



Australian Government

Department of Agriculture, Fisheries and Forestry

Persimmon fruit (*Diospyros kaki* L.) from
Japan, Korea and Israel

Draft Import Policy



December 2003

Foreword

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GLOSSARY OF TERMS AND ABBREVIATIONS

ALOP	appropriate level of protection
AQIS	Australian Quarantine and Inspection Service
Area	an officially defined country, part of a country or all or parts of several countries
Biosecurity Australia	an agency within the Australian Government Department of Agriculture, Fisheries and Forestry. Biosecurity Australia protects consumers and animal and plant health, and facilitates trade, by providing sound scientifically based and cost effective quarantine policy
Control (of a pest)	suppression, containment or eradication of a pest population
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	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
ICON	AQIS Import Conditions database
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 Standard for Phytosanitary Measures
National Plant Protection Organisation	official service established by a government to discharge the functions specified by the IPPC
NPPO	National Plant Protection Organisation
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	any means that allows the entry or spread of a pest
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 risk assessment (for quarantine pests)	evaluation of the probability of the introduction or 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 or spread of a pest
PFA	Pest Free Area
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 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

SPREAD.....EXPANSION OF THE GEOGRAPHICAL DISTRIBUTION OF A PEST WITHIN AN AREA

EXECUTIVE SUMMARY

The Australian Government Department of Agriculture, Fisheries and Forestry is considering the importation of fresh persimmon fruit from Japan, The Republic of Korea (hereinafter referred to as Korea) and Israel. In 2002, Biosecurity Australia officially advised stakeholders of the commencement of the generic Import Risk Analysis (IRA) on the importation of persimmons. In 2003, Biosecurity Australia conducted a preliminary risk assessment and determined that the potential quarantine pests associated with persimmons in Japan, Korea and Israel were not significantly different to those for which policy already exists. Therefore, Biosecurity Australia advised stakeholders of the cessation of the IRA and assessment of the import access request as a review and extension of existing policy.

Biosecurity Australia has existing policy for the importation of fresh persimmons from the USA (California, Arizona and Texas only) and New Zealand.

This document presents a draft import policy for fresh persimmon fruit imports into Australia from Japan, Korea and Israel.

Of the pests associated with fresh persimmon fruit in Japan, Korea and Israel, 26 pests (24 arthropods and two pathogens) were determined to be quarantine pests for Australia.

Of these pests, 20 arthropods and one pathogen were assessed to have unrestricted risk estimates above Australia's appropriate level of protection (ALOP) and risk management measures have been proposed.

This draft import policy concludes that the risks associated with the importation of fresh persimmons from Japan, Korea and Israel can be managed by applying a combination of risk management measures and operational maintenance systems, specifically:

- Registration of export orchards and packinghouses;
- Option of pest free areas or cold disinfestation for the management of *Ceratitis capitata* (Mediterranean fruit fly) for persimmons from Israel;
- Option of pest free area or methyl bromide fumigation for the management of *Stathmopoda masinissa* (persimmon fruit moth) for persimmons from Korea and Japan;
- Export orchard surveillance and sanitation for freedom from *Monilinia fructigena* (brown rot) for persimmons from Japan, Korea and Israel;
- Cleaning for the removal of mealybugs, scales and thrips;
- Inspection for freedom from leafrollers and moths;
- Pre-export inspection by the National Plant Protection Organisation (NPPO);
- Packing, labelling and storage procedures;
- Phytosanitary certification by the NPPO; and
- On-arrival quarantine clearance by AQIS.

INTRODUCTION

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

Biosecurity Australia has existing policy for the importation of fresh persimmons from the USA (California, Arizona and Texas only) and New Zealand.

Biosecurity Australia has now conducted a pest risk analysis (PRA) on fresh persimmons from Japan, Korea and Israel into Australia.

This document includes the following sections:

- Background to this risk analysis;
- A description of the scope of this risk analysis;
- An outline of current quarantine policy for the importation of fresh persimmons;
- The methodology and results of pest categorisation, risk assessment and risk management; and
- Recommended quarantine conditions for the importation of fresh persimmons from Japan, Korea and Israel into Australia.

METHOD FOR PEST RISK ANALYSIS

An outline of the pest risk analysis (PRA) methodology used for this review is provided in the Biosecurity Australia publication *Draft Guidelines for Import Risk Analysis* – September 2001. In accordance with ISPM No. 11 *Pest Risk Analysis for Quarantine Pests*, this PRA comprises three interrelated stages:

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

STAGE 1: INITIATION

The aim of the initiation stage is to identify the pest(s) and pathways (e.g. commodity imports) that are of quarantine concern and should be considered for risk analysis in relation to the identified PRA area. This PRA was initiated by requests from Japan, Korea and Israel to export commercially produced fresh persimmon fruit to Australia for human consumption. Further details are provided in the “Proposal to import persimmons from Japan, Korea and Israel” section of this document.

STAGE 2: RISK ASSESSMENT

The process for pest risk assessment can be broadly divided into three steps:

- Pest categorisation
- Assessment of probability of entry, establishment or spread
- Consequences of entry, establishment or spread (including environmental consequences)
- Unrestricted risk

Pest categorisation

Pest categorisation is a process to examine whether each of the pests identified in Stage 1 meet the 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 categorisation of a pest as a quarantine pest includes the following primary elements:

- Identity of the pest
- Presence or absence in the endangered area
- Regulatory status
- Potential for establishment or spread in the PRA area
- Potential for consequences in the endangered area

Pest categorisation was carried out in two stages in this PRA.

In the first stage, a list of pests of persimmons in Japan, Korea and Israel was categorised according to the presence or absence of each pest in Australia, and the association of each pest with persimmon fruit. This step represents an assessment of the potential for entry of the identified pests.

In the second stage, each pest absent from Australia (or part(s) of Australia) and with potential for entry, was categorised 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. A summary of the results of pest categorisation is given in the “Pest Categorisation” section of this document.

Pests found to have potential for entry, establishment or spread and potential for consequences satisfy the criteria for a quarantine pest. Further background and methodology for the detailed assessments conducted on the quarantine pests is provided below.

Assessment of the probability of entry, establishment or spread

Details on assessing the ‘probability of entry’, ‘probability of establishment’ and ‘probability of spread after establishment’ of a pest are given in ISPM 11. Assessing the probability of entry requires an analysis of each of the pathways with which a pest may be associated, from its origin to its establishment in the PRA area. The assessment of the probability of establishment or spread is based primarily on biological considerations similar to those for entry.

Assessment of potential consequences

The basic requirements for the assessment of consequences are described in the SPS Agreement under Article 5.3 and Annex A. Further detail on assessing consequences is given in the “potential economic consequences” section of ISPM 11. This ISPM separates the consequences into “direct” and “indirect” and provides examples of factors to consider within each. In this PRA, the term “consequence” is used to reflect the “relevant economic factors”/“associated potential biological and economic consequences” and “potential economic consequences” terms as used in the SPS Agreement and ISPM 11, respectively.

The results of the assessments of the probability for entry, establishment or spread and potential consequences for quarantine pests is given in the “Risk Assessment” section of this document.

Unrestricted risk

The unrestricted risk estimate for each pest is determined by combining the overall estimate for ‘entry, establishment and spread potential’ with the overall expected consequence using a risk estimation matrix, as described in the *Draft Guidelines for Import Risk Analysis* – September 2001. The requirement for risk management is then determined by comparing the unrestricted risk estimate with Australia’s Appropriate Level of Protection (ALOP) i.e. “very low”.

STAGE 3: PEST RISK MANAGEMENT

Where the estimate of unrestricted risk does not exceed Australia’s ALOP, risk management is not required. Where the unrestricted estimate exceeds Australia’s ALOP, risk management measures are required to

reduce this risk to an acceptable level. ISPM 11 provides details on the identification and selection of appropriate risk management options.

Risk management measures are identified for each quarantine pest as required and are presented in the “Risk Management” section of this document. The proposed phytosanitary regulations based on these measures are presented in the “Draft Quarantine Conditions” section of this document.

PROPOSAL TO IMPORT PERSIMMONS FROM JAPAN, KOREA AND ISRAEL

BACKGROUND

On 16 March 2001, Biosecurity Australia advised stakeholders through Plant Biosecurity Policy Memorandum (PBPM) 2001/05 that Japan, Korea and Israel had requested access for fresh persimmon fruit into Australia. PBPM 2002/02 of 29 January 2002 informed stakeholders that Biosecurity Australia had commenced a generic IRA on the importation of persimmons.

The existing conditions for persimmons cover importation from the USA (California, Texas and Arizona only) and New Zealand. Following a preliminary assessment, Biosecurity Australia considered that the potential quarantine pests associated with persimmons from Japan, Korea and Israel do not pose significantly different risks or require significantly different management measures than those for which policy already exists. Therefore, Biosecurity Australia determined that the access request would be progressed as a review and extension of existing policy, rather than an IRA.

Biosecurity Australia advised the State Departments of Agriculture and stakeholders in May and June 2003, respectively, that access request for the importation of fresh persimmons from Japan, Korea and Israel would be considered as an extension of existing policy for persimmons from the USA (California, Arizona and Texas only) and New Zealand.

SCOPE

In this draft import policy, Biosecurity Australia has considered the pests associated with fresh persimmon fruit in Japan, Korea and Israel in accordance with ISPM No. 11 *Pest Risk Analysis for Quarantine Pests*.

Persimmon fruit is defined as fresh fruit (including the calyx) of *Diospyros kaki* L. of the family Ebenaceae that has been cultivated, harvested, packed and transported to Australia under commercial conditions from Japan, Korea or Israel.

AUSTRALIA'S CURRENT QUARANTINE POLICY FOR THE IMPORT OF FRESH PERSIMMON FRUIT

International quarantine policy

The existing conditions for fresh persimmons currently cover importation from the USA (California, Arizona and Texas only) and New Zealand. All imported consignments of persimmons are subject to existing condition C6000 'General Import requirements for all fruits and vegetables'. In addition to general requirements, each country has specific import conditions. Details of the importation requirements for fresh persimmon fruit are available on AQIS Import Condition database (ICON) at <http://www.aqis.gov.au/icon>. The specific import conditions for each exporting country are summarised as follows:

New Zealand

- Persimmon fruit from New Zealand must be pre-cleared to confirm freedom from identified actionable quarantine pests. Preclearance is a quarantine inspection conducted by AQIS before consignments are exported.
- Pre-cleared fruit from New Zealand will be identified by detailing the shipping container numbers and the MAF Tyden seal numbers or the aircraft flight numbers on the Phytosanitary Certificate.
- The Phytosanitary Certificate will be endorsed with the following statement:
"Produce as identified by the attached Declaration of Intention to Export, reference number has been pre-cleared in New Zealand"
- Pre-cleared fruit with the correct documentation shall not be subjected to inspection in Australia. Should any discrepancy be found, the produce must be detained and appropriate corrective action will be determined. Corrective action in Australia may include further inspection, treatment or re-shipping of the product.
- Non pre-cleared consignments from New Zealand shall be subject to inspection on arrival in Australia and subject to AQIS approved treatment if insects and other contaminants are found.

United States of America

- Entry is permitted from Arizona, California and Texas in the USA.
- Each consignment must be accompanied by a Phytosanitary Certificate endorsed:

"The fruit in this consignment was sourced and packed in (name of State) which is free of all economically significant fruit flies."

OR

"The fruit in this consignment was sourced and packed in (name of county) which is an area free of all economically significant fruit flies."

OR

"The fruit in this consignment was sourced and packed in (name of county) which is an area located in excess of 15 kilometres from any fruit fly declared areas."

- This area freedom certification must include the nominated county or state name.
- Insects and contaminants must be treated, removed or destroyed using an AQIS approved method.

THE FRESH PERSIMMON INDUSTRY

THE PERSIMMON INDUSTRY IN AUSTRALIA

Persimmons have been grown non-commercially in Australia since the 1850s. The first commercial planting of non-astringent persimmons, including the variety Fuyu, was in 1982/83 and the number of trees increased

from that date to 100 000 by 1990 (Paulin and Collins, 2000). By 1993 the total plantings of astringent and non-astringent varieties were 107 574 trees (Nissen *et al.*, 2000).

Non-astringent varieties currently dominate production and the main varieties grown are Fuyu, Izu, Jiro, Suruga and Gailey. Fuyu is the dominant variety and accounts for approximately 75% of production (Horticulture Australia, 2003). Total persimmon production by the industry is estimated to be greater than 2100 tons per year with an average yield of 15.8 tons per hectare of orchard (Nissen *et al.* 2000).

Persimmon production areas in Australia

Persimmon production occurs in five mainland states from the semi-tropical far north of Queensland through New South Wales to the cooler temperate zones of Victoria, South Australia and Western Australia (Nissen *et al.*, 2000). Queensland produces all four of the varieties produced in Australia, which are Izu, Fuyu, Jiro and Suruga. New South Wales produces Fuyu and Jiro; South Australia produces Izu, Fuyu and Suruga, as does Victoria and Western Australia produces the Fuyu variety only (Nissen *et al.*, 2000).

Harvesting periods for Australian persimmons

Persimmons are harvested from late February to early May in Queensland; from late April to mid June in New South Wales; from late March to early June in South Australia; from late April to early June in Victoria and in Western Australia persimmons are harvested from May to June (Nissen *et al.*, 2000).

Export of persimmons from Australia

The main export markets are Singapore, Thailand, Malaysia and Hong Kong. Singapore is the largest importer of Australian persimmons, accounting for approximately 70% of total exports (Anon, 2002).

THE PERSIMMON INDUSTRY IN JAPAN

Principal cultivars are Fuyu, Matsumotowase Fuyu, Jiro and Maekawa Jiro for the non-astringent types and Hiratanenashi, Tonewase and Hachiya for astringent types. Nishimurawase is the most popular among pollination-variant and non-astringent types (Yonemori, 1997). According to FAO (2002), persimmon fruit production in Japan in 2002 is 269, 300 tons.

Persimmon production areas in Japan

The primary production areas are Wakayama, Fukuoka, Nara and Gifu Prefectures, followed by Aichi, Ehime, Niigata and Yamagata Prefectures (Yonemori, 1997).

Harvesting periods for Japanese persimmons

The harvest season is from mid September to mid December and stored fruit is available for consumption and export until March (Collins *et al.*, 1993).

Exports of persimmons from Japan

In the past, most of the fruit produced in Japan was sold locally and small quantities were exported to South East Asia (Collins *et al.*, 1993). During 2001 Japan exported 535 tons of persimmon fruit (FAO, 2002).

THE PERSIMMON INDUSTRY IN KOREA

Korea is a major producer of persimmons and the non-astringent varieties account for 85% of total production (Collins *et al.*, 1993). Total production of persimmon fruit in 2002 was 270, 000 tons (FAO, 2002).

Persimmon production areas in Korea

Sweet persimmon is commercially grown in the southern part of Korea, especially in Gyung-sangnam-do Province, which produces almost 58% of total persimmon crop. Chanwon is the centre of persimmon production within Gyung-sangnam-do Province, occupying 9% of total sweet persimmon production area and producing 11% of the persimmon crop in Korea. Other major persimmon production areas are Gyung-sangbuk-do and Jeollanam-do (NPQS, 2003). Astringent persimmon production areas extend to the central part of the Korean peninsula (GARES, 2003).

Harvesting periods for Korean persimmons

In Korea, fresh persimmons are available fresh from October to November and stored persimmons are available from December until February (Mowat, 2003).

Exports of persimmons from Korea

Korea exports fresh persimmon fruit to South East Asian countries (GARES, 2003) and USA (USDA, 1997). According to FAO (2002), 6,257 tons of persimmon fruit were exported during 2001.

THE PERSIMMON INDUSTRY IN ISRAEL

The current dominant cultivar grown in Israel is the astringent “Triumph” which is marketed under the common name of Sharon fruit. Total production of persimmons in the year 2001/2002 was 20, 000 tons of which 7, 000 tons were exported (PPIS, 2002).

Persimmon production areas in Israel

Israel has an expanding persimmon industry with production areas throughout the country, but mostly centred in Northern and Western Galilee, Hula Valley, Coastal Plain, the Northern Negev and the Sharon region north of Tel Aviv (PPIS, 2002).

Harvesting periods for Israeli persimmons

The harvesting period for persimmons in Israel is from November to January (Collins *et al.* 1993).

Exports of persimmons from Israel

The export season for the persimmons is from November to mid-March (Collins *et al.* 1993). Israel exports persimmons to the Far East (Singapore, Hong Kong, Thailand, Malaysia, Western Europe (United Kingdom, Scandinavia, Netherlands, Belgium, France, Germany, Switzerland, Austria), Brazil, USA, Canada and South Africa. Israel has also requested access for persimmons to Chile and Japan (PPIS, 2002).

MOST EXPORT MARKETS DO NOT REQUIRE SPECIFIC DISINFESTATION TREATMENTS OTHER THAN ROUTINE BRUSHING IN RUNNING WATER, WITH NO CHEMICAL ADDITIVES. IN TRANSIT COLD TREATMENT IS REQUIRED FOR CURRENT EXPORTS TO USA AGAINST MEDITERRANEAN FRUIT FLY (PPIS, 2002).

PEST CATEGORISATION

Details of the first stage of pest categorisation for persimmon fruit from Japan, Korea and Israel are presented in Appendices 1 and 2. Appendix 1 lists all known pests (arthropods, nematodes and diseases) associated with persimmons in Japan, Korea and Israel, and categorises them based on their presence or absence in Australia. 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). Appendix 2 contains information on whether the potential quarantine pests occur on the pathway under consideration in this draft import policy (i.e. in association with fresh persimmon fruit).

Three sooty mould causing fungi (*Capnophaeum fuliginodes*, *Scorias communis* and *Tripospermum juglandis*) 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 2.

Twenty-six pests have been identified as quarantine pests of persimmon fruit from Japan, Korea and Israel and are listed below in Table 1.

Table 1. Quarantine pests for persimmons from Japan, Korea and Israel

Pest	Common Name	Distribution (within Japan, Korea and Israel)
ARTHROPODS		
<i>Aceria diospyri</i> Keifer ¹ [Acarina: Eriophyidae]	Persimmon bud mite	Japan
<i>Adris tyrannus amurensis</i> Staudinger ^{2,3} [Lepidoptera: Noctuidae]	Akebia leaf-like moth	Japan and Korea
<i>Ceratitis capitata</i> Wiedemann ⁵ [Diptera: Tephritidae]	Mediterranean fruit fly; medfly	Israel
<i>Ceroplastes floridensis</i> Comstock ⁵ [Hemiptera: Coccidae]	Florida wax scale	Japan, Korea and Israel
<i>Cryptoblabes gnidiella</i> (Millière) ⁴ [Lepidoptera: Pyralidae]	Pyralid moth, Honeydew moth	Israel
<i>Grapholita molesta</i> (Busck) ⁵ Syn = <i>Cydia molesta</i> (Busck) [Lepidoptera: Tortricidae]	Oriental fruit moth	Korea
<i>Homona magnanima</i> Diakonoff ² [Lepidoptera: Tortricidae]	Oriental tea tortrix	Japan
<i>Lagoptera juno</i> (Dalman) ^{2,3} [Lepidoptera: Noctuidae]	Rose of Sharon leaf-like moth; Fruit-piercing moth	Japan and Korea

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<i>Lepidosaphes conchiformioides</i> Borchsenius ³ [Hemiptera: Diaspididae]	Pear oystershell scale	Korea
<i>Lobesia botrana</i> (Denis and Schiffermuller) [Lepidoptera: Tortricidae]	Grapevine moth	Japan and Israel
<i>Lopholeucaspis japonica</i> (Cockerell) ^{2, 3} [Hemiptera: Diaspididae]	Japanese baton-shaped scale	Japan and Korea
<i>Nezara antennata</i> Scott ⁶ [Hemiptera: Pentatomidae]	Green stink bug	Korea
<i>Parlatoria pergandii</i> Comstock ⁵ [Hemiptera: Diaspididae]	Black parlatoria scale	Korea and Israel
<i>Phenacoccus aceris</i> (Signoret) ³ [Hemiptera: Pseudococcidae]	Apple mealybug	Korea
<i>Phenacoccus pergandei</i> Cockerell ² [Hemiptera: Pseudococcidae]	Persimmon long wooly scale	Japan and Korea
<i>Planococcus kraunhiae</i> (Kuwana) ³ [Hemiptera: Coccidae]	Japanese mealybug	Japan and Korea
<i>Ponticulothrips diospyrosi</i> Haga & Okajima ² [Thysanoptera: Phlaeothripidae]	Japanese gall forming thrips	Japan
<i>Pseudaonidia duplex</i> (Cockerell) ^{2, 3} [Hemiptera: Diaspididae]	Camphor scale	Japan and Korea
<i>Pseudaulacaspis pentagona</i> (Targioni- Tozzetti) ¹ [Hemiptera: Diaspididae]	Peach white scale	Korea and Israel
<i>Pseudococcus cryptus</i> Hempel [Hemiptera: Pseudococcidae]	Citriculus mealybug, cryptic mealybug	Israel
<i>Retithrips syriacus</i> (Mayet) [Thysanoptera: Thripidae]	Black vine thrips; castor thrips; grape thrips	Israel
<i>Sesamia nonagrioides</i> (Lefebvre) [Lepidoptera: Noctuidae]	Pink maize stalk borer	Israel
<i>Stathmopoda masinissa</i> Meyrick [Lepidoptera: Oecophoridae]	Persimmon fruit moth	Japan and Korea
<i>Tenuipalpus zhizhilashviliae</i> (Reck) [Acarina: Tenuipalpidae]	Persimmon false spider mite	Japan and Korea
PATHOGENS		
<i>Monilinia fructigena</i> Honey ³ [Leotiales: Sclerotiniaceae]	Brown rot	Japan, Korea and Israel

<i>Phoma kakivora</i> (Hara) ['mitosporic fungi': Coelomycetes]	Black spot	Japan
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1. Covered under existing policy for persimmons from New Zealand.
2. Covered under existing policy for Fuji apple from Japan.
3. Covered under existing policy for Korean pear from Korea.
4. Covered under existing policy for citrus from Egypt.
5. Covered under existing policy for persimmons from the USA.
6. Covered under the draft import risk analysis for longan and lychee from China and Thailand.

Nineteen of the 26 quarantine pests listed in Table 1 have been assessed in previous import policies and IRAs, as indicated in the footnote. The seven additional pests (six arthropods and one fungus) that have not been previously assessed have been categorised in this draft import policy according to their potential for entry, establishment or spread in the PRA area and potential for consequences. The results of this second stage of pest categorisation are provided below in Table 2. The pests assessed as having 'feasible' potential for establishment or spread in the PRA area and 'significant' potential for consequences were determined to be quarantine pests for Australia. Detailed risk assessments for these seven quarantine pests are provided in the next section of this document. Information on these pests is provided in the technical data sheets in Appendix 3.

Table 2. Potential for establishment and economic consequences for pests not assessed in previous policies or IRAs

Scientific name	Common name	Potential for establishment or spread in the PRA area	Potential for economic consequences	Consider further? (yes/no)	
ARTHROPODS					
<i>Lobesia botrana</i> (Denis and Schiffermuller) [Lepidoptera: Tortricidae]	Grapevine moth	Feasible	Polyphagous and adults are highly mobile (CABI, 2002)	Significant Causes significant yield losses in grapevine (CABI, 2002)	Yes
<i>Pseudococcus cryptus</i> Hempel [Hemiptera: Pseudococcidae]	Citriculus mealybug, cryptic mealybug	Feasible	Polyphagous (Ben-Dov, 1994) and young mealybugs usually settle under the calyx (Smith <i>et al</i> , 1997)	Significant Mealy bugs can directly damage fruit and also produce honeydew resulting in heavy growth of sooty mould (Smith <i>et al</i> , 1997)	Yes
<i>Retithrips syriacus</i> (Mayet) [Thysanoptera: Thripidae]	Black vine thrips; castor thrips; grape thrips	Feasible	Highly polyphagous (Rosales, 2000) Adults capable of flight.	Significant Feeds on and blemishes leaves and fruit skin of persimmons (Morton, 1987)	Yes
<i>Sesamia nonagrioides</i> (Lefebvre) [Lepidoptera: Noctuidae]	Pink maize stalk borer	Feasible	Moderate host range (CABI, 2002). Adapted to tropical and subtropical climates.	Significant Considered as a serious pest of maize (CABI, 2002)	Yes
<i>Stathmopoda masinissa</i> Meyrick [Lepidoptera: Oecophoridae]	Persimmon fruit moth	Feasible	Larvae are internal feeders on persimmon (MAFF, 1987).	Significant Considered to be a serious pest of persimmon (AQIS, 1997).	Yes
<i>Tenuipalpus zhizhilashviliae</i> (Reck) [Acarina: Tenuipalpidae]	Persimmon false spider mite	Feasible	<i>Tenuipalpus</i> spp. are widespread in Australia.	Significant Feeds directly on fruit, which causes superficial damage and may result in commercial losses.	Yes
PATHOGENS					
<i>Phoma kakivora</i> (Hara) [Mitosporic fungi: Coelomycetes]	Black spot	Feasible	Phoma spp. are widespread in Australia.	Significant Known to cause direct damage to persimmon fruit (Yamada, 1966).	Yes

RISK ASSESSMENTS FOR QUARANTINE PESTS

Detailed risk assessments were conducted for the seven quarantine pests identified in the pest categorisation stage that have not been assessed under previous policies or IRAs. Each risk assessment includes a summary of supporting evidence with each likelihood estimate. An unrestricted risk estimate has been determined for each of these quarantine pests and those with a risk estimate above Australia's ALOP have been identified. More detailed technical information used in the risk assessments is provided in the pest data sheets in Appendix 3.

Further risk assessments for the 19 pests that have been previously assessed are not required in this draft import policy, as the existing policies are applicable to persimmons.

Of those pests that have previously been assessed, on-arrival inspection is required under existing policies for 15 pests (*Adris tyrannus amurensis*, *Ceroplastes floridensis*, *Cryptoblabes gnidiella*, *Grapholita molesta*, *Homona magnanima*, *Lagoptera juno*, *Lepidosaphes conchiformioides*, *Lopholeucaspis japonica*, *Parlatoria pergandii*, *Phenacoccus aceris*, *Phenacoccus pergandei*, *Planococcus kraunhiae*, *Ponticulothrips diospyrosi*, *Pseudaonidia duplex* and *Pseudaulacaspis pentagon*). No risk management measures are required for *Nezara antennata*, or *Aceria diospyri* as their unrestricted risk estimates were determined to be below Australia's ALOP in the draft import risk analysis for longan and lychee from China and Thailand and the import policy for persimmons from New Zealand, respectively. The risk potential for *Ceratitis capitata* and *Monilinia fructigena* was assessed to be above Australia's ALOP. Therefore, additional phytosanitary measures are required for these potential quarantine pests. An expanded description of these two pests is provided below:

***Ceratitis capitata* (Medfly)**

Mediterranean fruit fly is widely recognised as an economically important pest that is present on almost every continent and causes damage to a wide range of hosts. Australia is free of *C. capitata* except in the state of Western Australia, where in certain areas it is under official control (De Lima, 1993). Adults lay eggs under the skin of host fruit and larvae are internal feeders. These eggs and larvae would be difficult to detect during routine inspection (Fimiani, 1989). Therefore, it is likely that Medfly would arrive in Australia in infested persimmon fruit. Furthermore, adults are strong fliers and are capable of independent dispersal to new host plants. Adults and larvae may also be distributed via transport of fruit and discarded waste. As described in earlier risk assessments (e.g. Netherlands truss tomatoes) this pest would likely be distributed if infested fruit were imported. *C. capitata* is likely to establish in Australia as it has a wide range of hosts, many of which are available within Australia. However, current official control measures (domestic regulations) would reduce the likelihood of spread via infested fruit. If introduced, Medfly may have significant implications for trade in a number of economically important crops to overseas markets. The unrestricted risk estimate for Medfly was determined to be medium in the policy for imports of persimmons from the USA.

***Monilinia fructigena* (brown rot)**

Monilinia fructigena infects a wide range of economically important crops, including apple, pear, persimmon, plum, quince and sweet cherry. On susceptible hosts, brown rot on ripening of mature fruit typically develops as a rapidly spreading firm and brown lesion. However, infection of fruits can take place at any stage during fruit development and produce visible symptoms (CAB International, 2002). Conidia of *M. fructigena* are transported to young fruit via wind, water and insects. Initial infection is always via wounds or sites of insect damage, but subsequent spread by contact between adjacent fruit is possible (Rekhviashvili, 1975). As described in earlier risk assessments (e.g. Discussion paper and phytosanitary requirements on pest risk analysis of the importation of Korean pear fruit from the Republic of Korea) this fungus has the ability to cause latent infection in fruit, and also to develop during storage and transport. Furthermore, *M. fructigena* is likely to establish in Australia due to its wide host range and the favourable environmental conditions in Australia. The highly infectious nature of *M. fructigena* means that it is likely to enter Australia as a result of trade in fresh persimmon fruit, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia. The disease caused by *M. fructigena* is known to cause significant losses in commercial fruit crops both before and after harvest (Batra, 1991), and if introduced, may have significant impacts on international trade for a number of economically important commodities to countries where this pathogen is not present. The unrestricted risk estimate for *M. fructigena* was determined to be high in the policy for imports of Korean pears from the Republic of Korea (AQIS, 1999).

RISK ASSESSMENTS FOR ADDITIONAL QUARANTINE PESTS

Arthropods

***Lobesia botrana* (Denis and Schiffermüller) (grapevine moth)**

Probability of importation

The likelihood that *Lobesia botrana* will arrive in Australia with the importation of fresh persimmon fruit: **Moderate.**

- *L. botrana* is most commonly associated with grapevines. Persimmons are listed as a secondary host (CABI, 2002).
- The larvae feed externally on fruit. Mature larvae grow to a length of 10-15mm (CABI, 2002), and therefore are likely to be detected on the surface of the fruit during standard packing and sorting procedures. However, it is possible that early developmental stages of the larvae may hide under the calyx and may not be detected.
- Other species of moths from the Tortricidae family have been intercepted on persimmon fruit imported from the USA and New Zealand.

Probability of distribution

The likelihood that *Lobesia botrana* will be distributed to the endangered area as a result of the processing, sale or disposal of fresh persimmon fruit: **High**.

- The pest is likely to survive storage and transportation. Temperature induced dormancy has been reported in egg and larval stages (Tzanakakis *et al.*, 1988) and the diapausing pupae are protected inside a cocoon and are more rigid (Torres-Vila *et al.*, 1996). Larvae have a considerable dispersal capacity and are able to reach reproductive organs of hosts (Torres-Vila *et al.*, 1997).
- Larvae may hide underneath the calyx and remain with the commodity during distribution via wholesale or retail trade.
- *L. botrana* has a wide host range so may readily disperse to suitable host plants in Australia.
- All stages of the vine moth survive in the environment for long periods.

Probability of entry

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

The overall probability of entry is determined by combining the likelihoods of importation and 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 *L. botrana* 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**.

- *L. botrana* is highly polyphagous (CAB International, 2002) and has a high reproductive rate. Reproduction is bisexual (production of fertilised eggs) with two to four generations per year. Females lay 300 or more eggs at a rate of more than 35 per day during their lifetime (Exosect, 2003).
- This pest has a wide host range, including many species that are common in Australia, such as berries, olives, grapes and a number of ornamental plants.
- Environmental conditions in Australia are likely to be suitable for the establishment of this pest.

Probability of spread

The likelihood that *L. botrana* 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**.

- Adult moths are highly mobile and able to rapidly move between host plants, which are widely present in Australia.
- Temperate regions of Australia would be suitable for the spread of this moth.
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment and spread

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

The probability of entry, establishment and spread is determined by combining the likelihoods of entry, establishment and 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 *L. botrana*: **Low.**

Criterion	Estimate
<i>Direct consequences</i>	
Plant life, health or welfare	C — Vine moth can cause direct and indirect harm to a wide range of plant hosts. Larvae feeding on fruit directly reduce yield and contaminate the crop. Indirect loss is by feeding larvae that creates infection sites for fruit rots and feeding by fruit flies.
Any other aspects of the environment	A — There are no known consequences of vine moths on other aspects of the environment.
<i>Indirect consequences</i>	
Eradication, control etc.	B — Programs to minimise the impact of this pest on host plants are likely to be costly and include chemical and cultural control.
Domestic trade	B — The presence of this pest in commercial production areas may have a significant effect at the local level due to any resulting interstate trade restrictions on a wide range of commodities. Such restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	C — The presence of this pest in commercial production areas of a wide range of commodities (e.g. stone fruit and grapes) may have a significant effect at the regional level due to any limitations to access to overseas markets where this pest is absent.
Environment	A — Although additional pesticides may be required to control vine moths 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 and spread with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis* – September 2001: **Low.**

***Pseudococcus cryptus* Hempel (cryptic mealybug)**

Probability of importation

The likelihood that mealybugs will arrive in Australia with the importation of fresh persimmon fruit: **High.**

- Mealybugs are known to be associated with the persimmon fruit pathway. For example, mealybugs have been intercepted on persimmon fruit imports from the USA and New Zealand.
- Mealybugs are sessile, small (1.5-4mm) and are often inconspicuous (Lim *et al.*, 1998). Persimmon fruit packed for export are likely to be infested by mealybugs, as they can remain hidden and anchored beneath the calyx.

Probability of distribution

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

- *P. cryptus* is likely to survive storage and transportation because mealybugs generally tolerate cold temperature and over-winter at various stages of growth. It takes 42 days storage at 0°C for complete mortality of *Pseudococcus affinis* (Hoy and Whiting, 1997).
- Mealybugs may enter the environment in two ways: adults may be discarded with persimmon skin, or crawlers may be blown by wind, or carried by other vectors, from persimmons up to the point of sale or after purchase by consumers. Long-range dispersal of these pests would require movement of adults and nymphs with vegetative material. Shorter-range dispersal would occur readily through the random movement of crawlers with wind currents or biological or mechanical vectors. Although mealybugs imported with fruit are likely to be at non-mobile stages, ants can transport them to suitable hosts.
- Mealybugs hidden under the calyx may remain with the commodity during distribution via wholesale or retail trade and with waste material. Mealybugs are protected underneath the calyx, so may survive longer in the environment and are likely to be transferred to a suitable host.

Probability of entry

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

The overall probability of entry is determined by combining the likelihoods of importation and 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 mealybugs will establish based on a comparative assessment of factors in the source and destination areas considered pertinent to the ability if the pest to survive and propagate: **High**.

