syn. = *Thielaviopsis paradoxa* (De Seynes) Höhn. [anamorph]; *Ceratostomella paradoxa* Dade [teleomorph]; *Chalara paradoxa* (De Seynes) Sacc. [anamorph]; *Endoconidium fragrans* E.G. Lacroix [teleomorph]; *Hughesiella euricoi* Bat. &	Base rot; black rot; bulb rot; fruit rot; post-harvest rot	Microascales: Ceratocystidaceae	Yes – (CAB International, 2003)	Yes – NSW, QLD (CAB International, 2003) Not in WA (DAWA, 2003)	No – leaf, root, seed, stem (CAB International, 2003) This is a post-harvest disease (CAB International, 2003).	No (fruit rot)

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A.F. Vital [teleomorph]; *Ophiostoma paradoxa* (Dade) Nannf. [teleomorph]; *Sporoschisma paradoxum* De Seynes [teleomorph]; *Stilbochalara dimorpha* Ferd. & Winge [teleomorph]; *Thielaviopsis ethacetica* Went [teleomorph]]						
Cercospora mangiferae indicae Munjal Lal & Chona	Cercospora leaf spot; mango leaf spot	Hyphomycetales: Dematiaceae	Yes – (Rawal, 1998)	Not in WA (DAWA, 2003)	No – leaf (Rawal, 1998)	No
Cladosporium cladosporioides (Fresenius) de Vries [Syn. = *Cladosporium graminum*; *Cladosporium herbarum* Fr.; *Cladosporium cladosporioides* (Fres.) de Vries; *Mycosphaerella tassiana* (de Not.) Johanson; *Mycosphaerella tulasnei* (Jacz.) Lindau; *Mycosphaerella schoenoprasi*]	Black mould	Dothideales: Mycosphaerellaceae	Yes – (Singh & Kang, 1989)	Yes – (Johnson *et al*., 1991); ACT, NSW, NT, QLD, SA, TAS, VIC (APPD, 2004); WA (DAWA, 2003)	Yes – flower, fruit (Johnson *et al*., 1991)	No
Colletotrichum acutatum Simmonds ex Simmonds [Syn. = *Colletotrichum xanthii*]	Strawberry black spot; anemone leaf curl	Mitosporic fungi	Yes – (CAB International, 2003)	Yes – NSW, QLD, VIC (CAB International, 2003); WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf, stem (CAB International, 2003)	No
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. [anamorph] [Syn. = *Glomerella cingulata* (Stoneman) Spauld. & H. Schrenk [teleomorph]]	Anthracnose; anthracnose tear-stain black spot of fruit; black tip disease; blossom blight; brown blight (of coffee and tea); dieback (citrus); fruit rot; leaf spot; ripe rot of pepper; stem canker; storage rot; tear stain	Phyllachorales: Phyllachoraceae	Yes – (Sharma *et al*., 1994)	Yes – NSW, NT, QLD, WA (CAB International, 2003)	Yes – fruit, inflorescence, leaf, twig (Rawal, 1998)	No
Corticium rolfsii Curzi [teleomorph] [Syn. = *Athelia rolfsii* (Curzi) C.C. Tu & Kimbr. [teleomorph]; *Botryobasidium rolfsii* (Saccardo) Venkat.; *Corticium*	Collar rot; damping-off; sclerotium rot; wilt and fruit rot	Stereales: Corticiaceae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, SA, TAS, VIC, WA (CAB International, 2003)	Yes – fruit, inflorescence, leaf, root, seed, stem (CAB International, 2003)	No

