Australian Government

Biosecurity Australia

Final Report

Import Risk Analysis for Table Grapes from Chile

September 2005

Cite this report as:
Biosecurity Australia (2005). Final Report for the Import Risk Analysis for Table Grapes from Chile. Biosecurity Australia, Canberra, Australia.

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GLOSSARY OF TERMS AND ABBREVIATIONS

Additional declaration	a statement that is required by an importing country to be entered on a Phytosanitary Certificate and which provides specific additional information pertinent to the phytosanitary condition of a consignment
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	a prescribed Agency within the Australian Government Department of Agriculture, Fisheries and Forestry
Certificate	an official document, which attests to the phytosanitary status of any consignment affected by phytosanitary regulations
Consignment	a quantity of plant, plant products and/or other articles being moved from one country to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or more commodities or lots)
Control (of a pest)	suppression, containment or eradication of a pest population
DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
Endangered area	an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss
Entry (of a pest)	movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled
Entry potential	Likelihood of the entry of a pest
Establishment	the perpetuation, for the foreseeable future, of a pest within an area after entry
Establishment potential	Likelihood of the establishment of a pest
FAO	Food and Agriculture Organization of the United Nations
Fresh	not dried, deep-frozen or otherwise conserved
Host range	species of plants capable, under natural conditions, of suiting a specific pest
ICON	AQIS Import Conditions database
Inspection	official visual inspection of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations
Interception (of a pest)	the detection of a pest during inspection or testing of an imported consignment
Introduction (of pest)	entry of a pest resulting in its establishment

Introduction potential	Likelihood of the introduction of a pest
IPPC	International Plant Protection Convention, as deposited in 1951 with FAO in Rome and as subsequently amended
IRA	Import Risk Analysis, an administrative process through which quarantine policy is developed or reviewed, incorporating risk assessment, risk management and risk communication
ISPM	International Standard on Phytosanitary Measures
National Plant Protection Organisation	official service established by a government to discharge the functions specified by the IPPC (DAFF is Australia's NPPO)
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 analysis	the process of evaluating biological or other scientific evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it
Pest risk assessment (for quarantine pests)	evaluation of the probability of the introduction and spread of a pest and of the associated potential economic consequences
Pest risk management (for quarantine pests)	evaluation and selection of options to reduce the risk of introduction and spread of a pest
Phytosanitary Certificate	Certificate patterned after the model certificates of the IPPC

Phytosanitary measure	any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of quarantine pests
PRA	pest risk analysis
PRA area	area in relation to which a pest risk analysis is conducted
Polyphagous	feeding on a relatively large number of host plants from different plant families
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
Restricted risk	'Restricted' risk estimates are those derived when risk management measures are used
SAG	Servicio Agricola y Ganadero, the NPPO for Chile
SO_2/CO_2	Sulphur dioxide/carbon dioxide
Spread	expansion of the geographical distribution of a pest within an area
Spread potential	likelihood of the spread of a pest
SPS	Sanitary and phytosanitary
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures
Stakeholders	Government agencies, individuals, community or industry groups or organisations, whether in Australia or overseas, including the proponent/applicant for a specific proposal
Unrestricted risk	'Unrestricted' risk estimates are those derived in the complete absence of risk management measures
WTO	World Trade Organization

EXECUTIVE SUMMARY

This import risk analysis (IRA) recommends that table grapes from Chile be allowed entry into Australia subject to phytosanitary measures for Mediterranean fruit fly, Chilean false red mite, weevils, mealybugs, leafrollers, black widow spider (as a contaminating pest) and pest plants. These pests require the use of risk management measures, in addition to Chile's standard commercial production practices, to reduce the risk to a very low level to meet Australia's appropriate level of protection (ALOP).

State legislation in Western Australia currently prohibits the importation of fresh table grapes from any source, including other Australian States and Territories. The Western Australian State legislation requires modification before imports of table grapes into that State can occur.

A combination of risk management measures and operational systems will reduce the risk associated with the importation of table grapes from Chile to meet Australia's ALOP, specifically:

- pest free area status for Mediterranean fruit fly;
- pre-shipment fumigation with SO_2/CO_2 for black widow spider;
- methyl bromide fumigation for Chilean false red mite;
- inspection and remedial action for weevils, mealybugs, leafrollers and pest plants; and
- supporting operational systems to maintain and verify phytosanitary status.

A pre-clearance program is recommended, based on full or partial pre-clearance arrangements in Chile. The partial pre-clearance option allows methyl bromide fumigation to be undertaken on-arrival in Australia and has the advantage that any consignments that have been found with quarantine pest risks during pre-clearance inspection by AQIS in Chile that are not managed by methyl bromide fumigation, will not be exported from Chile to Australia.

Australia initiated an IRA for table grapes from Chile in December 1998, following a request from Servicio Agricola y Ganadero (SAG) for market access in 1995. Biosecurity Australia circulated the technical issues paper in September 2002, the draft IRA report in June 2003 and the revised draft IRA report in February 2005. Stakeholder comments were considered and material matters raised have been incorporated into, or addressed in, this final IRA report.

The *Final Import Risk Analysis Report* contains the following:

- Australia's framework for biosecurity policy and import risk analysis, the international framework for trade in plants and plant products, Australia's current policy for importation of table grapes and information on the background to this IRA;
- an outline of the methodology and results of pest categorisation and risk assessment;
- risk management measures;
- final import conditions for table grapes from Chile;
- further steps in the IRA process; and
- a table of stakeholders who commented on the revised draft IRA report and a summary of the main issues raised by these stakeholders.

Detailed risk assessments were conducted for those pests that were categorised as quarantine pests, to determine an unrestricted risk estimate for each organism. For those pests for which the unrestricted risk was estimated to be above Australia's ALOP, risk management measures were identified and selected.

Consultation with SAG, and input from stakeholders on the draft import conditions, has resulted in a set of final risk management measures. Details of these measures, including their objectives, are provided within this final IRA report.

Biosecurity Australia has made a number of changes to the risk analysis following consideration of stakeholder comments on the revised draft IRA report. These changes include:

- removal of spider mites from the risk assessments for quarantine pests, as no reference could be found to support the pathway association of these pests;
- a reduction in the probability of establishment for weevils from high to moderate on the basis of the long generation period of 19-20 months;
- a reduction in the probability of distribution of *Phomopsis viticola* to very low on the basis that the events necessary to transfer conidia to a host would be very unlikely to occur;
- an increase in the probability of establishment of *Phomopsis viticola* to high following reconsideration of the influence of climatic factors on the potential for infection in Western Australia and climate modelling analysis provided by the Department of Agriculture Western Australia;
- an increase in the probability of spread of *Phomopsis viticola* to moderate following reconsideration of the likelihood that the fungus could be distributed in infected propagation material;
- a reduction in the consequences of *Phomopsis viticola* to low following advice from Australian experts on the economic importance of this pathogen; and
- a revision of the methodology for pest plants.

1 BIOSECURITY FRAMEWORK

1.1 Introduction

This section outlines:

- The legislative basis for Australia's biosecurity regime;
- Australia's international rights and obligations;
- Australia's Appropriate Level of Protection;
- Import Risk Analysis; and
- Policy determination.

1.2 Australian Legislation

The *Quarantine Act 1908* and its subordinate legislation, including the *Quarantine Proclamation 1998*, are the legislative basis of human, animal and plant biosecurity in Australia.

Some key provisions are set out below.

1.2.1 Quarantine Act: Scope

Section 4 of the *Quarantine Act 1908* defines the scope of quarantine as follows.

In this Act, quarantine includes, but is not limited to, measures:

a) *for, or in relation to:*

   i) the examination, exclusion, detention, observation, segregation, isolation, protection, treatment and regulation of vessels, installations, human beings, animals, plants or other goods or things; or

   ii) *the seizure and destruction of animals, plants, or other goods or things; or*

   iii) *the destruction of premises comprising buildings or other structures when treatment of these premises is not practicable; and*

b) *having as their object the prevention or control of the introduction, establishment or spread of diseases or pests that will or could cause significant damage to human beings, animals, plants, other aspects of the environment or economic activities.*

Section 5D of the *Quarantine Act 1908* covers the level of quarantine risk.

A reference in this Act to a level of quarantine risk is a reference to:

a) *the probability of*

   i) a disease or pest being introduced, established or spread in Australia or the Cocos Islands; and

   ii) the disease or pest causing harm to human beings, animals, plants, other aspects of the environment, or economic activities; and

b) *the probable extent of the harm.*

Section 5D of the *Quarantine Act 1908* includes harm to the environment as a component of the level of quarantine risk. Environment is defined in Section 5 of the Quarantine Act 1908, in that it:

> *includes all aspects of the surroundings of human beings, whether natural surroundings or surroundings created by human beings themselves, and whether affecting them as individuals or in social groupings.*

1.2.2 Quarantine Proclamation

The *Quarantine Proclamation 1998* is made under the *Quarantine Act 1908*. It is the principal legal instrument used to control the importation into Australia of goods of quarantine (or biosecurity) interest. The Proclamation empowers a Director of Quarantine to grant a permit to import.

Section 70 of the *Quarantine Proclamation 1998* sets out the matters to be considered when deciding whether to grant a permit to import:

> *Things a Director of Quarantine must take into account when deciding whether to grant a permit for importation into Australia*
>
> *(I) In deciding whether to grant a permit to import a thing into Australia or the Cocos Islands, or for the removal of a thing from the Protected Zone or the Torres Strait Special Quarantine Zone to the rest of Australia, a Director of Quarantine:*
>
> *a) must consider the level of quarantine risk if the permit were granted; and*
>
> *b) must consider whether, if the permit were granted, the imposition of conditions on it would be necessary to limit the level of quarantine risk to one that is acceptably low; and*
>
> *(ba) for a permit to import a seed of a kind of plant that was produced by genetic manipulation -- must take into account any risk assessment prepared, and any decision made, in relation to the seed under the Gene Technology Act; and*
>
> *c) may take into account anything else that he or she knows that is relevant.*

1.2.3 Development of Biosecurity Policy

As can be seen from the above extracts, the legislation establishes the concept of the level of biosecurity (quarantine) risk as the basis of decision-making under Australian quarantine legislation.

Import risk analyses are a significant contribution to the information available to the Director of Animal and Plant Quarantine - a decision maker for the purposes of the Quarantine Proclamation. Import risk analysis is conducted within an administrative process – known as the IRA process (described in the *IRA Handbook*[1]).

The purpose of the IRA process is to deliver a policy recommendation to the Director of Animal and Plant Quarantine that is characterised by sound science, transparency, fairness and consistency. The key elements of the IRA process are covered in “Import Risk Analysis” below.

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[1] Biosecurity Australia (2003) *Import Risk Analysis Handbook*. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra

1.3 Australia’s International Rights and Obligations

It is important that import risk analyses conform to Australia’s rights and obligations as a World Trade Organization (WTO) Member country. These rights and obligations derive principally from the WTO’s *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement), although other WTO agreements may also be relevant. Specific international guidelines on risk analysis developed under the International Plant Protection Convention (IPPC) and by the Office International des Epizooties (OIE) are also relevant.

The SPS Agreement recognises the right of WTO Member countries to determine the level of sanitary and phytosanitary protection they deem appropriate, and to take the necessary measures to achieve that protection. Sanitary (human and animal health) and phytosanitary (plant health) measures typically apply to trade in, or movement of, animal and plant based goods within or between countries. The SPS Agreement applies to measures that may directly or indirectly affect international trade and that protect human, animal or plant life or health from pests and diseases or a Member’s territory from a pest.

The SPS Agreement provides for the following:

- The right of WTO Member countries to determine the level of sanitary and phytosanitary protection (its appropriate level of protection, or ALOP) they deem appropriate;
- An importing Member has the sovereign right to take measures to achieve the level of protection it deems appropriate to protect human, animal or plant life or health within its territory;
- An SPS measure must be based on scientific principles and not be maintained without sufficient scientific evidence;
- An importing Member shall avoid arbitrary or unjustifiable distinctions in levels of protection, if such distinctions result in discrimination or a disguised restriction on international trade;
- An SPS measure must not be more trade restrictive than required to achieve an importing Member’s ALOP, taking into account technical and economic feasibility;
- An SPS measure should be based on an international standard, guideline or recommendation where these exist, unless there is a scientific justification for a measure which results in a higher level of SPS protection to meet the importing Member’s ALOP;
- An SPS measure conforming to an international standard, guideline or recommendation is deemed to be necessary to protect human, animal or plant life or health, and to be consistent with the SPS Agreement;
- Where an international standard, guideline or recommendation does not exist or where, in order to meet an importing Member’s ALOP, a measure needs to provide a higher level of protection than accorded by the relevant international standard, such a measure must be based on a risk assessment; the risk assessment must take into account available scientific evidence and relevant economic factors;
- Where the relevant scientific evidence is insufficient, an importing Member may provisionally adopt SPS measures on the basis of available pertinent information. In such circumstances, Members shall seek to obtain the additional information necessary

for a more objective assessment of risk and review the SPS measure accordingly within a reasonable period of time;

- An importing Member shall accept the measures of other countries as equivalent, if it is objectively demonstrated that the measures meet the importing Member's ALOP.

1.4 Australia's Appropriate Level of Protection (ALOP)

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

Like many other countries, Australia expresses its ALOP in qualitative terms. Australia's ALOP, which reflects community expectations through government policy, is currently expressed as providing a high level of sanitary or phytosanitary protection aimed at reducing risk to a very low level, but not to zero.

ALOP can be illustrated using a 'risk estimation matrix' (Table 1). The cells of this matrix describe the product of likelihood[2] and consequences — termed 'risk'. When interpreting the risk estimation matrix, it should be remembered that, although the descriptors for each axis are similar ('low', 'moderate', 'high', etc.), the vertical axis refers to *likelihood* and the horizontal axis refers to *consequences*.

Table 1: Risk estimation matrix

Likelihood of entry, establishment or spread						
High likelihood	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Moderate	Negligible risk	Very low risk	Low risk	Moderate risk	High risk	Extreme risk
Low	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk	High risk
Very low	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk	Moderate risk
Extremely low	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk	Low risk
Negligible likelihood	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Negligible risk	Very low risk
	Negligible impact	*Very low*	*Low*	*Moderate*	*High*	*Extreme impact*

Consequences of entry, establishment or spread

The band of cells in Table 1 marked 'very low risk' represents Australia's ALOP, or tolerance of loss.

[2] The terms "likelihood" and "probability" are synonymous. "Probability" is used in the *Quarantine Act 1908* while "likelihood" is used in the WTO SPS Agreement. These terms are used interchangeably in this IRA report.

1.4.1 Risk management and SPS measures

Australia's plant and animal health status is maintained through the implementation of measures to facilitate the importation of products while protecting the health of people, animals and plants.

Australia bases its national measures on international standards where they exist and where they deliver the appropriate level of protection from pests and diseases. However, where such standards do not achieve Australia's level of biosecurity protection, or relevant standards do not exist, Australia exercises its right under the SPS Agreement to take appropriate measures, justified on scientific grounds and supported by risk analysis.

Australia's approach to addressing requests for imports of animals, plants and their products where there are biosecurity risks is, where appropriate, to draw on existing sanitary and phytosanitary measures for similar products with comparable risks. However, where measures for comparable biosecurity risks have not previously been established, further action would be required to assess the risks to Australia and determine the sanitary and phytosanitary measures needed to achieve Australia's ALOP.

1.5 Import Risk Analysis

1.5.1 Description

In animal and plant biosecurity, an import risk analysis identifies the pests and diseases relevant to an import proposal, assesses the risks posed by them and, if those risks are unacceptable, specifies the measures that could be taken to reduce those risks to an acceptable level. These analyses are conducted via an administrative process (described in the *IRA Handbook*) that involves, among other things, notification to the WTO, consultation and appeal.

1.5.2 Undertaking IRAs

Biosecurity Australia may undertake an IRA if:

- there is no relevant existing biosecurity measure for the good and pest/disease combination; or
- a variation in established policy is desirable because pests or diseases, or the likelihood and/or consequences of entry, establishment or spread of the pests or diseases could differ significantly from those previously assessed.

1.5.3 Environmental and human health

When undertaking an import risk analysis, Biosecurity Australia takes into account harm to the environment as part of its assessment of biosecurity risks associated with the potential import.

Under the *Environment Protection and Biodiversity Conservation Act 1999*, Environment Australia may assess proposals for the importation of live specimens and their reproductive material. Such an assessment may be used, or referred to, by Biosecurity Australia in its analyses.

Biosecurity Australia also consults with other Commonwealth agencies where they have responsibilities relevant to the subject matter of the IRA, e.g. Food Standards Australia New Zealand (FSANZ) and the Department of Health and Ageing.

1.5.4 The IRA process in summary

The process consists of the following major steps:

Initiation**:** This is the stage where the identified need for an IRA originates.

Scheduling and Scoping**:** At this stage, Biosecurity Australia considers all the factors that affect scheduling. Consultation with States, Territories and other Commonwealth agencies is involved. There is opportunity for appeal by stakeholders at this stage.

Risk Assessment and Risk Management**:** Here, the major scientific and technical work relating to risk assessment is performed. There is detailed consultation with stakeholders.

Reporting**:** Here, the results of the IRA are communicated formally. There is consultation with States and Territories. The Chief Executive of Biosecurity Australia then delivers the biosecurity policy recommendation arising from the IRA to the Director of Animal and Plant Quarantine. There is opportunity for appeal by stakeholders at this stage.

1.6 Policy Determination

The Director of Animal and Plant Quarantine makes the policy determination, which is notified publicly.

2 METHOD FOR PEST RISK ANALYSIS

The technical component of an IRA for plants or plant products is termed a 'pest risk analysis' or PRA. Biosecurity Australia conducts PRA in accordance with the International Standards for Phytosanitary Measures Publication Number 11 *Pest Risk Analysis for Quarantine Pests including Analysis of Environmental Risks and Living Modified Organisms* (ISPM 11). A summary of the requirements of ISPM 11 is given in this section plus descriptions of the methodology used to meet these requirements in this IRA. This summary is given to provide a description of the methodology used for this IRA and to provide a context for the technical information that is provided later in this document.

A PRA comprises three discrete stages:

- Stage 1: initiation of the PRA.
- Stage 2: pest risk assessment.
- Stage 3: pest risk management.

The *initiation* of a risk analysis involves the identification of the pest(s) and pathway(s) of concern that should be considered for analysis. *Risk assessment* comprises pest categorisation, assessment of the probability of introduction and spread, and assessment of the potential economic consequences (including environmental impacts). *Risk management* describes the evaluation and selection of options to reduce the risk of introduction and spread of a pest.

2.1 Stage 1: initiation of the PRA

This PRA was initiated in November 1998 by the market access request from the Chilean Servicio Agricola y Ganadero (SAG) in 1995 to export commercially produced table grapes from Chile into Australia for human consumption.

A list of pests likely to be associated with table grapes from Chile (i.e. the biosecurity risk pathway) was generated from information supplied by SAG, literature searches and database searches. This list was used in this PRA.

The aim of the initiation stage is to identify the pest(s) and pathways (e.g. commodity imports) which are of quarantine concern and should be considered for risk analysis in relation to the identified PRA area.

The "PRA area" is defined in this PRA as Australia or, in the case of regional quarantine pests, the "PRA area" is defined as the area of Australia that has regional freedom from the pest. The "endangered area" is defined as any area within Australia, where susceptible hosts are present, and in which ecological factors favour the establishment of a pest that might be introduced in association with table grapes from Chile.

2.2 Stage 2: pest risk assessment

Risk assessment describes the process of identifying pests of biosecurity concern, and estimating the risk (the probability of entry, establishment or spread, and the magnitude of the potential consequences) associated with each.

This pest risk assessment was carried out in accordance with IPPC standards and reported in the following steps:

- pest categorisation;
- assessment of probability of entry, establishment or spread; and
- assessment of potential consequences (including environmental impacts).

Pest risk assessment needs to be only as complex as is technically justified by the circumstances. ISPM 11 allows a specific PRA to be judged against the principles of necessity, minimal impact, transparency, equivalence, risk analysis, managed risk and non-discrimination.

2.2.1 Pest categorisation

Pest categorisation is a process to examine, for each pest, whether the criteria for a quarantine pest are satisfied. That is, whether the pests identified in Stage 1 (Initiation of the PRA) are 'quarantine pests' or not.

As stated in ISPM 11, a 'quarantine pest' is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled. An 'endangered area' is an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss. Under IPPC and FAO terminology, 'official control' means 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 the management of regulated non-quarantine pests.

On the basis of these definitions, the process of pest categorisation is summarised by the IPPC in the five elements outlined below:

- *Identity of the pest.* The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible.

  The taxonomic unit for the pest is generally species. The use of a higher or lower taxonomic level should be supported by scientifically sound rationale. For levels below the species, this should include evidence demonstrating that factors such as differences in virulence, host range or vector relationships are significant enough to affect phytosanitary status.

  Where a vector is involved, the vector may also be considered a pest to the extent that it is associated with the causal organism and is required for transmission of the pest.
- *Presence or absence in the endangered area.* The pest should be absent from all or part of the endangered area.
- *Regulatory status.* If the pest is present but not widely distributed in the PRA area, it should be under official control or be expected to be under official control in the near future.
- *Potential for establishment and spread in the PRA area.* Evidence should be available to support the conclusion that the pest could become established or spread in the PRA

area. The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area.

- *Potential for economic consequences in the endangered area.* There should be clear indication that the pest is likely to have an unacceptable economic impact (including environmental impact) in the PRA area.

Pest categorisation was conducted in two stages for this IRA.

- The Technical Issues Paper for this IRA was released in September 2002 with a list of pests of table grapes categorised according to the presence or absence of each pest in Australia, and the association of each pest with table grape clusters.
- The second stage of pest categorisation was documented in the draft IRA report, released in June 2003 and the revised draft IRA report, released in February 2005. This stage was based on the categorisation of each pest absent from Australia or clearly defined regions within Australia and associated with table grape clusters according to (a) its potential to become established or spread in Australia, and, (b) the potential for economic consequences. Categorisation of establishment or spread potential and potential for economic consequences was dichotomous, and expressed using the terms 'feasible' / 'not feasible', and 'significant' / 'not significant', respectively.