- Mealybugs are highly polyphagous and host plants are common in Australia e.g. citrus, pineapple and mango. The skin of infested fruit is likely to be discarded, therefore this pest may survive and find suitable hosts especially in the warmer subtropical and tropical regions of Australia.
- Mealybugs have a high reproductive rate. Reproduction is bisexual (production of fertilised eggs) with two to eight generations per year. Females lay between 90-600 eggs during their lifetime. The eggs hatch in 6-14 days and the first instars or 'crawlers' disperse to suitable feeding sites on their hosts or new plants. Nymphs are active during the first instar stage and may travel some distance to a new plant where

they become sessile for the remaining nymphal (larval) instars. Adult females can live for several months and produce up to several hundred offspring. Adult males are short-lived.

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.

- Tropical or subtropical environments of Australia would be suitable for the spread of this mealybug because they are recorded from such environments.
- Adults and nymphs can be moved within and between plantations by the movement of equipment and personnel. Crawlers can be dispersed onto other plants up to several hundred yards by wind (Rohrbach *et al.*, 1988).
- The relevance of natural enemies is not known.

Probability of entry, establishment and spread

The overall likelihood that mealybugs will enter Australia as a result of trade in fresh persimmon fruit, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia:

Moderate.

The probability of entry, establishment and spread is determined by combining the likelihoods of entry, establishment and 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 mealybugs: **Low.**

Criterion	Estimate
<i>Direct consequences</i>	
Plant life, health or welfare	C — Mealybugs can cause direct harm to a wide range of host plants and have also been reported as disease vectors (Rohrbach <i>et al.</i> , 1988). Fruit quality can be reduced by the presence of secondary sooty mould. 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 — There are no known consequences of mealybugs on other aspects of the environment.
<i>Indirect consequences</i>	
Eradication, control etc.	B — Programs to minimise the impact of this pest on host plants is 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).
Domestic trade	B — The presence of this pest in commercial production areas can 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 this pest in commercial production areas of a wide range of commodities (e.g. citrus, mango) can have a significant effect at the local level due to any limitations to access to overseas markets where these pests are absent. This species is regarded as a significant quarantine threat to United States agriculture e.g. citrus (Miller <i>et al.</i> , 2002), and measures are required to manage the risk of introduction of this species into the United States.
Environment	A — Although additional pesticides may be required to control mealybugs 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 and spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis* – September 2001: **Low**.

***Retithrips syriacus* (Mayet) (black vine thrips)**

Probability of importation

The likelihood that *R. syriacus* will arrive in Australia with the importation of fresh persimmon fruit: **High**.

- *R. syriacus* is known to be associated with persimmon production in Israel (PPIS, 2002).
- Adults are black in colour and nymphs are red, with a yellow head and legs. Therefore, all stages of this pest would be visible on the surface of fruit. However, thrips are relatively small and may remain hidden under the calyx, making them difficult to remove or detect during routine packing and sorting procedures, especially at low population levels. Therefore, it is likely that this pest will be associated with fruit packed for export.
- Other thrips species have been intercepted on persimmon fruit imports from the USA and New Zealand.

Probability of distribution

The likelihood that *R. syriacus* will be distributed to the endangered area as a result of the processing, sale or disposal of fresh persimmons: **High**.

- The pest is likely to survive storage and transportation.
- Thrips hidden under the calyx may remain with the commodity during distribution via wholesale or retail trade and with waste material.
- All stages of grape thrips survive in the environment for some time and could be transferred to a susceptible host.

Probability of entry

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

The overall probability of entry is determined by combining the likelihoods of importation and 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 *R. syriacus* 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**.

- *R. syriacus* is polyphagous (Rosales, 2000) and host plants are common in Australia e.g. mangoes, grapevines and a number of ornamental plant species. The skin of infested fruit is likely to be discarded; therefore this pest may survive and find suitable hosts in Australia.
- *R. syriacus* has a high reproductive rate. On average, females lay around 50 to 80 eggs. Reproduction is mainly bisexual (production of fertilised eggs), but is sometimes parthenogenic. This thrips produces about seven generations a year.
- Existing control programs may not be effective for some hosts.

Probability of spread

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

- Adults are capable of flight, and adults and immature forms may spread undetected via the movement of fruit or infested vegetative host material.
- Temperate regions of Australia would be suitable for the spread of this moth.
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment and spread

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

The probability of entry, establishment and spread is determined by combining the likelihoods of entry, establishment and 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 *R. syriacus*: **Low**.

Criterion	Estimate
<i>Direct consequences</i>	
Plant life, health or welfare	C — This pest is capable of causing direct harm to a wide range of hosts and can vector diseases.

Any other aspects of the environment A — There are no known consequences of black vine thrips on other aspects of the environment.

Indirect consequences

Eradication, control etc. B — Programs to minimise the impact of this pest on host plants may be necessary. Existing control programs may 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).

Domestic trade B — The presence of this pest in commercial production areas may 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 this pest in commercial production areas of a wide range of commodities (e.g. stone fruit and grapes) may have a significant effect at the district level due to any limitations to access to overseas markets where this pest is absent.

Environment A — Although additional pesticides may be required to control black vine thrips 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 and spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis – September 2001*: **Low**.

***Sesamia nonagrioides* (Lefebvre) (pink maize stalk borer)**

Probability of importation

The likelihood that *S. nonagrioides* will arrive in Australia with the importation of fresh persimmon fruit: **Very low**.

- Persimmon orchards in Israel are rarely infested by *S. nonagrioides* (PPIS, 2002) and it has only been recorded once on persimmons in Israel (Wysoki and Madjar, 1986).
- On some non-Poaceous crops the larvae feed on flower buds, flowers and fruits as well as tunnelling in leaf and stem tissues (CAB International, 2002). It is very unlikely that fruit sent to be packed for export contain this pest; however there is a very low chance that larvae may hide beneath the calyx of persimmon fruit.
- Noctuidae moths are rarely intercepted on persimmon fruit imports from the USA and New Zealand.

Probability of distribution

The likelihood that *S. nonagrioides* will be distributed to the endangered area as a result of the processing, sale or disposal of fresh persimmon fruit: **Low**.

- Stalk borers may enter the environment directly from fruit at the point of sale or after hatching from pupae attached to the discarded persimmon fruit skin or calyx.

- On maize crops, eggs require a constant temperature of 25-26°C for 5-6 days to hatch. The newly hatched larvae often move by crawling over the soil. Fully grown larvae over winter in the stem bases of maize plants (CAB International, 2002).

Probability of entry

The likelihood that *S. nonagrioides* will enter Australia as a result of trade in fresh persimmon fruit, and be distributed to the endangered area: **Very low**.

The overall probability of entry is determined by combining the likelihoods of importation and 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 *S. nonagrioides* 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: **Low**.

- The host range of *S. nonagrioides* is mainly restricted to Poacea cereal crops.
- On maize plants, females may lay several hundred eggs. During the growing season, development is continuous, without diapause, and the number of adult generations is determined by climatic factors and the availability of sufficient food (Anglade, 1972). In Greece, Kavut (1987) reported that adults emerge over a period of 30-40 days and there were three generations a year on maize crop. The likelihood of sufficient numbers of insects reaching maturity to establish a population would be low.

Probability of spread:

The likelihood that *S. nonagrioides* 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 this stalk borer, because it is recorded mainly from these environments. This species has a medium host range and environmental conditions play an important role in the survival of this species.
- The movement of newly hatched larvae is often slow as they crawl over the soil.
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment and spread

The overall likelihood that *S. nonagrioides* will enter Australia as a result of trade in fresh persimmon fruit, 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 and spread is determined by combining the likelihoods of entry, establishment and 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 *S. nonagrioides*: **Very low.**

Criteria	Estimate
<i>Direct consequences</i>	
Plant health or welfare	B — <i>S. nonagrioides</i> mainly feeds on stems of maize but may occur on leaves and fruits of host plants. Persimmon has been recorded as a host only once in Israel. Fruit quality may be reduced by the damage caused by larval feeding.
Any other aspects of the environment	A — There are no known consequences of this pest on other aspects of the environment.
<i>Indirect consequences</i>	
Eradication, control etc	B — Programs to minimise the impact of this pest on host plants are likely to be costly and include pesticide applications, biological control and crop sanitation.
Domestic trade	A – Domestic trade restrictions are not anticipated. The presence of stalk borers on persimmon fruit or seeds of susceptible crops is not common.
International trade	A — Presence of this pest on persimmon fruit is not common. The presence of stalk borers on other crops would be unlikely to have a significant effect on trade.
Environment	A— Although additional pesticide applications would be required to control this pest 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 and spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis* – September 2001: **Negligible.**

***Stathmopoda masinissa* (Meyrick) (persimmon fruit moth)**

Probability of importation

The likelihood that persimmon fruit moth will arrive in Australia with the importation of fresh persimmon fruit: **High.**

- The larvae of *S. masinissa* are internal borers that enter fruit through the stalk or calyx (MAFF, 1987).
- In Korea, larval infestations of *S. masinissa* on persimmon are commonly recorded under the pedicel, in the pedicel and in the fruit (Bae, 1997). Mature larvae can also overwinter at the calyx basin of persimmon fruit (Li, 1999).
- As the larvae are present inside the fruit, it is unlikely that *S. masinissa* will be detected during sorting and packing procedures.

Probability of distribution

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

- Persimmon fruit moth can enter the environment through the larvae that are associated with infested fruit, pedicel and calyx.
- The commodity may be distributed throughout Australia for retail sale. Long-range dispersal of these pests would require movement of larvae on infested fruit, pedicel, calyx or vegetative waste. Short-range dispersal would occur readily through the movement of larvae or adult moths.
- The intended use of the commodity is human consumption but waste material would be generated.

Probability of entry

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

The overall probability of entry is determined by combining the likelihoods of importation and 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 persimmon fruit moth 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 *S. masinissa* is restricted to *Diospyros* spp and *Amaranthus* spp. Neither of these species is widely grown in Australia on a large scale.
- *S. masinissa* has a high reproductive rate and has two generations per year. Females lay between 20-150 eggs, with an average of 70 eggs per female.

Probability of spread

The likelihood that persimmon fruit moth 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**.

- Adult moths are highly mobile and are capable of independent dispersal. The main distribution method would be through infested fruit, pedicel and calyx.
- Temperate regions of Australia would be suitable for the spread of this moth.
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment and spread

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

The probability of entry, establishment and spread is determined by combining the likelihoods of entry, establishment and 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 persimmon fruit moth: **Low**.

Criteria	Estimate
<i>Direct consequences</i>	
Plant life, health or welfare	C – <i>S. masinissa</i> is recorded as capable of causing direct damage to persimmon fruit. The young larvae bore into fruit from fruit stalk or calyx (MAFF, 1987) and infestation rate of up to 22% was recorded in the fruit (Bae, 1997).
Any other aspects of the environment	A – There are no known consequences of this pest on other aspects of the environment.
<i>Indirect consequences</i>	
Eradication, control etc	B – Additional programs to minimise the impact of this pest on host plants may be necessary.
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 restrictions on persimmons. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment.
International trade	C – Persimmon fruit moth is considered to be a serious pest of persimmons. The presence of this pest in commercial production areas may have a significant effect at the district level due to any limitations to access to overseas markets where this pest is absent e.g. the USA and New Zealand.
Environment	A — Although additional pesticide applications would be required to control these pests 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 and spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis* – September 2001: **Low**.

***Tenuipalpus zhizhilashviliae* (Reck) (persimmon false spider mite)**

Probability of importation

The likelihood that false spider mite will arrive in Australia with the importation of fresh persimmon fruit: **Moderate**.

- In general, false spider mites tend to colonise lower stems and leaves first, moving up through the plant and eventually to the fruit, if present in large populations (USDA, 1997). Therefore, these mites are not commonly associated with the fruit of persimmon.
- If mites were present beneath the calyx, they would be difficult to detect or remove.
- Mites have been intercepted on imports of fresh persimmon fruit from the USA and New Zealand.

Probability of distribution

The likelihood that false spider mite will be distributed to the endangered area as a result of the processing, sale or disposal of fresh persimmon fruit: **Low**.

- Immature stages and adults may survive the storage and transport and be associated with infested waste.
- Mites are not mobile and are unable to enter the environment unaided and disperse to suitable hosts. Mites may only enter the environment in two ways: adults or immature stages may be blown by wind, or carried by other vectors, such as transport of persimmons and discarded waste.

Probability of entry

The likelihood that false spider mite will arrive in Australia as a result of trade in fresh persimmon fruit, and be distributed to the endangered area: **Low**.

The overall probability of entry is determined by combining the likelihoods of importation and 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 false spider mite 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: **Low**.

- The host range of *T. zhizhilashviliae* is extremely limited as this mite is only known to attack persimmons and grapes (Ghai and Shenhmar, 1984). Persimmons trees are not widely present in Australia on a large scale, so it is unlikely that this mite would find suitable hosts and establish in Australia.
- The reproductive rate of false spider mites is low compared to other mite species, with 4-6 generations per year (Baker and Bambara, 1997).

Probability of spread

The likelihood that false spider mite 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: **Low**.

- Mites are unable to spread unaided and long-range dispersal of this pest would require movement of immature stages or adults with vegetative material.
- At a local level, mites are mainly spread by wind. However, the narrow host range of these mites means that they are unlikely to be spread by wind to other suitable hosts.

- If established, suitable environmental conditions are available in Australia for the spread of this pest.
- The relevance of natural enemies in Australia is not known.

Probability of entry, establishment and spread

The overall likelihood that false spider mite will enter Australia as a result of trade in fresh persimmon fruit, 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 and spread is determined by combining the likelihoods of entry, establishment and 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 false spider mite: **Very low**.

Criterion	Estimate
<i>Direct consequences</i>	
Plant life, health or welfare	B — Persimmon false spider mites can cause direct harm to a narrow range of plant hosts. The genus <i>Tenuipalpus</i> has been reported as disease vectors. The extent of damage caused by <i>T. zhizhilashviliae</i> on persimmons is not known.
Any other aspects of the environment	A — There are no known consequences of this pest on other aspects of the environment.
<i>Indirect consequences</i>	
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 cultural control.
Domestic trade	A – Domestic trade restrictions are not anticipated. The presence of false spider mites on persimmon fruit is not common.
International trade	B –The presence of false spider mites on susceptible hosts can have a significant effect at the local level due to any limitations to access to overseas markets where <i>T. zhizhilashviliae</i> is absent. This pest has been classified as a quarantine pest on persimmon fruit from Korea into United States (USDA, 1997).
Environment	A — Although additional pesticide applications would be required to control this pest 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 and spread’ with the ‘consequences’ using the risk estimation matrix as outlined in the Biosecurity Australia publication *Guidelines for Import Risk Analysis* – September 2001: **Negligible**.

PATHOGENS

***Phoma kakivora* (Hara) (black spot)**

Probability of importation

The likelihood that black spot will arrive in Australia with the importation of fresh persimmon fruit: **Low**.

- Black spot disease typically occurs on the surface of the fruit, but may also be observed on the calyx and petiole, or on the leaf blade (Yamada, 1966). The disease is present as irregular black stains, approximately 10-15mm in diameter. Therefore, it is likely that this pathogen would be detected during packing and sorting procedures.
- This pathogen is not commonly reported on persimmon.

Probability of distribution

The likelihood that black spot will be distributed to the endangered area as a result of the processing, sale or disposal of fresh persimmon fruit: **Moderate**.

- Pycnidia and spores of *P. kakivora* are likely to survive transportation and storage.
- The commodity may be distributed throughout Australia for retail sale. The intended use of the commodity is human consumption but waste material would be generated. *P. kakivora* may enter the environment in two ways: pycnidia and pycnidiospores may be associated with discarded persimmon skin or they may be spread by water from persimmons at the point of sale or after purchase by consumers.

Probability of entry

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

The probability of entry is determined by combining the likelihoods of importation and 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 black spot 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: **Very low**.

- Persimmons are the only known hosts of *P. kakivora* and are not widely grown in Australia on a large scale. Therefore, it is unlikely that this pathogen will spread to a suitable host and establish in Australia. Susceptibility of persimmons to black spot disease varies in different varieties. In Kouchi Prefecture, the disease is known to cause most damage in Jiro fruit (up to 35%), and extremely little in Fuyu fruit (Yamada, 1966).
- Specific information with regard to the suitable environmental conditions for *P. kakivora* is not available, however various *Phoma* spp are recorded in Australia.

Probability of spread

The likelihood that black spot 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:

Very low.

- Long-range dispersal of *P. kakivora* would require movement of inoculum with fruit or leaves. Locally spores are mainly spread by water splashes. The likelihood of this pest reaching susceptible hosts is very low as *P. kakivora* has a very narrow host range and is known to infect only persimmons, which are not widely cultivated within Australia.

Probability of entry, establishment and spread

The overall likelihood that black spot will enter Australia as a result of trade in fresh persimmon fruit, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia:

Extremely low.

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

Unrestricted risk estimate

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

As the probability of entry, establishment and spread of black spot is extremely low, using the described methodology for risk assessments, the unrestricted risk estimate for this pathogen can not be above Australia’s ALOP. Therefore, it is not necessary to document the remainder of the assessment for this pathogen.

CONCLUSIONS: RISK ASSESSMENTS

Table 3 summarises the detailed risk assessments and provides unrestricted risk estimates for the quarantine pests considered to be associated with fresh persimmons from Japan, Korea and Israel.

Two arthropods (*Sesamia nonagrioides* and *Tenuipalpus zhizhilashviliae*) and one pathogen (*Phoma kakivora*) were assessed to have an unrestricted risk below Australia’s ALOP and do not require management measures.

Four arthropods (*Lobesia botrana*, *Retithrips syriacus*, *Pseudococcus cryptus* and *Stathmopoda masinissa*) were assessed to have an unrestricted risk estimate of low.

Table 4 provides the final list of quarantine pests (including those pests considered in earlier IRAs or AQIS pre IRA assessments) associated with fresh persimmons from Japan, Korea and Israel 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 3. Results of the risk assessments

Scientific Name	Common name	Probability of			Overall Probability of entry, establishment and spread	Consequences	Unrestricted Risk
		Entry	Establishment	Spread			
ARTHROPODS							
<i>Lobesia botrana</i> (Denis and Schiffermüller)	Grapevine moth	Moderate	High	High	Moderate	Low	Low
<i>Pseudococcus cryptus</i> Hempel	Cryptic mealy bug	Moderate	High	High	Moderate	Low	Low
<i>Retithrips syriacus</i> (Mayet)	Black vine thrips	High	High	High	High	Low	Low
<i>Sesamia nonagrioides</i> (Lefebvre)	Pink maize stalk borer	Very low	Low	Moderate	Very low	Very low	Negligible
<i>Stathmopoda masinissa</i> Meyrick	Persimmon fruit moth	High	Moderate	High	Moderate	Low	Low
<i>Tenuipalpus zhizhilashviliae</i> (Reck)	Persimmon false spider mite	Low	Low	Low	Very low	Very low	Negligible
PATHOGENS							
<i>Phoma kakivora</i> (Hara)	Black spot	Very low	Very low	Very low	Extremely low	N/A	Negligible

Table 4. Quarantine pests of fresh persimmon fruit from Japan, Korea and Israel assessed to have unrestricted risk estimates above Australia's ALOP and therefore require risk management measures

Pest	Common name
ARTHROPODS	
<i>Adris tyrannus amurensis</i> Staudinger ^{2, 3} [Lepidoptera: Noctuidae]	Akebia leaf-like moth
<i>Ceratitis capitata</i> Wiedemann ⁵ [Diptera: Tephritidae]	Mediterranean fruit fly; Medfly
<i>Ceroplastes floridensis</i> Comstock ⁵ [Hemiptera: Coccidae]	Florida wax scale
<i>Cryptoblabes gnidiella</i> (Millière) ⁴ [Lepidoptera: Pyralidae]	Pyralid moth, Honeydew moth
<i>Grapholita molesta</i> (Busck) ⁵ Syn = <i>Cydia molesta</i> (Busck) [Lepidoptera: Tortricidae]	Oriental fruit moth
<i>Homona magnanima</i> Diakonoff ² [Lepidoptera: Tortricidae]	Oriental tea tortrix
<i>Lagoptera juno</i> (Dalman) ^{2, 3} [Lepidoptera : Noctuidae]	Rose of Sharon leaf-like moth; Fruit-piercing moth
<i>Lepidosaphes conchiformioides</i> ³ Borchsenius [Hemiptera: Diaspididae]	Pear oystershell scale
<i>Lobesia botrana</i> (Denis and Schiffermüller) [Lepidoptera: Tortricidae]	Grapevine moth
<i>Lopholeucaspis japonica</i> (Cockerell) ^{2, 3} [Hemiptera: Diaspididae]	Japanese baton-shaped scale
<i>Parlatoria pergandii</i> Comstock ⁵ [Hemiptera: Diaspididae]	Black parlatoria scale
<i>Phenacoccus aceris</i> (Signoret) ³ [Hemiptera: Pseudococcidae]	Apple mealybug
<i>Phenacoccus pergandei</i> Cockerell ² [Hemiptera: Pseudococcidae]	Persimmon long wooly scale
<i>Planococcus kraunhiae</i> (Kuwana) ³ [Hemiptera: Pseudococcidae]	Japanese mealybug

Pest	Common name
<i>Ponticulothrips diospyrosi</i> Haga & Okajima ² [Thysanoptera: Phlaeothripidae]	Japanese gall forming thrips
<i>Pseudaonidia duplex</i> (Cockerell) ^{2, 3} [Hemiptera: Diaspididae]	Camphor scale
<i>Pseudaulacaspis pentagona</i> (Targioni-Tozzetti) ¹ [Hemiptera: Diaspididae]	Peach white scale
<i>Pseudococcus cryptus</i> Hempel [Hemiptera: Pseudococcidae]	Citriculus mealybug, cryptic mealybug
<i>Retithrips syriacus</i> (Mayet) [Thysanoptera: Thripidae]	Black vine thrips; castor thrips; grape thrips
<i>Stathmopoda masinissa</i> Meyrick [Lepidoptera: Oecophoridae]	Persimmon fruit moth
PATHOGENS	
<i>Monilinia fructigena</i> Honey ³ [Leotiales: Sclerotiniaceae]	Brown rot

1. Covered under existing policy for persimmons from New Zealand.
2. Covered under existing policy for Fuji apple from Japan.
3. Covered under existing policy for Korean pear from Korea.
4. Covered under existing policy for citrus from Egypt
5. Covered under existing policy for persimmons from the USA.

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 fresh persimmon fruit from Japan, Korea or Israel (i.e. fruit sourced from commercial production sites subjected to standard cultivation, harvesting and packing activities).

Biosecurity Australia considers that the risk management measures listed below are commensurate with the identified risks. These measures are based on the measures that are currently in place for the importation of fresh persimmons from New Zealand and the USA (California, Texas and Arizona only) and other existing policies, where relevant. For those pests that are not covered under existing policy, Biosecurity Australia has proposed measures that are appropriate to reduce the level of risk to below Australia's ALOP.

The measures described below will form the basis of listed import conditions for fresh persimmon fruit from Japan, Korea and Israel, which are detailed in the next section entitled "Draft Quarantine Conditions".

RISK MANAGEMENT MEASURES

There are five categories of measures listed to manage the risks identified in the pest risk assessment:

1. Pest free areas or cold disinfestation for the management of *Ceratitidis capitata* (Mediterranean fruit fly) for persimmons from Israel.
2. Pest free areas or methyl bromide fumigation for the management of *Stathmopoda masinissa* (persimmon fruit moth) for persimmons from Korea and Japan.
3. Export orchard surveillance and sanitation for freedom from *Monilinia fructigena* (brown rot) for persimmons from Japan, Korea and Israel.
4. Cleaning for the removal of mealybugs, scales and thrips.
5. Inspection for the management of leafrollers and moths.
6. Supporting operational maintenance systems and verification of phytosanitary status.

[1] Options for the management of Mediterranean fruit fly

Ceratitidis capitata (Mediterranean fruit fly/Medfly) has been assessed to have an unrestricted risk of moderate, and therefore, measures are required to manage that risk for persimmons from Israel.

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, Medfly may enter, establish and spread. Biosecurity Australia has identified the following two options to manage risks associated with Medfly: Option 1a - to source fruit from pest free areas or Option 1b – cold disinfestation

Draft import policy: Fresh persimmon fruit from Japan, Korea and Israel

treatment. Biosecurity Australia considers that either of these two measures is appropriate to reduce the risk associated with Medfly to very low, which is below Australia's ALOP.

[1a] Pest free areas (PFA)

To verify the maintenance of Medfly pest free status for fresh persimmon production areas, Israeli authorities must undertake on-going crop monitoring/ surveillance trapping. The NPPO is responsible to define a set of conditions to be met by producers to establish and maintain pest free areas for Medfly. The verification of pest free status must be done by NPPO personnel or by persons duly authorized by the NPPO, as defined by the International Standards for Phytosanitary Measures, Food & Agriculture Organization, publication No. 4 *Requirements for the establishment of pest free areas*.

Under the PFA option, if any live or dead Medfly is detected in consignments of fresh persimmon fruit, that consignment will be deemed non-compliant with the pest free area status. Exports to Australia will be suspended until Biosecurity Australia and Israeli authorities are satisfied that appropriate corrective action has been taken to re-instate the pest free area status for Medfly, or an alternative risk management measure has been developed and approved.

Biosecurity Australia/AQIS must be notified by Israeli authorities of any Medfly detections or changes in the status of Medfly in persimmon orchards in Israel.

This measure is consistent with the existing policy for the import of fresh persimmon fruit from the USA, where pest free areas have been established for the States of California, Texas and Arizona.

[1b]: Cold disinfestation treatment

For persimmons, the USDA treatment schedule *T107-a Cold treatment* against Medfly (USDA, 2003) is as follows:

<u>Temperature</u>	<u>Exposure Period</u>
1.11°C (34°F) or below	14 days
1.67°C (35°F) or below	16 days
2.2°C (36°F) or below	18 days

This treatment schedule is approved by the USDA for disinfestation of *C. capitata* in persimmon fruit imported into the USA from Israel. The Israeli authorities have informed Biosecurity Australia that standard post-harvest storage for persimmon fruit is at -0.5 - 0°C, followed by approximately 14 days of intransit cold treatment at 0.5 to 1.5°C.

Biosecurity Australia proposes the option of pre-shipment/intransit cold treatment as specified by the USDA in treatment schedule T107a for persimmon fruit to manage the risk of Medfly.

[2] Options for the management of persimmon fruit moth

Stathmopoda masinissa (persimmon fruit moth) has been assessed to have an unrestricted risk of low, and therefore, measures are required to manage that risk for persimmons from Japan and Korea.

Larvae of persimmon fruit moth feed on flower pods, pedicels, calyces and within fruit of persimmon. Visual inspection alone is not considered to be an appropriate risk management option as the larvae feed internally. If infested fruit was not detected at inspection, persimmon fruit moth may enter, establish and spread. Identified options to manage risks associated with persimmon fruit moth are either by sourcing fruit from pest free areas or by the use of disinfestation treatments. Biosecurity Australia considers that either of these two measures is appropriate to reduce the risk associated with persimmon fruit moth to very low, which is below Australia's ALOP.

[2a]: Pest free areas

The NPPO is responsible to define a set of conditions to be met by producers to establish and maintain pest free areas for *S. masinissa*. The verification of pest free status must be done by NPPO personnel or by persons duly authorized by the NPPO, as defined by the ISPM No. 4 *Requirements for the establishment of pest free areas*, or ISPM No. 10 *Requirements for the establishment of pest free places of production and pest free production sites*.

Under the PFA option, if any live or dead persimmon fruit moth is detected in consignments of fresh persimmon fruit, that consignment will be deemed non-compliant with the pest free area status. Exports to Australia will be suspended until Biosecurity Australia and Japanese or Korean authorities are satisfied that appropriate corrective action has been taken to re-instate the pest free area status for persimmon fruit moth, or an alternative risk management measure has been developed and approved.

[2b]: Pre-shipment methyl bromide fumigation

Japan has conducted large-scale trials and confirmed the efficacy of methyl bromide fumigation for the management of *S. masinissa* in persimmon fruit (Matsuoka *et al*, 2001) for export to the USA. Based on the Japanese efficacy data, fumigation should be carried out for a duration of 2 hours according to the specifications below:

48g/m³ for 2hrs at a fruit pulp temperature of 15°C.

The loading ratio should not exceed 50% of the chamber volume.

[3] Export orchard surveillance and sanitation for freedom from brown rot

Monilinia fructigena (brown rot) has been assessed to have an unrestricted risk of low, and measures are therefore required to manage that risk for fresh persimmons from Japan, Korea and Israel.

M. fructigena affects blossoms, shoots, branches and fruit. The fungus over winters on peduncles, mummified fruit and twigs. It usually gains entry to the fruit through wounds, causing soft decay of the flesh. The disease occurs primarily on fruit in orchards that have blossom or shoot infection, and more often on mature fruit that have some damage. The disease may continue to develop after the fruit is in storage or in the market (Biosecurity Australia, 2003).

Current management measures in place for brown rot of pome fruit from Japan, Korea and China (Biosecurity Australia, 2003) can be applied to persimmons. Biosecurity Australia considers that

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these measures are appropriate to reduce the risk associated with brown rot to very low, which is below Australia's ALOP. These measures are:

- Fruit must be sourced only from registered orchards in designated export area.
- Fruit must be packed in registered packing houses.
- Detection/monitoring surveys for brown rot must be conducted by the NPPO in export orchards. The NPPO must submit the results to Biosecurity Australia, using an agreed reporting format.
- The NPPO must inspect all export orchards and a sample of non-export orchards, both inside and outside the designated export area during orchard inspection, and must monitor the levels of pests of concern. If brown rot is detected in any designated export area, fruit from that export area will not be permitted entry into Australia.
- Field sanitation measures in export orchards to reduce the incidence of brown rot.
- Export fruit free from disease symptoms during pre-export inspection by the NPPO and on-arrival inspection by AQIS.
- The NPPO must notify Biosecurity Australia if disease status changes or unusual weather conditions that give rise to conducive conditions for disease development to occur.

[4] Cleaning for the removal of mealybugs, scales and thrips

Mealybugs, scales and thrips have been assessed to have an unrestricted risk estimate above Australia's ALOP, and measures are therefore required to manage that risk. As these pests can hide underneath the fruit calyx, visual inspection alone is not considered to be an appropriate risk management option. If infested fruit was not detected at inspection, these pests may enter, establish and spread. Cleaning is proposed as a phytosanitary risk management measure for mealybugs, scales and thrips. Biosecurity Australia considers that this measure is appropriate to reduce the risk associated with mealybugs, scales and thrips to very low, which is below Australia's ALOP.

All fruit is to be cleaned of mealybugs, scales and thrips on the surface and underneath the calyx using any physical or mechanical means, such as high-pressure air/water blast or other equivalent measures. This must be completed in packinghouses that are registered and audited by the NPPO (refer to measure 6b).

[5] Inspection for the management of leafrollers and moths

Biosecurity Australia considers that targeted visual inspection for freedom from leafrollers and moths (other than persimmon fruit moth) is considered to be an appropriate measure to reduce the risk associated with leafrollers and moths to very low, which is below Australia's ALOP. If infested fruit was not inspected, these pests may enter, establish and spread.

Sheltered sites such as the calyx and any indented areas are to be inspected carefully. During inspection, the produce is to be examined directly with a lens or binocular microscope, or any pests or debris may be brushed onto a white sheet of paper for inspection under a lens or microscope.

This phytosanitary measure is based on the current risk management measures for persimmons from New Zealand and the USA.

[6] Supporting operational maintenance and verification of phytosanitary status

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

The proposed system of operational procedures for the production and export of fresh persimmons to Australia from Japan, Korea and Israel consist of:

- 6a. Registration of orchards in designated export areas;
- 6b. Registration of pack houses and auditing of procedures;
- 6c. Packaging and labelling compliance;
- 6d. Pre-export inspection by NPPO;
- 6e. Phytosanitary certification by NPPO;
- 6f. Storage and movement; and
- 6g. On-arrival phytosanitary inspection by AQIS.

[6a] Registration of export orchards

All persimmons for export to Australia must be sourced from export orchards registered with Japan's, Korea's, or Israel's NPPO prior to the commencement of exports. Copies of the registration records must be made available to AQIS upon request. The NPPO is required to register export orchards prior to commencement of exports.

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

[6b] Registration of packing houses and auditing of procedures

All packinghouses intending to export persimmon fruit to Australia must be registered with the NPPO.

The cleaning for removal of mealybugs, scales and thrips is to be done within the registered packinghouses in Japan, Korea and Israel.

If cold treatment is used for disinfestation of fruit flies, it is to be done within the registered packinghouses in Israel. Copies of the registration records for cold treatment in Israel must be provided to AQIS.

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 the NPPO and

provided to AQIS prior to exports commencing with updates provided if packinghouses are added or removed from the list.

If methyl bromide fumigation is used for the treatment of persimmon fruit moth, export fumigation facilities must be registered with the NPPO prior to commencement of exports. Facilities for methyl bromide fumigation in Japan and Korea are to comply with the relevant AQIS standards.

Registration of orchards, packinghouses and fumigation facilities is to include an audit program by the NPPO. An audit is to be conducted prior to registration and then done at least annually. Records of audits conducted by NPPO on pack houses should be available for review by AQIS as required.

The objective of this procedure is to ensure that packinghouses and fumigation facilities at which treatment procedures are carried out can be identified. This is to allow trace-back to individual orchards, packinghouses and fumigation facilities in the event of non-compliance and audit.

[6c] Packaging and labelling

All packages of persimmons 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 material but excludes the persimmon calyx.

Inspected and treated fruit would be required to be packed in new boxes. Packing material would be synthetic or be 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 persimmon 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 postharvest 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 persimmon fruit exported to Australia are 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 persimmon) is not imported with persimmons.
- The packaged persimmon fruit are labelled in such a way to identify the orchard and packinghouse (see measures 5a,b).

[6d] Pre-export inspection by NPPO

The NPPO will inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and trash using sampling rates developed by the NPPO in consultation with Biosecurity Australia/AQIS. Sheltered sites such as the calyx and any indented areas are to be inspected carefully.

The objective of this procedure is to ensure that persimmon 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.

Records of the interceptions made during these inspections (live or dead quarantine pests and trash) are to be maintained by the NPPO 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.

[6e] Phytosanitary certification by NPPO

The NPPO is required to issue a Phytosanitary Certificate for each consignment upon completion of pre-shipment phytosanitary inspection and treatment. The objective of this procedure is to provide formal documentation to AQIS verifying that the relevant measures have been done off-shore. Each Phytosanitary Certificate is to contain the following information:

Additional declarations

“The persimmons in this consignment have been produced in <<Japan/Korea/Israel>> in accordance with the conditions governing entry of fresh persimmon fruit to Australia and inspected and found to be free of quarantine pests”.

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 cleaning method, cold treatment (i.e. temperature, duration and packinghouse number) and methyl bromide fumigation (i.e. dosage, duration, fruit temperature, date and fumigation facility number), where relevant.