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centrifugum (Lév.) Bresad.; *Hypochnus centrifugus* (Lév.) Tul.; *Pellicularia rolfsii* (Curzi) E. West [teleomorph]; *Sclerotium rolfsii* var. *rolfsii* Saccardo; *Sclerotium rolfsii* Sacc. [teleomorph]]						
Corticium salmonicolor Berk. & Broome [Syn. = *Necator decretus* Massee [anamorph]; *Botryobasidium salmonicolor* (Berk. & Broome) Venkatar. [teleomorph]; *Corticium javanicum* Zimm. [teleomorph]; *Corticium zimmermanni* Sacc. & Syd. [teleomorph]; *Erythricium salmonicolor* (Berk. & Broome) Burdsall [teleomorph]; *Pellicularia salmonicolor* (Berk. & Broome) Dastur [teleomorph]; *Phanerochaete salmonicolor* (Berk. & Broome) Jülich [teleomorph]]	Pink disease; damping off; rubellosis; thread blight	Stereales: Corticiaceae	Yes – (IMI, 1996)	Yes – NSW, QLD (IMI, 1996) Not in WA (DAWA, 2003)	No – bark, branch, trunk (Lim & Khoo, 1985); leaf, stem (CAB International, 2003)	No
Curvularia tuberculata P.C. Jain [Syn. = *Cochliobolus tuberculatus* Sivan.]	Blight disease; curvularia blight; leaf spot	Dothideales: Pleosporaceae	Yes – (Lele *et al*., 1981)	Yes – QLD (APPD, 2004) Not in WA (DAWA, 2003)	No – leaf, shoot (Lele *et al*., 1981)	No
Dothiorella mangiferae H. & P. Sydow and Butler [Syn. = *Exosporina fawcetti* Wilson; *Hendersonula toruloidea* Nattrass; *Hendersonula creberrima* Sydow; *Torula dimidiata* Penz.; *Scytalidium dimidiatum* [anamorph] (Penz.) B. Sutton & Dyko;; *Fusicoccum parvum* Pennycook & Samuels; *Nattrassia mangiferae* (H. Sydow & P. Sydow) B. Sutton & Dyko; *Natrassia mangiferae* (Nattras) Sutton & Dyko; *Fusicoccum eucalypti*; *Hendersonula cypria*; *Hendersonula agathidis*; *Scytalidium lignicola*]	Stem end rot; apple branch wilt; blight; hendersonia rot; soft brown rot	Anamorphic fungi	Yes – (Pandey *et al*., 1981)	Yes – QLD (CABI/EPPO, 2000a)	No – branch, shoot, twig (Reckhaus & Adamou, 1987); inflorescence (Saaiman, 1997); leaf (Pandey *et al*., 1981) This is a post-harvest disease that affects mango fruit (Saaiman, 1997).	No
Drechslera halodes (Drechs.) Subramanian & P.C. Jain)	Leaf blight; leaf spot; target spot	Mitosporic fungi	Yes – (Sawant & Raut, 1994)	No – (APPD, 2004)	No – leaf (Sawant & Raut, 1994)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Helminthosporium halodes*; *Setosphaeria rostrata* K.J. Leonard; *Exserohilum rostratum* (Drechs.) K.J. Leonard & E.G. Suggs [anamorph]]				Not in WA (DAWA, 2003)		
Elsinoë mangiferae Bitancourt & Jenkins [Syn. = *Sphaceloma mangiferae* Bitancourt & Jenkins [anamorph]]	Mango scab	Dothideales: Elsinoaceae	Yes – (CAB International, 2003)	Yes – NT (Pitkethley, 1995); QLD (CAB International, 2003) Not in WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf, stem (CAB International, 2003)	**Yes (only for WA)**
Fusarium moniliforme var. *subglutinans* Wollenw. & Reinking [Syn. = *Cephalosporium sacchari* Butler; *Fusarium sacchari* var. *elongatum*; *Fusarium subglutinans* Nelson *et al*.; *Fusarium sacchari* var. *subglutinans* (Wollenw. & Reinking) Nirenberg; *Gibberella fujikuroi* var. *subglutinans* Edwards]	Bunchy top; flower malformation of mango; maize seedling blight; maize wilt; mango malformation; pineapple eye rot; pineapple fruit rot pitch pine canker; sugarcane top rot	Hypocreales: Hypocreaceae	Yes – (Rawal, 1998)	Yes – NSW (CAB International, 2003); WA (DAWA, 2003)	No – inflorescence, leaf, stem (Varma *et al*., 1974); shoot (Rawal, 1998)	No
Fusarium oxysporum Schlechtendahl [Syn. = *Fusarium oxysporum* var. *orthocerus*]	Mango malformation; bunchy top	Hypocreales: Hypocreaceae	Yes – (Bhatnagar & Beniwal, 1977)	Yes – NSW, QLD, SA, VIC, WA (CAB International, 2003)	Yes – fruit (Gafar *et al*., 1979); inflorescence, panicle, panicle bearing shoot (Bhatnagar & Beniwal, 1977)	No
Fusarium semitectum Berk. & Rav. [Syn. = *Fusarium pallidoroseum*]		Hypocreales: Hypocreaceae	Yes – (DPP, 2001)	Yes – (Sangalang *et al*., 1995); NSW, QLD, SA, TAS (APPD, 2004); WA (DAWA, 2003)	No – (DPP, 2001)	No
Fusarium solani (Martius) Sacc. [anamorph] [Syn. = *Nectria haematococca* (Wollenw.) Gerlach [teleomorph]; *Fusarium solani* var. *martii* (Appel & Wollenw.) Wollenw.; *Fusarium solani* var. *striatum* (Sherbakov) Wollenw.]	Dry root rot disease; foot rot of peas and beans; localized ring rot of ginger; seedling wilt dry rot of potato; seedling wilt; storage rot of yam; sudden death syndrome of	Hypocreales: Hypocreaceae	Yes – (CAB International, 2003)	Yes – NSW, QLD, SA, TAS, VIC (CAB International, 2003); WA (DAWA, 2003)	No – root, stem (CAB International, 2003)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
	soyabean; tuber rot					
Ganoderma applanatum (Pers.) Pat. [Syn. = *Fomes applanatus* (Pers.) Wallr.; *Polyporus applanatus* (Pers.) Fr.]	Ornamentals white butt rot; pine root rot; white shelf fungus; trees butt rot; white rot; wood decay	Ganodermatales: Ganodermataceae	Yes – (DPP, 2001)	Yes – NSW, QLD, SA, TAS, VIC (APPD, 2004)	No – (DPP, 2001)	No
Geotrichum candidum Link [Syn. = *Geotrichum candidum* var. *candidum* Link; *Oospora piricola* Mangin; *Oospora mali* Kidd & Beaumont; *Oospora lactis-parasitica* Pritch. & Port.]	Fruit rot; full rot; post harvest fungi; soft rot; sour rot; yeasty rot	Mitosporic fungi	Yes – (Badyal & Sumbali, 1990)	Yes – (Wade & Morris, 1982); NSW, QLD, TAS, VIC (APPD, 2004); WA (DAWA, 2003)	Yes – fruit (DPP, 2001)	No
Gibberella zeae (Schwein.) Petch [teleomorph] [Syn. = *Fusarium graminearum* Schwabe [anamorph]; *Fusarium roseum* f.sp. *cerealis*; *Fusarium roseum* var. *graminearum Fusarium roseum* Link; *Gibberella saubinetii* (Mont.) Sacc.; *Sphaeria zeae* Schwein.; *Gibbera saubinettii* Mont.]	Cobweb disease; ear rot of maize; fusarium root and stalk rot; gibberella ear rot; gibberella stalk rot; headblight of maize; malformation disease; pink ear rot; red ear rot; root rot of maize; scab of maize; stalk rot of maize	Hypocreales: Hypocreaceae	Yes – (CAB International, 2003)	Yes – NSW, NT, QLD, SA, VIC, WA (CAB International, 2003)	Yes – fruit, inflorescence, leaf, root, stem (CAB International, 2003)	No
Gilbertella persicaria	Gilbertella rot	Dothideales: Botryosphaeriaceae	Yes – (Prasad & Sinha, 1979)	No – (APPD, 2004)	Yes – fruit, inflorescence (Prasad & Sinha, 1979) This fungus primarily causes disease of overripe fruit in storage (Shane, 2003).	No (fruit rot)
Guignardia mangiferae A.J. Roy [teleomorph] [Syn. = *Phyllosticta anacardiacearum* van der Aa.]	Phyllosticta rot; phyllosticta leafspot; fruit rot		Yes – (Prasad & Sinha, 1979)	No – (APPD, 2004)	Yes – fruit; inflorescence (Prasad & Sinha, 1979); unripe fruit (Snowdon, 1990)	No (fruit rot)
Haplosporella beaumontiana		Coelomycetes	Yes – (Prakash & Raoof, 1985)	No – (APPD, 2004)	No – leaf, twig (Prakash & Raoof, 1985)	No
Hexagonia discopoda Pat. & Har.	Heart spongy rot; white sap	Polyporales: Polyporaceae	Yes – (DPP, 2001)	No – (APPD, 2004)	No – (DPP, 2001)	No
Leptoxyphium fumago	Sooty mould	Capnodiales: Mitosporic	Yes – (Prakash, 1991)	No – (APPD, 2004)	No – leaf, stem (Prakash, 1991)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
[Syn. = *Caldariomyces fumago*]		Capnodiaceae				
Macrophoma mangiferae Hingorani & Sharma	Leaf blight; lack rot; macrophoma rot; seedling blight		Yes – (DPP, 2001; Verma & Singh, 1996)	No – (APPD, 2004)	Yes – fruit, leaf, stem, twig (Rawal, 1998)	**Yes**
Macrophomina phaseolina (Tassi) Goidanich [Syn. = *Macrophoma phaseolina* Tassi; *Macrophoma phaseoli* Maubl.; *Botryodiplodia phaseoli* (Maubl.) Thirumalachar; *Macrophomina phaseoli* (Maubl.) S.F. Ashby; *Macrophoma cajani* Syd. *et al*.; *Macrophomina philippines* Petr.; *Macrophoma corchori* Sawada; *Rhizoctonia lamellifera* Small; *Dothiorella cajani* Syd. *et al*.; *Sclerotium bataticola* Taubenhaus; *Rhizoctonia bataticola* (Taubenhaus) E.J. Butler [anamorph]]	Charcoal rot; ashy stem blight; ashy stem decay; leaf blight; leaf spot disease; root rot	Mitosporic fungi	Yes – (CAB International, 2003)	Yes – NSW, QLD, SA, TAS (CAB International, 2003); NT (Pitkethley, 1998)	No – leaf, root, seed, stem (CAB International, 2003)	No
Meliola mangiferae Earle	Black mildew; sooty mould	Ascomycota: Meliolaceae	Yes – (Sharma & Badiyala, 1991)	No – (APPD, 2004) Not in WA (DAWA, 2003)	Yes – branch, petiole (Lim & Khoo, 1985); fruit, leaf (Sharma & Badiyala, 1991); inflorescence, stem (DPP, 2001)	No[#]
Microxyphium columnatum Bat., Cif. & Nascim.	Sooty mould		Yes – (Prakash, 1991)	No – (APPD, 2004) Not in WA (DAWA, 2003)	No – leaf, stem (Prakash, 1991)	No
Nectria rigidiuscula Berk. & Broome [teleomorph] [Syn. = *Calonectria rigidiuscula* (Berk. & Broome) Sacc. [teleomorph]; *Calonectria lichenigena* Speg. [teleomorph]; *Calonectria eburnea* Rehm [teleomorph]; *Calonectria sulcata* Starbäck [teleomorph]; *Calonectria tetraspora* (Seaver) Sacc. & Trotter [teleomorph]; *Fusarium rigidiusculum* W.C. Snyder & H.N. Hansen [anamorph]; *Fusarium decemcellulare* Brick [anamorph];	Cushion gall disease; die-back of cocoa; green point gall; witches' broom of mango	Hypocreales: Nectriaceae	Yes – (DPP, 2001)	No – (CAB International, 2003)	Yes – fruit, inflorescence (Prasad & Sinha, 1979); seed, stem (CAB International, 2003)	**Yes**