This final IRA report presents the results of the risk assessment and risk management measures for those pests determined to be above Australia's ALOP.

2.2.2 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. A synopsis of these details is given below, followed by a description of the qualitative methodology used in this IRA.

2.2.2.1 Probability of entry

The 'probability of entry' describes the probability that a quarantine pest will enter Australia as a result of trade in a given commodity, be distributed in a viable state to an endangered area and subsequently be transferred to a suitable host.

Steps identified in ISPM 11 relevant to PRA initiated by a pathway are:

- *Probability of the pest being associated with the pathway at origin* – e.g. prevalence in the source area, occurrence of life stages that would be associated with the commodity, volume and frequency of movement along the pathway, seasonal timing, pest management, cultural and commercial procedures applied at the place of origin;
- *Probability of survival during transport or storage* – e.g. speed and conditions of transport and duration of the lifecycle, vulnerability of the life-stages during transport or storage, prevalence of the pest, effects of commercial procedures applied;
- *Probability of pest surviving existing pest management procedures*; and
- *Probability of transfer to a suitable host* – e.g. dispersal mechanisms, whether the imported commodity is sent to few or many destination points in the PRA area, time of

year at which import takes place, intended use of the commodity, risks from by-products and waste.

The probability of entry may be divided for administrative purposes into the following components:

- **The probability of importation**: the probability that a pest will arrive in Australia when a given commodity is imported; and
- **The probability of distribution**: the probability that the pest will be distributed (as a result of the processing, sale or disposal of the commodity) to the endangered area, and subsequently be transferred to a suitable site on a susceptible host.

In breaking down the probability of entry into these two components, Biosecurity Australia has not altered the original meaning. The two components have been identified and separated to enable onshore and offshore pathways to be described individually.

The probability of importation and the probability of distribution are obtained from pathway scenarios depicting necessary steps in: the sourcing of the commodity for export; its processing, transport and storage; its utilisation in Australia; and the generation and disposal of waste.

2.2.2.2 Probability of establishment

In order to estimate the probability of establishment of a pest, reliable biological information (life cycle, host range, epidemiology, survival, etc.) should be obtained from the areas where the pest currently occurs. The situation in the PRA area can then be compared with that in the areas where it currently occurs and expert judgement used to assess the probability of establishment. Examples provided in ISPM 11 of factors to consider are:

- Availability, quantity and distribution of hosts in the PRA area;
- Environmental suitability in the PRA area;
- Potential for adaptation of the pest;
- Reproductive strategy of the pest;
- Method of pest survival; and
- Cultural practices and control measures.

2.2.2.3 Probability of spread after establishment

In order to estimate the probability of spread of the pest, reliable biological information should be obtained from areas where the pest currently occurs. The situation in the PRA area can then be carefully compared with that in the areas where the pest currently occurs and expert judgement used to assess the probability of spread. Examples provided in ISPM 11 of factors to consider are:

- Suitability of the natural and/or managed environment for natural spread of the pest;
- Presence of natural barriers;
- The potential for movement with commodities or conveyances;
- Intended use of the commodity;
- Potential vectors of the pest in the PRA area; and
- Potential natural enemies of the pest in the PRA area.

2.2.3 Method for evaluating the probability of entry, establishment or spread

Evaluation and reporting of likelihoods can be done qualitatively, semi-quantitatively or quantitatively. For qualitative evaluation, likelihoods assigned to steps in the scenarios are categorised according to a descriptive scale – e.g. 'low', 'moderate', 'high', etc. – where no attempt has been made to equate descriptors with numeric values or scores. For semi-quantitative evaluation, likelihoods are given numeric 'scores' (e.g. 1, 2, 3), or probabilities and/or probability intervals (e.g. 0–0.0001, 0.0001–0.001, 0.001-0.01, 0.01-1). For quantitative evaluation, likelihoods are described in purely numeric terms.

Each of these three approaches to likelihood evaluation has its advantages and constraints and the choice of approach depends on both technical and practical considerations. For this IRA, likelihood was evaluated and reported qualitatively using the terms described in Table 2.

Table 2: Nomenclature for qualitative likelihoods

Likelihood	Descriptive definition
High	The event would be very likely to occur
Moderate	The event would occur with an even probability
Low	The event would be unlikely to occur
Very low	The event would be very unlikely to occur
Extremely low	The event would be extremely unlikely to occur
Negligible	The event would almost certainly not occur

Qualitative likelihoods can be assigned to individual steps or to the probability that all the steps will occur. If the likelihoods have been assigned to individual steps then some form of 'combination rule' is needed for calculating the probability that all steps will occur. For this IRA the likelihoods were combined using a tabular matrix, as shown in Table 3.

Table 3: Matrix of rules for combining descriptive likelihoods

	High	Moderate	Low	V. Low	E. Low	Negligible
High	High	Moderate	Low	V. Low	E. Low	Negligible
Moderate		Low	Low	V. Low	E. Low	Negligible
Low			V. Low	V. Low	E. Low	Negligible
Very low				E. Low	E. Low	Negligible
E. low					Negligible	Negligible
Negligible						Negligible

In this IRA, qualitative likelihoods were assigned to the probability of entry (comprising an importation step and a distribution step), the probability of establishment and the probability of spread. In other IRAs, it may be considered relevant to assign qualitative likelihoods to additional steps. This would depend on the complexity of the issue and the information that was available. For example, within the importation step, separate qualitative likelihoods could be assigned to the probabilities that source fruit is infested, that the pest survives packinghouse procedures and that it survives storage and transport.

The procedure for combining likelihoods is illustrated in Table 4. The example assigns hypothetical values to the probability of importation (low) and the probability of distribution (moderate), which are then combined to give the probability of entry (low). The likelihoods are combined using the 'rules' provided in Table 3. The probability of entry is then combined with hypothetical likelihoods assigned to the probability of establishment (high) and probability of spread (very low) to give the overall probability of entry, establishment or spread (very low).

Table 4: Qualitative evaluation of the imported fruit scenario

Step	Qualitative descriptor	Product of likelihoods
Probability of importation	Low	
Probability of distribution	Moderate	
➔ Probability of entry	➔	Low
Probability of establishment	High ➔	Low
Probability of spread	Very low	
➔ Probability of entry, establishment and spread	➔	Very low

2.2.4 Assessment of consequences

The basic requirements for the assessment of consequences are described in the SPS Agreement, with Article 5.3 stating that:

"Members shall take into account as relevant economic factors: the potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease; the costs of control or eradication in the territory of the importing Member; and the relative cost-effectiveness of alternative approaches to limiting risks"

Assessment of consequences is also referred to in Annex A of the SPS Agreement in the definition of risk assessment:

"The evaluation of the likelihood of entry, establishment or spread of a pest or disease within the Territory of an importing Member according to the sanitary or phytosanitary measures which might be applied, and of the associated potential biological and economic consequences"

Further detail on assessing these "relevant economic factors" or "associated potential biological and economic consequences" for plant-based analysis is given under the "potential economic consequences" section in ISPM 11. This ISPM separates the consequences into "direct" and "indirect" and provides examples of factors to consider within each. These examples are listed below under the headings where they may be considered in an IRA. This is followed by a description of the methodology used in this IRA.

In this IRA, 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.

2.2.4.1 Direct pest effects

Plant life or health

- ISPM 11 provides the following examples that could be considered for the direct consequences on plant life or health:
- Known or potential host plants;
- Types, amount and frequency of damage;
- Crop losses, in yield and quality;
- Biotic factors (e.g. adaptability and virulence of the pest) affecting damage and losses;
- Abiotic factors (e.g. climate) affecting damage and losses;
- Rate of spread;
- Rate of reproduction;
- Control measures (including existing measures), their efficacy and cost;
- Effect of existing production practices; and
- Environmental effects.

Any other aspects of the environment

ISPM 11 provides the following examples that could be considered for the direct consequences on any other aspects of the environment:

- Environmental effects (listed as a general example in ISPM 11);
- Reduction of keystone plant species;
- Reduction of plant species that are major components of ecosystems (in terms of abundance or size), and endangered native plant species (including effects below species level where there is evidence of such effects being significant); and
- Significant reduction, displacement or elimination of other plant species.

2.2.4.2 Indirect pest effects

Eradication, control, etc.

ISPM 11 provides the following examples that could be considered for the indirect consequences on eradication, control, etc.:

- Changes to producer costs or input demands, including control costs;
- Feasibility and cost of eradication or containment;
- Capacity to act as a vector for other pests; and
- Resources needed for additional research and advice.

Domestic trade and International trade

ISPM 11 provides the following examples that could be considered for the indirect consequences on domestic and international trade (the two are considered separately):

- Effects on domestic and export markets, including particular effects on export market access; and
- Changes to domestic or foreign consumer demand for a product resulting from quality changes.

Environment

ISPM 11 provides the following examples that could be considered for the indirect consequences on the environment:

- Environmental and other undesired effects of control measures;
- Social and other effects (e.g. tourism);
- Significant effects on plant communities;
- Significant effects on designated environmentally sensitive or protected areas;
- Significant change in ecological processes and the structure, stability or processes of an ecosystem (including further effects on plant species, erosion, water table changes, increased fire hazard, nutrient cycling, etc.);
- Effects on human use (e.g. water quality, recreational uses, tourism, animal grazing, hunting, fishing); and
- Costs of environmental restoration.

2.2.5 Method for assessing consequences in this IRA

The relevant examples of direct and indirect consequences from ISPM 11 are considered for each of the broad groups (as listed above) and estimates of the consequences are assigned. The broad groups are shown in table form in the 'Risk Assessments for Quarantine Pests' section of this document.

The direct and indirect consequences were estimated based on four geographic levels. The terms 'local', 'district', 'regional' and 'national' are defined as:

Local: an aggregate of households or enterprises — e.g. a rural community, a town or a local government area.

District: a geographically or geopolitically associated collection of aggregates — generally a recognised section of a state, such as the 'North West Slopes and Plains' or 'Far North Queensland'.

Region: a geographically or geopolitically associated collection of districts — generally a state, although there may be exceptions with larger States such as Western Australia.

National: Australia-wide.

The consequence was described as 'unlikely to be discernible', of 'minor significance', significant' or 'highly significant':

- an '*unlikely to be discernible'* consequence is not usually distinguishable from normal day-to-day variation in the criterion.
- a consequence of '*minor significance*' is not expected to threaten economic viability, but would lead to a minor increase in mortality/morbidity or a minor decrease in production. For non-commercial factors, the consequence is not expected to threaten the intrinsic 'value' of the criterion — though the value of the criterion would be considered as 'disturbed'. Effects would generally be reversible.
- a '*significant'* consequence would threaten economic viability through a moderate increase in mortality/morbidity, or a moderate decrease in production. For non-commercial factors, the intrinsic 'value' of the criterion would be considered as significantly diminished or threatened. Effects may not be reversible.

- a '*highly significant*' consequence would threaten economic viability through a large increase in mortality/morbidity, or a large decrease in production. For non-commercial factors, the intrinsic 'value' of the criterion would be considered as severely or irreversibly damaged.

The values were translated into a qualitative impact score (A–F) using the schema outlined in Table 5.

Table 5: The assessment of local, district, regional and national consequences

Impact score					
	F	-	-	-	Highly significant
	E	-	-	Highly significant	Significant
	D	-	Highly significant	Significant	Minor
	C	Highly significant	Significant	Minor	Unlikely to be discernible
	B	Significant	Minor	Unlikely to be discernible	Unlikely to be discernible
	A	Minor	Unlikely to be discernible	Unlikely to be discernible	Unlikely to be discernible
		Local	*District*	*Regional*	*National*
			Level		

The overall consequence for each pest was achieved by combining the impact scores (A–F) for each direct and indirect consequence using a series of decision rules. These rules are mutually exclusive, and are addressed in the order that they appear in the list — for example, if the first rule does not apply, the second rule is considered. If the second rule does not apply, the third rule is considered and so on until one of the rules applies:

- Where the impact score of a pest with respect to any direct or indirect criterion is 'F', the overall consequences are considered to be 'extreme'.
- Where the impact scores of a pest with respect to more than one criterion are 'E', the overall consequences are considered to be 'extreme'.
- Where the impact score of a pest with respect to a single criterion is 'E' and the impact scores of a pest with respect to each remaining criterion are 'D', the overall consequences are considered to be 'extreme'.
- Where the impact score of a pest with respect to a single criterion is 'E' and the impact scores of a pest with respect to remaining criteria are not unanimously 'D', the overall consequences are considered to be 'high'.
- Where the impact scores of a pest with respect to all criteria are 'D', the overall consequences are considered to be 'high'.
- Where the impact score of a pest with respect to one or more criteria is 'D', the overall consequences are considered to be 'moderate'.
- Where the impact scores of a pest with respect to all criteria are 'C', the overall consequences are considered to be 'moderate'.
- Where the impact score of a pest with respect to one or more criteria is considered 'C', the overall consequences are considered to be 'low'.

- Where the impact scores of a pest with respect to all criteria are ‘B’, the overall consequences are considered to be ‘low’.
- Where the impact score of a pest with respect to one or more criteria is considered ‘B’, the overall consequences are considered to be ‘very low’.
- Where the impact scores of a pest with respect to all criteria are ‘A’, the overall consequences are considered to be ‘negligible’.

2.2.6 Method for risk assessment for pest plants in this IRA

The methodology used in this IRA for the risk assessment of pest plants is different from the methodology described above for other pests (i.e. arthropods, fungi, bacteria). Specific consideration of pest plants within IRAs is required only for certain commodities where it is considered feasible that pest plants would commonly be associated with the pathway. A description of the methodology, which meets the requirements of the ISPM 11, for pest plants is presented below.

Consideration of the distribution and status in Australia of each plant species in this IRA was based on established policy and any existing requirements for the importation of each plant species. The risk assessment took into account for each plant species its status as a pest plant and whether it has been considered before. The methodology also considers State and Territory legislation. Plant species that are under official control in an Australian State or Territory are recognised by the Commonwealth.

Consideration of the pathway association of the pest plants was based on the technical factors listed below. This assessment focussed on the dispersal mechanisms of the seeds and the likelihood of seed physically attaching to a grape cluster.

i) The preferred/likely habitat of each species and whether that corresponds with the likely habitat of Chilean vineyards;

ii) The time of year when seeds are produced, the length of time that seeds remain in the area of production and whether seeds will be present during the Chilean grape production period;

iii) The morphology of seed (i.e. do they possess an awn, bristled fruit, etc.) and whether seeds are likely to physically attach to grape bunches;

iv) The dispersal mechanisms of each species; and

v) The crops/areas that the species is reportedly associated with throughout the world, and whether this species is known to be associated with vineyards.

Where available, information on these technical factors was collated for each species. Specific information on the occurrence and phenology of the species in Chile was not always available so approximations were made from the available information. The assessment of the potential for each species to establish or spread was based on the following technical questions:

1) Is the pest plant likely to enter Australia via a Chilean grape bunch?

2) Once the pest plant has entered Australia, is it likely to establish?

3) Once the pest plant has established in Australia, is it likely to spread to other areas?

Each question must be assessed as a "yes" for the assessment to proceed to the next question and all three questions must be assessed as a "yes" for a pest plant to be considered as of potential quarantine concern.

Biosecurity Australia views the potential economic consequence for all pest plants as significant (as opposed to non-significant). Pest plants are recorded to cause economic losses in agricultural systems, especially when diseases or herbicide resistant strains of the pest plants are introduced. For example, pest plants in crops and pastures are estimated to cost the Australian industry $4 billion annually (Hussey *et al.*, 1997). Furthermore, pest plants are known to reduce the health of Australia's natural ecosystems, which not only has implications for the natural diversity of fauna and flora, but may also have indirect consequences such as reducing the economic value of tourism in the area where the pest plant infestations occur. Comprehensive discussion on the impact of pest plants on agriculture and the environment in general is provided in Holm *et al.* (1996).

Hence, when combined with 'significant' potential economic consequences, species that progressed through the assessment of establishment or spread are the quarantine pest plants for this IRA.

2.2.7 Method for determining the unrestricted risk estimate

The unrestricted risk estimate for each pest is determined by combining the likelihood estimates of entry, of establishment and of spread with the overall expected consequences, using a risk estimation matrix (Table 1). The unrestricted risk is then compared with Australia's ALOP to determine the need for appropriate risk management measures. Australia's ALOP is represented in this matrix by the row of cells marked 'very low risk'.

2.3 Stage 3: pest risk management

Risk management describes the process of identifying and implementing measures to manage risks so as to achieve Australia's appropriate level of protection, or tolerance for loss, while ensuring that any negative effects on trade are minimised.

To implement risk management appropriately, it is necessary to formalise the difference between 'unrestricted' and 'restricted' risk estimates. Unrestricted risk estimates are those derived in the absence of specific risk management measures, or following only internationally accepted baseline risk management procedures. By contrast, restricted or mitigated risk estimates are those derived when 'risk management' is applied. In the case of this IRA report, unrestricted risk is the risk associated with fruit produced to the standard achieved through normal practices of production, quality control, packing, transport and shipment from the specified areas, as described in documentation provided by SAG-Chile.

The conclusions from pest risk assessment are used to decide whether risk management is required and if so, the strength of measures to be used. Since zero-risk is not a reasonable option, the guiding principle for risk management is to manage risk to achieve the required degree of safety that can be justified and is feasible within the limits of available options and resources.

The unrestricted risk estimate is determined by the examination of the outputs of the assessments of the probability of entry, establishment or spread and the consequence. If the risk is found to be unacceptable, then the first step in risk management is to identify possible phytosanitary measures that will reduce the risk to, or below, an acceptable level.

ISPM 11 provides details on the identification and selection of appropriate risk management options and notes that the choice of measures should be based on their effectiveness in reducing the probability of introduction of the pest.

Examples given of measures commonly applied to traded commodities include:

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

The result of the pest risk management procedure will be either that no measures are identified which are considered appropriate or the selection of one or more management options that have been found to lower the risk associated with the pest(s) to an acceptable level. These management options form the basis of phytosanitary regulations or requirements.

2.3.1 Method for pest risk management in this IRA

The requirement for risk management is determined by comparing the unrestricted risk estimate for each pest with Australia's ALOP. Where the estimate of unrestricted risk does not exceed Australia's ALOP, risk management is not required. Where the unrestricted risk estimate exceeds Australia's ALOP, risk management measures are required to reduce the risk to an acceptable level.

Using the risk estimation matrix, risk management measures are required when the unrestricted risk estimate is low, moderate, high or extreme. Risk management measures are not required when the unrestricted risk estimate is very low or negligible.

Risk management measures were identified for each 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 Import Conditions section of this document.

3 PROPOSAL TO IMPORT TABLE GRAPES FROM CHILE

3.1 Background

Australia initiated an import risk analysis (IRA) for the importation of table grapes from Chile in December 1998, following a request from the Chilean Servicio Agricola y Ganadero (SAG) for market access in 1995.

The technical issues paper (TIP) for this IRA, notified in Plant Biosecurity Policy Memorandum (PBPM) 2002/40, was released for stakeholder comment on 6 September 2002. The TIP included background to the IRA and preliminary results of pest categorisation. Biosecurity Australia received comments from eight stakeholders on the TIP, which were considered and material matters raised were incorporated into, or addressed in, the draft IRA report.

The draft IRA report, notified in PBPM 2003/15, was released for stakeholder comment on 13 June 2003. The draft IRA report included the pest categorisation, the pest risk analysis for quarantine pests, the proposed risk management measures and the draft import conditions for this IRA. Biosecurity Australia received comments from seven stakeholders on the draft IRA report.

A revised draft IRA report, notified in PBPM 2005/04, was released for stakeholder comment on 24 February 2005. This met the Australian Government’s 2004 election commitment that all IRAs currently in progress would be reviewed and reissued for stakeholder consultation and comment, to further emphasise the rigour and transparency of Australia’s science based quarantine policy. Stakeholder comments on the draft IRA report were considered and material matters raised were incorporated into, or addressed in, the revised draft IRA report.

Biosecurity Australia received comments from ten stakeholders on the revised draft IRA report. These comments were considered and material matters raised have been incorporated into, or addressed in, this final IRA report. The Eminent Scientist’s Group (ESG) has considered Biosecurity Australia’s responses to stakeholders’ comments and provided a copy of their report to Biosecurity Australia’s Principal Scientist. Recommendations of the ESG and Principal Scientist have been incorporated into the final IRA report where appropriate. The final IRA report, ESG report and Principal Scientist report have been considered by the Director of Animal and Plant Quarantine.

3.2 Administration

3.2.1 Timetable

The section “Further steps in the Import Risk Analysis process” presented later in this report lists the steps required for the completion of this IRA.

3.2.2 Scope

This IRA considers the quarantine risks that may be associated with the importation of bunches of table grapes (*Vitis vinifera* L.) into Australia from Chile for human consumption. In this IRA, table grapes are defined as ‘table grape bunches’, which include peduncles, rachises, laterals, pedicels and berries but no other plant parts (Pratt, 1988). The produce will have been cultivated, harvested, packed and transported to Australia under standard commercial conditions.

3.3 Australia's Current Quarantine Policy for Importation of Table Grapes

3.3.1 International policy

Fresh table grapes may be imported into Australia (except for Western Australia[3]) from New Zealand and the USA (California) for human consumption subject to specific import conditions. Further details of the import requirements for table grapes are available at the ICON website http://www.aqis.gov.au/icon.

3.3.2 Domestic arrangements

The Commonwealth Government is responsible for regulating the movement of plants and plant products into and out of Australia. However, the State and Territory governments are primarily responsible for plant health controls within Australia. Legislation relating to resource management or plant health may be used by State and Territory government agencies to control interstate movement of plants and their products.

3.3.2.1 New South Wales

Under the *Plant Diseases Act 1924* (P28, Gazette No. 154, 18 November 1994), NSW Agriculture prohibits the introduction into NSW (and specified portions) of any part of the plant genus *Vitis*, including its fruit, and any used vineyard-related machinery on account of phylloxera (*Daktulospharia vitifolii*) unless written consent is given by an authorised person, it is accompanied by a plant health certificate, is appropriately inspected and transported as directed.