A consignment is the quantity of persimmon fruits covered by one Phytosanitary Certificate that arrives at one port in one shipment. All consignments would need to be shipped directly from one port or city in Japan, Korea or Israel to a designated port or city in Australia.

[6f] 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 NPPO must 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.

[6g] On-arrival phytosanitary inspection 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% of infestation in the consignment.

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

Where consignments are found to be non-compliant with requirements on-arrival, 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 Japanese, Korean or Israeli persimmon risk management systems. The program will continue only after Biosecurity Australia/AQIS is satisfied that appropriate corrective action has been taken.

Uncategorised pests

If an organism is detected on fresh persimmons from Japan, Korea or Israel 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 QUARANTINE CONDITIONS

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

- Import Condition 1. Registration of export orchards (links with risk management measures 1a, 2a, 3, 6a)
- Import Condition 2. Registration of packinghouses and auditing of procedures (6b)
- Import condition 3. Pest free area (PFA) for Medfly (1a)
- Import Condition 4. Pre-shipment/intransit cold disinfestation treatment for Medfly (1b)
- Import condition 5. Pest free areas of production for persimmon fruit moth (2a)
- Import Condition 6. Pre-shipment methyl bromide fumigation for persimmon fruit moth (2b)
- Import Condition 7. Export orchard surveillance and sanitation for brown rot (3)
- Import Condition 8. Cleaning for the removal of mealybugs, scales and thrips (4)
- Import Condition 9. Inspection for freedom from leafrollers and moths (5)
- Import Condition 10. Packing and labelling (6c)
- Import Condition 11. Pre-export phytosanitary inspection by the NPPO (3, 5, 6d)
- Import Condition 12. Phytosanitary certification by the NPPO (6e)
- Import Condition 13. Storage and movement (6f)
- Import Condition 14. On-arrival quarantine clearance by AQIS (6g)
- Import Condition 15. Review of policy

IMPORT CONDITION 1. REGISTRATION OF EXPORT ORCHARDS

All persimmon fruit for export to Australia must be sourced from export orchards registered with Japan, Korea or Israel's NPPO. Copies of the registration records must be made available to AQIS upon request. The NPPO is required to register all export orchards and growers prior to commencement of exports.

IMPORT CONDITION 2. REGISTRATION OF PACKINGHOUSES AND AUDITING OF PROCEDURES

All packinghouses intending to export persimmon fruit to Australia need to be registered with the NPPO.

The cleaning for removal of mealybugs, scales and thrips is to be done within the registered packinghouses.

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If cold treatment is used for disinfestation of fruit flies, it is to be done within the registered packinghouses in Israel. Copies of the registration records for cold treatment in Israel must be provided to AQIS.

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 the NPPO and provided to AQIS prior to exports commencing with updates provided if packinghouses are added or removed from the list.

If methyl bromide fumigation is used for the treatment of persimmon fruit moth, export fumigation facilities must be registered with the NPPO prior to commencement of exports. Facilities for methyl bromide fumigation in Japan and Korea are to comply with the relevant AQIS standards.

Registration of orchards, packinghouses and fumigation facilities is to include an audit program by the NPPO. An audit is to be conducted prior to registration and then done at least annually. Records of audits conducted by NPPO on packhouses should be available for review by AQIS as required.

IMPORT CONDITION 3. PEST FREE AREA (PFA) FOR MEDFLY

If the option of establishing a pest free area for Medfly is adopted by Israel, technical information including trapping and monitoring data, and regulatory procedures to justify maintenance of Israel's Medfly pest free status for fresh persimmon production areas must be provided to Biosecurity Australia/AQIS for consideration.

IMPORT CONDITION 4. PRE-SHIPMENT/INTRANSIT COLD DISINFESTATION TREATMENT FOR MEDFLY

If the cold disinfestation treatment option is to be adopted for Medfly disinfestation by Israel, the following procedure must be followed:

Medfly disinfestation only:

<u>Temperature</u>	<u>Exposure Period</u>
1.11°C (34°F) or below	14 days
1.67°C (35°F) or below	16 days
2.2°C (36°F) or below	18 days

The pulp of the fruit must be at or below the indicated temperature at time of beginning treatment. Cold treatment may be conducted in Israel in cold disinfestation facilities that are registered with and audited by the NPPO, or in transit in containers designated by the NPPO for such purposes.

Temperature values would need to be recorded to standards agreed between the NPPO and AQIS and monitored by the NPPO.

IMPORT CONDITION 5. PEST FREE AREA FOR PERSIMMON FRUIT MOTH

If the option of establishing a pest free area for persimmon fruit moth is adopted by Japan and/or Korea, technical information including monitoring and surveillance data, and regulatory procedures to justify maintenance of pest free status for fresh persimmon production areas must be provided to Biosecurity Australia/AQIS for consideration.

IMPORT CONDITION 6. PRE-SHIPMENT METHYL BROMIDE FUMIGATION FOR PERSIMMON FRUIT MOTH

If the methyl bromide fumigation option is to be adopted for disinfestation of *Stathmopoda masinissa* (persimmon fruit moth) by Japan or Korea, the following procedure must be followed:

Persimmon fruit moth disinfestation only:

48g/m³ for 2hrs at a fruit pulp temperature of 15°C.

The loading ratio should not exceed 50% of the chamber volume.

All fumigations must be supervised by NPPO.

All fumigation facilities for disinfestation of persimmon fruit moth must be registered with NPPO and would need to comply with NPPO standards for export grade facilities. These facilities must undergo fumigation testing to ensure that the chambers can deliver and maintain methyl bromide fumigation in accordance with the applicable NPPO standards. Records of chamber testing must be made available to AQIS if required.

IMPORT CONDITION 7. EXPORT ORCHARD SURVEILLANCE AND SANITATION FOR BROWN ROT

The NPPO in Japan, Korea and Israel must ensure that registered export orchards are subject to orchard sanitation and control measures against *Monilinia fructigena* (brown rot). The following procedures must be undertaken by all export orchards:

- Fruit must be sourced only from registered orchards in designated export area.
- Fruit must be packed in registered packing houses.
- Detection/monitoring surveys for brown rot must be conducted by the NPPO in export orchards. The NPPO must submit the results to Biosecurity Australia, using an agreed reporting format.
- The NPPO must inspect all export orchards and a sample of non-export orchards, both inside and outside the designated export area during orchard inspection, and must monitor the levels of pests of concern. If brown rot is detected in any designated export area, fruit from that export area will not be permitted entry into Australia. NPPOs will be required to notify Biosecurity Australia of any detection of brown rot in export orchards and any measures taken to control the outbreaks.
- Field sanitation measures in export orchards to reduce the incidence of brown rot.

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- Export fruit free from disease symptoms during pre-export inspection by the NPPO and on-arrival inspection by AQIS. If brown rot is detected, consignments will be rejected for export to Australia.
- The NPPO must notify Biosecurity Australia if disease status changes or unusual weather conditions that give rise to conducive conditions for disease development to occur.

IMPORT CONDITION 8. CLEANING FOR THE REMOVAL OF MEALYBUGS, SCALES AND THRIPS

All fruit is to be cleaned of mealybugs, scales and thrips on the surface and underneath the calyx using any physical or mechanical means, such as high pressure air/water blast or other equivalent measures. This must be completed in packinghouses that are registered and audited by the NPPO.

IMPORT CONDITION 9. INSPECTION FOR FREEDOM FROM LEAFROLLERS AND MOTHS

All fruit is to be inspected by NPPO and found free from leafrollers and moths (other than persimmon fruit moth) on the surface of the fruit and calyx. Inspection must be completed in packinghouses that are registered with and audited by the NPPO.

Sheltered sites such as the calyx and any indented areas are to be inspected carefully. During inspection, the produce is to be examined directly with a lens or binocular microscope, or any pests or debris may be brushed onto a white sheet of paper for inspection under a lens or microscope.

IMPORT CONDITION 10. PACKING AND LABELLING

All packages of persimmon fruit for export must be free from contaminated plant materials 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 persimmon calyx.

Inspected and treated fruit must be packed in new cartons. Packing material would be synthetic or 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 persimmon fruit must comply with the AQIS conditions (e.g. those in "Cargo containers: Quarantine aspects and procedures" (AQIS, 2003)).

All boxes should 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 11. PRE-EXPORT PHYTOSANITARY INSPECTION BY NPPO

The NPPO will inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and trash using sampling procedures developed by the NPPO in consultation with Biosecurity Australia/AQIS. Sheltered sites such as the calyx and any indented areas are to be inspected carefully.

The inspection procedure would ensure that fresh persimmon 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, and is clean on the surface and underneath the calyx.

Consignments that do not comply with the above requirements will be rejected for export to Australia.

Records of the interceptions made during these inspections (live or dead quarantine pests, and trash) are to be maintained by NPPO 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 12. PHYTOSANITARY CERTIFICATION BY NPPO

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

Additional declarations

- For Japan, Korea and Israel

“The persimmons in this consignment have been produced in <<Japan/Korea/Israel>> in accordance with the conditions governing entry of fresh persimmon fruit to Australia and inspected and found to be free of quarantine pests”.

- For Israel, if the option of area of freedom for *Ceratitis capitata* (Medfly) is adopted, following declaration is required:

*"The fruit in this consignment was sourced and packed in <<name of area>> which is an area free of *Ceratitis capitata* (Medfly)".*

OR

- *"The fruit in this consignment was sourced and packed in <<name of area>> which is an area located in excess of 15 kilometres from any *Ceratitis capitata* (Medfly) declared areas."*

- For Japan and Korea, if the option of pest free area for *Stathmopoda masinissa* is adopted, following declaration is required:

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*“The fruit in this consignment was sourced and packed in <<name of area>> which is a pest free area for *Stathmopoda masinissa* (persimmon fruit moth)”.*

Distinguishing marks

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

A consignment is the quantity of persimmon fruit covered by one Phytosanitary Certificate that arrives at one port in one shipment. All consignments would need to be shipped directly from one port or city in Japan, Korea or Israel to a designated port or city in Australia.

Treatment

- For Israel, if the option of post harvest cold disinfestation treatment for *Ceratitis capitata* (Medfly) is adopted, the following declaration is required:

*“The fruit in this consignment has been cold treated for disinfestation of *Ceratitis capitata* (Medfly).”*

- For Japan and Korea, if the option of disinfestation of harvested fruit by fumigation for *Stathmopoda masinissa* (persimmon fruit moth) is adopted, the following declaration is required:

*“The fruit in this consignment has been fumigated with methyl bromide for disinfestation of *Stathmopoda masinissa* (persimmon fruit moth).”*

- For Japan, Korea and Israel, the following declaration is required:

“The fruit in this consignment has been cleaned using <<specify procedure>>.”

IMPORT CONDITION 13. 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 NPPO must be maintained in secure conditions that will prevent mixing with fruit for export to other destinations. This could 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 low temperature cold storage before loading into a shipping container. Alternatively, packed fruit must be directly transferred at the packinghouse into a shipping container, which would be sealed and not opened until the container reached Australia.

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

IMPORT CONDITION 14. 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 persimmon is given below.

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

Unit = one individual persimmon fruit

Where consignments are found to be non-compliant with requirements on-arrival, 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 Japan or Korea or Israel persimmon risk management systems. The program will continue only after Biosecurity Australia/AQIS is satisfied that appropriate corrective action has been taken.

Uncategorised pests

If an organism that is detected on persimmons from Japan, Korea or Israel that has not been categorised, it will require assessment to determine its quarantine status and if phytosanitary action is required. The detection of any live 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 15. 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 import policy are based on a comprehensive analysis of relevant scientific literature and existing import requirements for persimmons 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.

REFERENCES

- Anglade, P. (1972). Les Sesamias. In: Balachowsky AS, (ed. *Entomologie appliquée a l'agriculture*. Tome II Lépidoptères, Vol. 2. Masson, Paris, pp. 1389-1398.
- Anon. (2002). The Australian Persimmon Export Company Pty Ltd.
<http://www.sweetgold.com.au/>
- AQIS (1997). Discussion Paper and Phytosanitary Requirements on Pest Risk Analysis of the Importation of Korean Pear Fruit from the Republic of Korea. Australian Quarantine and Inspection Service, Canberra.
- AQIS (1998). Final Import Risk Analysis of the Importation of Fruit of Fuji Apple (*Malus pumila* Miller var. *domestica* Schneider) from Aomori Prefecture in Japan. Australian Quarantine and Inspection Service, Canberra.
- AQIS (1999). Final Import Risk Analysis on the Importation of Fresh Fruit of Korean pear (*Pyrus ussuriensis* var. T. Lee) from the Republic of Korea. Australian Quarantine and Inspection Service, Canberra.
- AQIS. (2003). Australian Quarantine and Inspection Service Import Conditions Database.
<http://www.aqis.gov.au/ICON>. Australian Quarantine and Inspection Service, Canberra.
- Bae, S.D. (1997). Comparison in damaged aspect of wild persimmon fruit by second-generation larva of persimmon fruit moth, *Stathmopoda masinissa* Meyrick. *RDA Journal of Crop Protection* 39 (2): 57-60.
- Baker, J.R. and Bambara, S. (1997). False Spider Mites. North Carolina State University, North Carolina Extension Services, Department of Entomology Insect Note.
<http://www.ces.ncsu.edu/depts/ent/notes/O&T/flowers/note47.html>
- Ben-Dov, Y. (1994). A Systematic Catalogue of the Mealybugs of the World (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with Data on Geographical Distribution, Host Plants, Biology and Economic Importance. Intercept Limited, Andover, UK, 686 pp.
- Biosecurity Australia (2003). Longan and Lychee Fruit from the People's Republic of China and Thailand – Draft Import Risk Analysis Report. Biosecurity Australia, Canberra.
- Biosecurity Australia (2003). Review of the Australian Requirement for Petal Testing and Flower Cluster Examination at Blossoming for Pome Fruit from Japan, The Republic of Korea and The People's Republic of China. Biosecurity Australia, Canberra, 76pp.

Draft import policy: Fresh persimmon fruit from Japan, Korea and Israel

- CAB International. (2002). *Crop Protection Compendium*, 2002 Edition. CAB International, Wallingford, UK.
- Collins, R. J., George, A. P. and Mowat, A. D. (1993). HortResearch Publication - The World Trade in Persimmons. <http://www.hortnet.co.nz/publications/science/pers15.htm>
- de Lima, F., Woods, W. and Broughton, S. (1993). Control of Mediterranean Fruit Fly (Medfly) in Backyards. Department of Agriculture Western Australia. Farmnote No. 4/93. Agdex 201/622.
- Exosect (2003). Grape Moths. http://www.exosect.com/solutions/pests/grape_moth.asp.
- FAO (1996). Guidelines for Pest Risk Analysis. ISPM Pub. No. 2, FAO, Rome.
- FAO (2001). Pest Risk Analysis for Quarantine Pests. ISPM Pub.NO. 11, FAO, Rome.
- FAO (2002). Food and Agriculture Organisation of the United Nations, FAOSTAT, FAO Statistical Databases, http://www.fao.org/waicent/portal/statistics_en.asp
- Fimani, P. (1989). Mediterranean Region. pp 39-50. In: Robinson, A.S. and Hoper, G. (eds) Fruit Flies their Biology, Natural Enemies and Control. World Crop Pests Volume 3A. Elsevier, Amsterdam.
- GARES (2003). Research Outline of Sweet Persimmon Experiment Station. Sweet Persimmon Experiment Station, Gyongnam Agricultural Research and Extension Services, Korea.
- Ghai, S. and Shenhmar, M. (1984). A review of the world fauna of Tenuipalpidae (Acarina: Tetranychoida). *Oriental insects* 18: 99-172.
- Horticulture Australia (2003). Industry Profiles – Persimmon. <http://www.horticulture.com.au/aboutus/profiles3.cfm#24>
- Hoy, L.E. and Whiting, D.C. (1997). Low-temperature storage as a postharvest treatment to control *Pseudococcus affinis* (Homoptera: Pseudococcidae) on Royal Gala apples. *Journal of Economic Entomology* 90(5): 1377-1381.
- Kavut, H. (1987). Some biological findings relating to the control of maize stalk borer (*Sesamia nonagrioides* Lef. Lepidoptera: Noctuidae) causing damage in maize fields in the Aegean Region. *Turkiye I. Entomoloji Kongresi Bildirileri*, 13-16 Ekim 1987, Ege Universitesi, Bornova, Izmir. Bornova/Izmir, Turkey: *Ege Universitesi Ataturk Kultur Merkezi* 157-166.
- Li, Y.D. (1999). Experiment on control of *Kakivoria flavofasciata* Nasano on persimmon trees. *China Fruits* 2: 44.
- Lim, T.K., Diczbalis, Y., Landrigan, M. and McMahon, G. (1988). Mangosteen Quality Standards Chart. Prepared by the Northern Territory Department of Primary Industries and Fisheries.

- MAFF. (1987). Data provided by Japan Ministry of Agriculture, Forestry and Fisheries (MAFF) in letter, 24 April, 1987 to Counsellor (Agriculture), Australian Embassy, Tokyo, on file T93/2364.
- Matsuoka, T., Taniguchi, K., Hiramatsu, T. and Dote, F. (2001). Methyl bromide quarantine treatment for persimmon fruit moth in Japanese persimmons. *Research Bulletin of Plant Protection, Japan*, No. 37: 63-68.
- Miller, D.R., Miller, G.L. and Watson, G.L. (2002). Invasive species of mealybugs (Hemiptera: Pseudococcidae) and their threat to U.S. agriculture. *Proceedings of the Entomological Society of Washington* 104 (4): 825-836.
- Morton, J. (1987). Japanese persimmon. In: Fruits of Warm Climates.
http://www.hort.purdue.edu/newcorp/morton/japanese_persimmon.html
- Mowat, A. D. (2003). The World Scene - Production and marketing. Charting the Future: *Proceedings of the First National Non-astringent Persimmon Industry Workshop*. HortResearch Publication. <http://www.hortnet.co.nz/publications/science/pers7.htm>
- Nissen, R. J., George, A. P., Broadley, R. H. and Collins, R. J. (2000). A Survey of Cultivars and Management Practices in Australian Persimmon Orchards. *Second International Conference on the Persimmon*, Twin Waters Resort, Queensland.
- NPQS (2003). Personal Communication.
- Paulin, N. and Collins, R. J. (2000). The Development of the Australian Sweet Persimmon Industry. *Second International Conference on the Persimmon*, Twin Waters Resort, Queensland.
http://www.actahort.org/books/601/601_25.htm
- PPIS (2002). Pests of *Diospyros* spp.(Ebenaceae) in Israel, specifically *D. Kaki* L. (Japanese/Oriental persimmon, kaki fruit, "Sharon fruit"); rootstock – *D. virginiana* L. rootstock (American/common persimmon). Israel persimmon pest list-updated March 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.
- Rohrbach, K.G., Beardsley, J.W., German, T.L., Reimer, N.J. and Sanford, W.G. (1988). Mealybug wilt, mealybugs and ants on pineapple. *Plant Disease* 72: 558-565.
- Rosales, C.J. (2000). *Retithrips syriacus* (Mayet) (Thysanoptera: Thripidae) new insect of economic importance in Venezuela. *Boletín de Entomología Venezolana Diciembre* 15 (2): 259-262.
- Smith, D., Beattie, G.A.C. and Broadley, R. (eds). (1997). Citrus Pests and their Natural Enemies: Integrated Pest Management in Australia. Information Series QI97030. Queensland

Draft import policy: Fresh persimmon fruit from Japan, Korea and Israel

Department of Primary Industries and Horticultural Research and Development Corporation,
Brisbane, 263 pp.

Torres-Vila, L.M., Stockel, J., Bielza, P. and Lacasa, A. (1996). Efecto de la diapausa y del capullo sobre el potencial biótico de la polilla del racimo *Lobesia botrana* Den. y Schiff. (Lepidoptera: Tortricidae). *Boletín de Sanidad Vegetal, Plagas* 22: 27-36.

Torres-Vila, L.M., Stockel, J., Roehrich, R. and Rodríguez-Molina, M.C. (1997). The relation between dispersal and survival of *Lobesia botrana* larvae and their density in vine inflorescences. *Entomologia Experimentalis et Applicata* 84: 109-114.

Tzanakakis, M.E., Savopoulou –Soultani, M.C., Oustapassidis, C.S., Verras, S.C. and Hatziemmanuel, H. (1988). Induction of dormancy in *Lobesia botrana* by long day and high temperature conditions. *Entomologia Hellenica* 6: 7-10.

USDA (1997). Importation for Fresh Persimmon fruit, *Diospyros kaki* from South Korea into the United States - Qualitative, Pathway-initiated Pest Risk Assessment. Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture (USDA).

USDA (2003). USDA treatment schedule T107-a for Medfly disinfestation.

http://www.aphis.usda.gov/ppq/manuals/pdf_files/Treatment%20Chapters/05-02-T100-5.pdf

Wysoki, M. and Madjar, V.M. (1986). *Sesamia nonagrioides* on persimmon in Israel. *Phytoparasitica*: 14: 320.

Yamada, S. (1966). The stain on Japanese persimmon fruits caused by *Phoma kakivora*.
<http://www.rms2.agsearch.agropedia.affrc.go.jp/contents/JASI/report/fruit-engei.htm>

Yonemori, K. (1997). Persimmon industry and research activities in Japan. *Acta Horticulturae*. (ISHS) 436: 21-32, http://www.actahort.org/books/436/436_1.htm

APPENDICES

Appendix 1: Pest categorisation for persimmons (presence/absence)

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
ARTHROPODA				
<i>Acanthosoma denticaudum</i> Jakovlev Syn = <i>Acanthosoma denticauda</i> Kim <i>et al.</i> ; <i>Acanthosoma denticauda</i> Kim. [Hemiptera: Acanthosomatidae]	Red-backed stink bug	Japan, Korea (Kulik, 1965)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Aceria diospyri</i> Keifer [Acarina: Eriophyidae]	Persimmon bud mite	Japan (Hiehata, 1995), New Zealand (NZ MAF, 2003)	Yes (Halliday, 1998). Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Acrobasis tokiella</i> (Ragonot) [Lepidoptera: Pyralidae]	Apple leaf case bearer	Korea (KSPP, 1986; NPQS, 1995), United States (USDA, 1997)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Acronicta rumicis</i> Linnaeus [Lepidoptera: Noctuidae]	Sorrel cutworm, Knotgrass moth	Korea (Lee <i>et al.</i> , 1970.)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Adoretus tenuimaculatus</i> Waterhouse [Coleoptera: Scarabaeidae]	Brown chafer	Korea (KSPP, 1986)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Adris tyrannus amurensis</i> Staudinger [Lepidoptera: Noctuidae]	Akebia leaf-like moth	Korea (KSPP, 1986), Japan (AQIS, 1998), New Zealand (NZ MAF, 1999)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Agrius moerens</i> Saunders [Coleoptera: Bupresidae]	Jewel beetle	Japan (Akiyama and Akiyama, 1996)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Aleurocanthus spiniferus</i> Quaintance and	Citrus blackfly, Orange	Japan, Korea (CAB International, 2002),	Yes	Yes (For

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
Baker Syn = <i>Aleurocanthus citricolus</i> (Newstead) Quaintance and Baker; <i>Aleurocanthus rosae</i> Singh; <i>Aleurocanthus spiniferus</i> var. <i>intermedia</i> Silvestri; <i>Aleurodes citricola</i> Newstead; <i>Aleurodes spinifera</i> Quaintance). [Hemiptera: Aleyrodidae]	spiny whitefly, Citrus mealywing	USA – Hawaii (USDA, 1997)	(CAB International, 2002; Martin, 1999). Not in WA (DAWA, 2003)	WA only)
<i>Anomala albopilosa</i> Hope [Coleoptera: Scarabaeidae]	Green chafer	Korea (KSPP, 1986)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Anomala cuprea</i> (Hope) Syn = <i>Euchlora cuprea</i> . [Coleoptera: Scarabaeidae]	Cupreous chafer	Korea (KSPP, 1986; Cho <i>et al.</i> , 1989)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Anomala daimiana</i> Harold [Coleoptera: Scarabaeidae]	Cherry chafer	Korea (KSPP, 1986; Lee <i>et al.</i> , 1992)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Anomala rufocuprea</i> (Motschulsky) [Coleoptera: Scarabaeidae]	Soyabean beetle	Korea (Kim and Kang, 1993; Cho <i>et al.</i> , 1989)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Apate monachus</i> (Fabricius) Syn = <i>Apate monacha</i> Fabricius; <i>Apate</i> <i>carmelita</i> Fabricius; <i>Apate francisca</i> Fabricius; <i>Apate gibba</i> Fabricius; <i>Apate</i> <i>mendica</i> Olivier; <i>Apate monachus</i> var. <i>rufiventris</i> Lucas; <i>Apate semicostata</i> Thomson; <i>Apate senii</i> Stefani. [Coleoptera: Bostrichidae]	Date palm bostrichid, Black borer, Twig borer	Israel (PPIS, 2002), USA – intercepted in Florida (CAB International, 2002)	No (CSIRO, 2002; DAWA, 2003)	Yes

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<p><i>Aphis gossypii</i> Glover</p> <p>Syn = <i>Cerosipha gossypii</i> Glover; <i>Doralina frangulae</i> Kaltenbach; <i>Doralina gossypii</i> Glover; <i>Doralis frangulae</i> Kaltenbach; <i>Doralis gossypii</i> Glover; <i>Toxoptera leonuri</i> Takahashi; <i>Aphis bauhiniae</i> Theobald; <i>Aphis circezendis</i> Fitch. <i>Aphis citri</i> Ashmead of Essig; <i>Aphis citrulli</i> Ashmead.</p> <p>[Hemiptera: Aphididae]</p>	<p>Betelvine aphid, Cotton aphid, Cucurbits aphid, Green aphid, Melon aphid</p>	<p>Israel (PPIS, 2002), USA – California, Arizona and Texas, New Zealand (CAB International, 2002)</p>	<p>Yes</p> <p>(Naumann, 1993; CSIRO, 2002). Present in WA (DAWA, 2003)</p>	<p>No</p>
<p><i>Aphis spiraecola</i> Patch</p> <p>Syn = <i>Anuraphis erratica</i> del Guercio, <i>Aphis bidentis</i> Theobald, <i>Aphis citricola</i> van der Goot, <i>Aphis croomiae</i> Shinji, <i>Aphis deutziae</i> Shinji, <i>Aphis malvoides</i> van der Goot, <i>Aphis mitsubae</i> Shinji, <i>Aphis nigricauda</i> van der Goot, <i>Aphis pseudopomi</i> Blanchard, <i>Aphis virburnicolens</i> Swain,</p> <p>[Hemiptera: Aphididae]</p>	<p>Green citrus aphid, Spiraea aphid</p>	<p>Japan (CAB International, 2002), Korea (Cho <i>et al.</i>, 1997), Israel (PPIS, 2002), USA (including California, Arizona and Texas), New Zealand (CAB International, 2002)</p>	<p>Yes</p> <p>(Naumann, 1993; CSIRO, 2002). Present in WA (DAWA, 2003)</p>	<p>No</p>
<p><i>Archips fuscocupreanus</i> Walsingham</p> <p>Syn = <i>Cacoecia fuscocupreana</i> Walsingham; <i>Ptycholoma fuscocupreana</i> Walsingham.</p> <p>[Lepidoptera: Tortricidae]</p>	<p>Apple tortrix</p>	<p>Korea (Zhang, 1994; NPQS, 1995), USA (Maier and Mastro 1998)</p>	<p>No</p> <p>(Nielsen <i>et al.</i>, 1996; DAWA, 2003)</p>	<p>Yes</p>
<p><i>Archips ingentanus</i> Christoph</p>	<p>Larger apple tortrix</p>	<p>Korea (KSPP, 1986; Zhang, 1994)</p>	<p>No</p>	<p>Yes</p>

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Syn=Archippus ingentanus</i> Christoph). [Lepidoptera: Tortricidae]			(Nielsen <i>et al.</i> , 1996; DAWA, 2003)	
<i>Artena dotata</i> Fabricius [Lepidoptera: Noctuidae]	Noctuid	Japan (Watanabe, 1984), Korea (Yoon and Lee, 1974; Zhang, 1994; KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Ascotis selenaria</i> (Denis and Schiffermüller) <i>Syn =Boarmia selenaria</i> Schiffermuller [Lepidoptera: Geometridae]	Geometrid moth	Israel (PPIS, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Aspidiotus destructor</i> Signoret [Hemiptera: Diaspididae]	Coconut scale	Korea (KSPP, 1986), USA (USDA, 1997)	Yes (CSIRO, 2002), Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Basilepta fulvipes</i> (Motschulsky) [Coleoptera: Chrysomelidae]	Golden-green minute leaf beetle	Korea (AQIS, 1999)	No (CSIRO, 2002; DAWA, 2003)	Yes.
<i>Bemisia argentifolii</i> Bellows and Perring <i>Syn = Bemisia tabaci</i> biotype B. [Hemiptera: Aleyrodidae]	Tobacco whitefly, cotton whitefly, silverleaf whitefly, Poinsettia whitefly	Japan (Ota and Ozawa, 1997), Israel (PPIS, 2002), Korea, USA (including California, Texas and Arizona), New Zealand (CAB International, 2002)	Yes (Carver and Reid, 1996; Martin, 1999) Under official control, Restricted distribution in WA (Poole <i>et al.</i> , 2003; DAWA, 2003)	Yes
<i>Blenina senex</i> (Butler) [Lepidoptera: Noctuidae]	Bark-like moth	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003).	Yes
<i>Bothrogonia japonica</i> Ishihara [Hemiptera: Cicadellidae]	Black-tipped leafhopper	Korea (KSPP, 1986)	No (Day and Fletcher, 1994; DAWA, 2003)	Yes
<i>Caligula japonica</i> Moore <i>Syn =Dictyoploca japonica</i> (Moore) [Lepidoptera: Saturniidae]	Wild silk moth, camphor silk moth, Japanese giant silk moth	Japan (Zhang, 1994), Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Ceratitis capitata</i> (Wiedemann) [Diptera: Tephritidae]	Mediterranean fruit fly, Medfly	Israel (PPIS, 2002), USA - including California (CAB International, 2002)	Yes. Present in WA (De Lima <i>et al.</i> , 1993; DAWA, 2003) and under official control (De Lima <i>et al.</i> , 1993)	Yes (For WA only)
<i>Ceroplastes ceriferus</i> (Fabricius) [Hemiptera: Coccidae]	Indian white wax scale	Japan, USA – including Texas (CAB International, 2002)	Yes (CAB International, 2002; USDA, 2003). Present in WA (DAWA, 2003).	No
<i>Ceroplastes floridensis</i> Comstock [Hemiptera: Coccidae]	Florida wax scale	Japan, Korea, USA (including Texas), New Zealand (CAB International, 2002), Israel (PPIS, 2002)	Yes (Naumann, 1993). Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Ceroplastes japonicus</i> Green [Hemiptera: Coccidae]	Japanese wax scale	Japan (CAB International, 2002), Korea (Park <i>et al.</i> , 1992; KSPP, 1986)	No (CAB International, 2002; USDA, 2003; DAWA, 2003)	Yes
<i>Ceroplastes pseudoceriferus</i> Green [Hemiptera: Coccidae]	Wax scale	Japan (Kamei and Asano, 1976), Korea (NPQS, 1993; APPC, 1987; KSPP, 1986)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Ceroplastes rubens</i> Maskell [Hemiptera: Coccidae]	Pink wax scale	Korea (KSPP, 1986), USA – Hawaii and Florida (USDA, 1997)	Yes (CSIRO, 2002; CAB International, 2002). Present in WA (DAWA, 2003)	No
<i>Chrysochroa fulgidissima</i> (Schonherr) [Coleoptera: Buprestidae]	Two-striped green buprestid, Jewel beetle	Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Chrysomela populi</i> Linnaeus <i>Syn=Melasoma populi</i> [Coleoptera: Chrysomelidae]	Poplar leaf beetle	Japan (Matsuda and Sugawara, 1980), Korea (KSPP, 1986)	No (CAB International, 2002; DAWA, 2003)	Yes
<i>Cicadella viridis</i> (Linnaeus)	Green leafhopper	Korea (KSPP, 1986)	No	Yes

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
[Hemiptera: Cicadellidae] <i>Coccus hesperidum</i> Linnaeus	Common shield scale, Soft brown scale	Japan, Korea, USA (including California, Texas and Arizona), New Zealand (CAB International, 2002), Israel (PPIS, 2002)	(CSIRO, 2002; DAWA, 2003) Yes	No
[Hemiptera: Coccidae] <i>Coccura suwakoensis</i> (Kuwana and Toyoda)	Quince cottony scale	Korea (USDA, 2003)	No (USDA, 2003; DAWA, 2003)	Yes
[Hemiptera: Coccidae] <i>Conogethes punctiferalis</i> (Guenée) Syn = <i>Dichocrosis punctiferalis</i> (Guenée)	Yellow peach moth	Japan (MAFF, 1985), Korea, (KSPP, 1986)	Yes (CSIRO, 2002; Nielsen <i>et al.</i> , 1996; CAB International, 2002). Recorded in WA (ICDb, 2003; DAWA, 2003) NT, QLD, NSW, VIC, SA (CSIRO, 2002; CAB International, 2002)	No
[Lepidoptera: Pyralidae] <i>Cryptoblabes gnidiella</i> (Millière)	Pyralid moth, honeydew	Israel (PPIS, 2002), USA, New Zealand (CAB International, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
[Lepidoptera: Pyralidae] <i>Cyrtoclytus caproides</i> Bates Syn = <i>Cyrtoclytus capra</i> (Germar)	Long horn beetle	Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
[Coleoptera: Cerambycidae] <i>Drosicha corpulenta</i> (Kuwana)	Giant mealybug	Japan (Hashimoto and Ueda, 1985), Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes.
[Hemiptera: Margaroididae] <i>Ectinus sericeus</i> Candeze	Wheat wireworm	Japan (Kishii, 1983), Korea (KSPP, 1986)	No (Calder, 1998; DAWA, 2003)	Yes.
[Coleoptera: Elateridae] <i>Empoasca vitis</i> (Göthe)	Small green leafhopper	Japan, Israel (CAB International, 2002), Korea (KSPP, 1986)	No (CAB International, 2002; DAWA, 2003)	Yes
[Hemiptera : Cicadellidae] <i>Endoclyta excrescens</i> (Butler)	Japanese swift moth	Korea	No	Yes