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Fusarium spicaria-colorantis Sacc. & Trotter [anamorph]; *Scoleconectria tetraspora* Seaver [teleomorph]; *Spicaria colorans* De Jonge [anamorph]]						
Nodulsisporium indicum Reddy & Bilgrami, 1972	Leaf spot disease	Hyphomycetes	Yes – (Reddy & Bilgrami, 1972)	No – (APPD, 2004) Not in WA (DAWA, 2003)	No – leaf (Reddy & Bilgrami, 1972)	No
Oidium mangiferae Berthet, 1914	Powdery mildew of mango	Mitosporic fungi	Yes – (Rawal, 1998)	Yes – NSW, NT, QLD (APPD, 2004); WA (DAWA, 2003)	Yes – flower, fruit, leaf, stalk (Rawal, 1998); panicle (Ploetz & Prakash, 1997)	No
Penicillium crustosum	Fruit rot	Anamorphic fungi	Yes – (DPP, 2001)	Yes – (Hocking *et al*., 1988); ACT (APPD, 2004) Not in WA (DAWA, 2003)	Yes – fruit (DPP, 2001)	No (fruit rot)
Penicillium cyclopium Westling [Syn. = *Penicillium aurantiogriseum* Dierckx; *Penicillium aurantiocandidum* Dierckx; *Penicillium cyclopium* var. *aurantiovirens* (Biourge) Fassatiova; *Penicillium brunneoviolaceum* Biourge; *Penicillium johanniolii* Zaleski; *Penicillium lanoso-coeruleum* Thom.; *Penicillium martensii* Biourge; *Penicillium polonicum* Zaleski; *Penicillium puberulum* Bainier; *Penicillium verrucosum* var. *cyclopium* (Westling) Samson, Stolk & Hadlock]	Blue mould rot; fruit rot	Mitosporic fungi	Yes – (Palejwala *et al*., 1989)	Yes – cosmopolitan (CAB International, 2003)	Yes – fruit (Palejwala *et al*., 1989)	No
Pestalotiopsis glandicola (Castagne) Steyaert	Grey blight; pestalotia leaf spot	Mitosporic fungi	Yes – (Ullasa & Rawal, 1989)	Yes – NSW (APPD, 2004) Not in WA (DAWA, 2003)	Yes – fruit, leaf (DPP, 2001; Ullasa & Rawal, 1989)	Yes
Pestalotiopsis mangiferae (Henn.) Steyaert [Syn. = *Pestalotia mangiferae* P. Henn.; *Pestalotia funerea* var. *mangiferae*]	Grey leaf spot of mango; grey blight; pestalotia leaf spot	Mitosporic fungi	Yes – (Verma *et al*., 1991)	Yes – NT (Pitkethley, 1998); WA (DAWA, 2003)	Yes – fruit, leaf (Lim & Khoo, 1985)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
Pestalotiopsis versicolor (Spegazzini) Steyaert	Grey blight; pestalotia leaf spot	Mitosporic fungi	Yes – (DPP, 2001)	Yes – NSW, NT, QLD, VIC (APPD, 2004); WA (DAWA, 2003)	Yes – fruit, leaf (DPP, 2001)	No
Phellinus conchatus (Pers.: Fr.) Quél [Syn. = *Phellinus salicinus* Pers. sensu Bourdot & Galzin; *Fomes salicinus* (Pers.); *Polyporus salicinus* (Pers.); *Fomes conchatus* (Pers.); *Fomes conchatus* (Pers.) Fr.; *Pyropolyporus conchatus* (Pers.); *Polyporus conchatus* (Pers.); *Porodaedalea conchata* (Pers.)]	Heart spongy rot; white sap	Aphyllophorales: Polyporaceae	Yes – (DPP, 2001)	No – (APPD, 2004) Not in WA (DAWA, 2003)	No – (DPP, 2001)	No
Phellinus gilvus (Schweinitz: Fries) Patouillard [Syn. = *Polyporus gilvus* Schw.]	White pocket rot	Aphyllophorales: Polyporaceae	Yes – (DPP, 2001)	Yes – NSW, QLD, VIC (APPD, 2004) Not in WA (DAWA, 2003)	No – (DPP, 2001)	No
Phoma glomerata (Corda) Wollenweb & Hochapfel [Syn. = *Aposphaeria fibricola* (Berk.) Sacc.; *Coniothyrium glomerata* Corda; *Phoma alternariacearum* Brooks & Searle; *Phoma fibricola* Berk.]	Apple leaf spot; grapevine blight; phoma blight; wheat phoma spot	Diaporthales: Valsaceae	Yes – (Prakash & Singh, 1977)	Yes – NSW, QLD, TAS, VIC (APPD, 2004); WA (DAWA, 2003)	No – leaf (Prakash & Singh, 1977)	No
Phoma sorghina (Saccardo) Boerema, Dorenbosch & Van Kesteren	Leaf spot	Diaporthales: Valsaceae	Yes – (Prakash & Raoof, 1985)	Yes – NSW, NT, QLD, SA, VIC (APPD, 2004); WA (DAWA, 2003)	No – leaf, twig (Prakash & Raoof, 1985)	No
Phomopsis mangiferae Ahmad	Black fruit spot; stem end rot	Anamorphic fungi	Yes – (IMI, 1995; Laxminarayana & Reddy, 1975)	Yes – NSW (Letham, 1995); QLD (NCOF, 1997); WA (DAWA, 2003)	Yes – fruit, inflorescence, stem (Johnson *et al*., 1993a)	No
Phyllosticta mortonii Fairm.	Leaf blight; leaf spot; phyllosticta leaf spot	Anamorphic fungi	Yes – (Prajapati *et al*., 1989)	No – (APPD, 2004)	No – leaf (Prajapati *et al*., 1989)	No
Plenotrichella sp.		Coelomycetes	Yes – (Prakash & Raoof, 1985)	No – (APPD, 2004)	No – leaf, twig (Prakash & Raoof, 1985)	No
Polystictus persooni	White pocket rot	Passeriformes: Tyrannidae	Yes – (DPP, 2001)	No – (APPD, 2004)	No – (DPP, 2001)	No