The movement of any part of the plant genus *Vitis*, or anything likely to spread phylloxera, from phylloxera-infected areas of NSW is also prohibited. These requirements do not prohibit the introduction or movement of packaged fresh fruit, packaged dried fruit, or fruit processed into juice or wine being free from all shoots, leaves, canes or other plant residue or soil. NSW consequently has no specific restrictions on the movement of packaged fresh table grapes from within NSW or interstate.

3.3.2.2 Northern Territory

Table grapes are permitted entry into the Northern Territory subject to appropriate measures for fruit flies (*Bactrocera musae* [banana fruit fly], *Bactrocera cucumis* [cucumber fruit fly] and *Ceratitis capitata* [Mediterranean fruit fly]). Unless a fruit fly outbreak involving production areas is current in the relevant State, commercial consignments with packaging identifying them as grown in Victoria, South Australia or Tasmania are exempt from certification requirements. NSW is also exempt except for cucumber fruit fly certification. Certification for the relevant measure is required (area freedom, cold storage, post harvest insecticide treatment or methyl bromide fumigation).

[3] The importation of table grapes, seed, plants and used machinery into Western Australia from any source is prohibited under the *Plant Diseases Act 1914*.

3.3.2.3 Queensland

Part 8 of the *Plant Protection Regulation 2002* details Queensland's restrictions in relation to grape phylloxera. The whole of the State of Queensland is declared to be a pest quarantine area for grape phylloxera and restrictions apply on the introduction of this pest, grape plants and plant products, and appliances or other items that have been in contact with the plant or soil on which the plant has been growing. These restrictions do not apply to fruit that is packed in a fresh state for human consumption (i.e. table grapes).

3.3.2.4 South Australia

For table grapes to enter South Australia, the Plant Quarantine Standard of South Australia requires freedom from phylloxera, and either area freedom from fruit flies or disinfestation by cold storage. Citrus red mite (*Panonychus citri*), European red mite (*Panonychus ulmi*), phylloxera and western flower thrips (*Frankliniella occidentalis*) are all declared pests under the *Fruit and Plant Protection Act 1992.*

3.3.2.5 Tasmania

Table grapes are permitted entry into Tasmania subject to appropriate measures for fruit flies (area freedom, fumigation or cold disinfestation) and certification that they were sourced from outside a 40 km radius of any land on which grape phylloxera is known to occur.

3.3.2.6 Victoria

Under the *Plant Health and Plant Products Regulations 1996*, grapes for table use (i.e. table grapes) are permitted entry into Victoria provided they are packed for sale as table grapes in accordance with these Regulations.

3.3.2.7 Western Australia

The importation of table grapes, seed, plants and used machinery into Western Australia from any source is prohibited under the *Plant Disease Act 1914*, due to the historical absence of downy mildew (*Plasmopara viticola*) and the absence of grape phylloxera (*Daktulosphaira vitifolii*). Western Australia's previous freedom from downy mildew had led to the prohibition into the State, as there was no effective disinfection treatment or other phytosanitary measure for this disease. Downy mildew was recorded in Western Australia in 1997 (APPD, 2005) but the *Plant Diseases Regulations 1989* have not been amended to reflect this change in phytosanitary status as there has been no formal assessment of other exotic pests or diseases that could be introduced into Western Australia with imported table grapes. The Department of Agriculture Western Australia has advised that this legislation is being reviewed.

3.4 The Table Grape Industry in Australia

Approximately 80% of Australia's table grape production occurs in Victoria (60%) and New South Wales (20%). Table grape production was approximately 86,500 tonnes in 2002/03 with a total value of $171.7 million for 2001/02. [Source: Australian Table Grapes Association – Table Grape Annual Industry Report 2003]

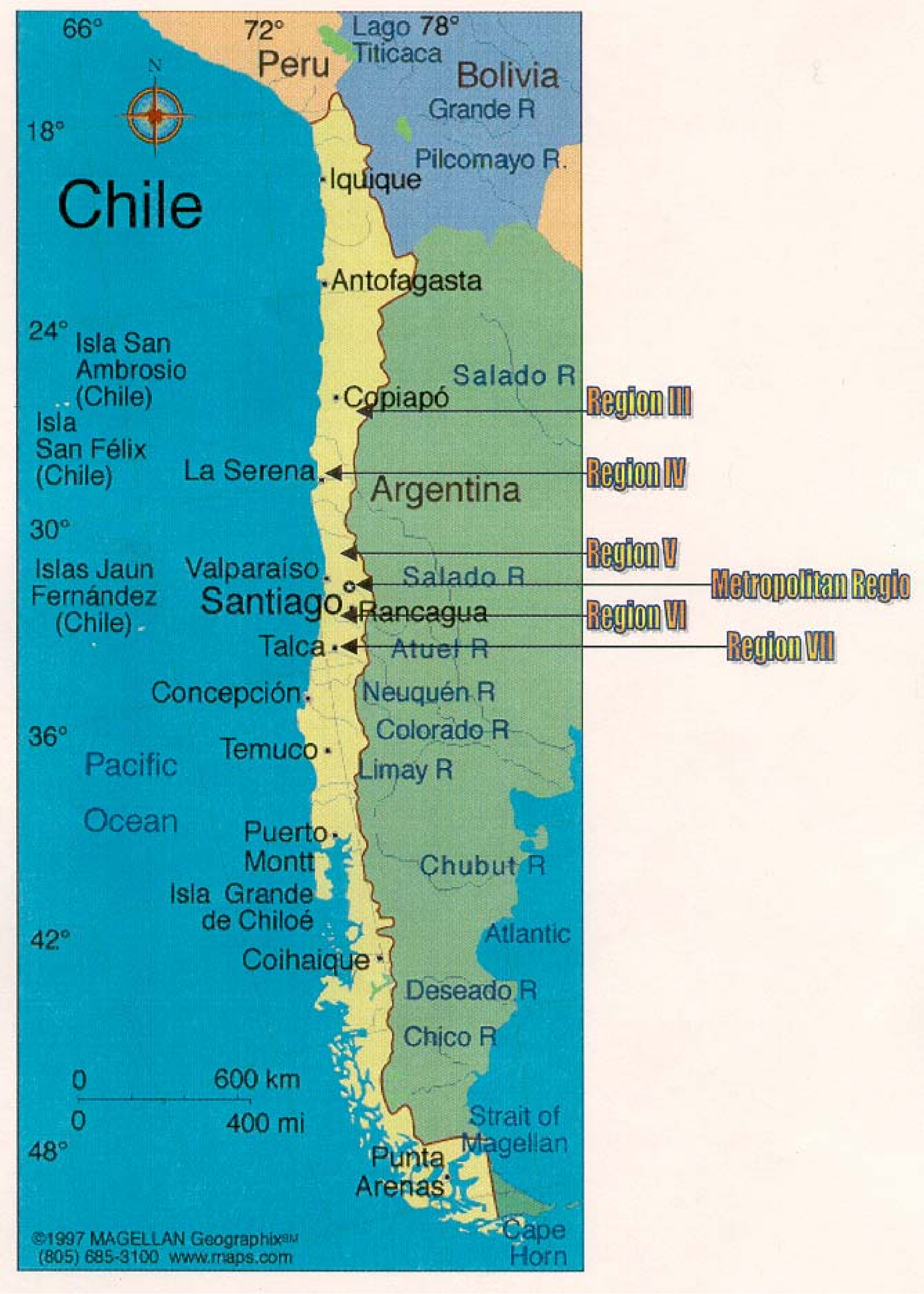
The production season is from October-March with the heaviest production in January-March. Common varieties are Thompson Seedless (mid to late January-mid March), Flame Seedless (January), Menindee Seedless and Red Globe.

[Source http://www.dpi.qld.gov.au/hortport/2788.html]

3.5 The Table Grape Industry in Chile

Chile is the largest producer and exporter of table grapes in the southern hemisphere, and in second largest in the world after Italy. Grape production in Chile stretches from Region III to Region VII (Figure 1), with table grape growing principally concentrated in Region V, Region VI and the Metropolitan Region. These three regions cover about 28,845 hectares, 65% of the total table grape production area.

Figure 1. Chilean table grape growing regions



Approximately 50% of production is consumed domestically and 50% exported. During the 2000/01 season 557,570 tonnes of table grapes were exported from Chile with 59% to the USA and Canada, 16% to Europe, 15% to the Middle East, 9% to Latin America and 1% to the Far East.

Chile produces more than 35 varieties of table grapes for export. Most are seedless varieties such as Thompson Seedless and Flame Seedless, with exports of these two varieties and Ribier accounting for 90% of total table grape exports from Chile.

Chilean table grapes are generally available from the third week of November to the last week of April. Production starts in November with early season varieties such as Perlette, Sugarone and Flame Seedless in the centre-north valleys of Copiapo (Region III) and ends in April in the centre-south valleys of Curico and Talca (Region VII), with varieties such as Red Globe, Ribier, Crimson Seedless, Red Seedless, and Emperor [Source: Chilean Fresh Fruit Association, www.cffa.org].

The grape producing regions in Chile all have winter rainfall but varying climates ranging from a desert climate in Region III (1-100 mm average rainfall per year) to a warm humid temperate climate in Region VII (1000-1100 mm average rainfall per year). Average monthly rainfall for Region III, Region IV, Region V, Region Metropolitana and Region VII is given in Table 6. Rainfall during the harvest period is low in all these regions.

Table 6: Average monthly rainfall for the grape growing regions of Chile from 1961 to 1990

Weather Station and Region	Month (rainfall in mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Copiapo Region III	0.0	0.0	1.1	0.2	0.4	1.1	6.5	2.0	0.2	0.5	0.0	0.0
La Serena Region IV	Trace	0.0	0.2	1.1	6.1	14.9	30.7	16.8	5.8	2.7	0.2	0.0
Quintero Region V	0.2	0.1	2.3	11.4	48.1	78.7	106.4	53.5	21.8	9.7	7.4	1.4
Santiago Metropolitana	0.4	0.8	3.2	10.4	42.2	70.4	86.6	51.8	22.0	13.4	9.2	2.1
Curico Region VII	3.8	0.7	15.0	32.2	109.8	148.6	166.1	98.3	56.6	35.7	23.3	11.8

Source: Hong Kong Observatory http://www.hko.gov.hk/wxinfo/climat/world/eng/s_america/ar_ch/ar_ch_n_e.htm

A general description of the process used for the export of grapes from Chile based on information provided by SAG is given below.

The grapes are manually harvested and cleaned (e.g. removing defective berries) in the field and placed in plastic boxes. The boxes are then transferred to central packing plants where they are treated with sulphur dioxide (SO_2) to prevent post-harvest fungal diseases. The grapes are then classified according to quality and a second check for defects conducted. The packing and labelling process is then conducted according to the requirements of the export destination. All packaging is new, “sanitarily fit” and of homogenous presentation. Each package is identified by the exporter, species, variety, packing data, producer and net weight. Prior to palletising, a further quality control check is conducted to verify compliance with the quality standards of the product and the packing standards of the individual company. Each pallet has a label or tab where the number of boxes, variety and classification by size and colour are identified. Palletised fruit is then quickly cooled to 2-4ºC (depending on market requirements) then maintained at 0ºC until delivered to the port.

4 RESULTS OF PEST RISK ASSESSMENTS

4.1 Pest Categorisation

The quarantine pests for table grapes from Chile have been determined through a comparison of the pests recorded on table grapes in Chile and Australia (present or absent, or present but not widely distributed and under official control [Appendix 1A], presence on the pathway under consideration [Appendix 1B], and potential for establishment or spread and associated consequences [Appendix 1C]). A number of pests are present in Australia but absent from Western Australia (based on advice provided to Biosecurity Australia by the Department of Agriculture Western Australia) and these pests are considered further in this IRA. Pests that do not meet the definition of a quarantine pest are not considered further in the IRA. Appendix 2 contains the methodology for pest plant categorisation.

The quarantine pests for table grapes from Chile, determined through this process of pest categorisation, are listed in Table 7. These pests require detailed risk assessment since they meet the IPPC criteria for a quarantine pest, specifically:

- the pest is known to be associated with table grapes in Chile;
- the pest is absent from Australia, or has a limited distribution and is under official control;
- the pest has the potential to be on the pathway;
- the pest has the potential for establishment or spread in the PRA area; and
- the pest has the potential for consequences.

Table 7: Quarantine pests for table grapes from Chile

Pest type	Common name
ARTHROPODS	
Acari (mites)	
Brevipalpus chilensis Baker [Acari: Tenuipalpidae]	Chilean false red mite
Coleoptera (weevils)	
Geniocremnus chiliensis (Boheman) [Coleoptera: Curculionidae]	Tuberous pine weevil
Naupactus xanthographus (Germar) [Coleoptera: Curculionidae]	Fruit tree weevil
Diptera (flies)	
Ceratitis capitata (Wiedemann) [Diptera: Tephritidae]	Mediterranean fruit fly
Hemiptera (leafhoppers, mealybugs, psyllids, sharpshooters, scales)	
Icerya palmeri Riley-How [Hemiptera: Margarodidae]	Margarodes scale
Parthenolecanium corni (Bouché) [Hemiptera: Coccidae]	European fruit lecanium*
Pseudococcus calceolariae (Maskell) [Hemiptera: Pseudococcidae]	Citrophilus mealybug*
Pseudococcus maritimus (Ehrhorn) [Hemiptera: Pseudococcidae]	Grape mealybug
Lepidoptera (leafrollers, moths, butterflies)	
Accuminulia buscki Brown [Lepidoptera: Tortricidae]	Tortricid leafroller
Accuminulia longiphallus Brown [Lepidoptera: Tortricidae]	Tortricid leafroller
Chileulia stalactitis (Meyrick) [Lepidoptera: Tortricidae]	Grape berry moth

Pest type	Common name
Proeulia auraria (Clarke) [Lepidoptera: Tortricidae]	Chilean fruit tree leafroller
Proeulia chrysopteris (Butler) [Lepidoptera: Tortricidae]	Fruit leafroller
Proeulia triquetra Obraztsov [Lepidoptera: Tortricidae]	Grape leafroller
Thysanoptera (thrips)	
Drepanothrips reuteri Uzel [Thysanoptera: Thripidae]	Grape thrips
Frankliniella australis Morgan [Thysanoptera: Thripidae]	Chilean flower thrips
Frankliniella occidentalis (Pergande) [Thysanoptera: Thripidae]	Western flower thrips
CONTAMINATING PESTS	
Latrodectus mactans (Fabricius) [Araneae: Theridiidae]	Black widow spider
PATHOGENS	
Fungi	
Phomopsis viticola (Sacc.) Sacc.	Phomopsis cane and leaf blight*
PEST PLANTS	
Calandrinia compressa Schrad. ex DC. (Portulacaceae)	Parakeelya
Carduus nutans L. (Asteraceae)	Nodding thistle
Carthamus lanatus L. (Asteraceae)	Saffron thistle
Chrysanthemoides monilifera (L.) Norl. (Asteraceae)	Bitou bush
Conium maculatum L. (Apiceae)	Hemlock
Physalis pubescens L. (Solanaceae)	Downy ground cherry
Rubus ulmifolius Schott (Rosaceae)	Blackberry
Senecio spp. (Asteraceae)	Fireweeds, groundsels
Silybum marianum (L.) Gaertn.	Variegated thistle
Sorghum halepense (L.) Pers. (Poaceae)	Johnson grass
Typha spp. (Typhaceae)	Bulrushes

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

4.2 Risk Assessments for Quarantine Pests

A detailed risk assessment is presented in this PRA for each of the quarantine pests identified through the process of pest categorisation. Each risk assessment involved the "assessment of the probability of entry, establishment or spread" and "assessment of consequences" as described in Section 2 - Method for Pest Risk Analysis. The unrestricted risk posed by each quarantine pest for table grapes from Chile was estimated by combining the probabilities of entry, of establishment and of spread with the estimate of associated potential consequences. The unrestricted risk estimates were then compared with Australia's appropriate level of protection (ALOP) to determine which quarantine pests presented an unacceptable level of risk requiring consideration of risk mitigation options.

Probability estimates of entry, of establishment and of spread and estimates of associated potential consequences are supported by relevant biological information. Because of similarities in pest biology, and consequent similarities between the risk assessments for some of the pests, the descriptions below are based, where relevant, on groupings of the pests. Detailed information on the biology and economic importance of each quarantine pest or pest group is provided in the data sheets in Appendix 3 of this IRA.

The risk assessment methodology for pest plants described in Part B of this document was used to determine the requirement for risk management measures for pest plants.

The risk assessments were conducted on the basis of the use of standard cultivation, harvesting and packing activities involved in the commercial production of table grapes in Chile; for example in-field hygiene and management of pests, cleaning and hygiene during packing, and commercial quality control activities.

4.2.1 Chilean false red mite

Species of false spider mite feed on a variety of ornamental, fruit and vegetable crops. The family Tenuipalpidae is considered to be cosmopolitan. Most species are not of economic importance but all are phytophagous. A few species cause severe economic damage to agricultural crops, ornamentals and tree species (Baker, 1949; Baker & Tuttle, 1987; Ochoa & Salas, 1989; Evans *et al*., 1993). The Chilean false red mite is native to Chile, has economic impact on Chilean fruit production and is subject to permanent control measures.

The false spider mite examined in this import risk analysis is:

- *Brevipalpus chilensis* Baker [Acari: Tenuipalpidae] – Chilean false red mite.

4.2.1.1 Introduction and spread probability

Probability of importation

The likelihood that Chilean false red mite (CFRM) will arrive in Australia with the importation of table grapes from Chile: **High**.

- CFRM has been reported on table grapes in Chile (Klein Koch & Waterhouse, 2000).
- CFRM lays eggs on the shoots, on leaves or in unopened buds (Gonzalez, 1968; 1983; 1989).
- CFRM primarily feeds on the lower surface of the leaves (Jeppson *et al*., 1975; SAG/USDA, 2002). It is expected that mites will be found on stems, during their transit from leaf to leaf.
- At high levels, CFRM kills buds as a result of tissue dehydration and causes wrinkling of the grapes (Gonzalez, 1968; 1983; 1989; Jeppson *et al*., 1975).
- CFRM is known to be associated with table grapes and has been intercepted on table grapes from Chile to the USA (SAG/USDA, 2002).

Probability of distribution

The likelihood that CFRM will be distributed to the endangered area as a result of the processing, sale or disposal of table grapes from Chile: **Low**.

- Adults or immature stages may not be detected within grape bunches and may be distributed via wholesale or retail trade.
- The commodity may be distributed throughout Australia for retail sale, as the intended use of the commodity is human consumption. Waste material would be generated.
- The ability of CFRM to move from discarded fruit waste to a suitable host is limited, as false spider mites are mainly sedentary (Kane, 2004) and slow moving (Jeppson *et al*., 1975).
- The host range of CFRM is relatively small, limiting its likelihood of locating a host (CABI, 2005).

Probability of entry (importation x distribution)

The likelihood that CFRM will enter Australia as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Low**.

- The overall probability of entry is determined by combining the probabilities of importation and distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

The likelihood that CFRM 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**.

- CFRM has multiple hosts including almond, apple, citrus, cherimoya, fig, kiwifruit, persimmon, quince and table grapes (Gonzalez, 1968, 1975, 1989; Jeppson *et al*., 1975; Ripa & Rodriguez, 1999). It also attacks species of forest trees, ornamentals and annual weeds (Jeppson *et al*., 1975). Many of these hosts are widespread in Australia.
- Fertilised adult females overwinter in vines under the bark where they hide in grooves and hollows (Gonzalez, 1968, 1983, 1989).
- Females lay 130 to 140 eggs during their average 30-day lifespan. After 10 or 12 days, nymphs hatch from the eggs, go through three stages and reach adulthood in 30 to 40 days. CFRM is multivoltine, with four to five generations per year (Gonzalez, 1968).
- Tenuipalpid mites appear to be best adapted to subtropical or tropical regions (Baker & Bambara, 1997). Some species of *Brevipalpus*, namely *B. californicus*, *B. lewisi*, *B. obovatus* and *B. phoenicis*, are already established in Australia (Smith *et al*., 1997). The establishment of these species in Australia indicates that environmental conditions would be suitable for establishment of CFRM in Australia.
- Presence of abundant host plants and a warm and humid climate would favour the development of high population densities of this mite in Australia.
- Existing control programs may be effective for some hosts (e.g. broad spectrum pesticide applications) but not for all hosts. However, pesticide resistance has been noted for CFRM.

Probability of spread

The likelihood that CFRM 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**.

- Natural physical barriers may prevent CFRM spreading unaided but adults and immature forms may spread undetected via the movement of fruit or infested vegetative host material.
- False spider mites have the potential to go undetected on plants due to their minute size, flat bodies and somewhat sedentary behaviour (Kane, 2004).
- The main means of long distance dissemination of CFRM is by the movement of plants and vegetative material (Gonzalez, 1983).
- Given the polyphagous nature of the CFRM, the occurrence of other host plants between commercial vineyards in Australia would aid the spread of this mite.
- Dispersal of CFRM is primarily by plant contact and mites may also be moved by human contact with infested plants.

- The relevance of natural enemies of CFRM in Australia is not known. Natural predators may be able to attack CFRM but there is no evidence that they would be effective.

Probability of entry, establishment and spread

The overall likelihood that CFRM will enter the PRA area as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within the PRA area: **Low**.

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.1.2 Consequences

Consideration of the direct and indirect consequences of CFRM: **Moderate**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Chilean false red mite is an important pest of various horticulture crops in Chile, and is capable of causing significant reductions in the production of marketable fruit. CFRM has been described as a very destructive pest of grapevines (Jeppson *et al*., 1975).
Any other aspects of the environment	**A** — There are no known direct consequences of the mite on the natural or urban environment but its introduction into a new environment may lead to competition for resources with native species.
Indirect consequences	
Eradication, control etc.	**C** — Additional programs to minimise the impact of these mites 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	**C** — The presence of CFRM in commercial production areas may have a significant effect due to any resulting interstate trade restrictions on a wide range of commodities.
International trade	**D** — The presence of CFRM in the commercial production areas of a range of commodities (apple, citrus and grape) may have a significant effect at the regional level due to any limitations to access to overseas markets where this pest is absent. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment. Various countries that import host commodities from Chile apply phytosanitary restrictions for this pest. Korea, South Africa and USA list CFRM as a pest of concern.
Environment	**A** — Pesticides required to control CFRM are estimated to have consequences that are unlikely to be discernible at the regional level and of minor significance at the local level.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.1.3 Unrestricted risk estimate

The unrestricted risk estimate for CFRM, determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1): **Low**.