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[Lepidoptera: Hepialidae]		(KSPP, 1986; Zhang, 1994)	(Nielsen <i>et al.</i> , 1996; CSIRO, 2002; DAWA, 2003)	
<i>Eriococcus lagerstroemiae</i> Kuwana	Crapemyrtle scale	Japan (USDA, 2003), Korea (NPQS, 1993; Kwon <i>et al.</i> , 1995; KSPP, 1986).	No (USDA, 2003; DAWA, 2003)	Yes
[Homoptera: Eriococcidae]				
<i>Eudocima fullonia</i> (Clerck)	Fruit piercing moth, Orange piercing moth	Japan, Korea, USA (CAB International, 2002)	Yes Recorded in NT, NSW, QLD (CAB International, 2002) and WA (ICDb, 2003; DAWA, 2003)	No
Syn = <i>Noctua dioscoreae</i> Fabricius; <i>Ophideres fullonica</i> Linnaeus; <i>Ophideres oblitteraus</i> Walker; <i>Othreis fullonia</i> Clerck; <i>Othreis fullonica</i> Linnaeus; <i>Othreis pomona</i> Hübner; <i>Phalaena (Attacus) fullonica</i> Linnaeus; <i>Phalaena (Noctua) phalonia</i> Linnaeus; <i>Phalaena pomona</i> Cramer; <i>Ophideres fullonia</i> Clerck.				
[Lepidoptera: Noctuidae]				
<i>Eumeta minuscula</i> (Butler) Syn= <i>Clania minuscula</i> (Butler)	Tea bagworm	Korea (KSPP, 1986; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
[Lepidoptera: Pyschidae]				
<i>Euproctis similis</i> Fuessly	Browntail moth	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
[Lepidoptera: Lymantriidae]				
<i>Euproctis subflava</i> (Bremer)	Oriental tussock moth	Japan (Kawamoto, 1978), Korea (KSPP, 1986; NPQS, 1995)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
[Lepidoptera: Lymantriidae]				
<i>Eutetranychus orientalis</i> (Klein)	Oriental red spider mite	Japan (CAB International, 2002), Israel (PPIS, 2002)	Yes, in WA (Ag WA, 2003; DAWA, 2003), and QLD (CAB International, 2002)	No
[Acarina: Tetranychidae]				
<i>Euzophera batangensis</i> Caradja	Persimmon bark borer	Korea	No	Yes

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[Lepidoptera: Pyralidae] <i>Euzopherodes vapidella</i> Mann Syn = <i>Ephestia vapidella</i> [Lepidoptera: Pyralidae]	Citrus stub moth	(Choi et al., 1998) Israel (PPIS, 2002)	(Nielsen <i>et al.</i> , 1996; DAWA, 2003) No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Frankliniella occidentalis</i> (Pergande) Syn = <i>F. californica</i> (Moulton) [Thysanoptera: Thripidae]	Western flower thrips	Japan, Korea, USA (including California, Arizona and Texas), New Zealand (CAB International, 2002), Israel (PPIS, 2002; CAB International, 2002)	Yes (AFD, 2001)	No
<i>Geisha distinctissima</i> (Walker) [Hemiptera: Flatidae]	Green broad-winged planthopper	Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Grapholita molesta</i> (Busck) Syn = <i>Cydia molesta</i> (Busck) [Lepidoptera: Tortricidae]	Oriental fruit moth	Korea (CIE, 1990; KSPP, 1986), USA (USDA, 1997), New Zealand (CAB International, 2002)	Yes, under official control (CSIRO, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Graptosaltria nigrofuscata</i> (Motschulsky) [Hemiptera: Cicadidae]	Large brown cicada	Japan (Shiozawa and Tsuchizaki, 1992) Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Gymnoscelis rufifasciata</i> (Haworth) [Lepidoptera: Geometridae]	Geometrid moth	Israel (PPIS, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Halyomorpha halys</i> (Stal) Syn = <i>Halyomorpha mista</i> (Uhler) [Hemiptera: Pentatomidae]	Yellow-brown stink bug	Korea (Chung <i>et al.</i> , 1995)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Haplothrips chinensis</i> Priesner [Thysanoptera: Phlaeothripidae]	Thrips	Korea (Woo, 1988)	No (Mound, 1996; DAWA, 2003)	Yes

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Heliethrips haemorrhoidalis</i> (Bouche) [Thysanoptera: Thripidae]	Greenhouse thrips	Israel (PPIS, 2002), USA (including California and Texas) (CAB International, 2002), New Zealand (NZ MAF, 2003)	Yes (AFD, 2001; Mound, 1996) Present in WA (DAWA, 2003)	No
<i>Hemiberlesia lataniae</i> (Signoret) Syn = <i>Diaspidiotus lataniae</i> [Hemiptera: Diaspididae]	Latania scale	Japan, USA – Including California (CAB International, 2002), Israel (PPIS, 2002), New Zealand (NZ MAF, 2003)	Yes Recorded in QLD (CAB International, 2002) and WA (ICDb, 2003; DAWA, 2003)	No
<i>Holochlora japonica</i> Brunner von Wattenwyl [Orthoptera: Tettigoniidae]	Japanese broad-winged katydid; Fruit-tree katydid	Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Homona magnanima</i> Diakonoff [Lepidoptera: Tortricidae]	Oriental tea tortrix	Japan (MAFF, 1985)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Hoshinoa longicellana</i> Walsingham Syn = <i>Archips longicellana</i> Walsingham [Lepidoptera: Tortricidae]	Common apple leafroller	Korea (Kim <i>et al.</i> , 1997)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Hyphantria cunea</i> (Drury) [Lepidoptera: Arctiidae]	Fall webworm, Mulberry moth	Korea (KSPP, 1986), USA – including California and Texas (CAB International, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Hypothenemus eruditus</i> Westwood [Coleoptera: Scolytidae]	Bark beetle	Korea (KSPP, 1986; Choo <i>et al.</i> , 1983), USA (USDA, 1997)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Icerya purchasi</i> Maskell [Hemiptera: Mararodidae]	Cottony cushion scale	Japan, Israel, New Zealand (CAB International, 2002), Korea (KSPP, 1986; CAB International,	Yes (CSIRO, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Lagoptera juno</i> (Dalman) [Lepidoptera : Noctuidae]	Rose of sharon leaf-like moth, Fruit-piercing moth	2002), USA (USDA, 1997) Japan (unconfirmed record) (CAB International, 2002), Korea (Lee <i>et al.</i> , 1970; AQIS, 1999)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Lepidosaphes conchiformioides</i> Borchsenius [Hemiptera: Diaspididae]	Pear oystershell scale	Korea (KSPP, 1986), USA (USDA, 1997)	Yes (CSIRO, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Lepidosaphes cupressi</i> Borchsenius Syns = <i>Lepidosaphes foliicola</i> Borchsenius; <i>Cornuaspis cupressi</i> Borchsenius. [Homoptera: Diaspididae]		Japan (USDA, 2003)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Lepidosaphes tubulorum</i> Ferris [Hemiptera: Diaspididae]	Dark oystershell scale	Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Lixus ornatus</i> Reiche [Coleoptera: Curculionidae]	Weevil	Israel (PPIS, 2002)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Lobesia botrana</i> Denis and Schiffermüller Syn = <i>Polychrosis botrana</i> Schiff. [Lepidoptera: Tortricidae]	European/Mediterranean grape berry/vine moth	Japan (CAB International, 2002), Israel (PPIS, 2002)	No (all Australian material misidentified as <i>L. botrana</i>) (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Lopholeucaspis japonica</i> (Cockerell) [Hemiptera: Diaspididae]	Japanese baton-shaped scale	Korea, Japan (CAB International, 2002; NPQS, 1995; KSPP, 1986), USA (not in California, Texas and Arizona) (USDA, 1997)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Lymantria dispar japonica</i> Motschulsky	Gypsy moth	Korea (NPQS, 1995; Zhang, 1994;	No	Yes

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
[Lepidoptera: Lymantriidae]		KSPP, 1986)	(Nielsen <i>et al.</i> , 1996; DAWA, 2003)	<i>Lymantria dispar</i> is in a WA list of pests that are not in WA
<i>Lymantria mathura</i> Moore	Pink gypsy moth, oak tussock moth	Japan (Zlotina <i>et al.</i> , 1998), Korea (NPQS, 1995; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes.
[Lepidoptera: Lymantriidae]				
<i>Maconellicoccus hirsutus</i>	Pink hibiscus mealybug	Japan, USA – including California (CAB International, 2002)	Yes In NT, QLD, SA (CAB International, 2002) Present in WA (DAWA, 2003)	No
[Hemiptera: Pseudococcidae]				
<i>Maladera castanea</i> (Arrow)	Asiatic garden beetle	Korea (KSPP, 1986), USA (USDA, 1997)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
[Coleoptera: Scarabaeidae]				
<i>Maladera matrida</i> Argaman [Coleoptera: Scarabaeidae]	Khomeini beetle	Israel (PPIS, 2002)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
[Coleoptera: Scarabaeidae]				
<i>Maladera orientalis</i> Motschulsky	Smaller velvety chafer	Korea (KSPP, 1986)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
[Coleoptera: Scarabaeidae]				
<i>Melanotus legatus</i> Candeze	Pectinate-horned click beetle	Japan (Unconfirmed record – CAB International, 2002), Korea (KSPP, 1986)	No (Calder, 1998; DAWA, 2003)	Yes
[Coleoptera: Elateridae]				
<i>Melolontha frater</i> Arrow	Larger frosted chafer	Korea (KSPP, 1986)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
[Coleoptera: Scarabaeidae]				
<i>Microleon longipalpis</i> Butlerlong	Palpi cochlid	Korea (KSPP, 1986; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
[Lepidoptera: Limacodidae]				

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Milviscutulus mangiferae</i> (Green) Syn = <i>Protopulvinaria mangiferae</i> , <i>Coccus mangiferae</i> [Hemiptera: Coccidae]	Mango shield scale, Mango scale	Israel (PPIS, 2002)	No (Brown, 1989; DAWA, 2003)	Yes
<i>Mimela splendens</i> (Gyllenhal) [Coleoptera: Scarabaeidae]	Scarab beetle	Korea (Kim, 1996)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Monema flavescens</i> Walker [Lepidoptera: Limicodidae]	Oriental moth	Korea (NPQS, 1993; NPQS, 1995; KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Myzus persicae</i> (Sulzer) [Hemiptera: Aphididae]	Green peach aphid	Korea (KSPP, 1986), Israel, New Zealand (CAB International, 2002), USA (USDA, 1997)	Yes (CSIRO, 2002) Present in WA (DAWA, 2003)	No
<i>Narosoideus flavidorsalis</i> (Staudinger) [Lepidoptera: Limacodidae]	Pear stinging caterpillar	Korea (KSPP, 1986; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Nezara antennata</i> Scott [Hemiptera: Pentatomidae]	Green stink bug	Korea (Jang and Choe, 1992)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Nymphalis xanthomela</i> Denis and Schifferrmüller [Lepidoptera: Nymphalidae]	Willow nymphalid	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Orgyia thyellina</i> Butler [Lepidoptera: Lymantriidae]	Japanese tussock moth	Korea (NPQS, 1995; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Pandemis heparana</i> (Denis and Schifferrmüller) [Lepidoptera: Tortricidae]	Fruit-tree tortrix	Korea (NPQS, 1995; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Panonychus ulmi</i> (Koch) [Acarina: Tetranychidae]	European red mite	Japan, Israel, New Zealand (CAB International, 2002), Korea (KSPP, 1986; CAB International, 2002), USA (USDA, 1997)	Yes under official control in WA (Halliday, 1998)	Yes (For WA only)
<i>Pantomorus cervinus</i> (Boheman) [Coleoptera: Curculionidae]	Fuller's rose beetle	Japan, USA (including California, Arizona and Texas), New Zealand (CAB International, 2002)	Yes (CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Parabemisia myricae</i> (Kuwana) [Hemiptera: Aleyrodidae]	Japanese bayberry whitefly	Japan, USA – including California (CAB International, 2002), Israel (PPIS, 2002)	No (Martin, 1999; DAWA, 2003)	Yes
<i>Parasa consocia</i> Walker Syn = <i>Latoia consocia</i> (Walker) [Lepidoptera: Limacodidae]	Green cochlid	Korea (Zhang, 1994; KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Parasa sinica</i> Moore Syn = <i>Latoia sinica</i> (Moore) [Lepidoptera: Limacodidae]	Chinese green cochlid	Korea (Zhang, 1994; CAB International, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Parlatoria pergandii</i> Comstock [Hemiptera: Diasididae]	Black parlatoria scale	Korea (KSPP, 1986), Israel (CAB International, 2002), USA - including California and Texas (USDA, 1997)	Yes (CSIRO, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Parthenolecanium corni</i> (Bouché) Syn = <i>Lecanium corni</i> Bouché [Hemiptera: Coccidae]	European fruit lecanium	Korea (USDA, 2003), USA (including California and Texas), New Zealand (CAB International, 2002)	Yes (CAB International, 2002; CSIRO, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Parthenolecanium persicae</i> (Fabricius) [Hemiptera: Coccidae]	Grapevine scale	Israel (PPIS, 2002), New Zealand, (NZ MAF, 2003)	Yes (Naumann, 1993) Present in WA (DAWA, 2003)	No
<i>Percnia albinigrata</i> Warren [Lepidoptera: Geometridae]	Looper	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Percnia giraffata</i> (Guenée) [Lepidoptera: Geometridae]	Spotted persimmon looper	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Phenacoccus aceris</i> (Signoret) [Hemiptera: Pseudococcidae]	Apple mealybug	Korea (NPQS, 1993; NPQS, 1995; KSPP, 1986), USA (USDA, 1997)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Phenacoccus pergandei</i> Cockerell [Hemiptera: Pseudococcidae]	Persimmon long wooly scale (in China)	Japan (Ueno, 1971), Korea (NPQS, 1995)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Piezodorus hybneri</i> (Gmelin) [Hemiptera: Pentatomidae]	Redbanded shield bug	Korea (Son-Chang <i>et al.</i> , 2000)	Yes (CSIRO, 2002) Present in WA (DAWA, 2003)	No
<i>Pinnaspis strachani</i> (Cooley) [Hemiptera: Diaspididae]	Lesser snow scale	Korea - Restricted distribution, USA (CAB International, 2002)	No (CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Planococcus citri</i> (Risso) [Hemiptera: Pseudococcidae]	Citrus mealybug	Korea (KSPP, 1986), Israel (PPIS, 2002), USA (USDA, 1997), New Zealand (CAB International, 2002)	Yes (USDA, 2003; CSIRO, 2002) Present in WA (DAWA, 2003)	No

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Planococcus kraunhiae</i> (Kuwana) [Hemiptera: Coccidae]	Japanese mealybug	Japan (MAFF, 1985), Korea (KSPP, 1986)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Platypleura kaempferi</i> (Fabricius) [Hemiptera: Cicadidae]	Kaempfer cicada	Korea (AQIS, 1999)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Plautia stali</i> Scott [Hemiptera: Pentatomidae]	Brown-winged stink bug	Korea (KSPP, 1986; NPQS, 1995)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Pleuroptya chlorophanta</i> Butler [Lepidoptera: Pyralidae]	Three striped pyralid?	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Polyphagotarsonemus latus</i> (Banks) [Acarina: Tarsonemidae]	Broad mite, Potato broad mite	Japan, Korea, USA, New Zealand (CAB International, 2002), Israel (PPIS, 2002)	Yes (AFD, 2001; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Ponticulothrips diospyrosi</i> Haga and Okajima [Thysanoptera: Phlaeothripidae]	Japanese gall forming thrips	Japan (Haga and Okajima, 1983; MAFF, 1987)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Popillia japonica</i> Newman [Coleoptera: Scarabaeidae]	Japanese beetle	Korea (KSPP, 1986), USA (USDA, 1997)	No (Cassis <i>et al.</i> , 1992; DAWA, 2003)	Yes
<i>Protaetia brevitarsis</i> Lewis [Coleoptera: Scarabaeidae]	Scarab beetle	Korea (Lee-Hyung Chul <i>et al.</i> , 1999)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Pseudaonidia duplex</i> (Cockerell) [Hemiptera: Diaspididae]	Camphor scale	Japan (MAFF, 1992), Korea (KSPP, 1986), USA (USDA, 1997)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Pseudaulacaspis pentagona</i> (Targioni-Tozzetti) [Hemiptera: Diaspididae]	Peach white scale	Korea (KSPP, 1986), Israel, New Zealand (CAB International, 2002), USA - including California and Texas (USDA, 1997)	Yes (CSIRO, 2002; CAB International, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Pseudococcus comstocki</i> (Kuwana) [Hemiptera: Pseudococcidae]	Comstock mealybug	Japan (MAFF, 1985), Korea (KSPP, 1986; USDA, 2003), USA (USDA, 1997)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Pseudococcus cryptus</i> Hempel [Hemiptera: Pseudococcidae]	Citriculus mealybug, Cryptic mealybug	Israel (PPIS, 2002)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Pseudococcus longispinus</i> (Targioni Tozzetti) Syn = <i>Pseudococcus adonidum</i> [Hemiptera: Pseudococcidae]	Long tailed mealy bug	Japan, USA – including California and Texas (CAB International, 2002), Israel (PPIS, 2002), New Zealand (NZ MAF, 2003)	Yes (CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Pseudococcus viburni</i> (Signoret,) Syn = <i>Pseudococcus affinis</i> Maskell [Hemiptera: Pseudococcidae]	Obscure mealybug	Israel (PPIS, 2002), New Zealand (NZ MAF, 2003)	Yes (Williams, 1985) Present in WA (DAWA, 2003)	No
<i>Ptycholoma lecheana circumclusana</i> (Christoph) [Lepidoptera: Tortricidae]	Persimmon leafroller	Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Pulvinaria aurantii</i> Cockerell Syns = <i>Lecanium notatum</i> Maskell; <i>Coccus notatus</i> Fernald; <i>Chloropulvinaria aurantii</i> Borchsenius; <i>Pulvinaria notatum</i> Takahashi; <i>Pulvinaria aurantii</i> Ben-Dov. [Homoptera: Coccidae]	Citrus cottony scale	Japan (USDA, 2003)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Pulvinaria citricola</i> Kuwana	Cottony citrus scale	Japan (USDA, 2003)	No	Yes

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Syns = Pulvinaria nipponica</i> Lindinger; <i>Eupulvinaria citricola</i> Borchsenius; [Homoptera: Coccidae]			(USDA, 2003; DAWA, 2003)	
<i>Pulvinaria idesiae</i> Kuwana <i>Syns = Eupulvinaria idesiae</i> Borchsenius [Homoptera: Coccidae]		Japan (USDA, 2003)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Quadraspidiotus perniciosus</i> (Comstock) <i>Syn = Comstockaspis perniciosus</i> (Comstock) [Hemiptera: Diaspididae]	San José scale	Korea (KSPP, 1986; USDA, 2003), USA (USDA, 1997), New Zealand (CAB International, 2002)	Yes (CSIRO, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Retithrips syriacus</i> (Mayet) [Thysanoptera: Thripidae]	Black black vine thrips, Castor thrips, Grape thrips	Israel (PPIS, 2002), USA - Florida (Hamon and Edwards, 1994)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Rhyzopertha dominica</i> (Fabricius) [Coleoptera: Bostrichidae]	Lesser grain borer, American wheat weevil	Korea, Israel, USA (CAB International, 2002)	Yes (CSIRO, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Ricania japonica</i> Melichar [Hemiptera: Ricaniidae]	Japanese leafhopper	Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Riptortus clavatus</i> (Thunberg) [Hemiptera: Alydidae]	Bean bug	Korea (Chung <i>et al.</i> , 1995)	No (CAB International, 2002; DAWA, 2003)	Yes
<i>Saissetia citricola</i> Kuwana <i>Syns = Takahashia citricola</i> Kuwana; <i>Saissetia citricola</i> Takahashi and Tachikawa;		Japan (USDA, 2003)	No (USDA, 2003; DAWA, 2003)	Yes

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Parasaissetia citricola</i> Yang. [Hemiptera: Coccidae]				
<i>Saissetia coffeae</i> (Walker) [Hemiptera: Coccidae]	Hemispherical scale	Korea (KSPP, 1986), Israel, New Zealand (CAB International, 2002), USA (USDA, 1997)	Yes (CSIRO, 2002) Present in WA (DAWA, 2003)	No
<i>Saissetia oleae</i> Syns = <i>Saissetia oleae cherimoliae</i> Gómez-Menor Ortega; <i>Coccus (Saissetia) oleae cherimoliae</i> Gómez-Menor Ortega; <i>Saissetia oleae cherimoliae</i> Gómez-Menor Ortega. [Homoptera: Coccidae]	Black scale	Japan, Israel (USDA, 2003)	Yes (USDA, 2003) Present in WA (DAWA, 2003)	No
<i>Scolytotlatypus mikado</i> Blandford [Coleoptera: Scolytinae]	Mikado ambrosia beetle	Korea (Choo and Woo, 1985)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Scopelodes contracta</i> Walker [Lepidoptera: Limacodidae]	Persimmon cochlid	Japan (Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Sesamia nonagrioides</i> (Lefebvre) [Lepidoptera: Noctuidae]	Mediterranean corn stalk borer, Pink maize stalk borer	Israel (PPIS, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Sinoxylon japonicum</i> Lesne [Coleoptera: Bostrichidae]	Two-horned stem-boring beetle	Japan (Ono, 1937), Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
<i>Sparganothis pilleriana</i> (Denis and Schiffermüller) [Lepidoptera: Tortricidae]	Grape berry moth	Korea (KSPP, 1986; Zhang, 1994)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Spilarctia subcarnea</i> (Walker) Syn = <i>Spilosoma subcarnea</i> Walker [Lepidoptera: Arctidae]	Tiger moth	Korea (Zhang, 1994; APPC, 1987; KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Spilosoma lubricipeda</i> (Linnaeus) [Lepidoptera: Arctidae]	White ermine moth	Korea (NPQS, 1993; KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Spilosoma punctaria</i> (Stoll) [Lepidoptera: Arctidae]	Red belly black-dotted arctiid	Japan (Akutsu, 1971), Korea (KSPP, 1986)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Spodoptera litura</i> (Fabricius) [Lepidoptera: Noctuidae]	Cluster caterpillar	Korea, USA, New Zealand (CAB International, 2002)	Yes (Nielsen <i>et al.</i> , 1996) Present in WA (DAWA, 2003)	No
<i>Stathmopoda masinissa</i> Meyrick [Lepidoptera: Oecophoridae]	Persimmon fruit moth	Japan (MAFF, 1985; Zhang, 1994), Korea (KSPP, 1986; Kim <i>et al.</i> 1997; NPQS, 1995)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Synanthedon tenuis</i> (Butler) Syn = <i>Conopia tenuis</i> Butler [Lepidoptera: Sesiidae]	Smaller clearwing moth	Japan (MAFF, 1987), Korea (KSPP, 1986; NPQS, 1995)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
<i>Takahashia japonica</i> (Cockerell) [Hemiptera: Coccidae]	String cottony scale	Korea (KSPP, 1986)	No (USDA, 2003; DAWA, 2003)	Yes
<i>Tenuipalpus zhizhilashvilliae</i> Rekk [Acarina: Tenipalpidae]	Persimmon false spider mite	Korea (KSPP, 1986), Japan (Ghai and Shenhmar, 1984)	No (Halliday, 1998; CSIRO, 2002; DAWA, 2003)	Yes
<i>Tetranychus urticae</i> Koch Syn= <i>Tetranychus cinnabarinus</i>	Carmine spider mite	Japan, USA -including California and Texas (CAB International, 2002), Israel	Yes (CSIRO, 2002)	Yes (For WA)

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(Boisduval)		(PPIS, 2002)	Not in WA (DAWA, 2003)	only)
[Acarina: Tetranychidae]				
<i>Tetranychus kanzawai</i> Kishida	Kanzawai spider mite	Korea (CAB International, 2002)	Yes	Yes
[Acarina: Tetranychidae]			(Halliday, 1998)	(For WA
			Not in WA (DAWA, 2003)	only)
<i>Trialeurodes vaporariorum</i> (Westwood)	Greenhouse whitefly	Japan, Korea, USA, New Zealand (CAB International, 2002), Israel (PPIS, 2002)	Yes	No
[Hemiptera: Aleyrodidae]			(Carver and Reid, 1996; CSIRO, 2002)	
			Present in WA (DAWA, 2003)	
<i>Tripidothorax belogloui</i> Jakovlev	Lygaeid bug	Korea (Lee <i>et al.</i> , 1994)	No	Yes
[Hemiptera: Lygaeidae]			(CSIRO, 2002; DAWA, 2003)	
<i>Tripidothorax cruciger</i> Motschulsky	Lygaeid bug	Korea (Kim <i>et al.</i> , 2000)	No	Yes
[Hemiptera: Lygaeidae]			(CSIRO, 2002; DAWA, 2003)	
<i>Vespa crabro</i> (Linnaeus)	Spotted giant hornet	Japan (Ono and Sasaki, 1987)	No	Yes
[Hymenoptera: Vespidae]		Korea	(CSIRO, 2002; DAWA, 2003)	
		(KSPP, 1986; Kim <i>et al.</i> , 1994), USA		
		(USDA, 1997)		
<i>Vespa mandarinia</i> Smith	Yellow jacket	Japan (Ono <i>et al.</i> , 1986), Korea (KSPP, 1986; Kim <i>et al.</i> , 1994)	No	Yes
[Hymenoptera: Vespidae]			(CSIRO, 2002; DAWA, 2003)	
<i>Vespa simillima xanthoptera</i> Cameron	Yellow hornet	Japan (CAB International, 2002), Korea (KSPP, 1986; Kim <i>et al.</i> , 1994)	No	Yes
[Hymenoptera: Vespidae]			(CSIRO, 2002; DAWA, 2003)	
<i>Xyleborus rubricollis</i> Eichhoff.	Ambrosia beetle, Red-necked bark beetle.	Korea (Choo and Woo, 1983; KSPP, 1986), USA - South Carolina (Kovach and Gorsuch 1985).	No	Yes.
Syn = <i>Ambrosiodmus rubricollis</i> (Eichhoff)			(CSIRO, 2002; DAWA, 2003).	

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
[Coleoptera: Curculionidae] <i>Xyleborus saxeseni</i> (Ratzeburg)	Fruit-tree pinhole borer	Korea (KSPP, 1986), USA (USDA, 1997)	Yes (CSIRO, 2002) Present in WA (Abbott, 1985; DAWA, 2003)	No
[Coleoptera: Scolytinae] <i>Xylosandrus brevis</i> (Eichhoff)	Short-winged bark beetle	Japan (Kajimura and Hijii, 1994), Korea (KSPP, 1986)	No (CSIRO, 2002; DAWA, 2003)	Yes
[Coleoptera: Curculionidae] <i>Xylosandrus germanus</i> (Blandford)	Alnus ambrosia beetle	Korea (Yoon <i>et al.</i> , 1982)	No (CSIRO, 2002; DAWA, 2003)	Yes
[Coleoptera: Scolytinae] <i>Zeuzera leuconotum</i> Butler	Wood leopard moth	Israel (CAB International, 2002)	No (Nielsen <i>et al.</i> , 1996; DAWA, 2003)	Yes
[Lepidoptera: Coccidae]				
NEMATODA				
<i>Aphelenchoides ritzmebosi</i> (Schwarz) Steiner and Buhner	Leaf nematode	Japan – restricted, Korea (CAB International, 2002)	Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
[Tylenchida: Aphelenchoididae] <i>Basiria graminophila</i> Siddiqi	Nematode	Korea (KSPP, 1986)	Yes (McLeod <i>et al.</i> , 1994) – Qld Not in WA (DAWA, 2003)	Yes (For WA only)
[Tylenchina: Tylenchidae] <i>Coslenchus costatus</i> (de Man) Siddiqi Syn = <i>Aglenchus costatus</i> (de Man) Meyl	Nematode	Japan (Mizukubo and Minagawa, 1984), Korea (KSPP, 1986)	Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
[Tylenchina: Tylenchidae] <i>Helicotylenchus dihystra</i> (Cobb) Sher	Spiral nematode	Japan, Israel, USA, New Zealand (CAB International, 2002)	Yes (McLeod <i>et al.</i> , 1994)	No
[Tylenchida: Hoplolaimidae]				

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Helicotylenchus pseudorobustus</i> (Steiner) Golden [Tylenchida: Haploloimidae]	Spiral nematode	Korea (CAB International, 2002; KSPP, 1986), USA (including California and Texas), New Zealand (CAB International, 2002)	Present in WA (DAWA, 2003) Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
<i>Meloidogyne incognita</i> (Kofoid and White) Chitwood Syn = <i>Meloidogyne acrita</i> Chitwood [Tylenchida: Heteroderidae]	Southern root knot nematode	Japan, Korea, Israel, USA – including Arizona, California and Texas (CAB International, 2002)	Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
<i>Meloidogyne javanica</i> (Treb) Chitwood [Tylenchida: Heteroderidae]	Javanese root knot nematode	Japan, Korea, USA – including Arizona, California and Texas (CAB International, 2002), Israel (PPIS, 2002)	Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
<i>Pratylenchus loosi</i> Loof [Tylenchida: Pratylenchidae]	Root lesion nematode	Japan (CAB International, 2002)	Yes (McLeod <i>et al.</i> , 1994) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Pratylenchus scribneri</i> Steiner [Tylenchida: Pratylenchidae]	Scribner's lesion nematode	Korea (Park <i>et al.</i> , 1999)	No (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
<i>Pratylenchus thornei</i> Sher and Allen [Tylenchida: Pratylenchidae]	Thorn's root lesion nematode	Japan, Israel, USA – Including California (CAB International, 2002), Korea (KSPP, 1986)	Yes (McLeod <i>et al.</i> , 1994; (CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Pratylenchus vulnus</i> Allen and Jensen	Walnut root lesion	Japan, Korea, USA (including	Yes	No

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
[Tylenchida: Pratylenchidae]	nematode	California), New Zealand (CAB International, 2002)	(McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	
<i>Tylenchulus semipenetrans</i> Cobb [Tylenchina: Tylenchulidae]	Citrus root nematode, slow decline nematode	Japan, Korea, Israel, USA - including Arizona, California and Texas (CAB International, 2002)	Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
<i>Xiphinema americanum sensu lato</i> Cobb [Dorylaimida: Longidoridae]	American dagger nematode	Japan, Korea, USA – including California and Texas (CAB International, 2002)	Yes (McLeod <i>et al.</i> , 1994) Present in WA (DAWA, 2003)	No
BACTERIA				
<i>Agrobacterium tumefaciens</i> (Smith and Townsend) Conn [Rhizobiales: Rhizobiaceae]	Crown gall	Japan, Korea, Israel – restricted, USA, New Zealand (CAB International, 2002)	Yes (APDD, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Pseudomonas syringae</i> pv. <i>syringae</i> van Hall [Pseudomonadales: Pseudomonadaceae]	Bacterial canker or blast	Japan, Korea, Israel, USA, New Zealand (CAB International, 2002)	Yes (APDD, 2002; CAB International, 2002) Present in WA(DAWA, 2003)	No
<i>Rhizobium radiobacter</i> (Beijerinck and van Delden) Young et al. [Rhizobiales: Rhizobiaceae]	Crown gall	Japan, Korea, Israel – restricted, USA, New Zealand (CAB International, 2002)	Yes (CAB International, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Rhizobium rhizogenes</i> [Rhizobiales: Rhizobiaceae]	Bacterial gall	Japan, USA – including California and Texas (CAB International, 2002)	Yes (CAB International, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
FUNGI				
<i>Alternaria alternata</i> (Fr.:Fr.) Keissler Syn = <i>A. tenuis</i> Nees ['mitosporic fungi': Hyphomycetes] possibly <i>A. alternata</i> pv. <i>citri</i>	Persimmon black spot, Fruit rot	Japan (Qadir and Hashinaga, 2001), Korea (Park <i>et al.</i> , 1999), Israel (PPIS, 2002), New Zealand (NZ MAF 2003)	Yes (APDD, 2002) Present in WA (DAWA, 2003)	No
<i>Aureobasidium pullulans</i> (de Bary) Arnaud ['mitosporic fungi': Hyphomycetes] Syn = <i>Dematium pullulans</i> (de Bary); <i>Aureobasidium oleae</i> (Castagne) Subram; <i>Aureobasidium vitis</i> Viala & G. Boyer; <i>Azymocandida malicola</i> (D.S. Clark & R.H. Wallace) E.K. Novak & Zsolt; <i>Candida malicola</i> D.S. Clark & R.H. Wallace; <i>Dematium pullulans</i> de Bary & Lowenthal; <i>Pullularia pullulans</i> (de Bary & Lowenthal) Berkhout; <i>Torula</i> <i>oleae</i> Castagne	Root rot, Blue stain, Core rot	Korea (Yun, 1997)	Yes (APDD, 2002) Present in WA (DAWA, 2003)	No
<i>Botrytis cinerea</i> Persoon (anamorph) Syn = <i>Botryotinia fuckeliana</i> (de Bary) Whetzel (teleomorph) [Helotiales: Sclerotiniaceae]	Grey mould	Korea (CAB International, 2002), Israel (PPIS, 2002), USA (USDA, 1997), New Zealand (NZ MAF, 2003)	Yes (APDD, 2002) Present in WA (DAWA, 2003)	No
<i>Capnophaeum fuliginodes</i> (Rehm) Yamamoto [Loculoascomycetes: Dothideales]	Sooty mould	Japan (MAFF, 1985; MAFF, 1987), Korea (KSPP, 1986)	No (Farr <i>et al.</i> , 2003; DAWA, 2003)	Yes

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Cercospora fuliginosa</i> Ellis S and Kellerman [‘mitosporic fungi’: Hyphomycetes]	Anthrachnose	Japan (MAFF, 2001)	No (Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Cercospora kaki</i> Ellis and Everhart [‘mitosporic fungi’: Hyphomycetes]	Angular leaf spot on leaves	Japan (MAFF, 1987), USA (USDA, 1997)	Yes (Qld) (Simmonds, 1966; Farr <i>et al</i> , 2003) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Cercospora kakivora</i> Hara [‘mitosporic fungi’: Hyphomycetes]	<i>Cercospora</i> leaf spot	Japan (Pollack, 1987; MAFF, 2001)	No (Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Cladosporium herbarum</i> (Persoon) Link [‘mitosporic fungi’: Hyphomycetes]	Sooty mould	Japan (MAFF, 1985; Saito <i>et al.</i> , 1997)	Yes (APDD, 2002; Sharma and Heather, 1981) Present in WA (DAWA, 2003)	No
<i>Fusarium oxysporum</i> Schlechtendahl:Fr. [‘mitosporic fungi’: Hyphomycetes]	<i>Fusarium</i> rot, Fruit rot, Branch canker	Japan, Korea (CAB International, 2002), Israel (PPIS, 2002)	Yes (Sampson and Walker, 1982; Cook and Dube, 1989; Shivas, 1989; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Fusicladium levieri</i> Magnus Syn = <i>Fusicladium diospyrae</i> Hori and Yoshida [Anamorphic Acantharia]	Black spot	Japan (MAFF, 1987)	No (Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Glomerella cingulata</i> (Stonem.) Spauld. & H. Schrenk [teleomorph] <i>Colletotrichum gloeosporioides</i> (Penz.) Sacc. [anamorph] [Sordariomycetidae: Glomerellaceae]	Anthrachnose	Japan, Korea, Israel (CAB International, 2002), USA (USDA, 1997), New Zealand (NZ MAF, 2003)	Yes (CAB International, 2002) Present in WA (DAWA, 2003)	No