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
				Not in WA (DAWA, 2003)		
Pseudocercospora mangiferae [Syn. = *Cercospora mangiferae*]	Cercospora leaf spot	Anamorphic fungi	Yes – (DPP, 2001)	No – (APPD, 2004) Not in WA (DAWA, 2003)	No – (DPP, 2001)	No
Rhinocladium corticum (Massee) [Syn. = *Peziotrichum corticolum* (Massee) Subramanian [teleomorph]]	Black banded disease; black bark		No – (Narasimhudu *et al*., 1987)	No – (APPD, 2004) Not in WA (DAWA, 2003)	No – bark, branch, leaf (Narasimhudu *et al*., 1987; Ploetz & Prakash, 1997)	No
Rhizopus arrhizus A. Fischer [Syn. = *Rhizopus oryzae* Went & Prinsen Geerligs; *Rhizopus maydis* Bruderlein; *Rhizopus nodosus* Namyslowski; *Rhizopus japonicus* Vuillemin]	Fruit rot; barn rot; soft rot	Mucorales: Mucoraceae	Yes – (Badyal & Sumbali, 1990)	Yes – NSW, VIC (APPD, 2004)	Yes – fruit (Badyal & Sumbali, 1990)	No (fruit rot)
Robillarda sessilis (Saccardo) Saccardo		Coelomycetes	Yes – (Prakash & Raoof, 1985)	No – (APPD, 2004)	No – leaf, twig (Prakash & Raoof, 1985)	No
Schizophyllum alneum Schröter	Sap rot; wood decay; wood rot	Agaricales	Yes – (DPP, 2001)	No – (APPD, 2004) Not in WA (DAWA, 2003)	No – (DPP, 2001)	No
Sclerotium rolfsii var. *delphinii* (Welch) Boerema & Hamers [Syn. = *Sclerotium delphinii* Welch]	Sclerotium rot	Anamorphic fungi	Yes – (DPP, 2001)	Not in WA (DAWA, 2003)	No – (DPP, 2001)	No
Stagonospora sp.		Anamorphic fungi	Yes – (DPP, 2001)	? – Genus is present in Australia (APPD, 2004)	No – leaf (DPP, 2001)	No
Stigmina mangiferae (Koorders) M.B. Ellis [Syn. = *Cercospora mangiferae* Koorders]	Stigmina leaf spot; spot blotch	Deuteromycetes	Yes – (Kakoti *et al*., 1998)	Yes – (Hyde, 1992); QLD (APPD, 2004); NT (Pitkethley, 1998)	No – leaf (Vecchietti & Zapata, 1999)	No
Synchytrium macrosporum Karling, 1956		Chytridiales: Synchytriaceae	Yes – (Sinha & Singh, 1995)	No – (APPD, 2004)	No – leaf (Sinha & Singh, 1995)	No
Thanatephorus cucumeris (Frank) Donk [teleomorph] [Syn. = *Rhizoctonia solani* Kühn [anamorph]; *Corticium areolatum*	Areolate leaf spot; bare patch (tulips, cereals); basal stem rot (soyabeans); black leg of sugar	Ceratobasidiales: Ceratobasidiaceae	Yes – (DPP, 2001)	Yes – (CAB International, 2003); NT (Pitkethley, 1998); WA (DAWA, 2003)	Yes – fruit, inflorescence, leaf, root, seed, stem (CAB International, 2003)	No