4.2.2 Weevils

Weevils are characterised by having an elongated, downwards curving snout. Many weevils are serious pests of crops, seeds and plants. They vary in size from small seed weevils, less than 2 mm long, to the large pine weevils, 20-25 mm long. The larval stages are relatively featureless white or yellowish grubs, usually legless, but with a well-developed head and jaws. Adults and larvae of all species feed either on living or dead plant tissues. The larvae of many species feed inside the roots, stems or seeds of plants, and some of these species can become serious pests of agricultural crops, garden plants and stored food products (Lawrence & Britton, 1991).

The weevils examined in this import risk analysis are:

- *Geniocremnus chiliensis* (Boheman) [Coleoptera: Curculionidae] – Tuberous pine weevil; and
- *Naupactus xanthographus* (Germar) [Coleoptera: Curculionidae] – South American fruit tree weevil.

The listed weevil species are recognised as significant pests of table grapes in Chile. Due to the recognised importance of the South American fruit tree weevil (SAFTW), it was used as the basis for the risk assessment.

4.2.2.1 Introduction and spread probability

Probability of importation

The likelihood that weevils will arrive in Australia with the importation of table grapes from Chile**: High**.

- These weevils have been reported on table grapes in Chile (Gonzalez, 1980).
- SAFTW lays eggs under the bark in several clusters. In Chile, SAFTW lay eggs in late summer and autumn (Caballero, 1972), from January to the end of March or the beginning of April (Gonzalez, 1980). On hatching, the larvae mainly feed on leaf rolls but will also feed on the buds, flowers and fruitlets of the host plant. Adult females are 14-18mm and males are 12-14mm (Gonzalez, 1983).
- The primary symptom is wilting of the foliage due to larval feeding. Adult feeding is noticeable only as superficial damage to leaves and fruits.
- Weevils hide during the day and move about the plants at nightfall (Lyon, 2000), biting deeply into the buds and the leaves, lacerating the vine canes.
- The peaks of adult emergence for SAFTW are in September-October and December-February (Gonzalez, 1983). This overlaps with the main season for table grapes in Chile (late November-late April, i.e. late spring-mid autumn).
- Adults of these weevils may be concealed within bunches of table grapes and have been intercepted on the table grapes from Chile in the US and Peru (Gonzalez, 1983).

Probability of distribution

The likelihood that weevils will be distributed as a result of the processing, sale or disposal of table grapes from Chile, to the endangered area: **Low**.

- Adults present within grape bunches may not be detected and may spread via wholesale or retail trade (as demonstrated by interceptions of SAFTW during phytosanitary inspections).
- The commodity may be distributed throughout Australia for retail sale, as the intended use of the commodity is human consumption. Waste material would be generated.

- SAFTW females are capable of producing offspring in the absence of males for up to 6 months (Gonzalez, 1983).
- The larvae of SAFTW are positively geotropic and enter the soil (Gonzalez, 1980), where they live at depths of 30-120 cm, depending on soil texture (Gonzalez, 1980; Ripa, 1986a). The larval stage has five instars and lasts 11-14 months, or longer, but never more than 20 months (Gonzalez, 1980).
- Adults are flightless (Ripa, 1984, 1985); therefore, the movement of SAFTW from grape bunches would be limited.

Probability of entry (importation x distribution)

The likelihood that weevils will enter the PRA area as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Low**.

- The overall probability of entry is determined by combining the probabilities of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

Comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **Moderate**.

- SAFTW has a wide host range including apple, avocado, citrus, custard apple, loquat, kiwifruit, olive, stone fruits and walnuts (Gonzalez, 1983; Ripa, 1986b) and these hosts are widely distributed in Australia.
- Some species of *Naupactus*, namely *Naupactus leucoloma*, is already established in Australia (APPD, 2005). Establishment of this weevil indicates that environmental conditions would be suitable for establishment of SAFTW in Australia.
- SAFTW is native to the southern part of South America (Gonzalez, 1980) and has been introduced into Chile (Wibmer & O'Brien, 1986), where it is now widespread and common in the central zone (Caballero, 1972; Gonzalez, 1980). It is also reported from Argentina (Bentancourt & Scatoni, 1992); Chile (Caballero, 1972); and Uruguay (Bentancourt & Scatoni, 1992). Similar environments occur in Australia.
- In Chile, eggs are laid in late summer and autumn (Caballero, 1972), from January to the end of March or the beginning of April (Gonzalez, 1980).
- Adult females lay eggs at night (Gonzalez, 1980) on the trunk of the host plant just below the branches (Gonzalez, 1980; Ripa, 1984), on or under the bark, or under plastic sleeves (Gonzalez, 1980). Eggs are laid in groups (Ripa, 1984), consisting of 25-45 eggs (Gonzalez, 1980) with up to 25 locations per plant (Gonzalez, 1983).
- SAFTW females are capable of producing offspring in the absence of males for up to 6 months with each female able to produce up to 1000 eggs (Gonzalez, 1983).
- The larvae are positively geotropic and enter the soil (Gonzalez, 1980), where they live at depths of 30-120 cm, depending on soil texture (Gonzalez, 1980; Ripa, 1986a). The larval stage has five instars and lasts 11-14 months, or longer, but never more than 20 months (Gonzalez, 1980). The larvae feed on the rootlets of the plants, or tunnel in older roots (Caballero, 1972).
- A generation can be completed in 19-20 months (Caballero, 1972).
- Existing control programs may be effective for some hosts (e.g. broad spectrum pesticide applications) but not for all hosts.
- Biosecurity Australia has reduced the probability of establishment for weevils in the final IRA report to moderate to bring this risk estimate into line with those for other

pests following reconsideration of the effect of the long generation time (19-20 months) on the risk estimate.

Probability of spread

Comparative assessment of those factors in the area of origin and in the PRA area considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- The fruit crop hosts of the SAFTW are located in many parts of Australia. Natural barriers, such as arid areas, climatic differentials and long distances, exist between these areas. The long distances between commercial host crops in Australia would make it difficult for the SAFTW to disperse by natural spread.
- These pests may be spread as adults via infested host commodities or as larvae in soil or on products/machinery that are carrying soil.
- SAFTW has limited natural dispersal mechanisms as adults cannot fly (Ripa, 1984; 1985). Adults can climb the trunks of host plants (Ripa, 1984; 1985), and when disturbed they drop to the ground (Ripa, 1987). The legless first-instar larvae are also able to climb (Loiácono & Díaz, 1992).
- Weevils are subject to attack by an array of predators and parasitoids. Various Hymenoptera (i.e. Mymaridae, Pteromalidae) attack eggs, and spiders and wasps prey upon larvae (Lawrence & Britton, 1991). *Fidiobia asina* has been reported attacking the eggs in Chile.
- The relevance of natural enemies in Australia is not known.
- Similar environments (e.g. temperature, rainfall) occur both in Chile and Australia.

Probability of entry, establishment or spread

The overall likelihood that weevils will enter the PRA area as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.2.2 Consequences

Consideration of the direct and indirect consequences of weevils: **Moderate**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — SAFTW attacks deciduous fruit trees (especially peach), vines and many other plants and requires active management during the growing season. The larvae feed on the leaves, rootlets of the plants or tunnel in older roots; when infestation is heavy, the plants are killed. The adults feed on the leaves, but cause less damage than the larvae (Caballero, 1972). It is not known to be very damaging in Uruguay (Bentancourt & Scatoni, 1992). In Chile, however, it is an introduced insect (Wibmer & O'Brien, 1986), and is considered one of the more important pests of grape (Gonzalez, 1983; Bentancourt & Scatoni, 1992).
Any other aspects of the environment	**A** — There are no known direct consequences of these pests on the natural environment, but their introduction into a new environment may lead to competition for resources with native species.
Indirect consequences	
Eradication, control etc.	**D** — Programs to minimise the impact of SAFTW on host plants are likely to be

Criterion	Estimate
	costly and include pesticide applications and crop monitoring. A control program would have to be implemented in infested orchards to reduce fruit damage and yield loss, thereby increasing production costs. Eradication and control would be significant at the regional level. SAFTW may potentially increase production costs by triggering specific controls as this pest is of quarantine concern to important trading partners.
Domestic trade	**C** — The presence of these pests 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.
International trade	**D** — The presence of SAFTW in the commercial production areas of a range of commodities (apple, citrus, grapes and stone fruits) may have a significant effect at the regional level due to any limitations to access to overseas markets where this pest is absent. These restrictions may lead to a loss of markets, which in turn would be likely to require industry adjustment. Various countries that import host commodities from Chile apply phytosanitary restrictions for this pest.
Environment	**A** — Although additional pesticide applications or other control activities would be required to control these pests on susceptible crops, any impact on the environment is unlikely to be discernible.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.2.3 Unrestricted risk estimate

The unrestricted risk estimate determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1): **Low**.

4.2.3 Mediterranean fruit fly

The fruit fly examined in this import risk analysis is:

- *Ceratitis capitata* (Wiedemann) [Diptera: Tephritidae] – Mediterranean fruit fly.

Chile is considered a "Pest Free Area" for Mediterranean fruit fly (Medfly). However, outbreaks of Medfly have occurred in Chile and been eradicated. It is presumed that the sporadic outbreaks derive from fresh produce imported from areas where the pest occurs. Biosecurity Australia considers there may be a risk of Medfly infesting fruit for export to Australia from outbreak zones while infestations are being eradicated in Chile. This risk assessment is for table grapes sourced from Medfly outbreak zones in Chile.

4.2.3.1 Introduction and spread probability

Probability of importation

The likelihood that Medfly will arrive in the PRA area with the importation of table grapes from Chile**: Low**.

- Biosecurity Australia currently recognises that Chile is free of Medfly. However, should this species become established in Chile, eggs laid by mature females may be present under the skin of host fruit. Larvae of this species are internal feeders and may not be readily detected by visual inspection.

Probability of distribution

The likelihood that Medfly will be distributed as a result of the processing, sale or disposal of table grapes from Chile, to the endangered area: **Moderate**.

- Should this species become established in Chile, imported fruit with internal larval infestation may be distributed throughout Australia via wholesale or retail trade.
- The commodity may be distributed throughout Australia for retail sale, as the intended use of the commodity is human consumption. Waste material would be generated.
- Medfly larvae may survive shipment because of their ability to tolerate cold storage temperatures (Thomas *et al*., 2001).
- In order for this species to transfer to another host, the larvae must complete their lifecycle within the discarded grape bunch (which would be quick to desiccate), pupate, hatch, and then find a suitable host with fruit in which to oviposit.

Probability of entry (importation x distribution)

The likelihood that Medfly will enter the PRA area as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Low**.

- The overall probability of entry is determined by combining the probabilities of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

Comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- Medfly is polyphagous, feeding on the fruits of many plants such as citrus, peach, pear, apple, apricot, fig, plum, kiwi fruit, quince, grape, sweet cherry, pomegranate and strawberry. Its host relationships vary from region to region depending on what fruits are available (White & Elson-Harris, 1994).
- Hosts are widely distributed throughout Australia, both in commercial orchard districts and suburban areas.
- Mediterranean type climates that favour the establishment of Medfly occur in various parts of Australia.
- Medfly is already established in areas of Western Australia. The largest populations occur in the Perth metropolitan area and in towns in the south west of the State (Woods, 1997).
- Development of Medfly is principally dependent on temperature. The optimum temperature is around 32ºC, which enables completion of a generation within 2 weeks. There are 4-5 generations per year, with the number of generations determined by temperature (Fletcher, 1989). In tropical and subtropical regions there may be as many as 12-13 generations per year. In southern Italy, 6 to 7 generations per year have been reported (HYPP, 2004).
- Females lay eggs in clusters of 3 to 7, about 2 to 5 mm deep inside the fruit. Under optimum conditions, the female may lay 500 to 600 eggs during her life (HYPP, 2004). Multiple oviposition by different females can result in many larvae occurring in the same fruit (Thomas *et al*., 2001). During warm weather, eggs hatch in 1.5 – 3 days. Larvae feed and develop within the fruit until ready to pupate in the soil (Thomas *et al*., 2001).

- Females will not lay eggs when temperatures drop below 16ºC except when exposed to sunlight for several days. Development of the egg, larval and pupal stages stop at 10ºC (Thomas *et al*., 2001).
- Medfly can survive the winter in both adult and immature stages (De Lima, 1998). Pupae carry the species through unfavourable conditions. In Australia, adults overwinter in citrus trees (Smith *et al*., 1997).

Probability of spread

Comparative assessment of those factors in the area of origin and in the PRA area considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Medfly has a wide host range (Thomas *et al*., 2001) and is tolerant to a range of environmental conditions. Without appropriate controls, this species may spread within Australia.
- Medfly is under official control in Australia to prevent its spread from Western Australia into other States (De Lima *et al*., 1993).
- There are restrictions in place in Australia on the movement of fruit to prevent the spread of fruit flies, including Medfly.
- Established detection (including a national fruit fly trap surveillance network), containment and eradication procedures in place in Australia for Medfly have been used previously to control its spread when outbreaks occur (Meats *et al*., 2003).

Probability of entry, establishment or spread

The overall likelihood that Medfly will enter the PRA area as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.3.2 Consequences

Consideration of the direct and indirect consequences of Medfly: **High**.

Criterion	Estimate
Direct consequences	
Plant life or health	**D** — Medfly is polyphagous and the most serious fruit fly pest in the Mediterranean environment (Christenson & Foote, 1960). It is capable of causing significant reductions in the production of marketable fruit.
Any other aspects of the environment	**B** — Fruit flies introduced into a new environment will compete for resources with the native species. There may be significant consequences of these pests for native plants at a local level, which would be unlikely to be discernible at a national level.
Indirect consequences	
Eradication, control etc.	**E** — Programs to control/eradicate this pest from areas in Australia would be costly. For example, the cost of eradication of Medfly is estimated at AU$70m for Western Australia and US$20m for Florida. In 1995, the papaya fruit fly eradication program, using male annihilation and protein bait sprays, cost AU$ 34 million (QDPI, 2003). The potential economic risk associated with Medfly is considerable, with an endemic infestation in California estimated to cost in excess US$ 1 billion per annum (Siebert, 1994). Over US$ 350 million has

Criterion	Estimate
	already been spent to prevent Medfly becoming established in California (Metcalf, 1995). Increases in the existing monitoring programs would also be costly.
Domestic trade	**D** — The presence of fruit flies in commercial production areas has a significant effect at the regional level due to interstate trade restrictions on a wide range of commodities.
International trade	**D** — The major risk for Australia arises from the imposition of much stricter phytosanitary restrictions on fruit exports should Medfly become established, even temporarily, in areas currently free of this pest. When the papaya fruit fly outbreak occurred in northern Queensland, Australia experienced trade effects that affected the whole country.
Environment	**A** — Although additional pesticide applications or other control activities would be required to control these pests on susceptible crops, any impact on the environment is unlikely to be discernible.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.3.3 Unrestricted risk estimate

The unrestricted risk estimate for Medfly, determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1): **Moderate**.

4.2.4 Mealybugs

Mealybugs injure plants by extracting relatively large quantities of sap and producing honeydew that serves as a substrate for the development of sooty moulds. They generally prefer warm, humid, sheltered sites away from adverse environmental conditions and natural enemies. Many mealybug species pose particularly serious problems to agriculture when introduced into new areas of the world without their specific natural enemies.

The mealybugs examined in this import risk analysis are:

- **Pseudococcus calceolariae* Maskell [Hemiptera: Pseudococcidae] – Citrophilus mealybug; and
- *Pseudococcus maritimus* (Ehrhorn) [Hemiptera: Pseudococcidae] – Grape mealybug.

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

4.2.4.1 Introduction and spread probability

Probability of importation

The likelihood that mealybugs will arrive in the PRA area with the importation of table grapes from Chile: **High**.

- These mealybugs have been reported on table grapes in Chile (Prado, 1991).
- Mealybugs are small and often inconspicuous but may be present on table grapes.
- Mealybugs are known to be associated with table grapes. For example, mealybugs have been intercepted on Chilean table grapes imported into New Zealand (NZ MAF, 2002a) and *Pseudococcus maritimus* has been intercepted during pre-export inspection of Californian table grapes destined for Australia.

Probability of distribution

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

- The commodity may be distributed throughout the PRA area for retail sale. The intended use of the commodity is human consumption but waste material would be generated (e.g. vegetative parts of the cluster and discarded berries).
- Mealybugs are likely to survive storage and transportation. *Pseudococcus affinis* can survive up to 42 days storage at 0ºC (Hoy & Whiting, 1997).
- Adults or juveniles could be present on discarded waste.
- Adult mealybugs are largely sedentary and can only crawl a few metres, restricting their ability to move from discarded waste to a suitable host.
- Short range dispersal of juveniles from waste could occur through the movement of crawlers in wind currents or as contaminants on biological or mechanical vectors (Williams, 1996).
- Long-range dispersal would require the movement of adults and nymphs with vegetative material.
- Mealybugs are polyphagous, increasing the chances that they could find a susceptible host.

Probability of entry (importation x distribution)

The likelihood that mealybugs will enter the PRA area as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Moderate**.

- The overall probability of entry is determined by combining the probabilities of importation and distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

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

- Grape mealybug is known to damage apple, damson, peach, European pear and grapevine. Citrophilus mealybug is a highly polyphagous species that has been recorded on 40 plant families (Ben-Dov, 1994) and these hosts are widespread in the PRA area.
- Mealybug development is temperature dependent. There is a minimum threshold temperature for each species of mealybug, below which development either ceases totally or is slowed significantly. There is also a maximum threshold temperature, above which development is slowed significantly or ceases altogether. If temperatures remain elevated for prolonged periods, insect mortality increases significantly.
- Mild to warm conditions are most favourable with temperatures of about 25°C and a high relative humidity being optimum for mealybug development. In Australia, mealybug populations peak in spring and autumn.
- These pests have high fecundity rates. Females of grape mealybug produce an average of 110 eggs in a lifetime. Mature females of citrophilus mealybug lay approximately

500 eggs and these hatch within a few days. Females cease feeding before egg laying and die at the end of egg laying.

- Existing control programs may be effective for some hosts (e.g. broad spectrum pesticide applications) but not all hosts (e.g. *Malus* and *Pyrus* where specific integrated pest management programs are used).
- Several species of *Pseudococcus* are reported in Australia, demonstrating the suitability of climatic conditions in Australia for their survival.

Probability of spread

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

- Movement of commodities would help the dispersal of these mealybugs. Adults and immature forms may spread undetected via the movement of fruit or infested vegetative host material.
- Short-range dispersal of juveniles could occur through the movement of crawlers, in wind currents or as contaminants on biological or mechanical vectors (Williams, 1996).
- Adult males are winged, capable of short flights and are short lived. Male dispersal by crawling or flight is strongly affected by the location of females and their production of sex pheromones.
- Natural enemies of the citrophilus mealybug, such as *Cryptolaemus montrouzieri* and the parasitoids *Tetracnemus pretisous* and *Coccophagus gurneyi*, are used to control this pest in Australia and other countries.
- Similar environments (e.g. temperature, rainfall) occur in Chile and Australia.

Probability of entry, establishment and spread

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

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.4.2 Consequences

Consideration of the direct and indirect consequences of mealybugs: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Mealybugs can cause direct harm to a wide range of plant hosts and have also been reported as disease vectors (Ben-Dove, 1994). Fruit quality can be reduced by the presence of sooty mould.
Any other aspects of the environment	**A** — There are no known direct consequences of citrophilus mealybug on the natural or built environment but its introduction into a new environment may lead to competition for resources with native species.
Indirect consequences	
Eradication, control etc.	**C** — Additional programs to minimise the impact of these pests on host plants

Criterion	Estimate
	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	**C** — The presence of these pests in commercial production areas may have a significant effect due to any resulting interstate trade restrictions on a wide range of commodities.
International trade	**C** — The presence of these pests in commercial production areas of a range of commodities (e.g. *Vitis* and *Citrus* spp.) may have a significant effect at the district level due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications or other control activities would be required to control these pests on susceptible crops, any impact on the environment is unlikely to be discernible.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.4.3 Unrestricted risk estimate

The unrestricted risk estimate for mealybugs, determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1): **Low**.

4.2.5 Scales

Scale insects are sessile, small and often inconspicuous and have been spread widely on plants and plant products. The reproductive rates for soft scales are weather dependent and more generations are produced in tropical climates. Coastal locations are also favourable because of their moderate climates. A wax-based covering protects armoured scales. The main economic damage caused by soft scale is from the downgrading of fruit quality caused by sooty mould fungi growing on the honeydew produced by these scales.

The scales examined in this extension of existing policy are:

- *Icerya palmeri* Riley-How [Hemiptera: Margarodidae] – Margarodes scale; and
- **Parthenolecanium corni* (Bouché) [Hemiptera: Coccidae] – European fruit lecanium.

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

The listed scales species are recognised as significant pests of table grapes in Chile. Due to the recognised importance of the European fruit lecanium (EFL), it was used as the basis for the risk assessment.

4.2.5.1 Introduction and spread probability

Probability of importation

The likelihood that scales will arrive in the PRA area with the importation of table grapes from Chile: **High**.

- These scales have been reported on table grapes in Chile (Klein Koch & Waterhouse, 2000; Prado, 1991).
- EFL females lay several eggs underneath their brown leathery shell (Battany, 2003). The females then die leaving the eggs well protected underneath the remaining shells.

- The first instars of EFL infest the foliage, usually on the undersides of the leaves, whereas later stages occur on the stems and branches.
- Scales have been intercepted on table grapes imported from Chile into New Zealand (NZ MAF, 2002a).