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
<i>Helicobasidium mompa</i> Tanaka [Auriculariales: Auriculariaceae]	Violet root rot	Japan, Korea (Farr <i>et al</i> , 2003)	No (Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Lasiodiplodia theobromae</i> (Pat.) Griffon and Maubl. (anamorph) Syn = <i>Diplodia theobroma</i> ; <i>Botryodiplodia theobromae</i> [Xylariales: Hyponectriaceae]	Fruit rot, Floral shoot dieback disease, Stem rot, Stem–end rot, Stem canker	Japan, USA – including California (CAB International, 2002), Israel (PPIS, 2002)	Yes (APDD, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Macrophoma kaki</i> Hara [‘mitosporic fungi’: Coelomycetes]		Japan (Watson, 1971; MAFF, 2001)	No (Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Macrophomina phaseolina</i> (Tassi) Goid [‘Mitosporic fungi’: Coelomycetes] Syn = <i>Sclerotium bataticola</i> Taubenh.	Charcoal rot	Japan, Korea, USA(including Arizona, California and Texas), New Zealand (CAB International, 2002), Israel (PPIS, 2002)	Yes (APDD, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Monilinia fructigena</i> Honey [Leotiales: Sclerotiniaceae]	Brown rot	Japan, Korea, Israel (CAB International, 2002)	No (APDD, 2002; CAB International, 2002; DAWA, 2003)	Yes
<i>Mycosphaerella nawae</i> (Sydow) Hiura and Ikata [Dothideales: Mycosphaerellaceae]	Circular leaf spot of persimmon	Japan (MAFF, 1987), Korea (NPQS, 1993)	Yes (APDD, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Nectria haematococca</i> (Wollenw.) Gerlach (teleomorph) [Hypocreales: Nectriaceae]	Dry rot of potato, Tuber rot	Japan, Korea (CAB International, 2002), Israel (PPIS, 2002; CAB International, 2002)	Yes (CAB International, 2002) Not in WA (DAWA, 2003)	Yes (For WA only)
<i>Fusarium solani</i> (Martius) Sacc. [anamorph]				
<i>Penicillium expansum</i> Link and Gray [‘Mitosporic fungi’: Hyphomycetes]	Fruit rot, blue mould	Israel (PPIS, 2002)	Yes	No

Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
			(APDD, 2002)	
<i>Pestalotia diospyri</i> Sydow	Leaf spot	Japan (MAFF, 1985)	Present in WA (DAWA, 2003)	
[‘mitosporic fungi’: Coelomycetes]			No	Yes
			(Farr <i>et al</i> , 2003; DAWA, 2003)	
<i>Pestalotia theae</i> Sawada	Ringspot, tea grey blight	Korea (Chang <i>et al.</i> 1996; Chang <i>et al.</i> , 1997)	Yes	Yes
Syn = <i>Pestalotiopsis theae</i> (Saw.) Steyeart			(APDD, 2002)	(For WA only)
[‘mitosporic fungi’: Coelomycetes]			Not in WA (DAWA, 2003)	
<i>Phoma kakivora</i> Hara	Phoma spot	Japan (Sugawara and Yamada, 1971; MAFF, 1985)	No	Yes
[‘mitosporic fungi’: Coelomycetes]			(Farr <i>et al</i> , 2003; DAWA, 2003)	
<i>Phoma loti</i> Cooke		Japan (MAFF, 2001)	No	Yes
[‘mitosporic fungi’: Coelomycetes]			(Farr <i>et al</i> , 2003; DAWA, 2003)	
<i>Phomopsis rojana</i> Linnaeus		Japan (MAFF, 2001)	No	Yes
[‘mitosporic fungi’: Coelomycetes]			(Farr <i>et al</i> , 2003; DAWA, 2003)	
<i>Phyllactinia guttata</i> (Wallr. : Fries) Leveille	Powdery mildew	Korea (NPQS, 1993), USA (USDA, 1997)	No	Yes
Syn = <i>Phyllactinia kakicola</i> Sawada;			(Farr <i>et al</i> , 2003; DAWA, 2003)	
<i>Phyllactinia corylea</i> (Persoon) Karsten				
[Erysiphales: Erysiphaceae]				
<i>Physalospora kaki</i> Hara		Japan (MAFF, 2001)	No	Yes
[Amphisphaerales: Hyponectriaceae]			(Farr <i>et al</i> , 2003; DAWA, 2003)	
<i>Rosellinia necatrix</i> (Hartig) Berlese	White root rot	Japan, Korea, USA (including California), New Zealand (CAB International, 2002), Israel (PPIS, 2002; CAB International,	Yes, but under official control (South Australia)	Yes
(teleomorph) Syn = <i>Dematophora necatrix</i> R. Hartig			(APDD, 2002)	
			Present in WA (DAWA, 2003)	

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Scientific name of the pest ¹	Common name (s)	Present in exporting country ²	Present in Australia ³	Consider further ⁴
[Xylariales: Xylariaceae]		2002)		
<i>Sclerotinia sclerotiorum</i> (Lib.) de Bary [Discomycetes: Helotiales]	Twig blight	Japan, Korea, USA (including Texas, Arizona and California), New Zealand (CAB International, 2002), Israel (PPIS, 2002; CAB International, 2002)	Yes (APDD, 2002; CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Scorias communis</i> Yamamoto [Dothidiales: Capnodiaceae]	Sooty mould	Japan (MAFF, 1985)	No (APDD, 2002; Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Septogloeum kaki</i> (Sydow) Hara [Dothideales: Mycosphaerellaceae]	Leaf spot	Japan (MAFF, 2001)	No (APDD, 2002; Farr <i>et al</i> , 2003; DAWA, 2003)	Yes
<i>Thanatephorus cucumeris</i> (Frank) Donk (teleomorph) [Ceratobasidiales: Ceratobasidiaceae]	Damping off, rice sheath blight, root rot	Japan, Korea, USA(CAB International, 2002), Israel (PPIS, 2002; CAB International, 2002)	Yes (CAB International, 2002) Present in WA (DAWA, 2003)	No
<i>Rhizoctonia solani</i> [anamorph]				
<i>Tripospermum juglandis</i> (Trumen) Sgazzini [‘mitosporic fungi’: Hyphomycetes]	Sooty mould	Japan (MAFF, 1985)	No (APDD, 2002; Farr <i>et al</i> , 2003; DAWA, 2003)	Yes

¹ The initial list contains all pests known to be associated with persimmons in Japan, Korea and Israel.

² Comparison of pests of persimmons in Japan, Korea and Israel with the USA (California, Arizona and Texas) and New Zealand

³ As described in Pest Categorisation (see *Method for Stage 2: Risk assessment*).

⁴ Pest present in Japan, Korea and Israel, but not in Australia or present but officially controlled, are considered further in the ‘present on pathway’ stage of pest categorisation.

References for Appendix 1

- Abbott, I. (1985). Forest Entomology Research in Western Australia. Technical report. Department of Conservation and Land Management Western Australia.
- AFD. (2001). Australian Faunal Directory, Australian Biological Resources Study ABIF-Fauna. Environment Australia.
<http://www.environment.gov.au/abrs/abif-fauna/>
- Akiyama, Y. and Akiyama, K. (1996). The buprestid beetles (Coleoptera: Buprestidae) from Hiroshima Prefecture, southwestern Japan. *Miscellaneous Reports of the Hiwa Museum for Natural History* 34: 181-192.
- Akutsu, K. (1971). Cytoplasmic polyhedrosis of the fall webworm, *Hyphantria cunea* Drury (Lepidoptera:Arctiidae). *Applied Entomology and Zoology* 6(4): 198-205.
- APDD (2002). Australian Plant Diseases Database. <http://www.planthealthaustralia.com.au/APPD/contributors/APDD.asp>
- APPC (1987). Insect Pests of Economic Significance Affecting Major Crops of the Countries in Asia and the Pacific Region. Technical Document No. 135. Bangkok, Thailand: Regional FAO Office for Asia and the Pacific (RAPA).
- AQIS (1998). Final Import Risk Analysis of the Importation of Fruit of Fuji Apple (*Malus pumila* Miller var. *domestica* Schneider) from Aomori Prefecture in Japan. Australian Quarantine Inspection Service, Canberra.
- AQIS (1999). Final Import Risk Analysis on the Importation of Fresh Fruit of Korean Pear (*Pyrus ussuriensis* var. T. Lee) from the Republic of Korea. Australian Quarantine Inspection Service, Canberra.
- Brown, E. (1989). Report to the Northern Australian Quarantine Services Scientific Working Party Plants. Contracted report.
- CAB International. (2002). *Crop Protection Compendium*, 2002 Edition. CAB International, Wallingford, UK.

- Calder, A.A. (1998). Coleoptera: Elateroidea. In: Zoological Catalogue of Australia. Volume 29.6 (Ed. By A. Wells), Melbourne: CSIRO Publishing xii, 248 pp.
- Carver, M. and Reid, I. A. (1996). Aleyrodidae (Hemiptera: Hemiptera) of Australia. Systematic catalogue, host plant spectra, distribution, natural enemies and biological control. *CSIRO Australia Division of Entomology Technical Paper 37*: 1-55.
- Cassis, G., Houston, W.W.K., Weir, T.A., and Moore, B.P. (1992). Zoological Catalogue of Australia. Coleoptera: Scarabaeoidea. AGPS, Canberra.
- Chang, T.H, Lim, T.H. Chung, B.K. and Kim, B.S. (1997). Studies on cultural characteristics *Pestalotiopsis theae* causing leaf blight on oriental persimmon tree. *Korean Journal of Plant Pathology* 13(4): 232-238.
- Chang, T.H, Lim, T.H. Chung, B.K., Kim, B.S. and Shim, H.K. (1996). Occurrence of leaf blight on sweet persimmon tree by *Pestalotiopsis theae*. *Korean Journal of Plant Pathology* 12(3): 377-379.
- Cho, J. R., Hong, K. J., Yoo, J. K., Bang, J. R. and Lee, J. O. (1997). Comparative toxicity of selected insecticides to *Aphis citricola*, *Myzus malisuctus* (Homoptera: Aphididae), and the predator *Harmonia axyridis* (Coleoptera: Coccinellidae). *Journal of Economic Entomology* 90(1): 11-14.
- Cho, S.S., Kim, S.H. and Yang, J.S. (1989). Studies on the seasonal occurrence of the white grubs and the chafers, and on the species of chafers in the peanut fields in Yeo-Ju area. *Research-Reports of the Rural Development Administration, Crop Protection* 31(3): 19-26.
- Choi, H. Y., Paek, M. K. and Bae, Y. S. (1998). Taxonomic notes on nine species of the tribe Phycitini (Lepidoptera, Pyralidae, Phycitinae) from Korea (1). *Insecta Koreana* 17(15): 23-39.
- Choo, H. Y. and Woo, K. S. (1983). A list of the bark and ambrosia beetles in jurious to fruit and flowering tree from Korea (Coleoptera: Scolytidae). *Korean Journal of Plant Protection* 22(3): 171-173.
- Choo, H.Y. and Woo, K.S. (1985). Taxonomic studies on the Platypodidae and Scolytidae (Coleoptera) from Korea. 1. Platypodidae Slolytoplatatypinae and Scolytinae. *Insecta Koreana* 5: 31-47.

- Chung, B. K., Kang, S. W. and Kwon, J. H. (1995). Damage, occurrence and control of hemipterous insects in non-astringent persimmon orchards. *RDA Journal of Agricultural Science, Crop Protection* 37(2): 376-382.
- Cook, R.P. and Dube, A.J. (1989). Host-pathogen index of plant diseases in South Australia. South Australian Department of Agriculture.
- CSIRO (2002). Australian Insect Common and Scientific Names. <http://www.ento.csiro.au/aicn/>
- DAWA (2003). Draft WA pest lists for arthropods, pathogens and nematodes. Provided by Department of Agriculture Western Australia, August 2003.
- DAWA (2003). Department of Agriculture Western Australia – Entomology Branch, Oriental red mite. <http://www.agric.wa.gov.au/ento/surveillance/oriental%20red%20mite.html>
- Day, M.F. and Fletcher, M.J. (1994). An annotated catalogue of the Australian Cicadelloidea (Hemiptera: Auchenorrhyncha). *Invertebrate Taxonomy* 8: 117-288.
- De Lima, F., Woods, W. and Broughton, S. (1993). Control of Mediterranean fruit fly (medfly) in backyards. Department of Agriculture Western Australia. Farmnote No. 4/93. Agdex 201/622.
- Farr, D. F., Bills, G. F., Chamuris G. P. and Rossman A. Y. (2003) Fungi on Plants and Plant Products in the United States. Internat Version, Systematic Botany and Mycology Laboratory. <http://nt.ars-grin.gov/fungaldatabases/fungushost/fungushostframe.cfm>
- Ghai, S. and Shenhmar, M. (1984). A review of the world fauna of Tenuipalpidae (Acarina: Tetranychoidae). *Oriental insects*: 18: 99-172.
- Haga, K. and Okajima, S. (1983). A new genus and species of Phlaeothripidae (Thysanoptera) harmful to persimmon from Japan. *Annotationes Zoologicae Japnenses* 56: 241-245.
- Halliday, R.B. (1998). Mites of Australia: A Checklist and Bibliography. Monographs on Invertebrate Taxonomy. Volume 5. Collingwood, Australia: CSIRO
- Hamon, A.B. and Edwards, G.B. (1994). Thrips (Thysanoptera) new to Florida: 1. Thripidae: Panchaethripinae. *Entomology-Circular-Gainesville* 365: 2.

- Hashimoto, A. and Ueda, M. (1985). Coil form wax on the egg surface of *Drosicha corpulenta* Kuwana (Homoptera: Margarodidae). *Applied Entomology and Zoology* 20(1): 92-93.
- Hiehata, K. (1995). Occurrence and injury of persimmon bud mite, *Aceria diospyri* Keifer, in persimmon fruits in Yamaguchi Prefecture. *Bulletin of the Yamaguchi Agricultural Experiment Station* 46: 114-119. Yamaguchi Agric. Exp. Stn., Ouchi mihori, Yamaguchi shi, Yamaguchi ken, Japan.
- ICDb (2003). Insect Collection Database or Insect Reference Collection. Department of Agriculture, Government of Western Australia.
- Jang, C. and Choe, K.R. (1992). Community analysis of superfamily Pentatomoidea (Hemiptera) in Mt. Kyeryongsan. *Korean Journal of Applied Entomology* 31(2): 89-100.
- Kajimura, H. and Hijii, N. (1994). Electrophoretic comparisons of soluble mycelial proteins from fungi associated with several species of ambrosia beetles. *Journal of the Japanese Forestry Society* 76(1): 59-65.
- Kamei, M. and Asano, S. (1976). Some juvenile hormone activities of methoprene to the overwintering adults of the oriental horned wax scale, *Ceroplastes pseudoceriferus* Green. *Botyu-Kagaku* 41(2): 71-75.
- Kawamoto, F. (1978). Studies on the venomous spicules and spines of moth caterpillars. II. Pharmacological and biochemical properties of the spicule venom of the Oriental tussock moth caterpillar, *Euproctis subflava*. Studies on the venomous spicules and spines of moth caterpillars. I. Fine structure and development of the venomous spicules of the *Euproctis* caterpillars. *Japanese Journal of Sanitary Zoology* 29(2): 175-183.
- Kim, I.S., Hong, K.J, Han, M.J. and Lee, M.H. (1997). Survey on the occurrence of quarantine pests for export in major non-astringent persimmon (*Diospyros kaki* Thunb.) production areas in Korea [Republic]. *RDA Journal of Crop Protection* 39(2): 67-71.
- Kim, J.I. (1996). Taxonomic study of Korean Rutelidae (Coleoptera) 4. Genus *Mimela*. *Korean Journal of Entomology* 26(3): 235-242.
- Kim, J.K., Moon, T.Y. and Yoon, I.B. (1994). Systematics of vespine wasps from Korea, 1. Genus *Vespa* Linnaeus (Vespidae, Hymenoptera). *Korean Journal of Entomology* 24(2): 107-115.

- Kim, T.H., Lim, K.Y., Kwak, J.S., Kim, C.S., Choi, K.H. and Kim, J. (2000). Bionomics of *Tropidothorax cruciger* (Motschulsky) on *Cynanchum wilfordii* Hemsley in Chinan, Chonbuk Province. *Korean Journal of Applied Entomology* 39(3): 165-169.
- Kishii, T. (1983). On some elaterid-species from Japan, with the description of two new taxa (Coleoptera). 'Notes on Elateridae from Japan and its adjacent area 3'. *Bulletin of the Heian High School* 27: 47-64.
- Kovach, J. and Gorsuch, C.S. (1985). Survey of ambrosia beetle species infesting South Carolina peach orchards and a taxonomic key for the most common species. *Journal-of-Agricultural-Entomology* 2(3): 238-247.
- KSPP (1986). A List of Plant Diseases, Insect Pests and Weeds in Korea (second edition). 633 pp.
- Kulik, S. A. (1965). The stink and shield bugs (Heteroptera: Pentatomidae) of Eastern Siberia and the Far East. *Acta Entomologica Musei Nationalis Pragae* Vol. 10, No. 93 (in Russian).
- Kwon, T.Y., Park, S.D., Park, S.D, Choi, B.S. and Kwon, Y.J. (1995). Seasonal occurrence and chemical control effects of *Eriococcus lagerstroemiae* Kuwana on persimmon trees. *Korean Journal of applied Entomology* 34(4): 295-299.
- Lee Hyung, C., Yoo Chong, M., Lee, H.C. and Yoo, C.M. (1999). Characteristics of antifreeze protein-1 induced during low temperature acclimation in the *Protaetia brevitarsis* (Coleoptera; Cetonidae) larva. *Korean Journal of Biological Sciences* 3(1): 47-52.
- Lee, C.E., Miyamoto, S. and Kerzhner, I.M. (1994). Additons and corrections to the list of Korean Heteroptera. *Nature and Life* 24(1-2): 1034.
- Lee, L.C, Yoo J.K. and Yoo, CY. (1970). Survey on the kinds of the fruit sucking moths and their damages in Korea. *Korean Journal of Plant Protection* 9(2): 99-102.
- Lee, S.C., Kim, S.S. and Kim, D.I. (1992). An observation of insect pests on the citron trees in southern region of Korea. *Korean Journal of Entomology* 23(3): 223-226.

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- MAFF. (1985). List of Harmful Pests Which Affect Persimmons at the Time of Harvest. Provided by Plant Quarantine Division, Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) to Australian Department of Trade January 1985, on file T92/116.
- MAFF. (1987). Data provided by Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) in letter, 24 April, 1987 to Counsellor (Agriculture), Australian Embassy, Tokyo, on file T93/2364.
- MAFF. (1992). Pest information (Appendix 3) provided by Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF), on file T92/589.
- MAFF. (2001). Additional Information List of the Japanese Persimmon Pests. Japanese Ministry for Agriculture, Forestry and Fisheries (MAFF), on file AFFA02/3296.
- Maier, C.T. and Mastro, V.C. (1998). Discovery, abundance, and distribution of the exotic apple tortrix, *Archips fuscocupreanus* Walsingham (Lepidoptera: Tortricidae), in the northeastern United States. *Proceedings of the Entomological Society of Washington* 100(3): 545-552.
- Martin, J. H. (1999). The Whitefly Fauna of Australia (Hemiptera: Aleyrodidae). A Taxonomic Account and Identification Guide. CSIRO, CSIRO Division of Entomology Technical Paper 38, 197 pp.
- Matsuda, K. and Sugawara, F. (1980). Defensive secretion of chrysomelid larvae *Chrysomela vigintipunctata* costella (Marseul), *C. populi* L. and *Gastrolina depressa* Baly (Coleoptera: Chrysomelidae). *Applied Entomology and Zoology* 15(3): 316-320.
- McLeod, R., Reay, F. and Smyth, J. (1994). Plant Nematodes of Australia Listed by Plant and by Genus. NSW Agriculture and RIRDC. ISBN 0731056116.
- Mizukubo, T. and Minagawa, N. (1984). The genus *Coslenchus Siddiqi* (Tylenchidae: Nematoda) from Japan. *Japanese Journal of Nematology* 14: 28-39.
- Mound, L.A. (1996). Thysanoptera. pp. 249-332 (App. I-IV), 394-414 (Index) in Wells, A. (ed.) Zoological Catalogue of Australia 26. Psocoptera, Phthiraptera, Thysanoptera. CSIRO Publishing, Melbourne, Australia.
- Naumann, I. D. (1993). CSIRO Handbook of Australian Insect Names. Common and Scientific Names for Insects and Allied Organisms of Economic and Environmental Importance. CSIRO, Australia.

- Nielsen, E.S., Edwards, E.D. and Rangsi, T.V. (eds). (1996). Checklist of the Lepidoptera of Australia. *Monographs on Australian Lepidoptera* Volume 4. CSIRO Australia.
- NPQS (1993). Pest List of Some Fruit Trees in Korea - Sweet Persimmon (*Diospyros kaki*). Provided by National Plant Quarantine Service of Korea in letter dated 14 June 1993 requesting a Pest Risk Assessment (FileT92/116).
- NPQS (1995). Letter from Hong In-Shik to R. Ikin, dated 21 July 1995 with attachment (Insect Pests 4), on file T92/2364.
- NZ MAF (1999). Import health standard commodity sub-class: Fresh fruit/vegetables, Korean pear, *Pyrus pyrifolia* from the Republic of Korea. New Zealand Ministry of Agriculture and Forestry.
- NZ MAF (2003). Persimmon pre clearance list provided to Plant Biosecurity on 18 March 2003. New Zealand Ministry of Agriculture and Forestry.
- Ono, K. (1937). On the insect pests of persimmon. *Insect World* 41(5): 195-199.
- Ono, M. and Sasaki, M. (1987). Sex pheromones and their cross-activities in six Japanese sympatric species of the genus *Vespa*. *Insectes Sociaux* 34(4): 252-260.
- Ono, M., Sasaki, M. and Okada, I. (1986). Mating behaviour of the giant hornet, *Vespa mandarinia* Smith, and its pheromonal regulation. *Proceedings of the XXXth International Congress of Apiculture, Nagoya, 1985*. pp. 255-259.
- Ota, M. and Ozawa, A. (1997). Vertical dispersion of the silver leaf whitefly, *Bemisia argentifolii* (Bellows and Perring) in field. *Proceedings of the Kanto Tosan Plant Protection Society* 44: 229-230.
- Park, J.D., Koo, H.Y. and Lee, W.G. (1992). Seasonal fluctuation of each stage, ovipositing and hatching behaviour of *Cerostegia japonicus* Green (Homoptera: Coccidae) on persimmon trees. *Research Reports of the Rural Development Administration, Crop Protection* 34(1): 48-53.
- Park, S., Zakauallah, K., Kim, J., Kim, S., Kim, K. and Choi, B.S. (1999). Association and density of plant parasitic nematodes in fruit orchards in Gyeongbuk province, Korea. *International Journal of Nematology* 9(2): 185-190.

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- Poole, M.C., Botha, J.H., Tuten, S. and Stuart, M.J. (2003). Preliminary Draft State Import Risk Analysis for silverleaf whitefly [*Bemisia tabaci* (Gennadius) biotype B] nursery stock, cut flowers/foilage and vegetables exported from the Perth metropolitan area into endangered areas within Western Australia. *Draft Report of Stakeholder consultation*. Department of Agriculture, Government of Werstern Australia. 1pp, 3pp refs.
- Pollack, F.G. (1987). An annotated compilation of *Cercospora* names. *Mycologia memoir* 12: 1-212.
- PPIS. (2002). Pests of *Diospyros* spp. (Ebenaceae) in Israel, specifically *D. Kaki* L. (Japanese/Oriental persimmon, kaki fruit, “Sharon fruit); rootstock – *D. virginiana* L. rootstock (American/common persimmon). Israel persimmon pest list-updated March 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.
- Qadir, A. and Hashinaga, F. (2001). Inhibition of postharvest decay of fruits by nitrous oxide. *Postharvest Biology and Technology* 22: 279-283.
- Saito, K., Yabu, H. and Ishii, J. (1997). Chromatographic screening of growth inhibitors for *Cladosporium herbarum* in the extracts of calcareous red algae. *Acta Biologica Hungarica* 48(2): 201-207.
- Sampson, P.J. and Walker, J. (1982). An Annotated List of Plant Diseases in Tasmania. Department of Agriculture, Tasmania.
- ScaleNet(2001). Ben-Dov, Y., Miller, D.R. and Gibson, G.A.P. (2000). <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>
- Sharma, I.K. and Heather, W.A. (1981). Hyperparasitism of *Melampsora larici-populina* by *Cladosporium herbarum* and *Cladosporium tenuissimum*. *Indian Phytopathology* 34(3): 395-397.
- Shiozawa, H. and Tsuchizaki, T. (1992). Distribution of Paulownia witches broom and a survey of sucking insects occurring on Paulownia plants in Japan. *Proceedings o -the Kanto Tosan Plant Protection Society* 39: 259-260.
- Shivas, R.G. (1989). Fungal and Bacterial Diseases of Plants in Western Australia. *Journal of the Royal Society of Western Australia* 72: 1-62.
- Simmonds, J.H. (1966). Host Index of Plant Diseases in Queensland. Queensland Department of Primary Industries, Brisbane.

- Son-Chang, K., Park-Sang, G., Hwang-Young, H. and Choi-Boo, S. (2000). Field occurrence of stink bug and its damage in soybean. *Korean Journal of Crop Science* 45(6): 405-410.
- Sugawara, H. and Yamada, S. (1971). Colour Handbook of Fruit Tree Diseases and Pests (in Japanese). Tokyo, Noson-Gyoson-Bunkakyokai. Provided by MAFF c 1987 (T93/2364).
- Ueno, H. (1971). Studies on the scale insects that attack Japanese persimmon *Diospyros kaki* L. 1. Interrelationships between overwintered larvae of the Japanese wisteria cottony mealybug, *Planococcus kraunhiae* and the elongate cottony scale, *Phenacoccus pergandei* Cockerell, in the orchard. *Japanese Journal of Applied Entomology and Zoology* 15: 211-214.
- USDA (1997). Importation of Fresh Persimmon Fruit, *Diospyros kaki* from South Korea into the United States. Qualitative, Pathway-initiated Pest Risk Assessment. U.S. Department of Agriculture.
- Watanabe, K. (1984). Captures of many *Artana dotata* moths (Noctuidae) at Hamamatsu City zone, possibly carried with typhoon. *Japan Heterocerists' Journal* 124: 389.
- Watson, A.J. (1971). Foreign Bacterial and Fungus Diseases of Food, Forage, and Fibre Crops. USDA Agricultural Research Service, 111 pp.
- Williams, D. J. (1985). Australian Mealybugs. British Museum (Natural History).
- Woo, K.S. (1988). Thrips as crop pests in Korea. *Acta Phytopathologica et Entomologica Hungarica* 23(3-4): 372.
- Yoon, J.K and Lee, D.K. (1974). Survey of fruit-piercing moths in Korea. (1) Species of the fruit-piercing moths and their damage. *Korean Journal of Plant Protection* 13(4): 217-225.
- Yoon, J.K., Kim, K.C., Cheon, S.J. and Kim, Y.S. (1982). Ecological studies on the bark beetles on plum and apricot. *Korean Journal of Plant Protection* 21(2): 78-86.

Yun, J.W., Kim, D.H. and Song, S.K. (1997). Enhanced production of fructosyltransferase and glucosyltransferase by substrate-feeding cultures of *Aureobasidium pullulans*. *Journal of Fermentation and Bioengineering* 84(3): 261-263.

Zhang, B.C. (1994). Index of Economically Important Lepidoptera. CAB International. 599pp.

Zlotina, M.A., Mastro, V.C., Leonard, D.E. and Elkinton, J.S. (1998). Survival and development of *Lymantria mathura* (Lepidoptera: Lymantriidae) on North American, Asian, and European tree species. *Journal of Economic Entomology* 91(5): 1162-1166.

Appendix 2: Pest categorisation for persimmons (pathway association)

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
ARTHROPODA					
<i>Acanthosoma denticaudum</i> Jakovlev Syn = <i>Acanthosoma denticauda</i> Kim [Hemiptera: Acanthosomatidae]	Red-backed stink bug	No (AQIS, 1998)	Not applicable	Not applicable	No
<i>Aceria diospyri</i> Keifer [Acarina: Eriophyidae]	Persimmon bud mite	Yes (Hiehata, 1995)	Yes (AQIS, 1995)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Acrobasis tokiella</i> (Ragonot) [Lepidoptera: Pyralidae]	Apple leaf case bearer	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Acronicta rumicis</i> Linnaeus Syn = <i>Acronicta alnoides</i> Geest, <i>Acronicta grisea</i> Warren, <i>Acronicta marginata</i> Lambillion, <i>Acronicta striata</i> Meves, <i>Acronicta suhrianna</i> Gillmer, <i>Acronicta tugubris</i> Schultc, <i>Acronycta bercei</i> Saunders, <i>Acronycta diffusa</i> Walker. [Lepidoptera: Noctuidae]	Sorrel cutworm, Knotgrass moth	No (CABI, 2002)	Not applicable	Not applicable	No
<i>Adoretus tenuimaculatus</i> Waterhouse [Coleoptera: Scarabaeidae]	Brown chafer	No (Lee <i>et al.</i> , 2002)	Not applicable	Not applicable	No
<i>Adris tyrannus amurensis</i> Staudinger [Lepidoptera: Noctuidae]	Akebia leaf-like moth	Yes (NZ MAF, 1999)	Yes (AQIS, 1998 & 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Agrilus moerens</i> Saunders [Coleoptera: Bupresidae]	Jewel beetle	No (Booth <i>et al.</i> 1990)	Not applicable	Not applicable	No
<i>Aleurocanthus spiniferus</i> Quaintance & Baker Syn = <i>Aleurocanthus citricolus</i> (Newstead) Quaintance & Baker; <i>Aleurocanthus rosae</i> Singh; <i>Aleurocanthus spiniferus</i> var. <i>intermedia</i> Silvestri; <i>Aleurodes citricola</i> Newstead; <i>Aleurodes spinifera</i> Quaintance) [Hemiptera: Aleyrodidae]	Citrus blackfly, Orange spiny whitefly, Citrus mealywing	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Ambrosiodmus rubricollis</i> (Eichhoff) Syn = <i>Xyleborus rubricollis</i> Eichhoff [Coleoptera: Scolytidae]	Ambrosia beetle; Red-necked bark beetle	No (Booth <i>et al.</i> 1990)	Not applicable	Not applicable	No
<i>Anomala albopilosa</i> Hope [Coleoptera: Scarabaeidae]	Green chafer	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Anomala cuprea</i> (Hope) Syn = <i>Euchlora cuprea</i> [Coleoptera: Scarabaeidae]	Cupreous chafer	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Anomala daimiana</i> Harold [Coleoptera: Scarabaeidae]	Cherry chafer	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Anomala rufocuprea</i> (Motschulsky) [Coleoptera: Scarabaeidae]	Soyabean beetle	No (Lee <i>et al.</i> 2002)	Not applicable	Not applicable	No
<i>Apate monachus</i> (Fabricius) Syn = <i>Apate monacha</i> Fabricius; <i>Apate</i>	Date palm bostrichid, Black borer, Twig borer	No (PPIS, 2002)	Not applicable	Not applicable	No

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>carmelita</i> Fabricius; <i>Apate francisca</i> Fabricius; <i>Apate gibba</i> Fabricius; <i>Apate mendica</i> Olivier; <i>Apate monachus</i> var. <i>rufiventris</i> Lucas; <i>Apate semicostata</i> Thomson; <i>Apate senii</i> Stefani [Coleoptera: Bostrichidae]					
<i>Archips fuscocupreanus</i> Walsingham Syn = <i>Cacoecia fuscocupreana</i> Walsingham; <i>Ptycholoma fuscocupreana</i> Walsingham [Lepidoptera: Tortricidae]	Apple tortrix	No (USDA, 1997). Genus is not associated with fruit.	Not applicable	Not applicable	No
<i>Archips ingentanus</i> Christoph Syn = <i>Archippus ingentanus</i> Christoph [Lepidoptera: Tortricidae]	Larger apple tortrix	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Artena dotata</i> Fabricius [Lepidoptera: Noctuidae]	Noctuid	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Ascotis selenaria</i> (Denis & Schiffermüller) Syn = <i>Boarmia selenaria</i> Schiffermuller [Lepidoptera: Geometridae]	Geometrid moth	No (USDA, 2002) (not on pathway for citrus from Korea)	Not applicable	Not applicable	No
<i>Aspidiotus destructor</i> Signoret [Hemiptera: Diaspididae]	Coconut scale	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Basilepta fulvipes</i> (Motschulsky) [Coleoptera: Chrysomelidae]	Golden-green minute leaf beetle	No (CAB International, 2002). Genus known to feed on	Not applicable	Not applicable	No

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Blenina senex</i> (Butler) [Lepidoptera: Noctuidae]	Bark-like moth	leaves and roots. No (USDA, 1997)	Not applicable	Not applicable	No
<i>Bothrogonia japonica</i> Ishihara [Hemiptera: Cicadellidae]	Black-tipped leafhopper	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Caligula japonica</i> Moore Syn = <i>Dictyoploca japonica</i> Moore [Lepidoptera: Saturniidae]	Wild silk moth	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Ceratitis capitata</i> Wiedemann [Diptera: Tephritidae]	Mediterranean fruit fly; medfly	Yes (PPIS, 2002)	Yes (persimmons from the USA)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Ceroplastes floridensis</i> Comstock [Hemiptera: Coccidae]	Florida wax scale	Yes (PPIS, 2002)	Yes (persimmons from the USA)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Ceroplastes japonicus</i> Green [Hemiptera: Coccidae]	Japanese wax scale	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Ceroplastes pseudoceriferus</i> Green [Hemiptera: Coccidae]	Wax scale	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Chrysochroa fulgidissima</i> Schonherr [Coleoptera: Buprestidae]	Two-striped green buprestid, jewel beetle	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Chrysomela populi</i> Linnaeus Syn= <i>Melasoma populi</i>	Poplar leaf beetle	No (USDA, 1997)	Not applicable	Not applicable	No