Scientific name	**Common name(s)**	**Order: Family**	**Present in India**	**Present in Australia**	**Present on importation pathway (fruit)**	**Consider further?**
[teleomorph]; *Corticium solani* (Prillieux & Delacroix) Bourdot & Galzin [teleomorph]; *Corticium vagum* Berk. & Curt. [teleomorph]; *Hypochnus aderholdii* Kolosh. [teleomorph]; *Hypochnus cucumeris* Frank [teleomorph]; *Hypochnus sasakii* Shirai [teleomorph]; *Hypochnus solani* Prillieux & Delacroix [teleomorph]; *Pellicularia filamentosa* f. *sasakii* (Pat.) Rogers [teleomorph]; *Pellicularia filamentosa* (Pat.) Rogers [teleomorph]; *Rhizoctonia aderholdii* Kolosch [anamorph]; *Rhizoctonia microsclerotia* [anamorph]; *Moniliopsis solani* (Kühn) R.T. Moore; *Sclerotium irregulare* Miyake [anamorph]]	beet; black scurf and stem rot (potato); black speck of potato; bottom rot (lettuce); bordered rice sheath spot; bulb rot (ornamentals); collar rot; crater disease (cereals); crown and root rot (sugar beet); crown bud rot (alfalfa); damping-off; foot rot; fruit rot; leaf blight (of rice); root canker (alfalfa); sheath blight of rice; stem canker (potato, sweet potato); web blight (legumes, ornamentals); leaf blight and tuber soft rot (yam); leaf blight (alfalfa, soyabeans, rape, mustard); root rot; sclerotial blight of rice; sharp cereal eyespot; spear tip (wheat); stem blight of rice; sore shin of tobacco; stem rot; seed rot (cotton, lupins, peanuts); seedling blight (alfalfa, clover, vegetables); wirestem (cotton)					
Tripospermum myrti (Lind) S. Hughes [Syn. = *Triposporium myrti*]	Sooty mould	Anamorphic fungi	Yes – (Prakash, 1991)	No – (APPD, 2004) Not in WA (DAWA, 2003)	Yes – fruit (Prakash, 1991); inflorescence, leaf, stem (DPP, 2001)	No#

Scientific name	Common name(s)	Order: Family	Present in India	Present in Australia	Present on importation pathway (fruit)	Consider further?
Viruses						
Mango crinkle disease	Mango crinkle disease		Yes – (Prakash *et al*., 1985)	No	No	No

[#] Sooty mould is the common name applied to several species of fungi that grow on honeydew secretions on plant parts and other surfaces (Laemmlen, 2003). Sucking insects are the primary cause of sooty mould growth. Sooty moulds are normally considered to be a cosmetic or aesthetic problem (Nameth *et al*., 2003). They do not infect plants but grow on surfaces where honeydew deposits accumulate and can indirectly damage the plant by coating the leaves. In extremely severe cases, it is possible for the black sooty growth to block enough sunlight to interfere with photosynthesis (Nameth *et al*., 2003). Fruits or vegetables covered with sooty moulds are edible and can be removed with a solution of mild soap and warm water wash (Laemmlen, 2003).

Acronyms:

ACT – Australian Capital Territory; NSW – New South Wales; NT – Northern Territory; QLD – Queensland; SA – South Australia; TAS – Tasmania; VIC – Victoria; WA – Western Australia

References for Appendix 1

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APPENDIX 2: POTENTIAL FOR ENTRY, ESTABLISHMENT OR SPREAD AND CONSEQUENCES

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
ARTHROPODS						
Coleoptera [beetles, weevils]						
Sternochetus frigidus (Fabricius) [Coleoptera: Curculionidae]	Mango pulp weevil	Feasible	This genus is present in Australia (AICN, 2004). Susceptible hosts are present in Australia (CAB International, 2003).	Significant	Major economic importance in India (DPP, 2001). This species has the potential to cause economic damage if introduced.	**Yes**
Sternochetus mangiferae (Fabricius) [Coleoptera: Curculionidae]	Mango seed weevil	Feasible	*S. mangiferae* is present in Australia (New South Wales, Northern Territory, Queensland) (AICN, 2004), but is under official control in Western Australia.	Significant	Major economic importance in India (DPP, 2001).	**Yes**
Diptera [flies]						
Bactrocera caryeae (Kapoor) [Diptera: Tephritidae]	Fruit fly	Feasible	Susceptible hosts (e.g. mango) are present in Australia.	Significant	Primary economic impact would result from quarantine restrictions imposed by important domestic and foreign export markets, rather than from direct yield losses from infested fruit.	**Yes**
Bactrocera correcta (Bezzi) [Diptera: Tephritidae]	Guava fruit fly	Feasible	Moderate host range (Allwood *et al*., 1999; Tsuruta *et al*., 1997).	Significant	In India, *B. correcta* is one of the important fruit borers of guava and can cause 80% damage (CAB International, 2003).	**Yes**
Bactrocera cucurbitae (Coquillett) [Diptera: Tephritidae]	Melon fly	Feasible	Wide host range (Weems, 1964).	Significant	*B. cucurbitae* is a very serious pest of cucurbit crops throughout its native range (tropical Asia) and in introduced areas such as the Hawaiian Islands (CAB International, 2003). Damage	**Yes**

[1] Association of the pest with the mango fruit pathway (see Appendix 1) was considered to be sufficient evidence of feasible potential for entry.

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
					levels can be anything up to 100% of unprotected fruit (CAB International, 2003).	
Bactrocera diversa (Coquillett) [Diptera: Tephritidae]	Three striped fruit fly	Feasible	Susceptible hosts (e.g. mango) are present in Australia.	Significant	Primary economic impact would result from quarantine restrictions imposed by important domestic and foreign export markets, rather than from direct yield losses from infested fruit.	**Yes**
Bactrocera dorsalis (Hendel) [Diptera: Tephritidae]	Oriental fruit fly	Feasible	Wide host range (Allwood *et al*., 1999; Tsuruta *et al*., 1997). Dispersed by infected fruit and adult flight (Fletcher, 1989). Strong flyer – adults can fly up to 50-100 km (Fletcher, 1989).	Significant	Primary economic impact would result from quarantine restrictions imposed by important domestic and foreign export markets, rather than from direct yield losses from infested fruit.	**Yes**
Bactrocera tau (Walker) [Diptera: Tephritidae]	Fruit fly	Feasible	Susceptible hosts (e.g. mango) are present in Australia.	Significant	Primary economic impact would result from quarantine restrictions imposed by important domestic and foreign export markets, rather than from direct yield losses from infested fruit.	**Yes**
Bactrocera zonata (Saunders) [Diptera: Tephritidae]	Peach fruit fly	Feasible	*B. zonata* is polyphagous (CAB International, 2003). Susceptible hosts are present in Australia.	Significant	*B. zonata* is an important fruit fly pest and causes severe damage to peach, guava and mango (CAB International, 2003).	**Yes**
Hemiptera [aphids, leafhoppers, mealybugs, psyllids, scales, true bugs, whiteflies]						
Abgrallaspis cyanophylli (Signoret) [Hemiptera: Diaspididae]	Cyanophyllum scale	Feasible	*A. cyanophylli* is present in Australia (New South Wales, Queensland, Tasmania) (AICN, 2004).	Significant	Considered to be a serious pest in Israel, USSR, USA (Florida) (Miller & Davidson, 1990).	**Yes**
Antestiopsis cruciata (Fabricius) [Hemiptera: Pentatomidae]	Indian coffee bug	Feasible	Susceptible hosts are present in Australia.	Not significant	Minor economic importance in India (DPP, 2001).	No
Aspidiotus nerii Bouché [Hemiptera: Diaspididae]	Oleander scale	Feasible	*A. nerii* is a highly polyphagous (Beardsley & Gonzalez, 1975). Its many hosts include agricultural crops, palms,	Significant	*A. nerii* is usually only a minor or non-economic pest on most of its hosts (DeBach & Rosen, 1991). However, it is	**Yes**