Probability of distribution

The likelihood that scales will be distributed to the endangered area as a result of the processing, sale or disposal of table grapes from Chile: **Low**.

- Adults or immature forms may remain on the surface of the fruit during distribution via wholesale or retail trade.
- Adults or immature forms are likely to survive storage and transport and be associated with infested waste.
- The commodity may be distributed throughout Australia for retail sale, as the intended use of the commodity is human consumption. Waste material would be generated.
- The natural dispersal mechanism that allows for the movement of scale species from discarded fruit waste to a suitable host is a significant limiting factor. Scales have a limited ability to disperse independently.

Probability of entry (importation x distribution)

The likelihood that scales will enter the PRA area as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Low**.

- The overall probability of entry is determined by combining the probabilities of importation and distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

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

- EFL is highly polyphagous, attacking some 350 plant species placed in 40 families (Ben-Dov, 1993). It attacks a wide range of crops, mostly woody fruit trees and ornamentals.
- A range of plants commonly found in the PRA area can act as hosts for these species, including *Prunus armeniaca* (apricot), *Prunus avium* (sweet cherry) and *Vitis vinifera* (grapevine).
- Although the precise climate tolerance of scales is unknown, they are considered to be tropical or subtropical pests, and are therefore less likely to establish in either cool or hot and dry climates.
- EFL reproduces sexually and parthenogenetically and has between one and three generations a year. It exhibits great heterogeneity between populations in sex ratio and number of generations (Danzig, 1995). One generation per year has been reported in New Zealand (Henderson, 2001) and California (Battany, 2003).
- EFL overwinters as immature females on twigs (Henderson, 2001). The new generation is produced through summer and the young tend to settle on the leaves before moving to the stems.
- EFL is already established in New South Wales, Tasmania and Victoria, indicating that suitable environments for its establishment are available in the PRA area.

- Australia has three species of *Icerya* (AICN, 2005), so conditions may be suitable for the establishment of *I. palmeri*.
- Existing control programs may be effective for some hosts (e.g. broad spectrum pesticide applications) but not necessarily all hosts.

Probability of spread

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

- EFL is already recorded in Australia (AICN, 2005) but is absent from Western Australia. There are similar environments in Western Australia that would be suitable for its spread.
- Dispersal is by the first-instar crawler, aided by wind and animals, and by human transport of infested material. Apart from the winged male, the other stages are mostly sedentary (Danzig, 1995).
- Similar environments (e.g. temperature, rainfall) occur in Chile and Australia.
- Several natural enemies that attack scales occur in Australia.

Probability of entry, establishment and spread

The overall likelihood that scales will enter the PRA area as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within the PRA area: **Low**.

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, establishment and spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.5.2 Consequences

Consideration of the direct and indirect consequences of scales: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — Scales can cause direct harm to a wide range of plant hosts (Gill, 1988). In Europe, EFL is a pest of a range of fruit and nut trees and ornamentals. It seriously infests hazel trees in Greece (Santas, 1985). Infestations result in reduced vigour and general debility of the host plant. In addition to the direct feeding damage, the honeydew excreted forms a substrate for the growth of black sooty moulds, fouling fruit and impairing photosynthesis, sometimes causing premature leaf drop. Sooty mould fouling reduces the value and marketability of produce and ornamentals.
Any other aspects of the environment	**A** — Scales introduced into a new environment will compete for resources with the native species. They are estimated to have consequences, which are unlikely to be discernible at the national level and of minor significance at the local level.
Indirect consequences	
Eradication, control etc.	**C** — Additional programs to minimise the impact of these pests 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 these pests in commercial production areas may have an effect due to any resulting interstate trade restrictions on a wide range of commodities.

Criterion	Estimate
International trade	**B** — The presence of these pests in commercial production areas of a range of commodities (e.g. *Vitis*, *Citrus*) may have an effect due to possible limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications or other control activities would be required to control these pests on susceptible crops, any indirect effect on the environment is unlikely to be discernible.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.5.3 Unrestricted risk estimate

The unrestricted risk estimate for scales, determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1): **Very low**.

4.2.6 Leafrollers

Leafrollers are larval (caterpillar) stages of a number of species of moth. Leafrollers are members of the Tortricidae family, which include 5,000 species throughout the world. Leaf roller larvae cause damage by chewing holes in fruit, resulting in scarring, desiccation and rotting of fruit. The genus *Proeulia* is native to Chile and includes 22 species from which three have been recorded on cultivated plants.

The leafrollers examined in this import risk analysis are:

- *Accuminulia buscki* Brown [Lepidoptera: Tortricidae] – Tortricid leafroller
- *Accuminulia longiphallus* Brown [Lepidoptera: Tortricidae] – Tortricid leafroller
- *Chileulia stalactitis* (Meyrick) [Lepidoptera: Tortricidae] – Grape berry moth
- *Proeulia auraria* (Clarke) [Lepidoptera: Tortricidae] – Chilean fruit tree leafroller
- *Proeulia chrysopteris* (Butler) [Lepidoptera: Tortricidae] – Fruit leafroller
- *Proeulia triquetra* Obraztsov [Lepidoptera: Tortricidae] – Grape leafroller

The listed leafroller species are recognised as significant pests of table grapes in Chile.

4.2.6.1 Introduction and spread probability

Probability of importation

The likelihood that leafrollers will arrive in Australia with the importation of table grapes from Chile**: Moderate**.

- These pests have been reported on table grapes in Chile (Brown, 1999; Gonzales, 1983).
- Larvae of *Accuminulia* feed on table grapes and stone fruits (Brown, 1999) while larvae of *Proeulia* and *Chileulia* feed on tree fruit, grapes and citrus (Gonzales, 1989).
- *Chileulia stalactitis* primarily feeds on foliage, mature fruit and developing fruit causing significant damage to stone fruits (Gonzalez, 1983).
- *Accuminulia*, *Chileulia* and *Proeulia* are capable of boring into the fruit of host plants (Brown, 1999). This study contradicts other studies that indicate that *Proeulia* species are external feeders (Pucat, 1994; Brown & Passoa, 1998).

- *Proeulia auraria* and *P. triquetra* are known to destroy buds, berries and vegetative material of *Vitis* in Chile and their presence is characterised by the presence of rolled up leaves (Gonzalez, 1983).
- *Accuminulia buscki* has been intercepted in the USA on Chilean table grapes (Brown, 1999).
- A range of lepidopterans has been intercepted during pre-shipment inspection of Californian table grapes destined for Australia.
- These pests may be associated with the table grape pathway but have not been intercepted on Chilean table grapes imported into New Zealand.

Probability of distribution

The likelihood that these pests will be distributed to the endangered area as a result of the processing, sale or disposal of table grapes from Chile: **Moderate**.

- Larvae can occur within fruit and/or within bunches and may therefore remain with the commodity during distribution via wholesale or retail sale.
- Adults and immature forms may also hide within bunches and remain with the commodity during distribution via wholesale or retail trade.
- The commodity may be distributed throughout Australia for retail sale, as the intended use of the commodity is human consumption. Waste material would be generated.
- If adult moths were to survive cold storage, they could enter the environment by flight from fruit at the point of sale, during transportation of purchased fruit from retailers to households and from discarded fruit waste at landfills.
- The natural dispersal stage for these pests is the adult.
- Early instar larvae that have escaped detection during inspection would be unlikely to develop in discarded fruit before the fruit desiccates or decays.
- The larvae would also be unlikely to find a suitable host on which to complete their development.

Probability of entry (importation x distribution)

The likelihood that leafrollers will enter Australia as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Low**.

- The overall probability of entry is determined by combining the probabilities of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

Comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- These pests have wide host ranges that include apple, citrus, kiwifruit, grapes and stone fruits (Gonzalez, 1983; Artigas, 1994; Brown, 1999). Many of these hosts are widely distributed in Australia.
- Some species can overwinter as first instar larvae protected by webs, in hollow or dried fruit of hosts, or continue to develop on evergreen hosts (Pucat, 1994).
- Egg masses are laid on the foliage of the host plants. Larvae primarily feed on the foliage and are also reported as external fruit feeders (Pucat, 1994; Brown & Passoa, 1998) or internal fruit feeders (Brown, 1999).
- Adult *Proeulia* females deposit plates of 15 to 40 eggs on the leaves (Campos *et al*., 1981); the hatched larvae form a protective tube by folding a leaf or by joining leaves

by a silk thread. In spring, they begin to feed on rolled leaves, in flowers and fruits. In summer, it takes 35 to 50 days to complete the life cycle (Artigas, 1994; Campos *et al*., 1981). Larvae hatched in autumn spend winter diapausing inside a cocoon in twigs, attached to leaves or in protected places. These larvae are reported to complete their development in sheltered places (Artigas, 1994; Campos *et al*., 1981).

- Pupation takes place on the leaves. Two annual generations have been reported for *Proeulia* species, with the possibility of a third partial generation (Campos *et al*., 1981). However, two to four generations have been reported for *Proeulia auraria* (Alvarez & Gonzalez, 1982).
- To establish, larvae would have to successfully pupate and then emerge to find a suitable mate to establish a population.
- Existing control programs may be effective for some hosts (e.g. broad spectrum pesticide applications) but not all hosts (e.g. citrus where specific integrated pest management programs are used).

Probability of spread

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**.

- Natural physical barriers (e.g. deserts/arid areas) may prevent long distance spread of these pests unaided but adults are capable of flight and larvae may be spread in infested host material.
- Short-distance dispersal occurs, as adults are mobile and able to rapidly move between host plants.
- The genus *Proeulia* is capable of flight with some species known to fly throughout the year. For example, *Proeulia auraria* is an abundant native insect in Chile and flies virtually throughout the year with flight peaks during January, April and September-November (Gonzalez, 1983).
- Environments (e.g. temperature, rainfall) similar to those in Chile occur in parts of Australia.
- Human activity can help the spread of these pests, as larvae associated with fruit may be moved around with the commodity.
- The relevance of natural enemies in Australia is not known.
- Because these species have multiple generations, are capable of flight and can be spread by humans in plant material their likelihood of spread is rated as high.

Probability of entry, establishment or spread

The overall likelihood that leafrollers will enter Australia as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

4.2.6.2 Consequences

Consideration of the direct and indirect consequences of leafrollers: **Moderate**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — These pests are recorded as capable of causing direct damage to host plants such as *Vitis* and *Prunus* spp. Some of the leafrollers damage the leaves, buds and fruit of their hosts (Brown, 1999; Gonzales, 1983). *Proeulia* spp. potentially reduce the yield and value of crops through external damage to fruit that reduces its market value.
Any other aspects of the environment	**A** — There are no known consequences of these pests on other aspects of the environment but their introduction into a new environment may lead to competition for resources with native species.
Indirect consequences	
Eradication, control etc.	**D** — Programs to minimise the impact of these pests on host plants are likely to be costly and include pesticide applications and crop monitoring. A control program would have to be implemented in infested orchards to reduce fruit damage and yield losses, thereby increasing production costs. Eradication and control would be significant at the regional level. *Proeulia* spp. may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.
Domestic trade	**C**— The presence of these pests in commercial production areas may have a significant effect due to any resulting interstate trade restrictions.
International trade	**D** — The presence of these pests in commercial production areas of a range of commodities (e.g. *Citrus, Vitis*, *Prunus*) may have a significant effect due to possible additional phytosanitary requirements for access to overseas markets where these pests are absent. For example *Proeulia* species are specifically of quarantine concern to China, Korea, Taiwan, Japan, Mexico and USA.
Environment	**A** — Although additional pesticide applications or other control activities would be required to control these pests on susceptible crops, and any indirect impact on the environment is unlikely to be discernable.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.6.3 Unrestricted risk estimate

The unrestricted risk estimate determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1)**: Low**.

4.2.7 Thrips

Thrips are small and narrow-bodied insects commonly found feeding on leaves and stems. Grape thrips and western flower thrips are the most important species causing damage on grapes. Both species are found in grape-growing areas.

The thrips examined in this import risk analysis are:

- *Drepanothrips reuteri* Uzel [Thysanoptera: Thripidae] – Grape thrips;
- *Frankliniella australis* Morgan [Thysanoptera: Thripidae] – Chilean flower thrips; and
- *Frankliniella occidentalis* (Pergande) [Thysanoptera: Thripidae] – Western flower thrips.

The listed thrips species are recognised as significant pests of table grapes in Chile. Due to the recognised importance of the grape thrips and western flower thrips (WFT), these were used as the basis for the risk assessment.

4.2.7.1 Introduction and spread probability

Probability of importation

The likelihood that thrips will arrive in the PRA area with the importation of table grapes from Chile**: Low**.

- Grape thrips represent a large part of the thrips populations associated with table grapes in some areas of Chile and along with WFT are considered an important pest (Gonzalez, 1983; Ripa, 1994).
- Both WFT and grape thrips can scar berries with their feeding, which renders certain varieties unmarketable (UC-IPM, 2002). Table grapes with such symptoms may be detected during pre-export inspections.
- The female WFT has an external ovipositor with two opposable serrated blades that are used to cut through the plant epidermis and deposit eggs in the tissues below (Childers & Achor, 1995).
- Thrips prefer cryptic habitats i.e. small crevices and tightly closed plant parts. Adults and immature forms may hide within bunches (i.e. in crevices on fruit stems).
- Thrips may be associated with the table grape pathway but these pests have not been intercepted on Chilean table grapes exported to New Zealand or Californian table grapes exported to Australia.

Probability of distribution

The likelihood that thrips will be distributed as a result of the processing, sale or disposal of table grapes from Chile, to the endangered area: **Moderate**.

- Adults and immature forms may hide within bunches (for example, in crevices on the fruit stems) and therefore remain with the commodity during distribution via wholesale or retail sale.
- 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 (e.g. vegetative parts of the cluster and discarded berries).
- These thrips could enter the environment directly from purchased fruit, from fruit at the point of sale, or through eggs that have hatched in discarded fruit or fruit waste before the fruit desiccates or decays.
- WFT is highly polyphagous and the adults and nymphs can disperse locally by wind-assisted flight (CABI/EPPO, 1997).

Probability of entry (importation x distribution)

The likelihood that thrips will enter the PRA area as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Low**.

- The overall probability of entry is determined by combining the probabilities of importation and of distribution using the matrix of ‘rules’ for combining descriptive likelihoods (Table 3).

Probability of establishment

Comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- WFT is polyphagous (*Citrus*, Cucurbitaceae, *Phaseolus* and *Prunus*) and some of these hosts commonly found in the PRA area can act as hosts for these species.
- Depending on environmental conditions and nutrient levels, female WFT lay 130–230 eggs during their lifetime (CABI, 2005). Eggs are deposited in leaves, bracts, and

petals and hatch in 2 to 4 days (Pfleger *et al*., 1995). The development time from egg to adult is 7 to 13 days when temperatures range from 18 to 23ºC (CABI, 2005).

- Thrips can have a high reproductive potential even in the absence of males (i.e. under glasshouse conditions *Frankliniella occidentalis* can have 15 generations per year).
- Many Australian environments would be suitable for the thrips' survival and reproduction as these species are noted for their ecological and physiological tolerance. WFT is already established in some areas of Australia.
- Existing control programs may be effective for some hosts (e.g. broad spectrum pesticide applications) but not all hosts (e.g. citrus where specific integrated pest management programs are used).

Probability of spread

Comparative assessment of those factors in the area of origin and in the PRA area considered pertinent to the expansion of the geographical distribution of the pest: **High**.

- Natural physical barriers (e.g. deserts/arid areas) may prevent these pests spreading unaided but adults are capable of flight and adults and immature forms may spread undetected via the movement of fruit or infested vegetative host material.
- WFT hatch large numbers of young, have rapid reproductive cycles, and increase their population faster than their predators (Mound & Teulon 1995).
- The relevance of natural enemies in Australia is not known.
- Similar environments (e.g. temperature, rainfall) occur in Chile and Australia.

Probability of entry, establishment or spread

The overall likelihood that thrips will enter the PRA area as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Australia: **Low**.

- The probability of entry, of establishment and of spread is determined by combining the probabilities of entry, establishment and spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.7.2 Consequences

Consideration of the direct and indirect consequences of thrips: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**C** — WFT is probably the most serious pest of floriculture crops in the world (Parrella, 1995). WFT damage plants directly by feeding and laying eggs on the plant, and indirectly by acting as vectors for viruses such as tomato spotted wilt virus and impatiens necrotic spot virus. In some host species, WFT feeding causes flower or leaf buds to abort or emerging leaves to become distorted (Childers & Achor, 1995).
Any other aspects of the environment	**A** — There are no known direct consequences of these species on any aspects of the environment but their introduction into a new environment may lead to competition for resources with native species.
Indirect consequences	
Eradication, control etc.	**B** — Additional programs to minimise the impact of these pests 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	**C** — The presence of these pests in commercial production areas may have a

Criterion	Estimate
	significant effect due to any resulting interstate trade restrictions on a wide range of commodities. Interstate measures are currently in place for WFT.
International trade	**C** — The presence of these pests in commercial production areas of a range of commodities (e.g. *Vitis, Prunus*) may have a significant effect due to any limitations to access to overseas markets where these pests are absent.
Environment	**A** — Although additional pesticide applications or other control activities would be required to control these pests on susceptible crops, any impact on the environment is unlikely to be discernible.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.7.3 Unrestricted risk estimate

The unrestricted risk estimate determined by combining the overall 'probability of entry, establishment or spread' with the 'consequences' using the risk estimation matrix (Table 1)**: Very low**.

4.2.8 Phomopsis cane and leaf spot

Phomopsis cane and leaf spot is an important disease in several viticultural regions of the world (Machowicz-Stefaniak *et al*., 1991; Nair *et al*., 1994), especially where rain following budbreak keeps grapevines wet for several days (Hewitt & Pearson, 1988). Phomopsis cane and leaf spot can affect most parts of the grapevine, including canes, leaves, rachises, flowers, tendrils and berries and can cause vineyard losses by weakening canes, damaging leaves, infecting rachises (which can result in poor fruit development and premature fruit drop) and infecting berries (resulting in a fruit rot near harvest).

The fungus examined in this import risk analysis is:

- **Phomopsis viticola* (Sacc.) Sacc. – Phomopsis cane and leaf spot.

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

The taxonomy of *Phomopsis viticola* is summarised in the data sheet for *Phomopsis viticola*.

4.2.8.1 Introduction and spread probability

Probability of importation

The likelihood that *P. viticola* will arrive in Western Australia with the importation of table grapes from Chile**: Low**.

- *Phomopsis viticola* has been reported from Chile (Mujica *et al*., 1980) but it is an infrequent pest of no economic importance (SAG, 2005). The fungus is not listed as present in Chile in CABI (2005), supporting its rare occurrence in Chile.
- Infection, initiated at bud break during prolonged, cool, wet periods, primarily occurs on leaves, canes and stems. If cool, wet conditions continue, the infections will spread to bunch stems, which may become brittle and break, resulting in the loss of the bunch.
- All parts of grape bunches (berries and bunch stems) are susceptible to infection throughout the growing season but most infections appear to occur early in the growing season (Ellis & Erincik, 2005).

- Berry infection, either direct or via infected rachis tissues (Erincik *et al*., 2002,) can occur throughout the growing season but most fruit infections probably occur early in the season (Erincik *et al*., 2001). Once inside green tissues of the berry, the fungus becomes latent (Erincik *et al*., 2002) and infected berries remain without symptoms until late in the season when the fruit matures (Ellis & Erincik, 2005).
- Visual symptoms first appear close to harvest as infected berries turn brown and shrivel (Ellis & Erincik, 2005) and black pycnidia are produced through the skin (Bugaret, 1990). These pycnidia exude yellowish spore masses before the berries finally shrivel and becoming mummified (Taylor & Mabbitt, 1961; Gärtel, 1972; Moller *et al*., 1981). Infected berries may abscise from the pedicel, leaving a dry scar (Hewitt & Pearson, 1988).
- Berry infection is favoured by 20-30 hour wet periods during flowering (Rawnsley & Wicks, 2002). Berries become less susceptible to infection and colonisation as they age from pea size to ripe (Pscheidt & Pearson, 1989).
- Infected fruit/bunches, if symptoms are visible, are likely to be discarded during harvest and grading operations.
- Recently infected fruit may not display symptoms and may be packaged for export.
- *Phomopsis viticola* has not been intercepted on table grapes exported from Chile to New Zealand or the USA, or on table grapes exported to Australia from California, where this pathogen also occurs.

Probability of distribution

The likelihood that *P. viticola* will be distributed to the endangered area as a result of the processing, sale or disposal of table grapes from Chile: **Very low**.

- Infected fruit not displaying disease symptoms, if imported, may be distributed. Cool storage employed by the wholesalers and retailers will not kill the fungus but it is likely to remain inactive until conditions become suitable for its development (Ellis & Erincik, 2005).
- Distribution of the commodity in Western Australia would be for retail sale, as the intended use of the commodity is human consumption. Waste material could be generated in the form of discarded bunches or bunch stems.
- It is likely that most imported bunch residues would be disposed of in garbage and be deep buried or composted at rubbish tips, removing any risk of distribution of the fungus to a host.
- *Phomopsis viticola* has a restricted host range, infecting *Vitis vinifera* (Eurasian grapevine), *Vitis rupestris* (North American grapevine); *Vitis aestivalis* (summer grape); *Vitis labrusca* (fox grape); *Vitis rotundifolia* (Muscadine grape) and *Parthenocissus quinquefolia* (Virginia creeper) (Galet & Morton, 1988; Uecker, 1988).
- Grapevines are restricted to vineyards and home gardens in Western Australia (DAWA, 2005), so it is likely that only a small number of imported bunches or bunch stems would be discarded in close proximity to a host.
- While *P. viticola* overwinters on the vine in infected canes and rachises (Pscheidt & Pearson, 1991; Ellis & Erincik, 2005), bunch residues discarded into the environment are likely to end on the ground, where they would be colonised and rotted by saprophytic fungi and bacteria.
- Table grapes would be imported from Chile from November to April, so the fungus would have to remain viable in the discarded bunch residues until spring, when pycnidia and conidia are produced on diseased tissue (Hewitt & Pearson, 1988).