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[Coleoptera: Chrysomelidae] <i>Cicadella viridis</i> (Linnaeus)	Green leafhopper	No (USDA, 1997)	Not applicable	Not applicable	No
[Hemiptera: Cicadellidae] <i>Coccurea suwakensis</i> (Kuwana & Toyoda)	Quince cottony scale	No (USDA, 2003)	Not applicable	Not applicable	No
[Hemiptera: Pseudococcidae] <i>Cryptoblabes gnidiella</i> (Millière)	Pyralid moth, Honeydew moth	Yes (PPIS, 2002)	Yes (BA, 2002)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
[Lepidoptera: Pyralidae] <i>Cyrtoclytus caproides</i> Bates Syn = <i>Cyrtoclytus capra</i> (Germar)]	Long horn beetle	No (Booth <i>et al.</i> 1990)	Not applicable	Not applicable	No
[Coleoptera: Cerambycidae] <i>Drosicha corpulenta</i> (Kuwana)	Giant mealybug	No (USDA, 1997)	Not applicable	Not applicable	No
[Hemiptera: Margaroididae] <i>Ectinus sericeus</i> Candeze	Wheat wireworm	No (USDA, 1997)	Not applicable	Not applicable	No
[Coleoptera: Elateridae] <i>Empoasca vitis</i> (Göthe)	Small green leaf hopper	No (USDA, 1997)	Not applicable	Not applicable	No
[Hemiptera : Cicadellidae] <i>Endoclyta excrescens</i> (Butler)	Japanese swift moth	No (USDA, 1997)	Not applicable	Not applicable	No
[Lepidoptera: Hepialidae] <i>Eriococcus lagerstroemiae</i> Kuwana	Crapemyrtle scale	No (USDA, 1997)	Not applicable	Not applicable	No
[Homoptera: Eriococcidae] <i>Eumeta minuscula</i> (Butler) Syn = <i>Clania minuscula</i> Butler	Tea bagworm	No (USDA, 1997)	Not applicable	Not applicable	No

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[Lepidoptera: Pyschidae] <i>Euproctis similis</i> Fuessly	Browntail moth	No	Not applicable	Not applicable	No
[Lepidoptera: Lymantriidae]		(USDA, 1997)			
<i>Euproctis subflava</i> (Bremer)	Oriental tussock moth	No	Not applicable	Not applicable	No
[Lepidoptera: Lymantriidae]		(USDA, 1997)			
<i>Euzophera batangensis</i> Caradja	Persimmon bark borer	No	Not applicable	Not applicable	No
[Lepidoptera: Pyralidae]		(Wang and Wang, 1988)			
<i>Euzopherodes vapidella</i> Mann Syn = <i>Epehstia vapidella</i>	Citrus stub moth	No	Not applicable	Not applicable	No
[Lepidoptera: Pyralidae]		(PPIS, 2002)			
<i>Geisha distinctissima</i> (Walker)	Green broad-winged planthopper	No	Not applicable	Not applicable	No
[Hemiptera: Flatidae]		(USDA, 1997; MAFF 2001)			
<i>Grapholita molesta</i> (Busck) Syn = <i>Cydia molesta</i> (Busck)	Oriental fruit moth	Yes	Yes	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
[Lepidoptera: Tortricidae]		(CAB International, 2002)	(persimmons from the USA)		
<i>Graptopsaltria nigrofuscata</i> (Motschulsky)	Large brown cicada	No	Not applicable	Not applicable	No
[Lepidoptera: Geometridae]		(USDA, 1997)			
<i>Gymnoscelis rufifasciata</i> Haworth	Geometrid moth, Double-striped pug	No	Not applicable	Not applicable	No
[Lepidoptera: Geometridae]		(PPIS, 2002)			
<i>Halyomorpha halys</i> (Stal) Syn = <i>Halyomorpha mista</i> (Uhler)	Yellow-brown stink bug	No	Not applicable	Not applicable	No
[Hemiptera: Pentatomidae]		(USDA, 1997)			

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Haplothrips chinensis</i> Priesner [Thysanoptera: Phlaeothripidae]	Thrips	No (Broughton and De Lima, 2002)	Not applicable	Not applicable	No
<i>Holochlora japonica</i> Brunner von Wattenwyl	Japanese broad-winged katydid; fruit-tree katydid	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Homona magnanima</i> Diakonoff [Lepidoptera: Tortricidae]	Oriental tea tortrix	Yes (MAFF, 1992)	Yes (AQIS, 1998)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Hoshinoa longicellana</i> Walsingham Syn = <i>Archips longicellana</i> Walsingham [Lepidoptera: Tortricidae]	Common apple leafroller	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Hyphantria cunea</i> (Drury) [Lepidoptera: Arctiidae]	Fall webworm, Mulberry moth	No (AQIS, 1998)	Not applicable	Not applicable	No
<i>Hypothenemus eruditus</i> Westwood [Coleoptera: Scolytidae]	Bark beetle	No (USDA, 1997)	Not applicable	Not applicable	Yes
<i>Lagoptera juno</i> (Dalman) [Lepidoptera : Noctuidae]	Rose of sharon leaf-like moth; Fruit-piercing moth	Yes (AQIS, 1998)	Yes (AQIS, 1998 & 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Lepidosaphes conchiformioides</i> Borchsenius [Hemiptera: Diaspididae]	Pear oystershell scale	Yes (USDA, 1997)	Yes (AQIS, 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Lepidosaphes cupressi</i> Borchsenius Syns = <i>Lepidosaphes foliicola</i> Borchsenius; <i>Cornuaspis cupressi</i> Borchsenius.		No (Xu <i>et al.</i> , 1995)	Not applicable	Not applicable	No

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[Hemiptera: Diaspididae] <i>Lepidosaphes tubulorum</i> Ferris	Dark oystershell scale	No (USDA, 1997)	Not applicable	Not applicable	No
[Hemiptera: Diaspididae] <i>Lixus ornatus</i> Reiche	Weevil	No (PPIS, 2002)	Not applicable	Not applicable	No
[Coleoptera: Curculionidae] <i>Lobesia botrana</i> Denis & Schiffermüller Syn = <i>Polychrosis botrana</i> Schiff.	European/Mediterranean grape berry/vine moth	Yes (PPIS, 2002)	No	Quarantine pest	Yes
[Lepidoptera: Tortricidae] <i>Lopholeucaspis japonica</i> (Cockerell)	Japanese baton-shaped scale	Yes (AQIS, 1999)	Yes (AQIS, 1998 & 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
[Hemiptera: Diaspididae] <i>Lymantria dispar japonica</i> Motschulsky	Asian gypsy moth	No (USDA, 1997)	Not applicable	Not applicable	No
[Lepidoptera: Lymantriidae] <i>Lymantria mathura</i> Moore	Pink gypsy moth	No (USDA, 1997)	Not applicable	Not applicable	No
[Lepidoptera: Lymantriidae] <i>Maladera castanea</i> (Arrow)	Asiatic garden beetle	No (USDA, 1997)	Not applicable	Not applicable	No
[Coleoptera: Scarabaeidae] <i>Maladera matrida</i> Argaman	Khomeini beetle	No (PPIS, 2002)	Not applicable	Not applicable	No
[Coleoptera: Scarabaeidae] <i>Maladera orientalis</i> Motschulsky	Smaller velvety chafer	No (USDA, 1997)	Not applicable	Not applicable	No
[Coleoptera: Scarabaeidae] <i>Melanotus legatus</i> Candeze	Pectinate-horned click beetle	No (USDA, 1997)	Not applicable	Not applicable	No
[Coleoptera: Elateridae]					

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Melolontha frater</i> Arrow [Coleoptera: Scarabaeidae]	Larger frosted chafer	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Microleon longipalpis</i> Butlerlong [Lepidoptera: Limacodidae]	Palpi cochlid	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Milviscutulus mangiferae</i> Green Syn = <i>Protopulvinaria mangiferae</i> ; <i>Coccus mangiferae</i> [Hemiptera: Coccidae]	Mango shield scale, Mango scale	No (PPIS, 2002)	Not applicable	Not applicable	No
<i>Mimela splendens</i> Gyllenhal [Coleoptera: Scarabaeidae]	Scarab beetle	No (Booth <i>et al.</i> 1990)	Not applicable	Not applicable	No
<i>Monema flavescens</i> Walker [Lepidoptera: Limicodidae]	Oriental moth	No (NPQS, 1993)	Not applicable	Not applicable	No
<i>Narosoideus flavidorsalis</i> (Staudinger) [Lepidoptera: Limacodidae]	Pear stinging caterpillar	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Nezara antennata</i> Scott [Hemiptera: Pentatomidae]	Green stink bug	Yes (MAFF, 1992; AQIS, 1998)	Yes (AQIS, 1998 & 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Nymphalis xanthomela</i> Denis & Schiffermüller [Lepidoptera: Nymphalidae]	Willow nymphalid	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Orgyia thyellina</i> Butler [Lepidoptera: Lymantriidae]	Japanese tussock moth	No (MAFF, 1992)	Not applicable	Not applicable	No
<i>Pandemis heparana</i> (Denis & Schiffermüller) [Lepidoptera: Tortricidae]	Fruit-tree tortrix	No (MAFF, 1992)	Not applicable	Not applicable	No

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Panonychus ulmi</i> (Koch) [Acarina: Tetranychidae]	European red mite	No (CAB International, 2002)	Not applicable	Not applicable	No
<i>Parabemisia myricae</i> (Kuwana) [Hemiptera: Aleyrodidae]	Japanese bayberry whitefly	No (PPIS, 2002)	Not applicable	Not applicable	No
<i>Parasa consocia</i> Walker Syn = <i>Latoia consocia</i> (Walker) [Lepidoptera: Limacodidae]	Green cochlid	No (AQIS, 1998)	Not applicable	Not applicable	No
<i>Parasa sinica</i> Moore Syn = <i>Latoia sinica</i> (Moore) [Lepidoptera: Limacodidae]	Chinese cochlid	No (AQIS, 1998)	Not applicable	Not applicable	No
<i>Parlatoria pergandii</i> Comstock [Hemiptera: Diasididae]	Black parlatoria scale	Yes (CAB International, 2002)	Yes (persimmons from the USA)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Parthenolecanium corni</i> (Bouché) (= <i>Lecanium corni</i> Bouché) [Hemiptera: Coccidae]	European fruit lecanium	No (CAB International, 2002)	Not applicable	Not applicable	No
<i>Percnia albinigrata</i> Warren [Lepidoptera: Geometridae]	Looper	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Percnia giraffata</i> (Guenée) [Lepidoptera: Geometridae]	Spotted persimmon looper	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Phenacoccus aceris</i> (Signoret) [Hemiptera: Pseudococcidae]	Apple mealybug	Yes (AQIS, 1999)	Yes (AQIS, 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Phenacoccus pergandei</i> Cockerell [Hemiptera: Pseudococcidae]	Persimmon long wooly scale (in China)	Yes (AQIS, 1998)	Yes (AQIS, 1998)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Planococcus kraunhiae</i> (Kuwana) [Hemiptera: Pseudococcidae]	Japanese mealybug	Yes (USDA, 1997)	Yes (AQIS, 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Platyleura kaempferi</i> (Fabricius) [Hemiptera: Cicadidae]	Kaempfer cicada	No (AQIS, 1998)	Not applicable	Not applicable	No
<i>Plautia stali</i> Scott [Hemiptera: Pentatomidae]	Brown-winged stink bug	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Pleuroptya chlorophanta</i> Butler [Lepidoptera: Pyralidae]	Three striped pyralid?	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Ponticulothrips diospyrosi</i> Haga & Okajima [Thysanoptera: Phlaeothripidae]	Japanese gall forming thrips	Yes (AQIS, 1998)	Yes (AQIS, 1998)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Popillia japonica</i> Newman [Coleoptera: Scarabaeidae]	Japanese beetle	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Protaetia brevitarsis</i> Lewis [Coleoptera: Scarabaeidae]	Scarab beetle	No Booth <i>et al.</i> 1990)	Not applicable	Not applicable	No
<i>Pseudaonidia duplex</i> (Cockerell) [Hemiptera: Diaspididae]	Camphor scale	Yes (MAFF, 1992)	Yes (AQIS, 1998 & 1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Pseudaulacaspis pentagona</i> (Targioni-Tozzetti)	Peach white scale	Yes (CAB International, 2002)	Yes (AQIS 1995)	Quarantine pest	Yes (current risk management measures for

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[Hemiptera: Diaspididae]					this pest will be adopted)
<i>Pseudococcus comstocki</i> (Kuwana)	Comstock mealybug	No	Not applicable	Not applicable	No
[Hemiptera: Pseudococcidae]		(MAFF, 2001)			
<i>Pseudococcus cryptus</i> Hempel	Citriculus mealybug, cryptic mealybug	Yes	No	Quarantine pest	Yes
[Hemiptera: Pseudococcidae]		(PPIS, 2002)			
<i>Ptycholoma lecheana circumclusana</i> (Christoph)	Persimmon leafroller	No	Not applicable	Not applicable	No
		(USDA, 1997)			
[Lepidoptera: Tortricidae]					
<i>Pulvinaria aurantii</i> Cockerell	Cottony citrus scale	No	No	Not applicable	No
Syns = <i>Lecanium notatum</i> Maskell; <i>Coccus notatus</i> Fernald; <i>Chloropulvinaria aurantii</i> Borchsenius; <i>Pulvinaria notatum</i> Takahashi		(APHIS, 1997)			
[Homoptera: Coccidae]					
<i>Pulvinaria citricola</i> Kuwana	Cottony citrus scale	No	No	Not applicable	No
Syns = <i>Pulvinaria nipponica</i> Lindinger; <i>Eupulvinaria citricola</i> Borchsenius		(Vranjic, 1997)			
[Hemiptera: Coccidae]					
<i>Pulvinaria idesiae</i> Kuwana		No	No	Not applicable	No
Syns = <i>Eupulvinaria idesiae</i> Borchsenius		(Kawai, 1980)			
[Hemiptera: Coccidae]					
<i>Retithrips syriacus</i> (Mayet)	Black black vine trips; castor thrips; grape thrips	Yes	No	Quarantine pest	Yes
[Thysanoptera: Thripidae]		(PPIS, 2002)			
<i>Ricania japonica</i> Melichar	Japanese leafhopper	No	Not applicable	Not applicable	No

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[Hemiptera: Ricaniidae] <i>Riptortus clavatus</i> (Thunberg)	Bean bug	(USDA, 1997) No	Not applicable	Not applicable	No
[Hemiptera: Alydidae] <i>Saissetia citricola</i> Kuwana Syns = <i>Takahashia citricola</i> Kuwana; <i>Saissetia citricola</i> Takahashi and Tachikawa; <i>Parasaissetia citricola</i> Yang.		(USDA, 1997) No (Kawai, 1980)	No	Not applicable	No
[Hemiptera: Coccidae] <i>Scolytoplatypus mikado</i> Blandford	Mikado ambrosia beetle	No	Not applicable	Not applicable	No
[Coleoptera: Scolytinae] <i>Scopelodes contracta</i> Walker	Small blackish cochlid	(Booth <i>et al</i> , 1990) No	Not applicable	Not applicable	No
[Lepidoptera: Limacodidae] <i>Sesamia nonagrioides</i> (Lefebvre)	Mediterranean corn stalk borer, pink maize stalk borer	(Common, 1990) Yes	No	Quarantine pest	Yes
[Lepidoptera: Noctuidae] <i>Sinoxylon japonicum</i> Lesne	Two-horned stem-boring beetle	No (Booth <i>et al</i> , 1990)	Not applicable	Not applicable	No
[Coleoptera: Bostrichidae] <i>Sparganothis pilleriana</i> (Denis & Schiffermüller)	Grape berry moth	No (Carter, 1984)	Not applicable	Not applicable	No
[Lepidoptera: Tortricidae] <i>Spilarctia subcarnea</i> (Walker) Syn = <i>Spilosoma subcarnea</i> Walker	Tiger moth	No (USDA, 1997)	Not applicable	Not applicable	No
[Lepidoptera: Arctidae]					

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Spilosoma lubricipeda</i> (Linnaeus) [Lepidoptera: Arctidae]	White ermine moth	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Spilosoma punctaria</i> (Stoll) [Lepidoptera: Arctidae]	Red belly black-dotted arctiid	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Stathmopoda masinissa</i> Meyrick [Lepidoptera: Oecophoridae]	Persimmon fruit moth	Yes (USDA, 1997)	Yes (AQIS, 1997&1999)	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
<i>Synanthedon tenuis</i> Butler Syn = <i>Conopia tenuis</i> Butler [Lepidoptera: Sessiidae]	Smaller clearwing moth	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Takahashia japonica</i> (Cockerell) [Hemiptera: Coccidae]	String cottony scale	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Tenuipalpus zhizhilashvilliae</i> Rekk [Acarina: Tenipalpidae]	Persimmon false spider mite	Yes (USDA, 1997)	No	Quarantine pest	Yes
<i>Tetranychus kanzawai</i> Kishida [Acarina: Tetranychidae]	Kanzawai spider mite	No (USDA, 1997; CABI, 2002)	Yes (AQIS, 1998 & 1999)	Non-quarantine pest	No
<i>Tetranychus urticae</i> Koch Syn= <i>Tetranychus cinnabarinus</i> Boisduval [Acarina: Tetranychidae]	Carmine spider mite	No (CAB International, 2002; PPIS, 2002)	Not applicable	Not applicable	No
<i>Tropidothorax belogloui</i> Jakovlev [Hemiptera: Lygaeidae]	Lygaeid bug	No (Lee <i>et al.</i> 1994)	Not applicable	Not applicable	No
<i>Tropidothorax cruciger</i> Motschulsky	Lygaeid bug	No	Not applicable	Not applicable	No

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[Hemiptera: Lygaeidae] <i>Vespa crabro</i> (Linnaeus)	Spotted giant hornet	(Lee <i>et al.</i> 1994) No	Not applicable	Not applicable	No
[Hymenoptera: Vespidae] <i>Vespa mandarinia</i> Smith	Yellow jacket	(AQIS, 1998) No	Not applicable	Not applicable	No
[Hymenoptera: Vespidae] <i>Vespa simillima xanthoptera</i> Cameron	Yellow hornet	(USDA, 1997) No	Not applicable	Not applicable	No
[Hymenoptera: Vespidae] <i>Xylosandrus brevis</i> (Eichhoff)	Short-winged bark beetle	(USDA, 1997) No	Not applicable	Not applicable	No
[Coleoptera: Cuculionidae] <i>Xylosandrus germanus</i> (Blandford)	Alnus ambrosia beetle	(USDA, 1997) No	Not applicable	Not applicable	No
[Coleoptera: Curculionidae] <i>Zeuzera leuconotum</i> Butler	Wood leopard moth	(Booth <i>et al.</i> 1990) No	Not applicable	Not applicable	No
[Lepidoptera: Coccidae]		(Common, 1990)			
NEMATODA					
<i>Basiria graminophila</i> Siddiqi	Nematode	No	Not applicable	Not applicable	No
[Tylenchida: Tylenchidae]		(no information found)			
<i>Pratylenchus loosi</i> Loof	Root lesion nematode	No	Not applicable	Not applicable	No
[Tylenchida: Pratylenchidae]		(CAB International, 2002)			
BACTERIA					

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Rhizobium radiobacter</i> (Beijerinck and van Delden) Young <i>et al.</i> [Rhizobiales: Rhizobiaceae]	Crown gall	No (CAB International, 2002)	Not applicable	Not applicable	No
<i>Rhizobium rhizogenes</i> [Rhizobiales: Rhizobiaceae]	Bacterial gall	No (CAB International, 2002)	Not applicable	Not applicable	No
FUNGI					
<i>Capnophaeum fuliginodes</i> (Rehm) Yamamoto [#] [Loculoascomycetes: Dothideales]	Sooty mould	Yes (MAFF, 1985)	No	Non-Quarantine pest.	No
<i>Cercospora fuliginosa</i> Ellis S & Kellerman [‘mitosporic fungi’: Hyphomycetes]	Anthracnose	No (MAFF, 2001)	Not applicable	Not applicable	No
<i>Cercospora kaki</i> Ellis and Everhart [‘mitosporic fungi’: Hyphomycetes]	Angular leaf spot on leaves	No (USDA, 1997)	Not applicable	Not applicable	No
<i>Cercospora kakivora</i> Hara [‘mitosporic fungi’: Hyphomycetes]	Leaf spot	No (MAFF, 2001)	Not applicable	Not applicable	No
<i>Fusicladium levieri</i> Magnus Syn = <i>Fusicladium diospyrae</i> Hori & Yoshida [Dothideales: Venturiaceae]	Black spot	No (only infects leaves, twigs or immature fruit (MAFF, 1987))	Not applicable	Not applicable	No
<i>Helicobasidium mompa</i> Tanaka [Auriculariales: Auriculariaceae]	Violet root rot	No (Sayama <i>et al.</i> 1994)	Not applicable	Not applicable	No
<i>Macrophoma kaki</i> Hara		No	Not applicable	Not applicable	No

Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
[‘mitosporic fungi’: Coelomycetes]		(USDA, 1997; MAFF, 2001)			
<i>Monilinia fructigena</i> Honey	Brown rot	Yes	Yes	Quarantine pest	Yes (current risk management measures for this pest will be adopted)
[Leotiales: Sclerotiniaceae]		(CAB International, 2002)	(AQIS, 1999)		
<i>Mycosphaerella nawae</i> (Sydow) Hiura and Ikata	Circular leaf spot of persimmon	No	Not applicable	Not applicable	No
[Dothideales: Mycosphaerellaceae]		(USDA, 1997)			
<i>Nectria haematococca</i> (Wollenw.) Gerlach (teleomorph)	Dry rot of potato, Tuber rot	No	Not applicable	Not applicable	No
[Hypocreales: Nectriaceae]		(PPIS, 2002)			
<i>Fusarium solani</i> (Martius) Sacc. [anamorph]					
<i>Pestalotia diospyri</i> Sydow	Leaf spot	No	Not applicable	Not applicable	No
[‘mitosporic fungi’: Coelomycetes]		(USDA, 1997)			
<i>Pestalotia theae</i> Sawada	Ringspot, tea grey blight	No	Not applicable	Not applicable	No
Syn = <i>Pestalotiopsis theae</i> (Saw.) Steyeart		(USDA, 1997)			
[‘mitosporic fungi’: Coelomycetes]					
<i>Phoma kakivora</i> Hara	Phoma spot	Yes	No	Quarantine pest	Yes
[‘mitosporic fungi’: Coelomycetes]		(Yamada, 1966)			
<i>Phoma loti</i> Cooke		No	Not applicable	Not applicable	No
[‘mitosporic fungi’: Coelomycetes]		MAFF, 2001)			
<i>Phomopsis rojana</i> Linnaeus		No	Not applicable	Not applicable	No
[‘mitosporic fungi’: Coelomycetes]		(MAFF, 2001)			

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Scientific name	Common name(s)	Associated with fruit ⁵	Considered under existing policies	Quarantine status	Consider pest further for risk assessment / risk management ⁶
<i>Phyllactinia guttata</i> (Wallr. : Fries) Leveille Syn = <i>Phyllactinia kakicola</i> Sawada; <i>Phyllactinia corylea</i> (Persoon) Karsten [Erysiphales: Erysiphaceae]	Powdery mildew	No (NPQS 1993)	Not applicable	Not applicable	No
<i>Phyalospora kaki</i> Hara [Amphisphisphaerales: Hyponectriaceae]	Leaf curl	No (MAFF, 2001)	Not applicable	Not applicable	No
<i>Rosellinia necatrix</i> Prill (teleomorph) Syn = <i>Dematophora necatrix</i> R. Hartig (anamorph) [Xylariales: Xylariaceae]	White root rot	No (CAB International, 2002)	Not applicable	Not applicable	No
<i>Scorias communis</i> Yamamoto [#] [Dothidiales: Capnodiaceae]	Sooty mould	Yes (MAFF, 1985)	No	Non-Quarantine pest	No
<i>Septogloeum kaki</i> (Sydow) Hara [Dothideales: Mycosphaerellaceae]	Leaf spot	No (MAFF, 2001)	Not applicable	Not applicable	No
<i>Tripospermum juglandis</i> (Trumen) Spegazzini [#] [‘mitosporic fungi’: Hyphomycetes]	Sooty mould	Yes (MAFF, 2001)	No	Non-Quarantine pest	No

⁵ Describes whether the pest is associated with the pathway.

⁶ Pests that are known to be associated with fresh persimmon fruit and either not present in Australia or present but not widely distributed and under official control, are to be considered further in the risk analysis

[#] 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).

References for Appendix 2

- APHIS (1997). Importation of Fragrant and Ya Pear Fruit from China into the United States, A Supplemental Pest Risk Assessment. United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Plant Protection and Quarantine.
<http://www.aphis.usda.gov/ppq/pim/Chinpear.pdf>
- AQIS (1995). Pest Risk Analysis of the Importation of Persimmon Fruit from New Zealand. Australian Quarantine and Inspection Service, Canberra.
- AQIS (1998). Final Import Risk Analysis of the Importation of Fruit of Fuji Apple (*Malus pumila* Miller var. *domestica* Schneider) from Aomori Prefecture in Japan. Australian Quarantine and Inspection Service, Canberra.
- AQIS (1999). Final Import Risk Analysis on the Importation of Fresh Fruit of Korean Pear (*Pyrus ussuriensis* var. T. Lee) from the Republic of Korea. Australian Quarantine and Inspection Service, Canberra.
- BA. (2002). Citrus Imports from Arab Republic of Egypt – A Review Under Existing Import Conditions for Citrus from Israel. Biosecurity Australia, Canberra.
- Booth, R.G., Cox, M.L. and Madge R.B. (1990). International Institute of Entomology (IIE) Guides to Insects of Importance to Man 3. Coleoptera. CAB International, UK.
- Broughton, S. and De Lima, F. (2002). Monitoring and Control of Thrips in Citrus. Farm note 7/2002, Department of Agriculture Western Australia,
http://www.agric.wa.gov.au/agency/Pubns/farmnote/2002/fn007_2002a.htm
- CAB International (2002). *Crop Protection Compendium*, Global Model 3. CAB International.
- Carter, D. J. (1984). Pest Lepidoptera of Europe. (Series entomologica, v 31) Junk Publishers, Dordrecht, Netherlands.
- Common, I. F. B. (1990). Moths of Australia. Melbourne University Press, Victoria, Australia.

- Hiehata, K. (1995). Occurrence and injury of persimmon bud mite, *Aceria diospyri* Keifer, in persimmon fruits in Yamaguchi Prefecture. *Bulletin of the Yamaguchi Agricultural Experiment Station* 46: 114-119. Yamaguchi Agric. Exp. Stn., Ouchi mihori, Yamaguchi shi, Yamaguchi ken, Japan.
- Kawai, S. (1980). Scale Insects of Japan in Colors. National Agricultural Education Association, Tokyo. 455 pp. (in Japanese).
- Lee, M.H., Choi, K. M., Han, M.J., An, S.B., Lee, S.H., Choi, J.Y. and Choi, D.N. (1994). Illustrated Insect Pests on Medicinal Crops. pp 189. Agri. Sci. Insti. RDA, Korea.
- Lee, D. W., Lee, K., Park, C., Choo, H. Y. and Kim, Y. S. (2002). Scarabs (Coleoptera: Scaradaeidae) in Sweet Persimmon Orchard and Effect on Sweet Persimmon. *Korean Journal of Applied Entomology* 41 (3): 183-189.
- NZ MAF (1999). Import Health Standard Commodity sub-class: Fresh fruit/vegetables mango, *Mangifera indica* from Fiji. New Zealand Ministry of Agriculture and Forestry. <http://www.maf.govt.nz/biosecurity/imports/plants/standards/mango-fj.pdf>
- MAFF (1985). List of Harmful Pests Which Affect Persimmons at the Time of Harvest. Provided by Plant Quarantine Division, Ministry of Agriculture, Forestry and Fisheries (MAFF) to Australian Department of Trade January 1985.
- MAFF (1987). Data provided by Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) in letter , 24 April, 1987 to Counsellor (Agriculture), Australian Embassy, Tokyo.
- MAFF (1992). Pest Information (Appendix 3). Provided by Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF), on file T92/589.
- MAFF (2001). Additional Information List of the Japanese Persimmon Pests. Japanese Ministry for Agriculture, Forestry and Fisheries (MAFF).
- NPQS (1993). Biological information received from National Plant Quarantine Service (NPQS; letter to M. Jeffery; 14. 6. 1993. On file T93/2364).
- PPIS (2002). Pests of *Diospyros* spp. (Ebenaceae) in Israel, specifically *D. Kaki* L. (Japanese/Oriental persimmon, kaki fruit, “Sharon fruit); rootstock – *D. virginiana* L. rootstock (American/common persimmon). Israel persimmon pest list-updated March 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.

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- Sayama, A., Kobayashi K. and Ogoshi A. (1994). Morphological and physiological comparisons of *Helicobasidium mompa* and *H. purpureum*. *Mycoscience* 35 (1): 15-20.
- ScaleNet(2001). Ben-Dov, Y., Miller, D.R. and Gibson, G.A.P. (2000). <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>
- USDA (1997). Importation of Fresh Persimmon Fruit, *Disopyros kaki* from South Korea into the United States. Qualitative, Pathway-initiated Pest Risk Assessment. U.S. Department of Agriculture (USDA).
- USDA (2002). Expansion of the Importation of Fresh Unshu Orange Fruit (*Citrus reticulata* Blanco var. *unshu* Swingle) from the Republic of Korea into Citrus Producing States of the Continental United States. A Pathway-initiated Pest Risk Assessment.
- Vranjic, J.A. (1997). Effects on host plants In: Ben-Dov, Y. and Hodgson, C.J. (eds). World Crop Pests – Soft Scale Insects, Their Biology, Natural Enemies and Control. Vol 7A. Elsevier, Amsterdam, Lausanne, New York, Oxford, Shannon, Singapore and Tokyo. 452 pp.
- Yamada, S. (1966). The stain on Japanese persimmon fruits caused by *Phoma kakivora*. <http://rms2.agsearch.agropedia.affrc.go.jp/contents/JASI/report/fruit-engei.htm>
- Wang, Z. F. and Wang, P.Y. (1988). The bionomics and control of a pyralid insect pest (*Euzophera batangensis*) of China. *Scientia-Silvae-Sinicae* 24(4): 496-498.
- Xu, C.M., Zhou, D.R. and Wu, X.Y. (1995). Studies on occurrence and control of *Lepidosaphes cupressi* Borchsenius on *Myrica rubra*. *Nanjing Nongye Daxue Xuebao* 18(4): 57-62.

APPENDIX 3: PEST DATA SHEETS

3.1 Arthropods

3.1.1 *Lobesia botrana* (Denis and Schiffermüller) [Lepidoptera: Tortricidae]

Synonyms and change in combination: *Coccyx botrana* Praun; *Cochylis botrana* Herrich-Schaffer; *Cochylis vitisana* Audouin; *Eudemis botrana* Frey; *Eudemis rosmarinana* Millière; *Grapholita botrana* Heinemann; *Lobesia rosmariana*; *Noctua romani* O. Costa; *Paralobesia botrana*; *Penthina vitivorana* Packard; *Polychrosis botrana* Ragonot; *Tinea premixtana* Hübner; *Tinea reliquana* Hübner; *Tortrix botrana* Denis and Schiffermüller; *Tortrix reliquana* Treitschke; *Tortrix romaniana* O. Costa; *Tortrix vitisana* Jacquin.

Common name(s): European grape vine moth, grape berry moth, grape fruit moth, grape leaf-roller, grape moth, grape vine moth, vine moth.

Hosts: *Actinidia chinensis* (Chinese gooseberry), *Arbutus unedo* (arbutus), *Berberis vulgaris* (European barberry), *Clematis vitalba* (traveller's-joy), *Cornus mas* (cornelian cherry), *Cornus sanguinea* (dogwood), *Daphne gnidium* (spurge flax), *Dianthus* spp. (carnation), *Diospyros kaki* (oriental persimmon), *Hedera helix* (ivy), *Ligustrum vulgare* (privet), *Lonicera tatarica* (Tatarian honeysuckle), *Menispermum canadense* (common moonseed), *Olea europaea* subsp. *europaea* (olive), *Parthenocissus quinquefolia* (Virginia creeper), *Prunus amygdalus* (hall's hardy almond), *Prunus avium* (gean), *Prunus domestica* (damson), *Prunus spinosa* (blackthorn), *Punica granatum* (pomegranate), *Ribes nigrum* (blackcurrant), *Ribes rubrum* (red currant), *Ribes uva-crispa* (gooseberry), *Rosmarinus officinalis* (rosemary), *Rubus caesius* (dewberry), *Rubus fruticosus* (blackberry), *Syringa vulgaris* (lilac), *Viburnum lantana* (wayfaring tree), *Vitis vinifera* (grapevine), *Ziziphus jujuba* (common jujube) (CAB International, 2002).

Plant part affected: On persimmons in Israel, *Lobesia botrana* causes external damage on fruit and infests flowers, buds, leaves, bark and vine (PPIS, 2002).

Distribution: Algeria, Armenia, Austria, Azerbaijan, Bulgaria, Cyprus, Czech Republic, Egypt, England, Eritrea, France, Georgia, Germany, Greece, Hungary, Iran, Iraq, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Lebanon, Libya, Luxembourg, Macedonia, Malta, Moldova, Morocco, Portugal, Romania, Slovakia, Slovenia, Spain, Switzerland, Syria, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan, Yugoslavia, not present in Korea (CAB International, 2002).

Biology

Life History:

L. botrana is a polyphagous pest, but grapevine is the main host. Persimmon is reported as a secondary host (CAB International, 2002). Pucat and Wallace (1995) reported that hosts other than stone fruit and grapevine have not been recently confirmed. Specific information on the damage caused on persimmon fruit is not available. The following description of damage symptoms refers to grapevine, on which symptoms largely depend on the phenological stage of the reproductive organs.

In Israel, *L. botrana* causes external damage on fruit and infests flowers, buds, leaves, bark and vine (PPIS, 2002). On inflorescences, neonate larvae penetrate single flower buds. Symptoms are not evident initially, because larvae remain protected by the top bud. Later, when larval size increases, each larva binds several flower buds together with silk forming glomerules that are visible to the naked eye. The larvae continue feeding whilst protected inside. Larvae usually make one to three glomerules during their development. Despite the hygienic behaviour of larvae, frass may remain adhering to the glomerules. On grapes, larvae feed externally and when the berries are a little desiccated, they penetrate them, bore into the pulp and remain protected by the berry peel. Larvae secure the pierced berries to surrounding ones with silk in order to avoid falling. Frass may also be visible. Each larva directly damages several berries, but if the conditions are suitable for fungal or acid rot development, a large number of berries placed around may be also affected. Damage is variety-dependent: generally it is more severe on grapevine varieties with dense grapes, because this increases both larval installation and rot development. On both inflorescences and grapes, several larvae may co-exist in a single reproductive organ. Larval damage on growing points, shoots or leaves is unusual.