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
			cut flowers and woody ornamentals (but not conifers) (CAB International, 2003). This species is present in Australia (New South Wales, Queensland, Tasmania) (CAB International, 2003).		particularly important where aesthetic value of the crop is high, for example in cut flowers and ornamentals (Van Driesche *et al*., 1998). In olive crops, the presence of a single scale makes a fruit unmarketable. Economic loss on table olives due to damage to fruits and reduced oil yield can be up to 70% (Alexandrakis & Benassy, 1981; Flint, 1990). Quiroga *et al*. (1991) reported that *A. nerii* was the most severe pest of jojoba (*Simmondsia chinensis*) fruits in northern and central Chile.	
Bagrada hilaris (Burmeister) [Hemiptera: Pentatomidae]	Painted bug	Feasible	Susceptible hosts are present in Australia.	Not significant	Minor economic importance in India (DPP, 2001). It is a pest of oilseeds and vegetables in India (Panizzi *et al*., 2000).	No
Ceroplastes actiniformis Green [Hemiptera: Coccidae]	Soft scale	Feasible	Other species from this genus are present in Australia (CAB International, 2003). Susceptible hosts are present in Australia (Ben-Dov *et al*., 2001).	Significant	This species can infest a range of host plants. Therefore, it has the potential to cause economic damage if introduced.	**Yes**
Chrysocoris patricius (Fabricius) [Hemiptera: Pentatomidae]	Bug	Feasible	Susceptible hosts are present in Australia.	Not significant	Minor economic importance in India (DPP, 2001). Other species in this genus are recorded as minor pests that attack flowers, shoots and leaves of host plants (Javahery *et al*., 2000).	No
Coccus longulus (Douglas) [Hemiptera: Coccidae]	Long soft scale	Feasible	*C. longulus* is highly polyphagous (Ben-Dov *et al*., 2001).	Significant	This species can infest a wide range of host plants. Therefore, it has the potential to cause economic damage if introduced.	**Yes**
Coptosoma nazirae Atkinson [Hemiptera: Plataspidae]	Dwarf shield bug	Feasible	Susceptible hosts are present in Australia.	Not significant	Minor economic importance in India (DPP, 2001).	No

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
Drosicha contrahens (Walker) [Hemiptera: Margarodidae]	Mango mealybug	Feasible	Susceptible hosts (e.g. mango) are present in Australia.	Not significant	Limited information on this pest. Minor economic importance in India (DPP, 2001).	No
Drosicha dalbergiae (Green) [Hemiptera: Margarodidae]	Mealybug	Feasible	Susceptible hosts (e.g. mango) are present in Australia.	Not significant	Limited information on this pest attacking mango. Minor economic importance in India (DPP, 2001).	No
Dysdercus koenigii (Fabricius) Hemiptera: Pyrrhocoridae	Red cotton bug	Feasible	Susceptible hosts are present in Australia.	Significant	*D. koenigii* is an important pest of cotton in India and Pakistan (Schaefer & Ahmad, 2000). Pest of plants of economic importance such as okra, eggplant and hollyhock, and a minor pest of legumes, pigeon pea and peanut (Schaefer & Ahmad, 2000).	**Yes**
Ferrisia virgata (Cockerell) [Hemiptera: Pseudococcidae]	Striped mealybug	Feasible	*F. virgata* is one of the most highly polyphagous mealybugs known (CAB International, 2003). This species is present in Australia (Northern Territory, Queensland) (CAB International, 2003).	Significant	*F. virgata* is a known vector of cocoa swollen shoot virus (CSSV) in West Africa and cocoa Trinidad virus (CTV, Diego Martin valley isolate) in Trinidad (Thorold, 1975). This species is a pest of coffee, cotton, cashew and kenaf, and is a major pest of guava (CAB International, 2003).	**Yes**
Halys dentata (Fabricius) [Hemiptera: Pentatomidae]	Bark bug	Feasible	Susceptible hosts are present in Australia.	Not significant	Minor economic importance in India (DPP, 2001).	No
Hemiberlesia rapax (Comstock) [Hemiptera: Diaspididae]	Greedy scale	Feasible	Wide host range (Davidson & Miller, 1990; Dekle, 1976). *H. rapax* is a cosmopolitan species of tropical origin that is present in Australia (South Australia, Tasmania, Victoria) (CAB International, 2003).	Significant	*H. rapax* is a major pest of both fruit and woody ornamental plants, primarily in the tropical and subtropical regions (CAB International, 2003).	**Yes**
Lepidosaphes beckii (Newman)	Mussel scale	Feasible	*L. beckii* is present in Australia (New South Wales, Northern Territory,	Significant	One of the most important and serious citrus pests in the world (Miller &	**Yes**

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
[Hemiptera: Diaspididae]			Queensland, South Australia, Tasmania, Victoria) (Ben-Dov *et al*., 2001; CAB International, 2003).		Davidson, 1990; Williams & Watson, 1988).	
Lepidosaphes gloverii (Packard) [Hemiptera: Diaspididae]	Glover's scale	Feasible	*L. gloverii* is present in Australia (New South Wales, Queensland, Victoria) (Ben-Dov *et al*., 2001).	Significant	Due to the introduction of parasitoids to control *L. gloverii* populations in many countries, it is now of less importance (CAB International, 2003). However, it is still occasionally sufficiently serious a pest to require control (CAB International, 2003).	**Yes**
Milviscutulus mangiferae (Green) [Hemiptera: Coccidae]	Mango shield scale	Feasible	Polyphagous host range (Ben-Dov *et al*., 2001)	Significant	This species can infest a wide range of host plants. Therefore, it has the potential to cause economic damage if introduced.	**Yes**
Nipaecoccus nipae (Maskell) [Hemiptera: Pseudococcidae]	Coconut mealybug	Feasible	*N. nipae* is polyphagous and has an extensive host range (Ben-Dov *et al*., 2001).	Not significant	*N. nipae* is generally of little economic importance, but it has become a pest of avocados and guavas in Hawaii, Bermuda and Puerto Rico and ornamental palms (CAB International, 2003). The damage caused by *N. nipae* may result in ornamental plants, fruit, cut flowers and foliage losing their market value (CAB International, 2003).	**Yes**
Paralecanium expansum (Green) [Hemiptera: Coccidae]	Soft scale	Feasible	*P. expansum* is present in Australia (Queensland) (Ben-Dov *et al*., 2001).	Not significant	Minor economic importance in India (DPP, 2001).	No
Planococcus ficus (Signoret) [Hemiptera: Pseudococcidae]	Grapevine mealybug	Feasible	Moderate host range. Susceptible hosts are present in Australia.	Significant	This species can infest a range of host plants. Therefore, it has the potential to cause economic damage if introduced.	**Yes**
Planococcus lilacinus (Cockerell) [Hemiptera: Pseudococcidae]	Coffee mealybug	Feasible	Extremely wide host range (CAB International, 2003). Susceptible hosts are present in Australia.	Significant	*P. lilacinus* is a pest of cocoa throughout the Oriental region and South Pacific area (CAB International, 2003). It also damages a wide variety of	**Yes**