- It is possible that pycnidia and conidia could be produced on infected bunch residues on the ground in spring, but under field conditions in Australia, at least 10 hours of rain, combined with relatively low temperatures, are required for conidial production (Emmett *et al*., 1992).
- Only infected bunch residues discarded in close proximity to a susceptible host could initiate an infection, as conidia from pycnidia on infected tissue rely on rain splash for dispersal (Hewitt & Pearson, 1988).
- The probability of distribution was reduced from low to very low in the final IRA report, based on reconsideration of the environmental conditions necessary for sporulation of *P. viticola* on discarded waste material and its transfer to susceptible host tissue.

Probability of entry (importation x distribution)

The likelihood that *P. viticola* will enter Western Australia as a result of trade in table grapes from Chile and be distributed in a viable state to the endangered area: **Very low**.

- The overall probability of entry is determined by combining the probabilities of importation and of distribution using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

Probability of establishment

Comparative assessment of factors in the source and destination areas considered pertinent to the ability of the pest to survive and propagate: **High**.

- *Phomopsis viticola* is established in temperate climatic regions throughout the viticultural world and has been reported in Africa, Asia, Australia (except Western Australia), Europe and North America (Hewitt & Pearson, 1988; Saber, 1998).
- *Phomopsis viticola* is most destructive in geographical regions with a moderate spring climate with sufficient rain at bud burst to keep vines wet for several days. These conditions occur in much of the grape growing areas of the South west regions of Western Australia (DAWA, 2005).
- Climate modelling, using Climex^{R} software (Sutherst *et al*., 2004) and data from locations where *P. viticola* is known to occur, predicts that all viticultural regions of Western Australia have climatic conditions suitable for the establishment and proliferation of *P. viticola* (DAWA, 2005).
- The occurrence of *Diaporthe australafricana* (as *Phomopsis* taxon 1) in Western Australia (Merrin *et al*., 1995) indicates that environmental conditions would also be suitable for the establishment of *P. viticola*. *Diaporthe australafricana* (as *Phomopsis* type 1) is common in the cooler, wetter grape growing areas and can coexist with *P. viticola* (as *Phomopsis* type 2) in the warmer regions of Australia (Rawnsley & Wicks, 2002).
- Infection occurs primarily in cold, wet weather and the fungus enters through leaf stomata, pruning wounds, lesions on canes or directly through uninjured young shoots (Cree, 2005).
- Prolonged periods of rain and cool weather favour disease development. Pycnidium production requires cool temperatures (Rawnsley & Wicks, 2002). At least 10 hours of rain, combined with relatively low temperatures are required for spores to be produced and a further 8-10 hours of very high relative humidity or surface wetness for infection to occur (Emmett *et al*., 1992).

- Spores require water to germinate and infection has been found to occur within a few hours in free water or 100% humidity (Hewitt & Pearson, 1988). The optimum temperature for spore germination and fungal growth is 23ºC (Patil *et al*., 1981). Berry infection is favoured by 20-30 hour wet periods during flowering (Rawnsley & Wicks, 2002).
- *Phomopsis viticola* overwinters on the vine in infected canes and rachises (Hewitt & Pearson, 1988; Pscheidt & Pearson, 1991; Ellis & Erincik, 2005) and in dormant buds (Jailloux & Bugaret, 1987; Mostert *et al*., 2000).
- *Phomopsis viticola* can survive on grapevines for up to 4.5 years (Moller & Kasimatis, 1981).
- The fungus produces dark pycnidia that produce α and β conidia and the combined infection potential of α and β conidia would increase the amount of inoculum each season (Sergeeva *et al*., 2003).
- In cool climates, the fungus may remain active throughout the growing season (Emmett & Wicks, 1994) but generally the most active growth of the fungus occurs during spring and autumn (Rawnsley & Wicks, 2002).
- The development of this disease is greatly influenced by climatic conditions, inoculum density and host growth stage (Bugaret, 1986). Environmental conditions must be favourable for development and subsequent spread of the disease (Rawnsley & Wicks, 2002).
- Existing fungicide control programs for downy mildew and black spot may prevent the establishment of *P. viticola* in vineyards. These programs include the protectant fungicides captan, chlorothalonil, dithianon and mancozeb that are known to control *P. viticola* (Rawnsley pers. com., 2005).
- The probability of establishment was changed from low to high in the final IRA report, following reconsideration of climatic factors on the potential for infection in Western Australia and climate modelling analysis provided by the Department of Agriculture Western Australia.

Probability of spread

Comparative assessment of those factors in the area of origin and in Western Australia considered pertinent to the expansion of the geographical distribution of the pest: **Moderate**.

- Climate modelling, using Climex^{R} software (Sutherst *et al*., 2004) and data from locations where *P. viticola* is known to occur, predicts that all viticultural regions of Western Australia have climatic conditions suitable for the establishment and proliferation of *P. viticola* (DAWA, 2005).
- In spring, pycnidia of *P. viticola* erupt through the epidermis of diseased tissue and exude conidia when wet (Hewitt & Pearson, 1988).
- Conidia liberated from pycnidia are dispersed by rain splash, and are also spread by nematodes and insect larvae (Punithalingam, 1979).
- Conidia carried by the combined action of wind and rain drops are the main means of dissemination of *P. viticola* (Emmett *et al*., 1992).
- *Phomopsis viticola* spreads mostly within the vine, rather than from vine to vine, so spread within the vineyard is localised (Hewitt & Pearson, 1988).
- Existing fungicide control programs for downy mildew and black spot may prevent the spread of *P. viticola* in vineyards. These programs include the protectant fungicides

captan, chlorothalonil, dithianon and mancozeb that are known to control *P. viticola* (Rawnsley pers. com., 2005).

- The main effect of these fungicide control programs would be to minimise the spread of *P. viticola* within infected vines and from infected vines to neighbouring vines during the growing season (DAWA, 2005).
- If isolated plants in a home garden were to become infected by *P. viticola*, it is likely that physical barriers would prevent its spread to other hosts due to the limited distance that conidia can be spread by rain splash.
- The fungus may overwinter within woody parts of the vine and in pycnidia on infected canes and spurs (Pine, 1959; Taylor & Mabbitt, 1961).
- *Phomopsis viticola* can survive on grapevines for up to 4.5 years (Moller & Kasimatis, 1981).
- Long distance dispersal to new viticultural areas occurs primarily through the transfer of infected or contaminated propagation materials such as budwood, cane cuttings and nursery stock (Hewitt & Pearson, 1988; Creecy & Emmett, 1990). There are currently no restrictions on the movement of grapevine material within Western Australia.
- The probability of spread was changed from low to moderate in the final IRA report, following reconsideration of the likelihood that the fungus could be distributed in infected propagation material.

Probability of entry, establishment or spread

The overall likelihood that *P. viticola* will enter Western Australia as a result of trade in table grapes from Chile, be distributed in a viable state to suitable hosts, establish in that area and subsequently spread within Western Australia: **Very low**.

- The probability of entry, establishment or spread is determined by combining the probabilities of entry, of establishment and of spread using the matrix of 'rules' for combining descriptive likelihoods (Table 3).

4.2.8.2 Consequences

Consideration of the direct and indirect consequences of *P. viticola*: **Low**.

Criterion	Estimate
Direct consequences	
Plant life or health	**B** — *Phomopsis viticola* is a serious pathogen of grapes in several viticultural regions of the world (Machowicz-Stefaniak *et al*., 1991; Nair *et al*., 1994). While reports in Australia have indicated 20-38% yield losses (Nair *et al*., 1994), it is unknown whether this figure is reflective of *Phomopsis* infection only or a combination of other factors affecting grapevines (Rawnsley & Wicks, 2002). *Phomopsis viticola* is present in most viticultural regions in Australia but yield losses are very low, mainly due to unfavourable environmental conditions that prevent disease progression on bunches (Rawnsley pers. com., 2005).
Any other aspects of the environment	**A** — There are no known direct consequences of this disease on the natural environment.
Indirect consequences	
Eradication, control etc.	**C** — Programs to minimise the impact of *P. viticola* may include fungicide applications (Clarke *et al*., 2004) and crop monitoring. Existing control programs for downy mildew and black spot in Western Australia will give control of *P. viticola* (Rawnsley pers. com., 2005).
Domestic trade	**A** — The presence of *P. viticola* in the commercial grapes production areas of Western Australia is estimated to have consequences that are unlikely to be discernible at the regional level and of minor significance at the local level. It is

Criterion	Estimate
	doubtful that there would be any resulting interstate trade restrictions on grapes as *P. viticola* is present in other states.
International trade	**A** — The disease is present within other viticultural regions of Australia and many grape-growing regions of the world (Machowicz-Stefaniak *et al*., 1991; Nair *et al*., 1994). There would be no significant effects on international trade.
Environment	**A** — Additional fungicide applications or other control activities may be required to control the disease on susceptible grape varieties.

Note: Refer to Table 5 (The assessment of local, district, regional and national consequences) and text under the 'Method for assessing consequences' section for details on the method used for consequence assessment.

4.2.8.3 Unrestricted risk estimate

The unrestricted risk estimate is determined by combining the overall 'probability of entry, of establishment and of spread' with the 'consequences' using the risk estimation matrix (Table 1): **Negligible**.

4.2.9 Black widow spider

- *Latrodectus mactans* (Fabricius) [Araneae: Theridiidae] – Black widow spider

Latrodectus mactans is not a plant pest and therefore is not subject to phytosanitary action. Therefore, the methodology described in this IRA for plant pests was not used for this particular risk assessment.

Latrodectus mactans is considered to be potentially associated with table grapes imported from Chile (see Pest Categorisation section) and is recognised as having an impact on human health and potential impacts on the environment. Applications to import this species into Australia (i.e. an importer who actively wanted to bring specimens into Australia) would, if approved, require an Import Permit and containment of the specimens in a high security quarantine facility.

A comprehensive assessment of the association of spiders (including black widow spider) with table grapes, risk mitigation measures and impact on human health is provided in a series of documents produced by the New Zealand Ministry of Agriculture and Forestry and Ministry of Health:

- Pest Risk Assessment of Spiders Associated with Table Grapes from United States of America (State of California), Australia, Mexico and Chile. Ministry of Agriculture and Forestry, Wellington, New Zealand (NZ MAF, 2002b);
- Mitigation Measures for the Management of Risks Posed by Exotic Spiders Entering New Zealand in Association with Imported Table Grapes. Ministry of Agriculture and Forestry, Wellington, New Zealand (NZ MAF, 2002c);
- Towards a Health Impact Assessment Relating to Venomous Spiders Entering New Zealand in Association with Imported Table Grapes: A Discussion Document. Ministry of Health, Wellington, New Zealand (NZ MAF, 2002d); and
- Review of Submissions (to the above 3 documents). September 2002. Ministry of Agriculture and Forestry, Ministry of Health and Department of Conservation (NZ MAF, 2002e).

Based on the potential association of *L. mactans* with table grapes from Chile, the demonstrated ability of other *Latrodectus* species to survive in Australia and the risks identified by the New Zealand Ministry of Agriculture and Forestry and Ministry of Health, it is concluded that the unrestricted risk associated with the species is not acceptable.

4.2.10 Pest Plants

Pest plants are not subject to the phytosanitary methodology described in this IRA for plant pests. The methodology used for pest plant categorisation in this IRA is outlined in Appendix 2A.

Pest plants are regulated under the *Quarantine Act 1908*. Within this Act, the *Quarantine Proclamation 1998* addresses quarantine by including measures that act to prevent or control the introduction, establishment or spread of diseases or pests that will or could cause significant damage to humans, animal, plants, environment or economic activities.

The pest plants outlined in Table 6 are considered to be potentially associated with table grapes imported from Chile (see Pest Categorisation section) and are recognised as having potential impacts on the environment.

Based on the potential association of these pest plants with table grapes from Chile and their potential to establish and spread in Australia, it is concluded that the unrestricted risk associated with these species is not acceptable.

4.3 Risk Assessment Conclusion

Table 8 summarises the detailed risk assessments and provides unrestricted risk estimates for the quarantine pests considered to be associated with table grapes from Chile.

Chilean false red mite, weevils, mealybugs and leafrollers were assessed to have an unrestricted risk estimate of low. Scales and thrips were assessed to have an unrestricted risk of very low. *Phomopsis viticola* was assessed to have an unrestricted risk of negligible.

Ceratitis capitata (Mediterranean fruit fly, Medfly) was assessed to have an unrestricted risk of “moderate”. As indicated in the risk assessment, Medfly is not considered a pest of table grapes in Chile, as it is not established but it has been detected previously and eradicated. Black widow spider and pest plants were assessed to have an unrestricted risk of not acceptable.

The unrestricted risk estimates for some of the quarantine pests exceed Australia’s ALOP. Specific risk management measures are therefore required to be applied to import table grapes from Chile into Australia to adequately address the potential quarantine risks.

Table 8: Unrestricted risk summary

Pest name	Probability of					Overall probability of entry, establishment and spread	Consequences	Unrestricted Risk
	Entry			Establishment	Spread			
	Importation	Distribution	Overall probability of entry					
Chilean false red mite	High	Low	Low	High	Moderate	Low	Moderate	**Low**
Weevils	High	Low	Low	Moderate	Moderate	Low	Moderate	**Low**
Mediterranean fruit fly	Low	Moderate	Low	High	Moderate	Low	High	**Moderate**
Mealybugs	High	Moderate	Moderate	High	High	Moderate	Low	**Low**
Scales	High	Low	Low	High	Moderate	Low	Low	Very low
Leafrollers	Moderate	Moderate	Low	High	High	Low	Moderate	**Low**
Thrips	Low	Moderate	Low	High	High	Low	Low	Very low
Phomopsis viticola	Low	Very low	Very low	High	Moderate	Very low	Low	Negligible
Black widow spider								Not acceptable
Pest plants								Not acceptable

Table 9 provides the final list of quarantine pests of table grapes from Chile that have been assessed to have an unrestricted risk estimate above Australia's ALOP. These pests require the use of risk management measures in addition to standard practices used in the production of commercial table grapes in Chile to meet Australia's ALOP. The risk management measures are described in the following section.

Table 9: Quarantine pests of table grapes from Chile assessed to have unrestricted risk estimates above Australia's ALOP

Pest type	Common name
ARTHROPODS	
Acari (mites)	
Brevipalpus chilensis Baker [Acari: Tenuipalpidae]	Chilean false red mite
Coleoptera (weevils)	
Geniocremnus chiliensis (Boheman) [Coleoptera: Curculionidae]	Tuberous pine weevil
Naupactus xanthographus (Germar) [Coleoptera: Curculionidae]	South American fruit tree weevil
Diptera (flies)	
Ceratitis capitata (Wiedemann) [Diptera: Tephritidae]	Mediterranean fruit fly
Hemiptera (leafhoppers, mealybugs, psyllids, sharpshooters, scales)	
Pseudococcus calceolariae (Maskell) [Hemiptera: Pseudococcidae]	Citrophilus mealybug*
Pseudococcus maritimus (Ehrhorn) [Hemiptera: Pseudococcidae]	Grape mealybug
Lepidoptera (leafrollers, moths, butterflies)	
Accuminulia buscki Brown [Lepidoptera: Tortricidae]	Tortricid leafroller
Accuminulia longiphallus Brown [Lepidoptera: Tortricidae]	Tortricid leafroller
Chileulia stalactitis (Meyrick) [Lepidoptera: Tortricidae]	Grape berry moth
Proeulia auraria (Clarke) [Lepidoptera: Tortricidae]	Chilean fruit tree leafroller
Proeulia chrysopteris (Butler) [Lepidoptera: Tortricidae]	Fruit leafroller
Proeulia triquetra Obraztsov [Lepidoptera: Tortricidae]	Grape leafroller
CONTAMINATING PESTS	
Latrodectus mactans (Fabricius) [Araneae: Theridiidae]	Black widow spider
PEST PLANTS	
Calandrinia compressa Schrad. ex DC. (Portulacaceae)	Parakeelya
Carduus nutans L. (Asteraceae)	Nodding thistle
Carthamus lanatus L. (Asteraceae)	Saffron thistle
Chrysanthemoides monilifera (L.) Norl. (Asteraceae)	Bitou bush
Conium maculatum L. (Apiceae)	Hemlock
Physalis pubescens L. (Solanaceae)	Downy ground cherry
Rubus ulmifolius Schott (Rosaceae)	Blackberry
Senecio spp. (Asteraceae)	Fireweeds, groundsels
Silybum marianum (L.) Gaertn.	Variegated thistle
Sorghum halepense (L.) Pers. (Poaceae)	Johnson grass
Typha spp. (Typhaceae)	Bulrushes

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

5 PEST RISK MANAGEMENT

Pest risk management evaluates and selects options for measures to reduce the risk of entry, establishment or spread of quarantine pests assessed to have an unrestricted risk estimate above Australia's ALOP via the importation of commercially produced table grapes from Chile, i.e. fruit from commercial production sites and subjected to standard cultivation, harvesting and packing activities.

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

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

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

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

Biosecurity Australia considers that the risk management measures described in this document will provide an appropriate level of protection against the pests identified in the risk assessment.

Biosecurity Australia has considered stakeholders comments on the draft and revised draft IRA reports to develop the risk management measures. Biosecurity Australia considers that the risk management measures below are commensurate with the identified risks and the measures form the basis of final import conditions for table grapes from Chile.

Biosecurity Australia regards the measures below to be consistent with measures that are currently in place for the importation of table grapes from New Zealand and from the USA.

5.1 Risk Management Measures and Phytosanitary Procedures

The measures described below form the basis of proposed import conditions for table grapes from Chile. These measures are detailed in the section entitled Import Conditions.

The following measures and phytosanitary procedures are proposed to mitigate the risks identified in the pest risk assessments:

- pest free areas for Mediterranean fruit fly;
- methyl bromide fumigation (either pre-shipment or on-arrival) for Chilean false red mite;
- pre-shipment fumigation with SO_2/CO_2 for black widow spider;
- inspection and remedial action for weevils, mealybugs, leafrollers and pest plants; and
- operational systems for the maintenance and verification of the phytosanitary status of table grapes.

5.1.1 Mediterranean fruit fly

Mediterranean fruit fly (Medfly) has been assessed to have an unrestricted risk estimate of moderate and measures are therefore required to manage this risk.

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

5.1.1.1 Pest free area for Mediterranean fruit fly

SAG has proposed that product for export to Australia would be sourced from Medfly free areas. Chile is considered a “Pest Free Area” for Medfly. The objective of this risk management measure is to ensure that table grapes exported to Australia are not infested with Medfly. SAG will verify maintenance of this status for this pest by routine crop monitoring/surveillance. Technical information justifying Chile’s freedom from Medfly has been provided to Biosecurity Australia by SAG and updates on detections and eradication activities are provided on an on-going basis. SAG must continue to notify Biosecurity Australia of the status of Medfly and any associated detections and eradication activities in Chile. To mitigate the risk of Medfly entering Australia in fruit from outbreak zones in Chile, the export of fruit from outbreak zones must be suspended immediately until area freedom has been re-established by SAG.

The finding of any live or dead Medfly associated with consignments of table grapes from Chile would indicate non-compliance with the pest free area status. If any live or dead Medflies are detected at inspections, the export program to Australia will be suspended until Biosecurity Australia and SAG are satisfied that appropriate corrective action has been taken to re-instate the pest free area status for Medfly or another risk management measure has been developed, and approved, as an alternative.

5.1.2 Chilean false red mite

Chilean false red mite has been assessed to have an unrestricted risk estimate of low and measures are therefore required to manage this risk.

Visual inspection alone is not considered to be an appropriate risk management option as these mites are minute and are not visible to the naked eye. If infested fruit was not detected at inspection, *Brevipalpus chilensis* may enter, establish or spread. Other identified options to manage risks associated with this pest are either the use of disinfestation treatments or by sourcing fruit from pest free areas.

5.1.2.1 Methyl bromide fumigation for Chilean false red mite (either pre-shipment or on-arrival)

SAG has not proposed table grape export areas in Chile as pest free areas for *Brevipalpus chilensis*. Methyl bromide fumigation is considered to be the only feasible measure for this pest to reduce the risk estimate from low to a very low level. Therefore, mandatory fumigation with methyl bromide is proposed for all export shipments in accordance with the relevant AQIS standards. The objective of this risk management measure is to reduce the unrestricted risk estimate to a level below Australia's ALOP.

The proposed fumigation measure may be completed either in Chile under full pre-clearance arrangements or on-arrival in Australia under a partial pre-clearance program. Under a partial pre-clearance program, fumigation on-arrival must occur at the first port of call, with no land bridging of consignments until the goods have cleared quarantine (i.e. the shipments are not released by AQIS until after the successful completion of the treatment).

Fumigation with methyl bromide must be carried out for a duration of 2 hours according to the specifications below:

- 32g/m^3 at a grape pulp temperature of 21ºC or greater;
- 40g/m^3 at a grape pulp temperature of 16ºC or greater but less than 21ºC; or
- 48g/m^3 at a grape pulp temperature of 10ºC or greater but less than 16ºC.

The loading ratio should not exceed 80% of the chamber volume. Fruit is not to be fumigated if the grape pulp temperature is less than 10ºC.

5.1.3 Black widow spider

The black widow spider (BWS) is not a plant pest and therefore <u>phytosanitary</u> measures cannot be applied against them. However, spiders have been assessed to have an unacceptable unrestricted risk estimate and <u>sanitary</u> measures are therefore required to manage that risk. Visual inspection alone is not considered to be an appropriate risk management option in view of the health risks for inspectors and the cryptic habit of individual spiders (which may conceal themselves in the carton rather than the inspected bunch). If infested fruit was not detected at inspection, these spiders may enter, establish or spread in Australia. Other identified options to manage risks associated with spiders are either the use of disinfestation treatments or by sourcing fruit from pest free areas.