The eggs of *L. botrana* are flat and measure 0.65-0.90 x 0.45-0.75 mm. Freshly laid eggs are pale cream in colour and later they become light grey and translucent with iridescent glints (Feytaud, 1924). Eggs are laid singly, and more rarely in small clusters of two or three. There are usually five larval instars. Neonate larvae are 0.95-1.00 mm long with a light yellow body. The head and prothoracic shield are deep brown/black in colour. Mature larvae reach a length of 10-15 mm and vary from light green to light brown in colour. The head and prothoracic shield of mature larvae are lighter than those of neonate larvae. Newly formed pupae are usually cream or light brown in colour but can also be light green or blue. A few hours later they become brown. Female pupae are larger (5-9 mm) than males (4-7 mm). Adults are 6-8 mm long with a wingspan of 10-13 mm. Adult size is greatly affected by larval food quality (Torres-Vila, 1995). The head and abdomen are cream coloured; the thorax is also cream with black markings and a brown ferruginous dorsal crest. The legs have alternate pale cream and brown bands. Forewings have a mosaic-shaped pattern with black, brown, cream, red and blue ornamentation. Hind wings are light brownish grey and darker towards the apex (CAB International, 2002).

There is no clear sexual dimorphism, but the sexes may be easily separated by their general morphology and behaviour. Males are smaller than females as they have a narrower abdomen

with a fine anal comb of modified scales. When disturbed, males move more quickly than females (CAB International, 2002).

Moth activity including flight, feeding, calling, mating and egg-laying, is principally displayed at dusk, although some activity can also occur at daybreak or at any time on cloudy days. Water availability is necessary for adults to reach their potential reproductive output (Torres-Vila *et al.*, 1996b). One to three days after mating, females initiate oviposition on host reproductive organs. Females lay 300 or more eggs at a rate of more than 35 per day eggs during their lifetime. The eggs hatch in 7-11 days in spring, and in summer in 3-5 days (Exosect, 2003). Larvae have a considerable dispersal capacity and are able to reach reproductive organs placed around those selected for egg-laying by females (Torres-Vila *et al.*, 1997). Many young larvae die, but mortality among older larvae is very low (CFIA, 2003). Thus available food for larvae changes throughout the season according to the phenology of the host reproductive organs, and this may also affect to a great extent both survival (Torres-Vila *et al.*, 1992; Gabel and Roehrich, 1995) and reproductive output (Torres-Vila, 1995). Pest development ceases at temperatures below 10.5°C (CFIA, 2003). After larval development, pupation occurs principally on leaves in non-diapausing individuals (1st and 2nd generations). Larval development averages 20-28 days whereas pupal development averages 12-14 days in non-diapaused individuals. Individuals from the last generation overwinter as diapausing pupae from autumn to the next spring, located under vine bark or stake crevices, and protected inside a cocoon more rigid than that of non-diapausing pupae. The cocoon reduces dehydration and weight loss in overwintering pupae, maintaining female potential fecundity (Torres-Vila *et al.*, 1996a). Abiotic factors may have a major effect on population dynamics of *L. botrana* at all insect stages. In particular, temperature acting on adult and larval stages regulates female fecundity (Bergougnoux, 1988; Torres-Vila, 1996); adult activity and longevity (Bovey, 1966); egg mortality (Coscollá *et al.*, 1986); and pupal mortality (Torres-Vila *et al.*, 1993). Temperature-induced dormancy has been reported in egg and larval stages (Tzanakakis *et al.*, 1988).

The moth has two generations per year in northern cold areas, and more usually three in southern temperate ones, although this general latitudinal pattern is often modified by the altitude-derived gradient and/or microclimatic conditions in a given area (CAB International, 2002).

Yield loss quantification on grape vines with larval damage to their inflorescences has been carried out using several approaches, including comparing naturally damaged and undamaged grapes (as inflorescences) by weighing or counting formed berries; artificial infestations with larvae; and damage simulation by direct ablation of flowers and berries (Roehrich, 1978; Coscollá, 1980; Gabel, 1989). Most studies show a high compensation capacity of grapevine, variable between vine varieties, supporting the presence of 1-4 glomerules, or the ablation of 30 flowers per inflorescence, without significant yield losses (Roehrich and Schmid, 1979). Larvae feeding on fruit directly reduces yield and contaminates the crop. More importantly, feeding by larvae creates infection sites for fruit rots and feeding by fruit flies (Exosect,

2003). Larval boring in grapes may promote a number of fungal rots including *Aspergillus*, *Alternaria*, *Rhizopus*, *Cladosporium*, *Penicillium* and especially the grey rot caused by *Botrytis cinerea* (Fermaud and Le Menn, 1989; Fermaud, 1990).

Lobesia botrana should be regarded as a potentially serious pest on a worldwide scale for all the vine-growing areas that are presently unaffected (CAB International, 2002).

Control: The abnormal distribution patterns of *Lobesia botrana* emphasize the inherent risk of new, undesired introductions when infested grapes and/or plant material are transported around the world. Phytosanitary control in commercialization channels should be enforced to limit further pest spread, especially in importer countries with favourable climatic conditions for pest development (CAB International, 2002).

Several cultural methods may reduce pest incidence to a highly variable degree.

Voukassovitch (1924) listed some direct (pest-killing) and indirect (microclimate-modifying) practices to reduce *L. botrana* infestation levels, including pruning the vine canopy, leaf stripping, irrigation, earthing-up, weeding and especially harvesting date. However, cultural methods have limited efficacy by themselves, and are often inapplicable in major vineyards where possibilities of changing cultural schedules are restricted. Chemical control of eggs and larvae is the most widely used control method, due to high efficiency and low cost. Chemical control, by itself or included in Integrated Pest Management programmes, is at present necessary to keep *L. botrana* populations below the economic damage threshold.

Several broad-spectrum insecticides (organochlorines, carbamates, organophosphates and pyrethroids) are currently used to control *L. botrana*, but insect growth regulators and biological insecticides are also used. See Coscollá (1997) for a recent review of chemical control of *L. botrana*. In most situations Integrated Pest Management procedures are recommended against *L. botrana*, integrating all the available control methods in varying proportions, but with chemical control being, as far as possible, a minor component. Improvement of detection and inspection methods and accurate damage threshold establishment are used to enhance Integrated Pest Management programmes, which are being developed in most vine-growing countries

Parasitoids of *L. botrana* include: *Ascogaster quadridentata* attacking larvae in Austria, Germany, Italy and Russia; *Campoplex difformis* attacking larvae in Austria, Bulgaria, France, Germany, Italy, Russia and Spain; *Dibrachys affinis* attacking larvae and pupae in Algeria, Austria, France, Italy, Spain and Switzerland; *Dibrachys cavus* attacking larvae and pupae in Algeria, Austria, Bulgaria, France, Germany, Italy, Spain and Switzerland; *Hemiteles areator* attacking pupae in Austria, France, Germany, Italy, Russia and Algeria; *Pimpla turionellae* attacking larvae and pupae in Austria, France, Germany, Italy, Russia and Spain; *Trichogramma evanescens* attacking eggs in Austria, France, Germany, Italy, Russia, Spain and the Ukraine (CAB International, 2002).

Predators of *L. botrana* include:

Chrysopa carnea attacking eggs and larvae in Bulgaria, France, Russia, Spain and Italy (CAB International, 2002).

Pathogens of *L. botrana* include: *Beauveria bassiana* attacking larvae and pupae in France, Italy and Spain (CAB International, 2002).

References:

- Bergougnoux, P. (1988). Dynamique de la population de *Lobesia botrana* Schiff. dans un vignoble de Beaumes de Venise (Vaucluse). Etude comparative du facteur thermique sur l'émergence et la ponte dans une population d'élevage et une population naturelle. Marseille, France: *Mémoire DEA de l'Université de Marseille*.
- Bovey, P. (1966). Superfamille des Tortricidae. In: Balachowsky AS, ed. Entomologie Appliquée à l'Agriculture Vol. 2 (1). Paris, France: Masson et Cie., 859-887.
- CAB International. (2002). *Crop Protection Compendium, 2002 Edition*. CAB International, Wallingford, UK.
- CFIA (2003). *Lobesia botrana*, Mediterranean vine moth. Canadian Food Inspection Agency. <http://www.inspection.gc.ca/english/sci/surv/data/lobbote.shtml>.
- Coscollá, R. (1980). Estudio poblacional, ecológico y económico de la Polilla del racimo de la vid *Lobesia botrana* Den. & Schiff. en la provincia de Valencia. Planteamiento de un sistema de lucha dirigida. Valencia, Spain: Tesis Doctoral de la ETS de Ingenieros Agrónomos de la Universidad Politécnica de Valencia.
- Coscollá, R. (1997). La polilla del racimo de la vid (*Lobesia botrana* Den. y Schiff.). Valencia, Spain: Generalitat Valenciana, Consejería de Agricultura, Pesca y Alimentación.
- Coscollá, R., Sanchez, J. and Beltran, V. (1986). Preliminary study on the mortality of eggs of *Lobesia botrana* Den. & Schiff. caused by high temperatures and low relative humidities in the laboratory. *Boletín de Sanidad Vegetal, Plagas* 12(1): 3-7.
- Exosect (2003). Grape Moths. http://www.exosect.com/solutions/pests/grape_moth.asp.
- Fermaud, M. (1990). Incidence des attaques larvaires d'Eudémis *Lobesia botrana* sur le développement de la Pourriture Grise *Botrytis cinerea* chez la vigne: rôle des facteurs du milieu et mécanismes mis en jeu. Paris, France: Thèse Doctoral de l'INA PG, INRA.
- Fermaud, M. and Le Menn, R. (1989). Association of *Botrytis cinerea* with grape berry moth larvae. *Phytopathology* 79(6): 651-656.
- Feytaud, J. (1924). Notes biologiques sur les vers du raisin (*Cochylis* et Eudémis). *Revue de Zoologie Agricole et Appliquée*, Numéro spécial, 36 pp.
- Gabel, B. (1989). Fixation du seuil de nuisibilité des chenilles de la Tordeuse de la Grappe de la première génération. *Defense des Végétaux* 259: 17-20.

- Gabel, B. and Roehrich, R. (1995). Sensitivity of grapevine phenological stages to larvae of European grapevine moth, *Lobesia botrana* Den. et Schiff. (Lep., Tortricidae). *Journal of Applied Entomology* 119(2): 127-130.
- PPIS. (2002). Pests of *Diospyros* spp. (Ebenaceae) in Israel, specifically *D. Kaki* L. (Japanese/Oriental persimmon, kaki fruit, "Sharon fruit"); rootstock – *D. virginiana* L. rootstock (American/common persimmon). Israel persimmon pest list-updated March 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.
- Pucat, A.M. and Wallace, S.(1995). *Lobesia botrana* (Mediterranean vine moth). Plant Health Survey Unit, Science branch, Canadian Food Inspection Agency.
<http://www.inspection.gc.ca/english/sci/surv/data/lobbote.html>
- Roehrich, R. (1978). Recherches sur la nuisibilité de *Eupoecilia ambiguella* Hb. et *Lobesia botrana* Den. et Schiff. *Defense des Végétaux* 191: 106-124.
- Roehrich, R. and Schmid, A. (1979). Tordeuses de la grappe: évaluation du risque, détermination des périodes d'intervention et recherche des méthodes de lutte biologique. In: *Proceedings of the International Symposium IOBC/WPRS on Integrated Plant Protection in Agriculture and Forestry*. Vienna, Austria: IOBC/WPRS, 245-254.
- Torres-Vila, L.M. (1995). Factores reguladores del potencial biótico y de la poliandria en la polilla del racimo de la vid *Lobesia botrana* Den. y Schiff., (Lepidoptera: Tortricidae). Madrid, Spain: Tesis Doctoral de la ETS de Ingenieros Agrónomos de la Universidad Politécnica de Madrid.
- Torres-Vila, L.M. (1996). Efecto de la temperatura de desarrollo preimaginal sobre el potencial biótico de la polilla del racimo de la vid, *Lobesia botrana* (Denis y Schiffermuller, (1775) (Lepidoptera: Tortricidae). *Revista de Lepidopterología* 24: 197-206.
- Torres-Vila, L.M., Oustry, L., Schmitz, V., Roehrich, R. and Stockel, J. (1993). Action of relative humidity and temperature fluctuation on non-diapausing pupae of the grape vine moth *Lobesia botrana* Den. & Schiff. (Lepidoptera: Tortricidae). *Boletín de Sanidad Vegetal, Plagas* 19(1): 79-93.
- Torres-Vila, L.M., Schmitz, V. and Stockel, J. (1992). Effect of the phenological stage and of grape cultivar on the establishment and survival of the first generation of larvae of the grape vine moth *Lobesia botrana* Den. and Schiff. (Lepidoptera; Tortricidae). *Boletín de Sanidad Vegetal, Plagas*, 18(4): 755-764.
- Torres-Vila, L.M., Stockel, J., Bielza, P. and Lacasa, A. (1996a). Efecto de la diapausa y del capullo sobre el potencial biótico de la polilla del racimo *Lobesia botrana* Den. y Schiff. (Lepidoptera: Tortricidae). *Boletín de Sanidad Vegetal, Plagas* 22: 27-36.
- Torres-Vila, L.M., Stockel, J. and Rodriguez-Molina, M.C. (1996b). Efecto de la indisponibilidad de agua sobre el potencial biótico de la polilla del racimo *Lobesia*

- botrana* Den. y. Schiff. (Lepidoptera: Tortricidae). *Boletín de Sanidad Vegetal, Plagas* 22: 443-449.
- Torres-Vila, L.M., Stockel, J., Roehrich, R. and Rodríguez-Molina, M.C. (1997). The relation between dispersal and survival of *Lobesia botrana* larvae and their density in vine inflorescences. *Entomologia Experimentalis et Applicata* 84: 109-114.
- Tzanakakis, M.E., Savopoulou –Soultani, M.C., Oustapassidis, C.S., Verras, S.C. and Hatziemmanuel, H. (1988). Induction of dormancy in *Lobesia botrana* by long day and high temperature conditions. *Entomologia Hellenica* 6: 7-10.
- Voukassovitch, P. (1924). Contribution à l'étude de l'Eudémis (*Polychrosis botrana* Schiff.) de la Pyrale de la Vigne *Oenophthira pilleriana* Schiff.) et de leurs parasites. Toulouse, France: Thèse Doctoral de la Faculté des Sciences de l'Université de Toulouse.

3.1.2 *Pseudococcus cryptus* (Hempel) [Hemiptera: Pseudococcidae]

Synonyms and changes in combination: *Dysmicoccus cryptus* Hempel; *Pseudococcus citriculus* Green.

Common name(s): cryptic mealybug, citriculus mealybug.

Host(s): *Artocarpus altilis* (breadfruit); *Artocarpus incisa* (breadfruit) (Ben-Dov, 1994); *Artocarpus odoratissimus* (tarap) (Lit, 1997); *Calophyllum inophyllum* (Alexandrian laurel); *Citrus aurantifolia* (lime); *Citrus aurantium* (bitter orange); *Citrus × paradisi* (grapefruit) (Ben-Dov, 1994); *Citrus reticulata* (mandarin) (CAB International, 2002); *Citrus reticulata* (mandarin); *Citrus sinensis* (sweet orange) (Ben-Dov, 1994); *Citrus unshiu* (Satsuma) (CAB International, 2002); *Citrus* sp. (Lit, 1997); *Cocos nucifera* (coconut); *Coffea arabica* (Arabian coffee) (Ben-Dov, 1994); *Coffea liberica* (Liberian coffee) (Williams and Watson, 1988); *Crinum asiaticum* (Asiatic poison lily) (Ben-Dov, 1994); *Dahlia* sp. (Williams and Granara de Willink, 1992); *Diospyros kaki* (PPIS, 2002), *Dillenia indica* (elephant-apple) (Ben-Dov, 1994); *Elaeis guineensis* (African oil palm) (Williams and Watson, 1988); *Erythrina* sp. (coral tree) (Ben-Dov, 1994); *Garcinia mangostana* (mangosteen) (Anon., 2000); *Gardenia* sp. (Ben-Dov, 1994); *Heliconia* sp. (Lit, 1997); *Hevea brasiliensis* (rubbertree) (Williams and Watson, 1988); *Ixora* sp. (Lit, 1997); *Mangifera indica* (mango) (Ben-Dov, 1994); *Ocotea pedalis* (Stout, 1979); *Osbornia ocdonta* (Lit, 1997); *Pandanus* sp. (screwpine); *Pandanus upoluensis* (palm) (Ben-Dov, 1994); *Passiflora foetida* (wild passionfruit) (Williams and Watson, 1988); *Persea americana* (avocado); *Piper methysticum* (kava); *Plumeria* sp. (frangipani) (Ben-Dov, 1994); *Psidium guajava* (guava) (Williams and Watson, 1988); *Selaginella* sp. (spike moss) (Ben-Dov, 1994).

Plant part(s) affected: Roots of coffee (Cecilia *et al.*, 2002). Most mealybug species feed on foliage, flowers, fruits and stems, but some species e.g. *Rhizoecus* feed on roots (Drees and Jackman, 1999).

Distribution: *Pseudococcus cryptus* is widely distributed in South East Asia, tropical Africa, mideastern Mediterranean and South America. However, it is particularly a pest of citrus in

Israel, into which it was inadvertently introduced in 1937 (Blumberg *et al.*, 1999). Following importation of the encyrtid *Clausenia purpurea* Ishii, the pest was successfully controlled.

Distribution includes: Afghanistan (Ben-Dov, 1994); American Samoa (Ben-Dov, 1994); Argentina (Williams and Granara de Willink, 1992); Bangladesh (Varshney, 1992); Brazil (Ben-Dov, 1994); British Indian Ocean Territories (Chagos Archipelago) (Ben-Dov, 1994); China (Hu *et al.*, 1992); Costa Rica (Ben-Dov, 1994); El Salvador (Ben-Dov, 1994); India (West Bengal) (Nath, 1972); Iran (Kozár *et al.*, 1996); Israel (Ben-Dov, 1994); Japan (Ben-Dov, 1994); Kenya (Ben-Dov, 1994); Mauritius (Ben-Dov, 1994); Micronesia, Federated States of (Ponape Island) (Ben-Dov, 1994); Paraguay (Williams and Granara de Willink, 1992); Philippines (Lit, 1997); Palau (Beardsley, 1966); Sri Lanka (Ben-Dov, 1994); Taiwan (Ben-Dov, 1994); United States (Hawaii) (Ben-Dov, 1994); United States Virgin Islands (Ben-Dov, 1994); Vietnam (Ben-Dov, 1994); Western Samoa (Williams and Watson, 1988); Zanzibar (Ben-Dov, 1994).

Biology

Natural History: No specific details on the biology of *Pseudococcus cryptus* are available. However, the life history of a similar species of mealybug, *Planococcus citri* (Risso), is outlined below.

During winter, citrus mealybugs shelter in cracks in the branches or trunk, or in leaf axils of host plants. Young mealybugs move onto citrus fruit in late spring and usually settle under the calyx or between touching fruit (Smith *et al.*, 1997). Mealybugs produce honeydew, resulting in heavy growths of sooty mould (Smith *et al.*, 1997). This species is regarded as a significant quarantine threat to United States agriculture e.g. citrus (Miller *et al.*, 2002).

Adult female *Planococcus citri* are white, about 3 mm long, and covered with a white, fluffy wax. White wax filaments surround the body margin, with the last pair up to ¼ the length of the female body. Males are tiny, gnat-like insects with one pair of fragile wings and non-functional mouthparts. They are short-lived (Smith *et al.*, 1997).

Pale yellow eggs are laid in an elongated, loose, cottony egg sac extending beneath and behind the female. About 300-600 eggs are laid over 1-2 weeks, and these eggs hatch in about a week (Smith *et al.*, 1997). Very young nymphs (crawlers) are flat, oval and yellow. They develop through several stages (instars) over several weeks before reaching sexual maturity. There are three moults for females and four for males. Winged males emerge from a tiny fluffy cocoon and fly to the female mealybug to mate (Drees and Jackman, 1999). The complete life cycle takes about 6 weeks during the summer and there are 3-6 generations per year (Smith *et al.*, 1997).

Control: Following the introduction of *P. cryptus* into Israel in 1937, it was biologically controlled with the encyrtid *Clausenia purpurea* Ishii, prior to its recurrence in newer varieties of citrus (Blumberg *et al.*, 1999). Other natural enemies which attack nymphs and adults include the following parasitoids: *Anagyrus pseudococci*; *Cryptanusia luzonica*; *Paraplatycerus citriculus* and *Promuscidea unfasciiventris*; and following predators:

Amblyseius swirskii; *Brumoides suturalis*; *Chilocorus nigrita*; *Diadiplosis hirticornis*; and *Pseudoscymnus dwipakalpa* (CAB International, 2002).

References:

- Anon. (2000). Research Report to Increase Yield and Fruit Quality of Mangosteen. 1.3 Integrated Control of Mangosteen Pests. Bangkok, Thailand: Department of Agriculture. (In Thai).
- Beardsley, J.W. (1966). Insects of Micronesia. Homoptera: Coccoidea. *Insects of Micronesia* 6: 377-562.
- Ben-Dov, Y. (1994). A Systematic Catalogue of the Mealybugs of the World (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with Data on Geographical Distribution, Host Plants, Biology and Economic Importance. Intercept Ltd., Andover, UK, 686 pp.
- Blumberg, D., Ben-Dov, Y., Mendel, Z., Hodgson, C. and Porcelli, F. (1999). The citriculus mealybug, *Pseudococcus cryptus* Hempel, and its natural enemies in Israel: history and present situation. Proceedings of the VIII International Symposium on Scale Insect Studies ISSIS-VIII held at Wye (UK) August 31st - September 6th 1998. *Entomologica* 33: 233-242.
- CAB International (2002). *Crop Protection Compendium (2002 edition)*. Wallingford, UK: CAB International.
- Drees, B.M. and Jackman, J. (1999). Field Guide to Texas Insects. Houston,: Gulf Publishing Company. <http://www.insects.tamu.edu/images/insects/fieldguide/bimg118.html>
- Hu, X., He, J. and Wang, X. (1992). Homoptera: Coccoidea. In: Peng, J., Liu, Y., Zhao, J. *et al.* (eds) Iconography of Forest Insects in Hunan China. Hunan Forestry Institute, pp. 176-203.
- Kozár, F., Fowjhan, M.A. and Zarrabi, M. (1996). Checklist of Coccoidea and Aleyrodoidea (Homoptera) of Afghanistan and Iran, with additional data to the scale insects of fruit trees in Iran. *Acta Phytopathologica et Entomologica Hungarica* 31: 61-74.
- Lit, I.L., Jr. (1997). New records and additional notes on Philippine mealybugs (Pseudococcidae, Coccoidea, Hemiptera). *Philippine Entomologist* 11(1): 33-48.
- Miller, D.R., Miller, G.L. and Watson, G.L. (2002). Invasive species of mealybugs (Hemiptera: Pseudococcidae) and their threat to U.S. agriculture. *Proceedings of the Entomological Society of Washington* 104 (4): 825-836.
- Nath, K. (1972). Studies on the citrus inhabiting coccids (Coccoidea: Hemiptera) of Darjeeling District, West Bengal. *Bulletin of Entomology* 13: 1-10.
- PPIS. (2002). Pests of *Diospyros* spp.(Ebenaceae) in Israel, specifically *D. Kaki* L. (Japanese/Oriental persimmon, kaki fruit, “Sharon fruit”); rootstock – *D. virginiana* L. rootstock (American/common persimmon). Israel persimmon pest list-updated March

- 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.
- Santa Cecilia, L.V.C., Reis, P.R. and Souza, J.C. (2002). About the nomenclature of coffee mealybug species in Minas Gerais and Espirito Santo States, Brazil. *Neotropical Entomology* 31(2): 333-334.
- Smith, D., Beattie, G.A.C. and Broadley, R. (eds). (1997). Citrus Pests and their Natural Enemies: Integrated Pest Management in Australia. Information Series QI97030. Brisbane, Australia: Queensland Department of Primary Industries and Horticultural Research and Development Corporation, 263 pp.
- Varshney, R.K. (1992). A checklist of the scale insects and mealy bugs of South Asia. Part 1. *Records of the Zoological Survey of India, Occasional Paper* 139: 1-152.
- Williams, D.J. and Granara de Willink, M.C. (1992). Mealybugs of Central and South America. Wallingford, UK: CAB International, 635 pp.
- Williams, D.J. and Watson, G.W. (1988). The Scale Insects of the Tropical South Pacific Region. Part 2. The Mealybugs (Pseudococcidae). Wallingford, UK: CAB International, 260 pp.

3.1.3 *Retithrips syriacus* (Mayet) [Thysanoptera: Thripidae]

Synonyms and change in combination: None.

Common name(s): black vine trips, castor thrips, grape thrips.

Hosts: *Cercis siliquastrum* (Judas tree) (Wysoki, 1999), Cotton varieties Suvin and LRA 5166 (Gopichandran *et al.*, 1992), *Diospyros kaki* (persimmon) (Rubin, 1995; Wysoki, 1999; PPIS, 2002), *Eucalyptus globulus* (blue gum tree) (Ananthakrishnan *et al.*, 1992), *Eucalyptus* spp. (eucalypt) (Rosales, 2000), *Feijoa sellowiana* (guava) (Wysoki, 1999), *Feijoa* spp. (pineapple guava) (Wysoki, 1999), *Jatropha curcas* (purging nut) (Hamon and Edwards, 1994), *Leucaena* spp. (lead tree) (Ghosh *et al.*, 1986), *Mangifera indica* (mango) (Wysoki, 1999), *Manihot esculenta* (cassava) (Ananthakrishnan, 1978; Lal, 1982; Ananthakrishnan *et al.*, 1992), *Manihot glaziovii* (ceara rubber tree) (Bastos and Alves, 1981), *Melaleuca quinquenervia* (melaleuca tree) (Medina and Franqui, 2001), Orchidaceae (orchids) (Oda *et al.*, 1997), *Persea americana* (avocado) (Izhar *et al.*, 1992; Wysoki, 1999), *Platanus* spp. (plane trees) (Halperin, 1990), *Pyrus cydonia* (quince) (Wysoki, 1999), *Ricinus communis* (castor bean) (Suresh and Ananthakrishnan, 1988; Ananthakrishnan *et al.*, 1992), *Rosa* spp. (rose) (Dash and Naik, 1998; Wysoki, 1999), *Terminalia catappa* (tropical almond) (Hamon and Edwards, 1994), *Vitis* spp. (grapevines) (Wysoki, 1999).

Plant part affected: Leaves (grapevines, eucalypt, cassava, persimmon) (Monteiro, 2001) and fruit skin (persimmon) (Morton, 1987; PPIS, 2002).

Distribution: Brazil (Bastos and Alves, 1981), India (Ananthakrishnan, 1978; Lal, 1982; Kumar *et al.*, 1985; Ghosh *et al.*, 1986; Dash and Naik, 1998), Israel (Halperin, 1990; Izhar *et al.*, 1992; Rubin, 1995; PPIS, 2002), Palestine (Morton, 1987), Puerto Rico (Medina and

Franqui, 2001), Sri Lanka (Oda *et al.*, 1997), USA (Florida) (Hamon and Edwards, 1994), Venezuela (Rosales, 2000).

Biology

Life History: *R. syriacus* feeds on and blemishes leaves and fruit skin of persimmons in Palestine (Morton, 1987), fruit damage is also reported in Israel (PPIS, 2002). The leaves of grapevines, eucalypt and cassava plants in Brazil are damaged by this pest (Monteiro, 2001). *R. syriacus* is a polyphagous pest and infests more than 50 plant species (Rosales, 2000). No specific details on the biology of *R. syriacus* on persimmons is available.

In Venezuela, on *Eucalyptus* spp., *R. syriacus* forms colonies on the leaves and tears epidermis by absorbing the sap. When the colonies are abundant, they cover the whole leaves altering the leaf colour to a silverplated tone with numerous black points. When the damage is very intense, *R. syriacus* causes defoliation. Rain reduces the populations drastically and the plants recover their natural colour (Rosales, 2000).

Larvae are reddish in colour with a yellowish head and legs whilst pupae are reddish in colour. The adults are very small, females are approximately 1.5 mm in length and males are slightly smaller. Adults are of dark colour (almost black) with clear appendices (Lewis, 1997).

Female *R. syriacus* lay their eggs on the upper and lower surfaces of leaf tissue. The area around the egg protrudes above the leaf surface. On average, one female will lay approximately 50 eggs and under optimal conditions as many as 80 eggs may be laid. Eggs incubate from 10 to 30 days, according to temperature. The most rapid development occurs between 27 and 30°C; above this temperature, egg development is delayed. Egg mortality is still low at 30°C, but increases rapidly with rising temperature. At 37°C larvae fail to hatch. If leaves on which eggs are laid become desiccated, the eggs die rapidly (Avidoz and Harpazi, 1969).

Upon hatching, the larvae immediately start to feed and during development they hardly ever move away from the egg. There are two larval instars and development takes from 6 to 35 days with the most rapid development at 28-30°C. Larvae are less sensitive than the eggs to extremes in climatic conditions, though mortality increases when the temperature rises above 33°C. Above 37°C, no larva attain pupation. The majority of larvae also die when the temperature drops below 14°C. Larvae are resistant to low air humidities as long as the host leaf is water-saturated (Avidoz and Harpazi, 1969). In hot weather, the prepupal phase takes about one day, and the pupal stage 2 days. Development at lower temperatures takes longer, and may last, for example, 21 days at 15°C. Pupae are resistant to low humidities, but are also extremely sensitive to high air humidities approaching 100% RH. Cold air (15°C and less) and also high temperatures (37°C) are lethal to most of the pupae (Avidoz and Harpazi, 1969).

Adults generally mate on the day of emergence. In autumn the numbers of the sexes are equal, whereas in other seasons, females far outnumber males. At times the females even comprise

70-80% of the total adult population. Under favourable climatic conditions the adults live from 10 to 20 days, whereas at lower temperatures longevity may reach 40 days. In summer the female starts to lay about 3 days after emergence, though in colder seasons there is a pre-oviposition period of 8-18 days. When the temperature drops below 17°C or rises above 37°C, oviposition is arrested. Only males emerge from unfertilised eggs. The black vine thrips produces about seven generations a year. These thrips are sometimes parthenogenic (Avidov and Harpazi, 1969).

Studies on this pest in the municipality of Maranguape, Brazil showed that there are 4 population peaks (in February, March, April and July), and that the population increases linearly with time (Bastos and Alves, 1981).

Control: *R. syriacus* has been controlled on persimmon by spraying with nicotine sulfate in Palestine (Morton, 1987). On roses, carbofuran applied as 0.15 or 0.18 g a.i./plant has significantly reduced the population of this pest (Nair *et al.*, 1990). On cassava, 99 - 100% mortality of last-instar nymphs was obtained within 48 h when plants were sprayed with an emulsifiable concentrate containing 40% monocrotophos used at 1.05 ml/litre, a solution containing 50% dicrotophos used at 0.75 ml/litre, an emulsifiable concentrate containing 2.5% deltamethrin (decamethrin) used at 0.6 ml/litre, an emulsifiable concentrate containing 30% fenvalerate used at 0.43 ml/litre, dichlorvos (DDVP) at 0.6 ml a.i./litre, an emulsifiable concentrate containing 40% triazophos used at 2 ml/litre or an emulsifiable concentrate containing 35% endosulfan used at 1.5 ml/litre (Bastos and Figueiredo, 1980).

Predators of *Retithrips syriacus* include: *Cryptolaemus montrouzieri* (Rubin, 1995); *Franklinothrips megalops* (Trybom) (Wysoki, 1999); *Geocoris ochropterus* (Kumar *et al.*, 1985); *Nephus reunioni* (Rubin, 1995); *Symphaerobius sanctus* (Rubin, 1995). *Megaphragma priesneri* (Kryger) is an egg parasitoid of this pest (Wysoki, 1999).

References:

- Ananthakrishnan, T.N. (1978). Impact of deforestation and introduction of plantation crops on the thrips fauna of Western Ghats. *Memoirs of the School of Entomology, St. John's College, Agra* 6: 123-124.
- Ananthakrishnan, T.N., Gopichadran, R. and Gurusubramanian, G. (1992). Influence of chemical profiles of host plants on the infestation diversity of *Retithrips syriacus*. *Journal of Biosciences* 17(4): 483-489.
- Avidov, Z. and Harpazi, I. (1969). Plant Pests of Israel English ed. Jerusalem, Israel Universities Press, 549 pp.
- Bastos, J.A.M. and Alves, V.P.O. (1981). Levantamento populacional do trips vermelho da manicoba, *Retithrips syriacus* (Mayet, 1890) em manicoba. *Fitossanidade* 5(1): 1-6.
- Bastos, J.A.M. and Figueiredo, R.W-de. (1980). New tests on the control of the red 'manicoba' thrips, *Retithrips syriacus* (Mayet, 1890) with synthetic organic insecticides. *Fitossanidade*. 4: 5-6.

- CAB International. (2002). *Crop Protection Compendium, 2002 Edition*. CAB International, Wallingford, UK.
- Dash, P.C. and Naik, A.K. (1998). Thrips fauna associated with rose in Orissa. *Insect Environment* 4(2): 59.
- Ghosh, S.P., Pillai, K.S. and Thankappan, M. (1986). Cassava based multiple cropping system II. Incidence of pests and diseases. *Journal of Root Crops* 12(2): 83-89.
- Gopichandran, R., Gurusubramanian, G. and Ananthkrishnan, T.N. (1992). Influence of chemical and physical factors on the varietal preference of *Retithrips syriacus* (Mayet) (Panchaethripinae: Thysanoptera) on different cultivars of cotton. *Phytophaga Madras* 4(1): 1-9.
- Halperin, J. (1990). Arthropod fauna and main insect pests of plane trees in Israel. *Phytoparasitica* 18(4): 309-319.
- Hamon, A.B. and Edwards, G.B. (1994). Thrips (Thysanoptera) new to Florida: 1. Thripidae: Panchaethripinae. *Florida Department of Agriculture and Consumer Services, Division of Plant Industry Entomology Circular* 365.
- Izhar, Y., Yehuda, B., Swirski, E., Wysoki, M. and Dagan, M. (1992). Occurrence of the black black vine trips, *Retithrips syriacus* Mayet, on avocado in Israel and trials to control the pest by insecticides of plant origin. *Alon Hanotea* 46(8): 523-529.
- Kumar, N.S., Ananthkrishnan, T.N. and Suresh, K.N. (1985). *Geocoris ochropterus* Fabr. as a predator of some thrips. *Proceedings Indian National Science Academy Biological Sciences* 51(2): 185-193.
- Lal, S.S. (1982). Influence of weather factors on the population of spider mites (Acari: Tetranychidae) and thrip (Thysanoptera) on cassava in Kerala. *Indian Journal of Acarology* 7(1): 5-10.
- Lewis, T. (1997). *Thrips as Crop Pests*. CAB International, Institute of Arable Crops Research, Tothamsted, Harpenden Herts, UK, 740pp.
- Medina, G.S. and Franqui, R.A. (2001). *Retithrips syriacus* (Mayet), the black black vine trips (Insecta: Thysanoptera: Thripidae) new to Puerto Rico. *Journal of Agriculture of the University of Puerto Rico* 85(1-2): 85-89.
- Monteiro, R.C. (2001). The Thysanoptera Fauna of Brazil. Thrips and Tospoviruses. *Proceedings of the 7th International Symposium on the Thysanoptera*.
<http://www.ento.csiro.au/thysanoptera/Symposium/Section9/49-Monterio.pdf>
- Morton, J. (1987). Japanese Persimmon. p. 411–416. In: Morton, J.F. *Fruits of Warm Climates*. Miami, Florida.
http://www.hort.purdue.edu/newcrop/morton/japanese_persimmon.html#Pests%20and%20Diseases
- Nair, R.V., Mathew, T. B. and Visalakshi, A. (1990). The effect of carbofuran applied on the control of pests of roses. *Entomology*, 15: 273-275.