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
					economically important crops such as coffee, tamarinds, custard apples, coconuts, citrus, grapes, guavas and mangoes (CAB International, 2003).	
Planococcus minor (Maskell) [Hemiptera: Pseudococcidae]	Pacific mealybug	Feasible	Wide host range (Ben-Dov *et al*., 2001). *P. minor* is present in Australia (New South Wales, Northern Territory, Queensland, South Australia) (Ben-Dov *et al*., 2001).	Significant	This species can infest a range of host plants. Therefore, it has the potential to cause economic damage if introduced.	**Yes**
Rastrococcus iceryoides (Green) [Hemiptera: Pseudococcidae]	Downey snowline mealybug	Feasible	*R. iceryoides* is one of the most polyphagous species of *Rastrococcus*, occurring on plants belonging to diverse botanical families (CAB International, 2003).	Significant	Major economic importance in India (DPP, 2001). *R. iceryoides* causes damage to mangoes and citrus in India, as well as cotton and kapok (CAB International, 2003).	**Yes**
Rastrococcus invadens Williams [Hemiptera: Pseudococcidae]	Mealybug	Feasible	Wide host range (Ben-Dov *et al*., 2001).	Significant	*R. invadens* does not seem to be of great economic importance in India (CAB International, 2003). In fact, the species had not been recognised and was mistaken for *R. spinosus*, before it was accidentally introduced into Africa (Williams, 1986). However, wherever this mealybug appeared in Africa it became a pest of prime importance on mango, sometimes on citrus, and on many horticultural crops and shade trees (Agounké *et al*., 1988; Ivbijaro *et al*., 1992).	No
Rastrococcus spinosus (Robinson) [Hemiptera: Pseudococcidae]	Philippine mango mealybug	Feasible	Susceptible hosts are present in Australia.	Significant	Major economic importance in India (DPP, 2001).	**Yes**
Spilostethus pandurus (Scopoli)	Indian milkweed bug	Feasible	Highly polyphagous (Sweet, 2000). Susceptible hosts are present in	Significant		**Yes**

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
[Hemiptera: Lygaeidae]			Australia.			
Lepidoptera [butterflies, moths]						
Cryptoblabes gnidiella (Millière) [Lepidoptera: Pyralidae]	Honeydew moth	Feasible	*C. gnidiella* is polyphagous and able to use almost any plant, but it is most often encountered on commercial crops (CAB International, 2003).	Significant	*C. gnidiella* is an important pest of citrus, grapes and pomegranates in the Mediterranean area (CAB International, 2003). It is most noted as a pest of avocados in Israel, of Azolla, sorghum and rice in India, and sporadically of maize or other crops in any warm part of the world (CAB International, 2003). Losses caused by this pest are not quantified in the literature, although in Israel, combined losses of macadamia nuts as a result of *C. gnidiella*, *Apomyelois ceratoniae* and the tortricid *Cryptophlebia leucotreta* amounted to 30% (Wysoki, 1986).	**Yes**
Ctenomeristis ebriola Meyrick [Lepidoptera: Pyralidae]	Mango caterpillar	Feasible	Other species from this genus are present in Australia (Nielsen *et al*., 1996). Susceptible hosts are present in Australia.	Not significant	Limited information on this pest.	No
Deanolis sublimbalis Snellen [Lepidoptera: Pyralidae]	Red-banded mango caterpillar	Feasible	*D. sublimbalis* is present in Australia (Queensland), but is under official control (QDPIF, 2004).	Significant	*D. sublimbalis* has been described as a major pest in Orissa, India (Butani, 1979). This species is said to have caused considerable damage in Andhra Pradesh, India in recent years (Zaheruddeen & Sujatha, 1993). In tropical parts of Asia, it causes commercial losses in the order of 10-15% in mango (QDPIF, 2004).	**Yes**
Deudorix isocrates (Fabricius) [Lepidoptera: Lycaenidae]	Pomegranate fruit borer	Feasible	Other species from this genus are present in Australia (Nielsen *et al*., 1996). Susceptible hosts are present in Australia.	Significant	*D. isocrates* is a pest of apple, ber, litchi, guava, loquat, mango, pear, plum, aonla, pomegranate and sapote in India (Srivastava, 1997).	**Yes**

Scientific name	Common name	Potential for entry[1], establishment or spread in the PRA area		Potential for consequences		Consider further?
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
Monopis leuconeurella (Ragonot) [Lepidoptera: Pyralidae]	Fruit borer	Feasible	Other species from this genus are present in Australia (Nielsen *et al*., 1996). Susceptible hosts are present in Australia.	Not significant	Limited information on this pest. Old record of this pest on mango in India (Ponnuswami, 1971).	No
Orgyia postica (Walker) [Lepidoptera: Lymantriidae]	Oriental tussock moth	Feasible	*O. postica* is a species of forests and forest-steppe which has adapted well to orchards and forest plantations (CAB International, 2003). Susceptible hosts are present in Australia.	Significant	In Taiwan, *O. postica* is a major pest of cultivated grapevines (Chang, 1988) and roses (Wang, 1982). Larvae cause serious damage to young leaves of cacao in the Philippines, both in nurseries and plantations (CAB International, 2003). When very numerous they can cause total defoliation, killing or stunting the tree (Sanchez & Laigo, 1968).	**Yes**
Thylacoptila paurosema Meyrick [Lepidoptera: Pyralidae]	Fruit borer	Feasible	Other species from this genus are present in Australia (Nielsen *et al*., 1996). Susceptible hosts are present in Australia.	Not significant	Limited information on this pest.	No
FUNGI						
Elsinoë mangiferae Bitancourt & Jenkins [Dothideales: Elsinoaceae]	Mango scab	Feasible	Limited host range. *E. mangiferae* is recorded in Australia (Northern Territory and Queensland) (CAB International, 2003).	Significant	Without chemical control, losses as high as 90% have been observed in one orchard in Australia (Darwin) (CAB International, 2003).	**Yes**
Macrophoma mangiferae Hingorani & Sharma [Mitosporic fungi]	Leaf blight	Feasible	Limited host range.	Not significant	Mainly affects leaves and stems (Okigbo, 2001). Causes post harvest fruit rot in mango fruit (Prasad & Sinha, 1980).	No
Nectria rigidiuscula Berk. & Broome [teleomorph] [Hypocreales: Nectriaceae]	Witches' broom of mango	Feasible	Susceptible hosts are present in Australia (CAB International, 2003).	Not significant	The fungus is mostly a saprophyte living on dead bark. It may occasionally cause fruit decay (CAB International, 2003). Recorded only once on mango (Prasad & Sinha, 1979).	No