5.1.3.1 Pre-shipment fumigation with SO_2/CO_2 for black widow spider

SAG has not proposed table grape export areas in Chile as pest free areas for BWS. Treatment by pre-export fumigation with SO_2/CO_2 is considered appropriate to reduce the risk estimate to an acceptable level. The efficacy of the SO_2/CO_2 treatment against BWS is reported as 92% under best conditions (quoted in NZ MAF, 2002b) and 87-99% depending on the packaging used (quoted in NZ MAF, 2002e). Efficacy of the treatment against juveniles and eggs sacs of BWS is unknown (quoted in NZ MAF, 2002e). Methyl bromide fumigation as a stand-alone treatment at the proposed dosages for mites is reported as not killing BWS. Higher methyl bromide dosage rates (e.g. 80g/m^3) would be required to kill BWS (quoted in NZ MAF, 2002c). However, it is considered that the combination of pre-export SO_2/CO_2 treatment and pre-export or on-arrival methyl bromide treatment would provide acceptable fatality rates of BWS. This treatment combination currently applies to table grapes imported into Australia from California. There have been no rejections of Californian table grapes in Australia due to live interceptions of BWS.

Therefore, it is proposed that all shipments undergo normal commercial pre-export fumigation with a mixture of sulphur dioxide and carbon dioxide (SO_2/CO_2). The objective of this risk management measure is to reduce the survival of any BWS associated with packed table grapes or packaging. Under the proposed fumigation arrangement, the palletised table grapes would be treated with a mixture of 1% sulphur dioxide and 6% carbon dioxide for a minimum of 30 minutes.

5.1.4 Weevils, mealybugs, leafrollers and pest plants

Weevils, mealybugs and leafrollers have been assessed to have an unrestricted risk estimate of low and measures are therefore required to manage this risk. Pest plants have been assessed to have an unrestricted risk estimate of unacceptable and measures are therefore required to manage this risk.

5.1.4.1 Inspection and remedial action

Visual inspection would involve the examination of a sample of table grapes to detect the presence of the weevils, mealybugs, leafrollers and pest plants. Remedial action when pests are present is proposed as an appropriate risk management option for these pests, given trained inspectors can readily detect these pests.

The objective of this measure is to ensure that consignments of table grapes from Chile infested with these pests can be readily identified and subjected to appropriate remedial action. This measure is considered to reduce the risk associated with weevils, mealybugs, leafrollers and pest plants to very low level to meet Australia's ALOP.

In response to the release of the draft IRA report, several stakeholders questioned the proposed mandatory fumigation of table grapes for leafrollers and weevils, as outlined in the draft IRA report. The draft IRA report had determined that visual inspection alone was not considered to be an appropriate risk management option in view of the level of risk identified and because clear visual external signs of infestation (particularly in recently infested bunches of grapes) may not be present.

Biosecurity Australia reassessed the risk for weevils and reduced the unrestricted risk estimate for this group from moderate in the draft IRA report to low in the revised draft IRA report. In view of the unrestricted risk estimate of low for both weevils and leafrollers, and comments from stakeholders regarding the efficacy of phytosanitary inspection as a risk mitigation measure for these groups, it is recommended that these groups not require mandatory methyl bromide fumigation.

5.1.5 Operational systems for the 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 table grapes from Chile is maintained and verified during the process of production and export to Australia. Biosecurity Australia proposes a system that is consistent with and equivalent to the systems currently in place for the importation of table grapes from California and New Zealand. Details of this system, or of an equivalent one, will be determined by agreement with SAG.

The system is based on either full or partial pre-clearance arrangements. Precedents to date indicate that advantages of the partial pre-clearance option include: i) fumigation can be undertaken on-arrival in Australia, and ii) following phytosanitary inspection in Chile, any consignments that may be found with quarantine pests risks that are not managed by methyl bromide fumigation, are not exported from Chile.

The proposed system of operational procedures for the production and export of table grapes from Chile to Australia would include:

- registration of vineyards and fumigation facilities;
- packaging and labelling compliance;
- specific conditions for storage and movement of produce;
- phytosanitary inspection by SAG and remedial action;
- pre-clearance phytosanitary inspection by AQIS;
- phytosanitary certification by SAG; and
- on-arrival document compliance examination by AQIS.

5.1.5.1 Registration of vineyards and fumigation facilities

All table grapes for export must be sourced only from registered export vineyards. Copies of the registration records must be available for audit by AQIS if requested. SAG is required to register all export vineyards and export fumigation facilities prior to the commencement of exports. Facilities for SO_2/CO_2 fumigation in Chile are required to comply with SAG standards for export grade facilities. Facilities for methyl bromide fumigation in Australia and Chile are to comply with or be equivalent to the relevant AQIS standards.

The objective of this procedure is to ensure that vineyards and fumigation facilities from which table grapes are sourced can be identified. This is to allow trace back to individual vineyards and fumigation facilities in the event of non-compliance and for audit (of fumigation facilities). For example, if live pests are intercepted on fumigated product, the ability to identify a specific fumigation facility allows the investigation and corrective action to be targeted rather than applying to all possible facilities.

5.1.5.2 Packaging and labelling

All table grapes for export must be found free from regulated articles[4] (including trash and pest plant seeds of quarantine concern to Australia). Table grapes must be packed in a way that is demonstrated to allow efficacious treatment with SO_2/CO_2 and subsequently with methyl bromide. No unprocessed packing material of plant origin will be allowed. All wood material used in packaging of table grapes must comply with the AQIS conditions, as set out in "Cargo containers: quarantine aspects and procedures" (AQIS, 1996).

All boxes must be labelled with the vineyard registration number and boxes/pallets with the fumigation facility number. 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 vineyards.

The exporter/freight forwarder must complete a Notice of Intention to Export (NOI) prior to any pre-clearance. The NOI will describe the pallets (by pallet card number or other method approved by AQIS) that the exporter wants included in the inspection lot. The NOI must be presented to the AQIS pre-clearance officer prior to inspection, and will be signed/stamped by AQIS as a record of inspection and the precleared status of the produce.

The objectives of this procedure are to ensure that:

- The table grapes exported to Australia are not contaminated by quarantine pest plants or regulated articles (which may vector pests identified as not on the pathway and pests not known to be associated with table grapes);
- Unprocessed packing material (which may vector pests identified as not on the pathway and pests not known to be associated with table grapes) is not imported with the table grapes;
- The table grapes are packaged in such a way as to allow effective application of the required chemical treatments (SO_2/CO_2 and methyl bromide); and
- The packaged table grapes are labelled in such a way as to identify the vineyard and fumigation facility and whether they have been pre-cleared.

5.1.5.3 Specific conditions for storage and movement of produce

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

Product for export to Australia that has been inspected and certified by SAG 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.

SAG, in consultation with Biosecurity Australia/AQIS, is to develop arrangements for secure storage and movement of produce.

[4] The IPPC defines a regulated article as "any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved".

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

5.1.5.4 Phytosanitary inspection by SAG and remedial action

SAG will inspect all consignments in accordance with official procedures for all visually detectable quarantine pests and regulated articles (including trash and pest plant seeds of quarantine concern to Australia). Sample rates must achieve a confidence level of 95% that not more than 0.5% of the units in the consignment are infested/infected. This equates to a level of zero units infested by quarantine pests in a random sample size of 600 units from the homogenous lot in the consignment[5]. The 600-unit sample must be selected randomly from every lot[6] in the consignment.

Detection of live quarantine pests or regulated articles will result in failure of the consignment. If a consignment fails inspection by SAG, the exporter will be given the option of treatment and re-inspection of the consignment or removal of the consignment from the export pathway.

Records of the interceptions made during these inspections (live or dead quarantine pests, and regulated articles) are to be maintained by SAG 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.

5.1.5.5 Pre-clearance phytosanitary inspection by AQIS

After receipt of a Notice of Intention to Export (NOI), AQIS will inspect consignments in accordance with official procedures for all visually detectable quarantine pests and regulated articles (including trash and pest plant seeds of quarantine concern to Australia). Sample rates must achieve a 95% confidence level that not more than 0.5% of the units (grape bunches) in the consignment are infested. This equates to a level of zero units infested by quarantine pests in a random sample size of 600 units from the homogenous lots in the consignment. The 600-unit sample must be selected randomly from every lot in the consignment. The detection of live quarantine pests or regulated articles will result in the failure of a consignment.

The objective of this procedure is to ensure that table grapes exported to Australia do not contain quarantine pests or regulated articles, comply with packing and labelling requirements, and have undergone SO_2/CO_2 treatment and methyl bromide fumigation (if off-shore methyl bromide fumigation option has been undertaken).

Records of the interceptions made during these inspections (live or dead quarantine pests, and regulated articles) are to be provided to SAG 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.

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5 A consignment is the number of boxes of table grapes from shipment from Chile to Australia covered by one phytosanitary certificate.

6 An inspection lot is the number of boxes presented for a single phytosanitary inspection.

5.1.5.6 Phytosanitary certification by SAG

SAG will issue a phytosanitary certificate for each consignment after completion of the pre-export fumigation treatments (as appropriate) and pre-export phytosanitary inspection. The objective of this procedure is to provide formal documentation to AQIS verifying that the relevant measures have been undertaken offshore. Each phytosanitary certificate is to contain the following information:

Additional declarations:

"The grapes in this consignment have been produced in Chile in accordance with the conditions governing entry of fresh table grapes to Australia and inspected and found free of quarantine pests"

"AQIS pre-clearance inspection undertaken in Chile in accordance with the Work Plan for the Pre-clearance of Chilean Table Grapes to Australia <insert date>*"*

consistent with International Standards for Phytosanitary Measures No. 7 *Export Certification Systems* (FAO, 1997).

Note: The Work Plan will be developed between AQIS and SAG following the finalisation of this IRA.

5.1.5.7 On-arrival quarantine clearance by AQIS

Consignments inspected by AQIS under pre-clearance arrangements do not require on-arrival inspection by AQIS in Australia. AQIS will undertake a documentation compliance examination for consignment verification purposes prior to release of the consignment from quarantine. However, for consignments that undergo on-arrival methyl bromide fumigation, AQIS may, in addition, perform monitoring inspections using the AQIS standard sampling plan. No land bridging of goods will be permitted unless goods have cleared quarantine.

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

5.2 Action for non-complying lots

Where inspection lots are found to be non-compliant with requirements, then remedial action must be taken as outlined at the beginning of this section. If product continually fails inspection, Biosecurity Australia/AQIS reserves the right to suspend the export program and conduct an audit of the table grape risk management systems in Chile. The program will recommence only after Biosecurity Australia/AQIS is satisfied that appropriate corrective action has been taken.

5.3 Uncategorised Pests

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

6 IMPORT CONDITIONS

The import conditions described below are based on the conclusions of the pest risk analysis contained in this final IRA report. Specifically, these conditions reflect the proposed risk management measures in the previous section.

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

- Registration of vineyards and fumigation facilities (5.1.5.1)
- 'Pest Free Area' for Mediterranean fruit fly (5.1.1.1)
- Notice of Intention to Export (5.1.5.2)
- Packing and labelling (5.1.5.2)
- Storage (5.1.5.3)
- Pre-export fumigation with SO_2/CO_2 (5.1.3.1)
- Phytosanitary inspection by SAG (5.1.5.4)
- Fumigation with methyl bromide (5.1.2.1)
- Pre-clearance phytosanitary inspection by AQIS (5.1.5.5)
- Phytosanitary certification (5.1.5.6)
- On-arrival quarantine clearance by AQIS (5.1.5.7)
- Western Australia
- Review of policy

6.1 Registration of Vineyards and Fumigation Facilities

All table grapes for export must be sourced only from registered export vineyards. Servicio Agricola y Ganadero (SAG) is required to register all export vineyards and export fumigation facilities prior to commencement of exports to enable trace back in the event of non-compliance. Facilities for SO_2/CO_2 fumigation in Chile are required to comply with SAG standards for export grade facilities. Facilities for methyl bromide fumigation in Australia and Chile are to comply with, or be equivalent to, the relevant AQIS standards. Copies of the registration records for SO_2/CO_2 and methyl bromide treatment facilities in Chile must be provided to AQIS.

6.2 Pest Free Area for Mediterranean Fruit Fly

Chile is considered a "Pest Free Area" for Mediterranean fruit fly (Medfly). Technical information justifying Chile's freedom from Medfly has been provided to Biosecurity Australia by SAG in the past and updates on detections and eradication activities are provided on an on-going basis. Biosecurity Australia must continue to be notified of the status of Mediterranean fruit fly and any associated detections and eradication activities in Chile. To mitigate the risk of Medfly entering Australia in fruit from outbreak zones in Chile, the export of fruit from outbreak zones must be suspended immediately until area freedom has been re-established by SAG.

If any live or dead Mediterranean fruit flies are detected at inspection, the export program to Australia will be suspended until Biosecurity Australia/AQIS and SAG are satisfied that appropriate corrective action has been taken to reinstate the pest free area status or another risk management measure has been developed and approved by Biosecurity Australia.

6.3 Notice of Intention to Export

A Notice of Intention to Export (NOI) will be the primary document that confirms pre-clearance of Chilean table grape shipments. The NOI must be presented to the AQIS pre-clearance officer prior to inspection, and will be signed/stamped by AQIS as a record of inspection and the precleared status of the produce.

The exporter/freight forwarder must complete an NOI prior to any pre-clearance inspection. The NOI will describe the pallets (by pallet card number or other method approved by AQIS) that the exporter wants included in the inspection lot[7].

Participants are to keep appropriate records to enable trace back of product from the NOI issued, through the packinghouse (including pallet identification) to each supplying grower.

If the lot passes AQIS phytosanitary inspection, the AQIS officer will sign and stamp the NOI. The original document is to be retained by the AQIS officer and copies provided to SAG and the participant. Other copies specific to each consignment must be marked to identify which pallets from the original inspection lot are included in a consignment. Such copies will be attached to the appropriate phytosanitary certificate accompanying each specific consignment. Participants[8] may use copies of the NOI as inventory worksheets.

6.4 Packing and Labelling

All table grapes for export to Australia must be found free from regulated articles. Table grapes must be packed in a way that is demonstrated to allow efficacious treatment with SO_2/CO_2 and methyl bromide. No unprocessed packing material of plant origin will be allowed. All wood packing material used in packaging of table grapes must comply with the conditions stipulated in “Cargo containers: quarantine aspects and procedures” (AQIS, 1996) and as contained in the AQIS ICON database.

Perforated transparent polyvinyl bags within Toyon Kraft Veneer (TKV) boxes (that is, boxes with processed wood ends and sides made of Kraft paper) or plastic boxes are currently accepted for the import of table grapes into Australia from California. Biosecurity Australia/AQIS is willing to consider other forms of packaging subject to efficacy data for SO_2/CO_2 and methyl bromide treatment being provided by SAG.

Packaging material includes export cartons/boxes, plastic bags within which individual grape bunches are contained within the export carton/box, any plastic or paper used to line export cartons/boxes, any pallets upon which the cartons/boxes are stacked, and any strapping or other materials associated with the export pallet. All packaging (except pallets) must be new.

[7] A lot is the quantity of units (bunches) of grapes identifiable by its homogeneity of composition, for example source vineyard or fumigation facility. A lot may form part of a consignment, or comprise the entire consignment

[8] A “participant” is any treatment facility or other entity that is registered by SAG for the purpose of the export of Chilean table grapes to Australia.

All boxes must be labelled with the vineyard registration number and boxes/pallets with the fumigation facility number. Box stamping requirements will only be necessary for consignments consisting of individual boxes that will not be palletised, and not for complete pallets. Procedures will be developed by AQIS to deal with missing box stamps on a case-by-case basis.

Stacking of boxes on pallets must be done in such as way as to facilitate permeation and diffusion of fumigant through the entire pallet. The pallets should be securely strapped only after phytosanitary inspection has been carried out following post-harvest treatment.

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 vineyards.

Pallet cards must be securely fastened to the pallet in order to withstand handling at the ports of export/import. If pallet cards are not affixed or cannot be located on arrival in Australia the pallet will not be considered pre-cleared. Additionally, any unpalletised boxes that have not been marked with the pallet number will be considered not to be pre-cleared.

6.5 Storage

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

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

Product that has been pre-cleared by AQIS must be maintained in secure conditions segregated from rejected lots, non-inspected table grapes and other fruit.

The product must be segregated in such a way as to ensure that product is not mixed with fruit for export to other destinations or is not reinfested. Segregation of 1 metre in all directions under ambient temperature storage conditions or a minimum of 100 mm in all directions in a cool storage environment is currently accepted for the import of table grapes into Australia from California.

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

6.6 Pre-shipment fumigation with SO_2/CO_2

All export shipments must undergo mandatory pre-shipment fumigation with a mixture of sulphur dioxide and carbon dioxide (SO_2/CO_2). The palletised table grapes must be treated with a mixture of 1% sulphur dioxide and 6% carbon dioxide for a minimum of 30 minutes.

All packaging material shall be subjected to SO_2/CO_2 fumigation under the same conditions prescribed for export table grapes and subjected to post fumigation security measures necessary to prevent infestation with spiders of concern or subject to such security measures necessary to prevent infestation with spiders of concern from the time of manufacture until the time of export.

SAG is to supervise the SO_2/CO_2 fumigation treatments. AQIS may direct SAG to suspend a fumigation facility should live spiders of concern be detected during inspections. The suspended facility may be reinstated following favourable results of an investigation conducted by SAG/AQIS.

6.7 Fumigation with Methyl Bromide

All export shipments must undergo mandatory fumigation with methyl bromide in accordance with, or equivalent to, the relevant AQIS standards. The fumigation may be conducted either pre-export in Chile or on-arrival in Australia.

Fumigation on-arrival must occur at the first port of call. No land bridging of consignments will be permitted unless the goods have cleared quarantine. For on-arrival treatments, the shipments are not released by AQIS until after the successful completion of the treatment.

Fumigation with methyl bromide must be carried out for a duration of 2 hours according to the specifications below:

- $32g/m^3$ at a grape pulp temperature of 21ºC or greater;
- $40g/m^3$ at a grape pulp temperature of 16ºC or greater but less than 21ºC;
- $48g/m^3$ at a grape pulp temperature of 10ºC or greater but less than 16ºC.

The loading ratio should not exceed 80% of the chamber volume. Fruit is not to be fumigated if the grape pulp temperature is less than 10ºC. An AQIS-supervised fumigation treatment in Australia will typically not require a follow up inspection.

An AQIS inspector will monitor all fumigation treatments in Australia and in Chile where pre-export fumigation is conducted. AQIS may direct SAG to suspend a fumigation facility should live quarantine pests be detected during inspection of consignments that have been fumigated with methyl bromide. The suspended facility may be reinstated following favourable results of an investigation conducted by SAG/AQIS.

Fumigation facilities will ensure that they have systems in place that will assure that treated and untreated product is identified and segregated at all times while at the facility.

6.8 Phytosanitary Inspection by SAG and Remedial Action

SAG will inspect all consignments in accordance with AQIS procedures for all visually detectable quarantine pests and other regulated articles[9] (including trash and pest plant seeds of quarantine concern to Australia). The AQIS sampling protocol requires inspection of 600 units (grape bunches) for quarantine pests, in systematically selected random samples per homogeneous consignment[10] or lot[11]. Biometrically, if no pests are detected by the inspection, this sample size achieves a confidence level of 95% that not more than

[9] The IPPC defines a regulated article as “any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harbouring or spreading pests, deemed to require phytosanitary measures, particularly where international transportation is involved”.

[10] A consignment is the number of boxes of table grapes for shipment from Chile to Australia covered by one phytosanitary certificate.

[11] An inspection lot is the number of boxes presented for a single phytosanitary inspection.

0.5% of the units in the consignment are infested/infected. The level of confidence depends on each fruit in the consignment having about the same likelihood of being affected by a quarantine pest and the inspection technique being able to reliably detect all quarantine pests in the sample. For table grapes, AQIS defines a unit as one bunch.

The detection of live quarantine pests or regulated articles during an inspection will result in the failure of the inspection lot. Remedial action may then be taken. Action may include:

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

The export program to Australia will be suspended if any live Mediterranean fruit flies are detected in the consignments, until Biosecurity Australia and SAG are satisfied that appropriate corrective action has been taken.

Records of the interceptions made during these inspections (live quarantine pests and regulated articles) must be maintained by SAG 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.

6.9 Pre-clearance Phytosanitary Inspection by AQIS

AQIS will inspect all consignments in accordance with the official procedures for all visually detectable quarantine pests and regulated articles (including trash and pest plant seeds of quarantine concern to Australia). Sample rates must achieve a 95% confidence level that not more than 0.5% of the units (grape bunches) in the consignment are infested. This equates to a level of zero units infested by quarantine pests in a random sample size of 600 units from the homogenous lots in the consignment. The 600 unit sample must be selected randomly from every lot in the consignment. The detection of live quarantine pests or regulated articles will result in the failure of a consignment.

Records of the interceptions made during these inspections (live or dead arthropod pests, pest plant seeds and trash) are to be maintained by AQIS. This information will assist in future reviews of this import pathway and consideration of the appropriateness of the phytosanitary measures.

For consignments that are to undergo pre-export SO_2/CO_2 and methyl bromide treatments, the inspection is to be conducted after both treatments have been conducted.

For consignments that are to undergo pre-export SO_2/CO_2 treatment and on-arrival methyl bromide fumigation, the inspection is to be conducted after the SO_2/CO_2 fumigation treatment has been conducted.

Participants are to remove pallets/packages from cool-stores as directed by AQIS. This will be on a random basis so all pallets in the lot must be in the one place and accessible at the time of inspection. AQIS will undertake pre-clearance inspection of lots submitted by participants. Participants are to reassemble pallets immediately after completion of pre-clearance inspection. For the purposes of pre-clearance inspections, fumigation lots conducted within a 36-hour period may be combined into one inspection lot if consistent treatment procedures are followed from the same treatment facility.

Sufficient cartons/boxes will be selected at random from the nominated lot to ensure a 600 bunch inspection can be completed. The number of cartons/boxes inspected to obtain the 600 bunches will be recorded.

Inspection will require that each bunch be individually examined. Limited destructive sampling may be required to break open tight bunches. The full 600 bunches selected for inspection will be completed regardless of whether any detections are found earlier in the inspection.