- Oda, Y., Kahawatta, U.C., Rajapaksha, G.B.J.P. and Rajapaksha, H. (1997). Thrips collected in Sri Lanka. *Research Bulletin of the Plant Protection Service Japan* 33: 71-73.
- PPIS. (2002). Pests of *Diospyros* spp.(Ebenaceae) in Israel, specifically *D. Kaki* L. (Japanese/Oriental persimmon, kaki fruit, “Sharon fruit”); rootstock – *D. virginiana* L. rootstock (American/common persimmon). Israel persimmon pest list-updated March 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.
- Rosales, C.J. (2000). *Retithrips syriacus* (Mayet) (Thysanoptera: Thripidae) new insect of economic importance in Venezuela. *Boletin de Entomologia Venezolana Diciembre* 15(2): 259-262.
- Rubin, A. (1995). A decade of integrated control of persimmon pests in Israel. *Israel Journal of Entomology* 29: 287.
- Suresh, G. and Ananthkrishnan, T.N. (1988). Leaf-age correlated changes in oxidative enzymes in *Retithrips syriacus* (Mayet) infested *Ricinus communis*. *Current Science* (Bangalore) 57(13): 744-746.
- Wysoki, M. (1999). Thysanoptera in Israel. The 16th Conference of the Entomological Society of Israel, Research on Thrips in Israel. *Phytoparasitica* 27(3): 73-80.
<http://www.phytoparasitica.org/phyto/pdfs/1999/issue3/meet.pdf>

3.1.4 *Sesamia nonagrioides* (Lefebvre) [Lepidoptera: Noctuidae]

Synonyms and change in combination: *Sesamia botanephaga* Tams and Bowden; and *Sesamia vuteria* Stoll.

Common name(s): Mediterranean corn stalk borer, pink maize stalk borer.

Hosts: Cared (sedges), *Diospyros kaki* (oriental persimmon), *Gladiolus* spp. (sword lily), *Musa* spp. (banana), *Oryza sativa* (rice), Poacea (cereals), *Saccharum officinarum* (sugarcane), *Solanum melongena* (aubergine), Sorghum, *Strelitzia reginae* (bird of paradise), wild and cultivated grasses, *Zea mays* (maize) (CAB International, 2002).

Plant part affected: Whole plant, stems, roots, growing points, inflorescence, fruits/pods, and seeds (CAB International, 2002).

Distribution: Burundi, Cape Verde, Congo, Cote d’Ivoire, Cyprus, France, Ghana, Greece, Iran, Israel, Italy, Kenya, Mali, Morocco, Nigeria, Portugal, Spain, Sudan, Tanzania, Togo, Turkey, Twanda, Uganda. Not recorded in Japan and Korea (CAB International, 2002).

Biology

Life History:

Sesamia nonagrioides has been recorded on persimmons only once in Israel, in 1986 (Wysoki and Madjar, 1986). Persimmon orchards in Israel are rarely infested by this pest (PPIS, 2002). *S. nonagrioides* is a serious pest of maize in southern Europe and North Africa but is also of local importance as a pest of sorghum, rice, wheat and barley. The larvae feed in stems,

eating out frass-filled galleries. They do not usually feed on the young terminal leaves, so are less likely to cause the holing and scarification that is typical of attack by *Busseola fusca* and *Chilo* spp. Stem tunnelling may kill growing points, resulting in 'deadheart' symptoms as terminal leaves die, and may also cause stem breakages. Larvae may also feed in maize cobs and in inflorescence stalks of other cereals. On some non-poaceous crops the larvae feed on flower buds, flowers and fruits as well as tunnelling in leaf and stem tissues (CAB International, 2002).

A general account of the biology and ecology of this species was published by Anglade (1972). Adult behaviour has been little studied. They are nocturnal but are seldom caught in light traps and may often move by crawling over the soil. They mate and the females lay eggs on the two nights following emergence. Eggs are inserted under the leaf sheaths at the base of young maize plants and several hundred may be laid in a single batch, arranged in up to five parallel lines. The newly hatched larvae feed on the leaf sheath, penetrate the base of the stem and then eat galleries upwards in the stem and, at a later stage of plant development, tunnel into the base of the inflorescence. Extensive frass-filled galleries are eaten out and the larvae pupate within them. At a constant temperature of 25-26°C eggs hatch after 5-6 days, larvae feed for 25-30 days and the pupal period lasts 12-15 days. During the winter, larvae remain within stems and stubble but mortality is high when freezing temperatures of -5°C persist for a few days. During the growing season development is continuous, without diapause, and the number of adult generations is determined by climatic factors and the availability of sufficient food. In Spain and Sicily, where breeding is continuous, all stages may be present at the same time (Anglade, 1972).

In Greece, Kavut (1987) reported that mature larvae overwintered in stems of maize and also in those of *Typha latifolia* and *Arundo donax* growing along the banks of streams; 60-75% of the overwintering larvae resumed activity at 10 and 14°C, respectively, but activity declined when the temperature fell to 3°C. Adults emerged over a period of 30-40 days and there were three generations a year in the study area.

In Iran, Gemsli and Kamali (1992) reported that fully grown larvae overwintered in the stem bases of maize plants and that adult moths emerged in late March. Four generations were produced during the growing season with a partial fifth generation on second plantings of maize.

In Turkey, where this species is a major pest of rice, larvae overwintered in the bases of rice plants and the first generation developed on *Typha* in some areas (Fazeli, 1992).

Mating behaviour was studied in Greece by Babilis and Mazomenos (1992) who recorded that in laboratory conditions, at about 25°C, 5% RH and LD 16:8, females began calling during the first scotophase following emergence, with peak calling in the second scotophase.

Maximum calling was observed between the fourth and fifth hours of scotophase and the calling pattern varied with age. Matings began during the first scotophase following emergence. Mated females did not remate and few males mated more than once.

Final instar larvae under short photoperiods enter a facultative diapause but may moult up to seven times before pupation, with some growth occurring so that diapause larvae produce heavier pupae than non-diapause larvae (Gadenne *et al.*, 1997).

Cold hardiness and the overwintering strategy of this species have been studied in France by Gillyboeuf *et al.* (1994) who concluded that the survival of overwintering larvae is related only to the microclimate of the overwintering site and that the freezing tolerance capacity of the larvae seemed to be irrelevant. Hilal (1992) studied the effect of extreme temperatures in laboratory experiments and reported 85% mortality after 4 hours at -5°C.

Brief descriptions of all stages of *S. nonagrioides*, with references to earlier publications, are given by Carter (1984).

Eggs are hemispherical, about 1 mm in diameter, slightly flattened and with radial striations. They are creamy-white when laid, but become pink as they develop. Larvae grow to a length of about 40 mm and are smooth, shiny and almost uniformly pinkish-yellow, except for greyish median and lateral lines. The head capsule and the thoracic plate are a shining dark brown. Badolato (1976) gives a detailed description and lists characters that distinguish larvae of this species from those of *S. cretica*. Meijerman and Ulenberg (1996) have also published a detailed description, based on African material, and reported that they found no reliable characters to distinguish *S. nonagrioides* larvae from those of *S. calamistis* and other African species of *Sesamia*.

Female pupae are up to about 18 mm long and males are slightly shorter, up to about 16 mm. They are chestnut brown and the terminal cremaster is bluntly conical with four robust, pointed, terminal projections. Badolato (1976) published an illustrated description and listed characters distinguishing pupae of *S. nonagrioides* from those of *S. cretica*. *S. nonagrioides* belongs in the family Noctuidae, which is characterized by the presence in adults of a tympanal organ (an opaque membrane) on each side of the metathorax facing posteriorly towards the abdomen. The hind-wing venation is also distinctive with only three, not four, veins associated with the posterior part of the hind-wing cell and only two anal veins. Adult wingspan is up to about 40 mm, with males generally smaller than females. The forewings are pale cartridge buff, suffused with light ochraceous colour and with variable darker markings. The hind wings are white with a pale buff suffusion at the apex (CAB International, 2002).

Field inspection is the main method of detecting infestations. Positive diagnosis is based on microscope examination of the male genitalia and, to some extent, of the female reproductive system and larval chaetotaxy (CAB International, 2002).

Control: Anglade (1972) summarized methods of control used up to that date and Naibo *et al.* (1996) have reviewed integrated control methods that are currently in use in France. The most effective combination involves reduction of the population of overwintering larvae by destruction of crop residues in the autumn and exposure to cold during the winter, followed by chemical treatments against first-generation larvae in the new crops. This limits the initial

populations in the crop and chemical treatments against subsequent generations are then only necessary in localities where high populations persist.

In north-west Spain, early sowing could be a useful measure of control as early-maturing plants escape borer attack (Cartea *et al.*, 1994). Plant breeding for resistance has been in progress for some time and a meridic diet has been developed for laboratory rearing (Giacometti, 1995). Evaluation of sources of resistance to this species and the European corn borer (*Ostrinia nubilalis*) in Spain indicated that landraces of maize from the Ebro valley could be a good resource of resistance or tolerance to stem borers and that EPS7(S)C2 could be used as base material for a breeding program (Malvar *et al.*, 1993). In Portugal, the tachinid *Lydella thompsoni* has been recorded as an important parasitoid with biocontrol activity effective throughout the 2nd and 3rd generations but parasitoids were generally less effective than entomopathogens (Figueiredo and Araujo, 1996). Successful biological control has been reported from the Cape Verde Islands (van Harten *et al.*, 1990). According to Anglade (1972) this species is rarely parasitized, probably because it is protected within stems.

Parasitoids of *Sesamia nonagrioides* include: *Descampsina sesamiae* attacking larvae in West Africa; *Diadegma terebrans*; *Exorista segregata* attacking larvae; *Lydella thompsoni* attacking larvae in Spain, Portugal and France; *Masicera sphingivora* attacking larvae; *Pediobius furvus* attacking pupae in West Africa and the Cape Verde Islands; *Pediobius imbreus*; *Pseudogonia rufifrons* attacking larvae; *Telenomus busseolae* attacking eggs in the Cape Verde Islands, Greece and Turkey (CAB International, 2002).

Pathogens of *Sesamia nonagrioides* include: *Paecilomyces farinosus*; *Paecilomyces fumosoroseus* (CAB International, 2002).

References:

- Anglade, P. (1972). Les Sesamias. In: Balachowsky AS, ed. Entomologie appliquée a l'agriculture. Tome II Lépidoptères, Vol. 2. Paris, France: Masson: 1389-1398.
- Babalís, N.A. and Mazomenos, B.E. (1992). Mating behaviour of the corn stalk borer *Sesamia nonagrioides*. *Entomologia Experimentalis et Applicata* 65: 199-204.
- Badolato, R. (1976). Comparative characters for *Sesamia nonagrioides* (Lef., 1827) and *S. cretica* Led., 1857, in their various developmental stages. (Lep. Noctuidae). *Graellsia* 32: 265-277.
- CAB International. (2002). *Crop Protection Compendium, 2002 Edition*. CAB International, Wallingford, UK.
- Cartea, M.E., Malvar, R.A., Revilla, P., Ordás, A. and Alvarez, A. (1994). Seasonal occurrence and response of maize inbred lines to pink stem borer in the northwest of Spain. *Maydica* 39(3): 191-196.
- Carter, D.J. (1984). Pest Lepidoptera of Europe. *Series Entomologica*, Vol. 31. Dordrecht, Netherlands: Dr W Junk.

- Fantinou, A.A., Karndinos, M.G. and Tsitsipis, J.A. (1995). Diapause induction in *Sesamia nonagrioides* (Lepidoptera: Noctuidae) effect of photoperiodism and temperature. *Environmental Entomology* 24: 1458-1466.
- Fazeli, M.J. (1992). Biology and control of *Sesamia nonagrioides* botanephaga in the Fars Province. *Applied Entomology and Phytopathology* 59(1-2): 13-14.
- Figueiredo, D. and Araujo, J. (1996). Mortality factors of *Sesamia nonagrioides* Lef. (Lepidoptera: Noctuidae) in Portugal. 1 - Parasitoids. *Boletim de Sanidad Vegetal, Plagas* 22: 251-260.
- Gadenne, C., Dufour, M.C., Rossignol, F., Becard, J.M and Couillaud, F. (1997). Occurrence of non-stationary larval moults during diapause in the corn-stalk borer, *Sesamia nonagrioides* (Lepidoptera: Noctuidae). *Journal of Insect Physiology* 43: 425-431.
- Gemsi, G.R. and Kamali, K. (1992). Biology, host range and damage of corn stem borer in Khuzestan. *Applied Entomology and Phytopathology* 59(1-2): 31-33.
- Giacometti, R. (1995). Rearing of *Sesamia nonagrioides* Lefevre on a meridic diet (Lepidoptera, Noctuidae). *Redia* 78: 19-27.
- Gillyboeuf, N., Anglade, P., Lavenseau, L. and Peypelut, L. (1994). Cold hardiness and overwintering strategy of the pink maize stalk borer, *Sesamia nonagrioides* Lef. (Lepidoptera: Noctuidae). *Oecologia* 99(3/4): 366-373.
- Hilal, A. (1992). The effect of extreme temperatures on the development and mortality of the maize stalk borer, *Sesamia nonagrioides* Lef. (Lep. Noctuidae). *Al Awamia* 75: 155-168.
- Kavut, H. (1987). Some biological findings relating to the control of maize stalk borer (*Sesamia nonagrioides* Lef. Lepidoptera: Noctuidae) causing damage in maize fields in the Aegean Region. *Turkiye I. Entomoloji Kongresi Bildirileri*, 13-16 Ekim 1987, Ege Universitesi, Bornova, Izmir. Bornova/Izmir, Turkey: *Ege Universitesi Ataturk Kultur Merkezi* 157-166.
- Lopez, E., Eizaguiire, M. and Albajes, R. (1995). Diapause detection and monitoring in the Mediterranean corn stalk borer. *Physiological Entomology* 20, 330-336.
- Malvar, R.A., Carrea, M.E., Revilla, P., Ordas, A., Alvarez, A. and Mansilla, J.P. (1993). Sources of resistance to pink stem borer and European corn borer in maize. *Maydica* 38(4): 313-319.
- Meijerman, L. and Ulenberg, S.A. (1996). Identification of African stem borer larvae (Lepidoptera: Noctuidae, Pyralidae) based on morphology. *Bulletin of Entomological Research* 86: 567-578.
- Naibo, B., Algans, J.L. and Brasseur, A. (1996). The maize *Sesamia*: injuriousness and means of control. *Phytoma* 486: 23-27.
- PPIS. (2002). Pests of *Diospyros* spp. (Ebenaceae) in Israel, specifically *D. kaki* L. (Japanese/Oriental persimmon, kaki fruit, "Sharon fruit"); rootstock – *D. virginiana* L.

rootstock (American/common persimmon). Israel persimmon pest list-updated March 2002, received from the PRA Unit, Plant Protection and Inspection Services (PPIS), Ministry of Agriculture and Rural Development, Bet Dagan, Israel.

van Harten, A., Monteiro-Neves, A. and Mendes-Brito, J. (1990). Import, rearing, release and recovery of parasitoids and predators of pests in the Cape Verde Islands from April 1983 to December 1987. *Investigacao Agraria*, Cape Verde, 3: 39-49.

Wysoki, M. and Madjar, V.M. (1986). *Sesamia nonagrioides* on persimmon in Israel. *Phytoparasitica*, 14: 320.

3.1.5 *Stathmopoda masinissa* (Meyrick) [Lepidoptera: Oecophoridae]

Synonyms and change in combination: *Kakivoria flavofasciata* Nagano

Common name(s): persimmon fruit moth.

Hosts: *Amaranthus* spp. (magic fountain amaranthus) (Moriuti and Yasuda, 1983); *Diospyros kaki* (persimmon) (USDA, 1997); *Diospyros kaki* var. *domestica* (wild persimmon) (Bae, 1997); *Diospyros lotus* (dateplum persimmon) (Xu *et al.*, 1996).

Plant part affected: Persimmon fruit (USDA, 1997).

Distribution: Japan (MAFF, 1985), Korea (KSPP, 1986; Kim *et al.* 1997; NPQS, 1995), Thailand (Moriuti and Yasuda, 1983). Not present in Australia (Nielsen *et al.*, 1996; DAWA, 2003).

Biology

Life History: *Stathmopoda masinissa* has two generations a year, the first generation adults emerge from late May to early June and second generation moths emerge from late July to early August. The moths rest on underside of leaves during daytime and emerge around sunset and mating occurs during dawn. They lay eggs after sunset. The moths lay one egg per shoot, mostly on the first five shoots from the top of fruit bearing branch. The number of eggs laid by one female range from 20 to 150 with an average of 70 eggs per female. The first generation eggs hatch in 10 days and second ones in 6 days after egg laying. The young larvae bore into the shoots and feed until second instar and attack fruit afterwards. In early to mid July after feeding several fruit, the first generation larvae spins its cocoon in early to mid September under the bark. Excrement of the pest can be seen around the hole of the infested shoot. The infested shoots soon die and the leaves fall if larvae feed on their petioles. Larvae bore into the fruit from the fruit stalk or calyx and excrement can be seen around entrance holes (MAFF, 1987).

Larval infestation of *S. masinissa* in wild persimmon fruit, *Diospyros kaki* var. *domestica* was investigated during autumn 1991 in Korea. Infestation rates were 41, 37 and 22% under the pedicel, in the pedicel and in the fruit, respectively. Infestation rates varied from 88% on 30 August, to 2.5% on 10 October and 0% on 15 October (Bae, 1997).

From field studies carried out in Japan, a close relationship was found between the numbers of calyces remaining on persimmon twigs after larval hibernation and the number of

hibernating larvae of *S. masinissa*. It is suggested that calyx numbers could be used to predict the occurrence of *S. masinissa* the following spring (Kiyonaga and Tanaka, 1987).

Control: In Japan, forecasting of *S. masinissa* is carried out based on the number of insects collected by 100W light traps. Optimum timing for control is 7-10 days after the peak day of moth emergence. Cartap is used as an effective insecticide (MAFF, 1987). Since mature *Stathmopoda masinissa* larvae usually over winter in the gaps of split trunk bark and the calyx basin of persimmon fruit; scraping of bark to kill the over wintered larvae has been a key method for its control in China (Li, 1999). In the vegetative period, spraying 3 times with an 800-1500x solution of 40% omethoate, 50% dichlorvos or 50% phoxim between 2-8 June and 20-25 July also gave good control (Li, 1999).

A methyl bromide fumigation schedule with 48 g/m for 2 hours at 15°C with 50% loading resulted in complete mortality of *S. masinissa* larvae in persimmon fruits from Japanese orchards that had not been sprayed with pesticide. A total of 31739 larvae in fresh persimmons were killed completely in 16 replicated tests conducted from 1992 to 1999. This methyl bromide standard would provide for sufficient quarantine security for exporting Japanese persimmons. (Matsuoka *et al.*, 2001)

DBI-3204 (Bistrifluron, ISO proposed) is a new IGR insecticide of benzoylphenyl urea class. It is a highly active insecticide that shows a good controlling effect against whiteflies and lepidopterous insect pests such as *S. masinissa* (Kim *et al.*, 2000).

References:

- Bae, S.D. (1997). Comparison in damaged aspect of wild persimmon fruit by second-generation larva of persimmon fruit moth, *Stathmopoda masinissa* Meyrick. *RDA Journal of Crop Protection* 39(2): 57-60.
- DAWA (Department of Agriculture Western Australia) (2003). Draft WA Pest Lists for Arthropods, Pathogens and Nematodes. Provided by Department of Agriculture Western Australia, August 2003.
- Kim, I.S., Hong, K.J, Han, M.J. and Lee, M.H. (1997). Survey on the occurrence of quarantine pests for export in major non-astringent persimmon (*Diospyros kaki* Thunb.) production areas in Korea [Republic]. *RDA Journal of Crop Protection* 39(2): 67-71.
- Kim, K.S., Chung, B.J. and Kim, H.K. (2000). DBI-3204: a new benzoylphenyl urea insecticide with a particular activity against whitefly. *The BCPC Conference: Pests and diseases, Volume 1. Proceedings of an international conference held at the Brighton Hilton Metropole Hotel, Brighton, UK, 13-16 November 2000*, 41-46. British Crop Protection Council; Farnham; UK
- Kiyonaga, T. and Tanaka, M. (1987). Studies of integrated control of persimmon pests in Kurume District 1. Quantity prediction of persimmon fruit moth (*Stathmopoda masinissa* Meyrick) occurrence in the following spring, by the numbers of calyces on the trees in winter. *Proceedings of the Association for Plant Protection of Kyushu* 33: 214-215.

- KSPP. (1986). A List of Plant Diseases, Insect Pests and Weeds in Korea (second edition), Korean Society of Plant Protection, 633 pp.
- Li, Y.D. (1999). Experiment on control of *Kakivoria flavofasciata* Nasano on persimmon trees. *China Fruits* 2: 44.
- MAFF (1985). List of Harmful Pests Which Affect Persimmons at the Time of Harvest. Provided by Plant Quarantine Division, Ministry of Agriculture, Forestry and Fisheries (MAFF) to Australian Department of Trade January 1985.
- MAFF. (1987). Data provided by Japan Ministry of Agriculture, Forestry and Fisheries (MAFF).
- Matsuoka, T., Taniguchi, K., Hiramatsu, T. and Dote, F. (2001). Methyl bromide quarantine treatment for persimmon fruit moth in Japanese persimmons. *Research Bulletin of the Plant Protection Service Japan* 37: 63-68.
- Moriuti, S. and Yasuda, K. (1983). *Stathmopoda masinissa* Meyrick and *Eretmocera impactella* (Walker.) (Lepidoptera: Stathmopodidae) new to the fauna of Thailand. *Applied Entomology and Zoology* 18(3): 431-432.
- Nielsen, E.S., Edwards, E.D. and Rangsi, T.V. (eds). (1996). Checklist of the Lepidoptera of Australia. Monographs on Australian Lepidoptera Volume 4. CSIRO Australia.
- NPQS (1995). Personal communication.
- USDA (1997). Importation of Fresh Persimmon Fruit, *Disopyros kaki* from South Korea into the United States. Qualitative, Pathway-initiated Pest Risk Assessment. U.S. Department of Agriculture.
- Xu, S., Yang, X.D., Liu, S., Wang, H. and Feng, C.G. (1996). Studies on the control of the persimmon fruit worm (*Kakivoria flavofasciata* Nagano). *Journal of Hebei Agricultural University* 19(1): 68-72.

3.1.6 *Tenuipalpus zhizhilashviliae* (Reck) [Acarina: Tenuipalpidae]

Synonyms and change in combination: None.

Common name(s): persimmon false spider mite.

Hosts: *Diospyros kaki* (persimmon), *Vitis vinifera* (grape vines) (Ghai and Shenhmar, 1984).

Plant part affected: Fruit and other plant parts (USDA, 1997).

Distribution: Japan (Ghai and Shenhmar, 1984), Korea (KSPP, 1986), Russia (Ghai and Shenhmar, 1984), Taiwan (Tseng *et al.* 1974). No record of this pest in Israel.

Biology

Life History:

No specific details on the biology of *Tenuipalpus zhizhilashviliae* or its damage on persimmons is available. However, life history of a closely related species from the same

genus, *Tenuipalpus granati*, which attacks pistachio (Mehrnejad and Ueckermann, 2002; Mehrnejad, 2003), pomegranate and grapevine plants (Mehrnejad, 2003) is outlined below.

On pistachio, in Iran, *T. granati* overwinters in the adult stage, near the base of buds and under the bud scales, but it can also be found in crevices on the plant branches and twigs. It has several generations per year, and does not weave a silken web on the leaf or fruit. The eggs are reddish and are laid around the mid and sub-veins of pistachio leaves. The larvae and nymphs are red to orange colour but the adults turn to pale orange with numerous tiny black spots. In heavy infestations, fruit buds may drop and kernel development can be stopped. Severe damage may occur by defoliation in the late summer. *T. granati* is heavily attacked by predatory mites belonging to the Phytoseiidae and Ascidae, as well as by the coccinellid beetles (Mehrnejad, 2003). On grapevines, in Greece, *T. granati* did not cause extensive damage in vineyards (Papaioannou –Souliotis *et al*, 1999)

Control: According to U.S. Department of Agriculture, Federal Register (7 CFR Sec. 319.56-2kk), inspection, phytosanitary certificate stating that fruit has been inspected and is free of quarantine pests, and labelling requirements are adequate to prevent the introduction of quarantine pests into the United States. Also orchards where persimmons are grown must be inspected for quarantine pests by the Korean national plant quarantine service (NPQS) at least once during the growing season and before harvest (USDA, 2002).

References:

- Ghai, S. and Shenhmar, M. (1984). A review of the world fauna of Tenuipalpidae (Acarina: Tetranychoidae). *Oriental insects* 18: 99-172.
- KSPP. (1986). A List of Plant Diseases, Insect Pests and Weeds in Korea (second edition). 633pp.
- Mehrnejad, M.R. (2003). The current status of pistachio pests in Iran.
<http://ressources.ciheam.org/om/pdf/c56/01600196.pdf>.
- Mehrnejad, M.R. and Ueckermann, E.A. (2002). Phytophagous and Predatory Mites of Pistachio Trees in Iran. *Acta Horticulturae* (ISHS) 591, 545-547.
http://www.actahort.org/books/591/591_84.htm
- Papaioannou-Souliotis, P., Markoyiannaki-Printzious, D., Rumbos, I. and Adamopoulos, T. (1999). Phytoseiid mites associated with vine in various provinces of Greece: a contribution to faunistics and biogeography, with reference to eco-ethological aspects of *Phytoseius finitimus* (Ribaga) (Acari: Phytoseiidae). *Acarologia* 40(2): 113-125.
- Tseng, Y.H., I, S.T. and Tjying, I.S. (1974). Systematic and distribution of phytophagous and predatory mites on grape in Taiwan. Part I. Phytophagous mites. *Journal of the Agricultural Association of China* 88: 56-73.
- USDA (1997). Importation of Fresh Persimmon Fruit, *Diospyros kaki* from South Korea into the United States. Qualitative, Pathway-initiated Pest Risk Assessment. U.S. Department of Agriculture.

USDA (2002). Proposed rules – Importation of fruits and vegetables; correction. *Federal Register*. 67, No. 216.

<http://www.setonresourcecenter.com/register/2002/Nov/07/67799A.pdf>

3.2 Pathogens

3.2.1 *Phoma kakivora* (Hara) [‘mitosporic fungi’: Coelomycetes]

Synonyms and change in combination: None.

Common name(s): black spot, fruit stain.

Hosts: *Diospyros kaki* (persimmon) (Yamada, 1966).

Plant part affected: Fruit and leaves (Yamada, 1966).

Distribution: Japan (Yamada, 1966).

Biology

Life History: Since 1930, reports of black spot disease have been limited to the listing of its name in the Common Names of Economic Plant Diseases in Japan in 1965 and Yamada’s work in 1966, indicating that it is not a common disease (Yamada, 1966).

Phoma kakivora causes fruit stains are mostly circular or somewhat irregular shape with about 10-15mm in diameter consisting of many small black spots, which began to appear on the young fruits just after petal fall in the field in early May. These black spots start as small, blackish-brown spots on the surface and beneath the epidermis of persimmon fruit. Once the spots reach a size of approximately 0.1 mm to 0.5 mm, they turn black, gradually increase in number, and protrude slightly. Often, the black spots appear in clusters, forming circular, or irregular-shaped stains some 10 mm to 15 mm in diameter. Otherwise, they may adopt a wave-like shape, or the clusters will merge and cover almost the entire surface of the fruit, or the black spots will disperse across the fruit. Black spots typically occur on the surface of the fruit, but on close examination they may also be observed on the calyx and petiole, or on the leaf blade (Yamada, 1966).

The disease is most commonly seen in fruit from the lower branches, and on a single piece of fruit and is most frequent on parts that are in shade, or where rainwater pools (Yamada, 1966).

Pycnidia of the *Phoma kakivora* appear first under the epidermis as black spots, but subsequently break through the epidermis and protrude. They are of slightly eccentric spheroid or ellipsoid shape, with diameter from 100 to 250 μ and height of 80 to 150 μ , with an ostiole at the apex. The pycnospore are either oval or a truncated egg shape, and are granular, ranging in size from 4.3 to 7.5 x 5 to 10 μ . The size of the spermatium ranged from 0.8 to 2.3 x 2.5 to 7.5 μ , and both edges were slightly swollen.

Information with regard to the suitable environmental conditions, mode of spread, establishment and control of *P. kakivora* is not available. In general, short range dispersal of

Phoma spp. would be through water splashes and long distance spread would be by the movement of infected fruit and leaves. Results of the experiments conducted during September 1963 and July 1964 suggest that the period of infection of the pathogen reaches its end around late June, and does not occur thereafter (Yamada, 1966).

In Kouchi Prefecture, the disease is known to cause most damage in Jiro fruit (up to 35%), and extremely little in Fuyuu fruit (Yamada, 1966).

Control: Specific information with regard to the control of *Phoma kakivora* on persimmons is not available. Details of the control of citrus black spot disease caused by *Phoma citricarpa* (*Guignardia citricarpa*) are outlined below.

The removal of infected off-season citrus fruit to reduce conidial inoculum has been successful as a control method in South Africa (Koltze, 1981).

Citrus black spot was effectively controlled on Valencia orange trees by cupric hydroxide applied at petal fall, alone or followed by a second application 6 weeks later, or by Bordeaux mixture applied at petal fall (Bertus, 1981a, b). Benomyl was also applied alone or as supplemental treatments 16 weeks after petal fall. Significant control of black spot was obtained with all treatments, except benomyl alone. However, there were no differences in yield or fruit quality (Bertus, 1982).

Combining oil with fungicides, mancozeb followed by benomyl, thiophanate-methyl, carbendazim, thiabendazole or propineb plus oil, increased control of black spot on sweet orange (Tsai *et al.*, 1977; Tsai, 1982; Kellerman and Kotze, 1979). In other studies, these fungicides were not as effective as benomyl (Tsai, 1978). Single applications of benomyl alone or with oil have been effective for the control of black spot on Valencia orange but two applications are generally recommended (Kellerman and Kotze, 1973; Kiely, 1976).

Pre-harvest sprays on satsuma fruit with benomyl, thiophanate, thiophanate-methyl, thiabendazole, furidazole and Bayer 6233 provided significant control of *G. citricarpa* (Yamada *et al.*, 1972).

The leaves of the mango were sprayed with contact sprays, copper and mancozeb and the systemic fungicide benomyl; benomyl provided the most significant control of *G. citricarpa* (McMillan, 1986).

Hall (1973) described the post-harvest disease of black spot in citrus and subsequent control measures. Fruit produced for fresh market should be maintained at temperatures below 20°C after harvest to inhibit post-harvest development of the disease (Timmer, 1988). A preharvest thiophanate-methyl spray was more effective than a post-harvest thiohanate-methyl dip in reducing the incidence of storage rot by *Penicillium italicum*, *P. digitatum*, *Alternaria citri*, *Geotrichum candidum*, *Diaporthe citri* and *Phoma citricarpa* (*G. citricarpa*) (Nam *et al.*, 1993).

References:

- Bertus, A.L. (1981a). Fungicidal control of black spot and melanose on coastal Valencia oranges in New South Wales. *Australasian Plant Pathology* 10(3): 53-55.
- Bertus, A.L. (1981b). Fungicidal control of black spot on coastal Valencia oranges. *Rural Newsletter* 79: 32-33.
- Bertus, A.L. (1982). Fungicidal control of melanose and black spot on coastal Valencia oranges. *Rural Newsletter* 83: 24-25.
- Hall, E.G. (1973). Storage and market diseases of [citrus] fruit. XVI. *CSIRO Food Research Quarterly* 33, 3, Supplement.
- Kellerman, C.R. and Kotze, J.M. (1973). A single application of benomyl controls citrus black spot. *Citrus and Sub-tropical Fruit Journal* 476: 19-22.
- Kellerman, C.R. and Kotze, J.M. (1979). The black spot disease of citrus and its control in South Africa. In: Grierson W, ed. *Proceedings of the International Society of Citriculture* 3: 992-996.
- Kiely, T. (1976). Control measures for black spot of Valencias. *Rural Newsletter* 59, 35-36.
- Koltze, J.M. (1981). Epidemiology and control of citrus black spot in South Africa. *Plant Disease* 65(12): 945-950.
- McMillan, R.T Jr. (1986). *Guignardia citricarpa* a cause of black spot on mango foliage in Florida. *Journal of Phytopathology* 117: 260-264.
- Nam, K.W., Kweon, H.M. and Song, N.H. (1993). Storage of satsuma mandarin. I. Storability of satsuma mandarin influenced by thiophanate-methyl treatment and mechanical injuries. *Journal of the Korean Society for Horticultural Science*, 34(4): 279-284.
- Timmer, L.W. (1988). Black Spot. In: Whiteside, J.O., Garnsey, S.M. and Timmer, L.W, (eds). *Compendium of Citrus Diseases*. St. Paul, Minnesota, USA: APS Press.
- Tsai, Y.P. (1978). Chemical control of citrus black spot. *Plant Protection Bulletin, Taiwan* 20(1): 67-72.
- Tsai, Y.P. (1982). Citrus black spot control in Taiwan. *Proceedings of the International Society of Citriculture* 1: 344-346.
- Tsai, Y.P., Shiao., Liao, T.H. and Sun, M.H. (1977). Field trials of citrus black spot control in Taiwan. *Plant Protection Bulletin, Taiwan*, 19(2): 140-145.
- Yamada, S. (1966). The stain on Japanese persimmon fruits caused by *Phoma kakivora*. <http://rms2.agsearch.agropedia.affrc.go.jp/contents/JASI/report/fruit-engei.htm>
- Yamada, S.I., Kuramoto, T. and Tanaka, H. (1972). Studies on the control of citrus fruit decay in storage. VII. The effect of spraying satsuma fruit with a fungicide in the orchard. *Bulletin of the Horticultural Research Station B Okitsu* 12: 207-228.