References for Appendix 2

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APPENDIX 3: PESTS ASSOCIATED WITH MANGO (*MANGIFERA INDICA* L.) FROM THE REPUBLIC OF THE PHILIPPINES

Species	Common Name	Present in Philippines	Present in Australia	Australian quarantine status[1]	Present in pathway	Quarantine management required[1]
Arthropods						
Aleurocanthus woglumi	citrus blackfly	yes	no	Quarantine	no	
Bactrocera cucurbitae	melon fly	yes	no	Quarantine	yes	yes
Bactrocera occipitalis	fruit fly	yes	no	Quarantine	yes	yes
Bactrocera philippinensis	Philippine fruit fly	yes	no	Quarantine	yes	yes
Chlumetia brevisigna	twig borer	yes	no	Quarantine	no	
Chlumetia transversa	twig borer	yes	no	Quarantine	no	
Eudocima fullonia	fruit piercing moth	yes	yes	Non Quarantine	no	
Helopeltis sp.	mosquito bug	yes	no	Quarantine	no	
Icerya seychellarum	Seychelles fluted scale	yes	yes	Non Quarantine	yes	
Idioscopus clypealis	mango leafhopper	yes	no	Quarantine	no	
Idioscopus nitidulus	leafhopper	yes	yes - part	Quarantine	no	
Mictis longicornis	twig wilter	yes	no	Quarantine	no	
Nephopterix sp.	black borer	yes	no	Quarantine	yes	yes
Niphonoclea albata	twig borer	yes	no	Quarantine	no	
Niphonoclea capito	twig borer	yes	no	Quarantine	no	
Noorda albizonalis	red-banded caterpillar	yes	no	Quarantine	yes	yes
Orgyia postica	Oriental tussock moth	yes	no	Quarantine	no	
Parasa lepida	blue-striped nettle grub	yes	no	Quarantine	no	
Planococcus lilacinus	coffee mealybug	yes	no	Quarantine	yes	yes
Saissetia coffeae	helmet scale	yes	no	Quarantine	no	
Sternochetus frigidus	mango pulp weevil	yes	no	Quarantine	yes	yes

[1] "Quarantine pest" – According to the IPPC definition, 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, 1996).

Species	Common Name	Present in Philippines	Present in Australia	Australian quarantine status[1]	Present in pathway	Quarantine management required[1]
Sternochetus mangiferae	mango seed weevil	uncertain	yes - part	Quarantine	yes	yes
Thosea sp.	slug caterpillar	yes	no	Quarantine	no	
Thosea sinensis	slug caterpillar	yes	no	Quarantine	no	
Typhlocyba nigrobilineata	mango hopper	yes	no	Quarantine	no	
Algae						
Cephaleuros virescens	algal leaf spot	yes	yes	Non Quarantine	no	
Bacteria						
Xanthomonas campestris pv. *mangiferaeindicae*	bacterial black spot	yes	yes	Non Quarantine	yes	
Fungi						
Alternaria alternata	alternaria rot	yes	yes	Non Quarantine	yes	
Aspergillus niger	black mould	yes	yes	Non Quarantine	yes	
Botrytis cinerea	blossom blight	yes	yes	Non Quarantine	yes	
Colletotrichum gloeosporioides	anthracnose	yes	yes	Non Quarantine	yes	
Cytosphaera mangiferae	stem end rot	yes	yes	Non Quarantine	yes	
Dothiorella dominicana	stem end rot	yes	yes	Non Quarantine	yes	
Dothiorella mangiferae	stem end rot	yes	yes	Non Quarantine	yes	
Elsinoe mangiferae	mango scab	yes	yes - part	Quarantine	yes (low)	yes
Erythricium salmonicolor	pink disease	yes	yes	Non Quarantine	no	
Geotrichum candidum	sour rot	yes	yes	Non Quarantine	yes	
Guignardia mangiferae	phyllosticta rot	yes	yes	Non Quarantine	yes	
Lasiodiplodia theobromae	stem end rot	yes	yes	Non Quarantine	yes	
Macrophoma luzonensis	grey leaf spot	yes	no	Quarantine	no	
Macrophomina phaseolina	charcoal rot	yes	yes	Non Quarantine	no	
Mucor circinelloides	mucor rot	yes	yes	Non Quarantine	yes	

Species	Common Name	Present in Philippines	Present in Australia	Australian quarantine status[1]	Present in pathway	Quarantine management required[1]
Nattrassia mangiferae	stem end rot	yes	yes	Non Quarantine	yes	
Oidium mangiferae	powdery mildew	yes	yes	Non Quarantine	no	
Penicillium spp.	blue mould	yes	yes	Non Quarantine	yes	
Pestalotiopsis mangiferae	grey leaf spot	yes	yes	Non Quarantine	yes	
Phoma glomerata	phoma rot	yes	yes	Non Quarantine	no	
Phoma sorghina	phoma rot	yes	yes	Non Quarantine	no	
Phomopsis mangiferae	stem end rot	yes	yes	Non Quarantine	yes	
Phytophthora nicotianae var. *parasitica*	phytophthora rot	yes	yes	Non Quarantine	yes	
Phytophthora palmivora	phytophthora rot	yes	yes	Non Quarantine	no	
Rhizopus arrhizus	rhizopus rot	yes	yes	Non Quarantine	yes	
Rhizopus oryzae	rhizopus rot	yes	yes	Non Quarantine	yes	
Rhizopus stolonifer	transit rot	yes	yes	Non Quarantine	yes	
Stemphylium vesicarium	stemphylium rot	yes	yes	Non Quarantine	yes	
Stigmina mangiferae	stigmina rot	yes	yes	Non Quarantine	no	
Nematoda						
Hemicriconemoides mangiferae		yes	yes	Non Quarantine	no	