All fruit will be removed from each selected carton/box and the empty carton/box examined for quarantine pests and regulated articles. The detection of live quarantine pests or regulated articles during an inspection will result in the failure of the inspection lot. Remedial action may then be taken. Action may include:

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

Lots that fail inspection must be clearly identified with a label indicating that the lot is rejected for export to Australia. Rejected product must be segregated from other table grapes that are either awaiting inspection or have passed inspection. Product rejected for Australian quarantine purposes is not eligible for export to Australia.

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

6.10 Phytosanitary Certification by SAG

SAG will issue an International Phytosanitary Certificate (IPC) for each consignment upon completion of pre-export fumigation treatment(s) and phytosanitary inspection, containing the following information:

Additional declarations

- *“The grapes in this consignment have been produced in Chile in accordance with the conditions governing entry of fresh table grapes to Australia and inspected and found free of quarantine pests”*.
- *“AQIS pre-clearance inspection undertaken in Chile in accordance with the Work Plan for the Pre-clearance of Chilean Table Grapes to Australia <insert date>”*

Note: The Work Plan will be developed between AQIS and SAG following the finalisation of this IRA.

Distinguishing marks

- The pallet card numbers, container numbers, aircraft flight number (where known) and seal numbers (for sea freight).

Treatments

- Details of pre-export fumigation treatments conducted (dosage, duration, grape pulp temperature, date).
- The fumigation facility number (for the SO_2/CO_2 treatment facility and the methyl bromide fumigation facility).

6.11 On-arrival Quarantine Clearance by AQIS

On arrival, the documentation for each consignment will be examined by AQIS for consignment verification purposes at the port of entry in Australia prior to release from quarantine. However, for consignments that undergo on-arrival methyl bromide fumigation, AQIS may, in addition, perform monitoring inspections as appropriate.

6.11.1 Documentation errors

Any ‘consignment’ with incomplete documentation, or where certification does not conform to specifications, or seals on the containers are damaged or missing, will be held pending clarification by SAG and determination by AQIS, with the options of re-export or destruction. SAG will be notified immediately by AQIS of any such problems.

6.12 Western Australia

State legislation in Western Australia currently prohibits the importation of fresh table grapes from any source, including other Australian States and Territories. Biosecurity Australia considers that the risk management measures proposed in this IRA report appropriately manage the risks associated with the importation of table grapes from Chile into all States and Territories of Australia. However, the Western Australian State legislation requires modification before imports into that State can occur.

6.13 Audit of Protocol

During the first season of trade, an officer from Biosecurity Australia and/or an officer from AQIS will visit areas in Chile designated for export of table grapes to Australia in order to audit the operation of the protocol including registration and operational procedures.

6.14 Review of Policy

This policy will be reviewed at the end of the first year of export of table grapes from Chile to Australia and in the event of new outbreaks in Chile of pests of concern to Australia.

7 CONCLUSIONS

The findings of this final IRA report are based on a comprehensive analysis of relevant scientific literature and existing import requirements for table grapes into Australia.

Biosecurity Australia considers that the proposed risk management measures and proposed import conditions in this final IRA report will provide an appropriate level of protection against the pests identified in the risk assessment.

In the course of preparing the final IRA report, Biosecurity Australia received and considered stakeholder comments on the revised draft IRA report. An overview of stakeholder comments and a list of those who commented are included in the final IRA report. Biosecurity Australia has considered all scientific issues raised in the submissions of stakeholders and material matters raised have been incorporated into, or addressed in, this final IRA report.

8 FURTHER STEPS IN THE IMPORT RISK ANALYSIS PROCESS[12]

The IRA process requires that the following steps be followed for the implementation of import policy:

- A thirty day appeal period commencing from the release date of the final IRA report (appeals will be considered if there was a significant deviation from the process as set out in the IRA Handbook that adversely affected the interests of a stakeholder or a significant body of scientific evidence relevant to the outcome of the IRA was not considered);
- Consideration of any appeals;
- If no appeals, or if appeals are rejected, the recommended policy will be submitted to the Director of Animal and Plant Quarantine who will make the final policy determination; and
- Biosecurity Australia will notify registered stakeholders, SAG and the WTO of the final policy determination.

[12] The process described here is the new process as outlined in Biosecurity Australia's *Import Risk Analysis Handbook* 2003.

9 STAKEHOLDER COMMENTS ON THE REVISED DRAFT IRA REPORT

Biosecurity Australia has received comments on the revised draft IRA report for table grapes from Chile from ten stakeholders, namely

	Organisation	Representative	Date received
1	Department of Agriculture - Western Australia	Shashi Sharma - Program Manager, Plant Health	19 May 2005
2	Department of Primary Industries - New South Wales	B.D. Buffier – Director General	16 June 2005
3	Department of Primary Industries - Victoria	Peter Bailey - Biodiversity Victoria	6 April 2005
4	Department of Primary Industries and Fisheries - Queensland	Jim Varghese - Director General	13 April 2005
5	Department of Primary Industries, Water and Environment - Tasmania	Andrew Bishop - Biosecurity Policy Group	6 April 2005
6	Food Standards Australia New Zealand	Kent Brown - A/g General Manager, Food Safety and Services	13 April 2005
7	Grape Growers Association of Western Australia (Inc.)	Kim Taylor - President	17 April 2005
8	Servicio Agricola y Ganadero - Chile	Marcos Beeche Cisternas - Manager, Division of Agriculture Protection	25 April 2005
9	South West Table Grape Growers Association (Inc.)	Allan Price - President	10 April 2005
10	Wine Industry Association - Western Australia	Sue Vidovich	11 April 2005

Comments were received relating to a number of pests and their categorisation, including regional freedom status, the methodology used in this IRA and the results of the risk ratings attributed to certain pests. Of particular significance were comments relating to the pathogen *Phomopsis viticola,* which does not occur in Western Australia.

These comments have been carefully considered in the preparation of the final IRA report, and Biosecurity Australia would like to thank all those who provided comments, as these assist in ensuring that the risk assessment process is technically accurate and rigorous.

Detailed responses to these comments have been prepared and are available on the public file held by Biosecurity Australia.

10 REFERENCES

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APPENDIX 1: PEST CATEGORISATION

1A Pest categorisation for table grapes from Chile - presence or absence in Australia

1B Pest categorisation for table grapes from Chile – association with table grape bunches

1C Potential for establishment or spread and consequences

Appendix 1A: Pest categorisation for table grapes from Chile – Presence or absence in Australia (arthropods and pathogens)

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
ARTHROPODS				
Acari (mites)				
Brevipalpus chilensis Baker [Acari: Tenuipalpidae]	False red mite	Klein Koch & Waterhouse, 2000		Yes
Brevipalpus obovatus Donnadieu [Acari: Tenuipalpidae]	Privet mite	Klein Koch & Waterhouse, 2000	Halliday, 1998	No
Bryobia praetiosa Koch [Acari: Tetranychidae]	Tetranychid mite	Bolland *et al*., 1998	Halliday, 1998	No
Bryobia rubrioculus (Sheuten) [Acari: Tetranychidae]	Brown almond mite	Klein Koch & Waterhouse, 2000	Halliday, 1998	No
Colomerus vitis (Pagenstecher) [Acari: Eriophyidae] strain a	Grape erineum mite; grape leaf blister mite	Gonzalez, 1983	James & Whitney, 1993	No
Colomerus vitis (Pagenstecher) [Acari: Eriophyidae] strain b	Grape bud mite	Gonzalez, 1983	James & Whitney, 1993	No
Eotetranychus lewisi (McGregor) [Acari: Tetranychidae]	Lewis spider mite	Klein Koch & Waterhouse, 2000		Yes
Oligonychus punicae (Hirst) [Acari: Tetranychidae]	Avocado brown mite	Bolland *et al*., 1998	AICN, 2004 (except WA)	Yes
Oligonychus vitis Zaher & Shehata [Acari: Tetranychidae]	Table grape red mite	Klein Koch & Waterhouse, 2000		Yes
Oligonychus yothersi McGregor [Acari: Tetranychidae]	Avocado red mite	Bolland *et al*., 1998		Yes
Panonychus citri McGregor [Acari: Tetranychidae]	Citrus red mite	Bolland *et al*., 1998	AICN, 2004 (except WA)	Yes
Panonychus ulmi (Koch) [Acari: Tetranychidae]	European red mite	Gonzalez, 1983	AICN, 2004; Learmonth, 2005	No
Petrobia latens (Muller) [Acari: Tetranychidae]	Tetranychid mite	Bolland *et al*., 1998	Halliday, 1998	No
Tetranychus desertorum Banks [Acari: Tetranychidae]	Tetranychid mite	Prado, 1991	AICN, 2004 (except WA)	Yes
Tetranychus ludeni Zacher [Acari: Tetranychidae]	Red spider mite	Prado, 1991	Halliday, 1998	No
Tetranychus urticae Koch [Acari: Tetranychidae]	Two spotted spider mite	Klein Koch & Waterhouse, 2000	Halliday, 1998	No
Coleoptera (beetles, weevils)				
Athlia rustica (Erichson) [Coleoptera: Scarabaeidae]	Brown beetle	Klein Koch & Waterhouse, 2000		Yes
Callideriphus laetus Bl. [Coleoptera: Cerambycidae]	Peumo borer	Klein Koch & Waterhouse, 2000		Yes

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Carpophilus hemipterus (Linnaeus) [Coleoptera: Nitidulidae]	Dried fruit beetle	Klein Koch & Waterhouse, 2000	James *et al*., 2000	No
Dexicrates robustus (Blanchard) [Coleoptera: Bostrichidae]	Tree wood borer	Klein Koch & Waterhouse, 2000		Yes
Geniocremnus chilensis (Boheman) [Coleoptera: Curculionidae]	Tuberous pine weevil	Klein Koch & Waterhouse, 2000		Yes
Micrapate humeralis (Blanchard) [Coleoptera: Bostrichidae]	Mesquite borer	Klein Koch & Waterhouse, 2000		Yes
Micrapate scabrata (Erichson) [Coleoptera: Bostrichidae]	Vine borer	Klein Koch & Waterhouse, 2000		Yes
Naupactus xanthographus (Germar) [Coleoptera: Curculionidae]	Fruit tree weevil	Klein Koch & Waterhouse, 2000		Yes
Neoterius mystax (Blanchard) [Coleoptera: Bostrichidae]	Fence borer	Klein Koch & Waterhouse, 2000		Yes
Otiorhynchus rugosostriatus (Goeze) [Coleoptera: Curculionidae]	Rough strawberry root weevil	Wibmer & O'Brien, 1986; Devotto & Gerding, 2001	Restricted to Tasmania (Miller, 1979)	Yes
Otiorhynchus sulcatus (Fabricius) [Coleoptera: Curculionidae]	Black vine weevil	Prado, 1988	AICN, 2004 (except WA)	Yes
Pantomorus ruizi (Brèthes) [Coleoptera: Curculionidae]	Alfalfa root weevil	Klein Koch & Waterhouse, 2000		Yes
Platyapistes venustus (Erichson) [Coleoptera: Curculionidae]	Green weevil	Gonzalez, 1983		Yes
Diptera (flies)				
Ceratitis capitata (Wiedemann) [Diptera: Tephritidae]	Mediterranean fruit fly; Medfly	Prado, 1991	WA only (Hancock *et al.*, 2000) - Under official control)	Yes
Drosophila melanogaster Sturtevant [Diptera: Drosophilidae]	Vinegar fly	Klein Koch & Waterhouse, 2000	Olsen *et al*., 2001	No
Drosophila simulans Sturtevant [Diptera: Drosophilidae]	Vinegar fly	CABI, 2004	Hoffmann, 1991	No
Hemiptera (aphids, leafhoppers, mealybugs, scales, true bugs, whiteflies)				
Aphis fabae Scopoli [Hemiptera: Aphididae]	Black aphid	Klein Koch & Waterhouse, 2000		Yes
Aphis gossypii Glover [Hemiptera: Aphididae]	Cotton aphid	Gonzalez, 1983	APPD, 2004	No
Aphis illinoisensis Shimer [Hemiptera: Aphididae]	Grapevine aphid	Klein Koch & Waterhouse, 2000		Yes
Aphis spiraecola Patch [Hemiptera: Aphididae]	Brown citrus aphid	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Aspidiotus nerii Bouché [Hemiptera: Diaspididae]	Aucuba scale	Klein Koch & Waterhouse, 2000	AICN, 2004	No
Balclutha aridula (Linnavuori) [Hemiptera: Cicadellidae]	Ballica leafhopper	Klein Koch & Waterhouse, 2000		Yes

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Coccus hesperidum Linnaeus [Hemiptera: Coccidae]	Brown scale	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Diaspidiotus ancylus (Putnam) [Hemiptera: Diaspididae]	Putnam scale	Klein Koch & Waterhouse, 2000	AICN, 2004 (except WA)	Yes
Diaspidiotus perniciosus (Comstock) [Hemiptera: Diaspididae]	San Jose scale	Klein Koch & Waterhouse, 2000	AICN, 2004	No
Hemiberlesia lataniae (Signoret) [Hemiptera: Diaspididae]	Lataniae scale	Klein Koch & Waterhouse, 2000	AICN, 2004	No
Hemiberlesia rapax (Comstock) Hemiptera: Diaspididae]	Greedy Scale	Klein Koch & Waterhouse, 2000	AICN, 2004	No
Icerya palmeri Riley-How [Hemiptera: Margarodidae]	Margarodes scale	Prado, 1991		Yes
Leptoglossus chilensis Spinola [Hemiptera: Coreidae]	Brown Chilean leaf-footed bug	Klein Koch & Waterhouse, 2000		Yes
Macrosiphum euphorbiae (Thomas) [Hemiptera: Aphididae]	Potato aphid	CABI, 2004	Dillard *et al*., 1993	No
Margarodes vitis (Philippi) [Hemiptera: Margarodidae]	Grape pearl	Klein Koch & Waterhouse, 2000		Yes
Nezara viridula (Linnaeus) [Hemiptera: Aphididae]	Green vegetable bug	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Parthenolecanium corni (Bouché) [Hemiptera: Coccidae]	European fruit scale	Klein Koch & Waterhouse, 2000	AICN, 2004 (except WA)	Yes
Parthenolecanium persicae (Fabricius) [Hemiptera: Coccidae]	Peach scale	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Planococcus citri (Risso) [Hemiptera: Pseudococccidae]	Citrus mealybug	Klein Koch & Waterhouse, 2000	Gullan, 2000	No
Pseudococcus calceolariae (Maskell) [Hemiptera: Pseudococccidae]	Citrophilus mealybug	Prado, 1991	AICN, 2004 (except WA)	Yes
Pseudococcus longispinus Targioni-Tozzetti [Hemiptera: Pseudococccidae]	Long-tailed mealybug	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Pseudococcus maritimus (Ehrhorn) [Hemiptera: Pseudococcidae]	Grape mealybug	Klein Koch & Waterhouse, 2000		Yes
Pseudococcus viburni Maskell [Hemiptera: Pseudococccidae]	Tuber mealybug	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Saissetia coffeae (Walker) [Hemiptera: Coccidae]	Brown coffee scale	Ben-Dov, 1993	APPD, 2004	No
Saissetia oleae (Olivier) [Hemiptera: Coccidae]	Mediterranean black scale	Klein Koch & Waterhouse, 2000	APPD, 2004	No
Tettigades chilensis Amyot & Serville [Hemiptera: Cicadidae]	Common cicada	Klein Koch & Waterhouse, 2000		Yes

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Hymenoptera (ants, wasps)				
Ametastegia glabrata Fallen [Hymenoptera: Tenthredinidae]	Holoartic sawfly	Prado, 1991	AICN, 2004 (except WA)	Yes
Polistes buyssoni Brethes [Hymenoptera: Vespidae]	Paper wasp	Klein Koch & Waterhouse, 2000		Yes
Vespula germanica (Fabricius) [Hymenoptera: Vespidae]	European wasp	Klein Koch & Waterhouse, 2000	AICN, 2004 (except WA)	Yes
Isoptera (termites)				
Neotermes chilensis (Blanchard) [Isoptera: Kalotermitidae]	Chilean termite	Klein Koch & Waterhouse, 2000		Yes
Lepidoptera (moths, butterflies)				
Accuminulia buscki J. Brown [Lepidoptera: Tortricidae]	Tortricid leafroller	Brown, 1999		Yes
Accuminulia longiphallus J. Brown [Lepidoptera: Tortricidae]	Tortricid leafroller	Brown, 1999		Yes
Agrostis ipsilon (Hufnagel) [Lepidoptera: Noctuidae]	Black cutworm	Parra *et al*., 1986	AICN, 2004	No
Chileulia stalactitis (Meyrick) [Lepidoptera: Tortricidae]	Grape berry moth	Klein Koch & Waterhouse, 2000		Yes
Copitarsia consueta (Walker) [Lepidoptera: Noctuidae]	Copitarsia cutworm	Gonzalez, 1983		Yes
Copitarsia turbata (Herrich-Schaffer) [Lepidoptera: Noctuidae]	Copitarsia cutworm	Klein Koch & Waterhouse, 2000		Yes
Hyles annei (Guérin-Méneville) ([Lepidoptera: Sphingidae]	Vine hornworm	Klein Koch & Waterhouse, 2000		Yes
Hyles euphorbiarum (Guérin-Méneville & Percheron) [Lepidoptera: Sphingidae]	Palqui hornworm	Klein Koch & Waterhouse, 2000		Yes
Hyles lineata Fabricius (*Celerio lineata* (Fabricius)) [Lepidoptera: Sphingidae]	White lined sphinx	Gonzalez, 1983	AICN, 2004	No
Paracles rudis (Butler) [Lepidoptera: Arctiidae]	Red grape caterpillar	Klein Koch & Waterhouse, 2000		Yes
Peridroma saucia (Hübner) [Lepidoptera: Noctuidae]	Variegated cutworm	Klein Koch & Waterhouse, 2000		Yes
Proeulia auraria (Clarke) [Lepidoptera: Tortricidae]	Orange leaf roller	Klein Koch & Waterhouse, 2000		Yes
Proeulia chrysopteris (Butler) [Lepidoptera: Tortricidae]	Fruit leaf roller	Klein Koch & Waterhouse, 2000		Yes
Proeulia triquetra Obraztsov [Lepidoptera: Tortricidae]	Grape leaf roller	Klein Koch & Waterhouse, 2000		Yes
Spodoptera frugiperda J.E. Smith [Lepidoptera: Noctuidae]	Fall armyworm	CABI/EPPO, 1997		Yes
Orthoptera (crickets, grasshoppers, locusts)				
Achaeta fulvipennis Brown [Orthoptera: Gryllidae]	Cricket	Gonzalez, 1983		Yes

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Dichroplus maculipennis (Blanchard) [Orthoptera: Acrididae]	Spotted wing grasshopper	Klein Koch & Waterhouse, 2000		Yes
Schistocerca cancellata (Serville) [Orthoptera: Acrididae]	South American locust	Gonzalez, 1983		Yes
Thysanoptera (thrips)				
Drepanothrips reuteri Uzel [Thysanoptera: Thripidae]	Grape thrips	Klein Koch & Waterhouse, 2000		Yes
Frankliniella australis Morgan [Thysanoptera: Thripidae]	Chilean flower thrips	Klein Koch & Waterhouse, 2000		Yes
Frankliniella occidentalis (Pergande) [Thysanoptera: Thripidae]	Western flower thrips	Klein Koch & Waterhouse, 2000	Restricted distribution (Mound & Gillespie, 1997)	Yes
Heliothrips haemorrhoidalis (Bouché) [Thysanoptera: Thripidae]	Greenhouse thrips	Klein Koch & Waterhouse, 2000	AICN, 2004	No
Thrips australis (Bagnall) [Thysanoptera: Thripidae]	Eucalyptus thrips	Prado, 1991	AICN, 2004	No
Thrips tabaci Lindeman [Thysanoptera: Thripidae]	Onion thrips	Klein Koch & Waterhouse, 2000	AICN, 2004	No
CONTAMINATING PESTS				
Latrodectus mactans (Fabricius) [Araneae: Theridiidae]	Black widow spider	Schenone & Correa, 1985		Yes[13]
GASTROPODS (snails, slugs)				
Helix aspersa Muller [Gastropoda: Helicidae]	Brown garden snail	Gonzalez, 1983	Furness, 1977	No
PATHOGENS				
Bacteria				
Agrobacterium vitis (Smith & Townsend) Conn	Crown gall of grapes	Burr *et al*., 1998	Gillings & Ophel-Keller, 1995	No
Pseudomonas syringae van Hall pv. *syringae* van Hall	Bacterial blast	Bradbury, 1986	APPD, 2004	No
Rhizobium radiobacter (Beijerinck & van Delden) Young *et al*.	Crown gall	Bradbury, 1986	Bradbury, 1986	No
Fungi				

[13] The black widow spider, although a non-plant pest was identified to be a sanitary (public health) concern.

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Alternaria alternata (Fr.: Fr.) Keissl.	Alternaria leaf blight	Pszczólkowski *et al*., 2003	APPD, 2004	No
Alternaria vitis Cavara	Grapevine alternariosis	Mujica & Vergara, 1945		Yes
Armillaria mellea (Vahl) P. Kummer	Armillaria root rot	SAG, 2003		Yes
Aspergillus niger Tiegh.	Aspergillus rot	Pszczólkowski *et al*., 2003	APPD, 2004	No
Athelia rolfsii (Curzi) C.C. Tu & Kimbrough	Seedling blight	CABI, 2004	APPD, 2004	No
Botryosphaeria dothidea (Moug.) Ces. & de Not.	Macrophoma rot	SAG, 2003	APPD, 2004 (except WA)	Yes
Botryosphaeria obtusa (Schwein.) Shoemaker	Dead arm, canker	SAG, 2003	APPD, 2004	No
Botrytis cinerea Pers: Fr.	Grey mould	Pszczólkowski *et al*., 2003	APPD, 2004	No
Cladosporium herbarum (Pers.: Fr.) Link	Cladosporium rot	Pszczólkowski *et al*., 2003	APPD, 2004	No
Cylindrocarpon destructans (Zinssmeister) Scholten]		SAG, 2003	APPD, 2004	No
Elsinoe ampelina (de Bary) Shears	Anthracnose, bird's eye rot (black spot)	Mujica *et al*., 1980	Nicholas *et al*., 1994	No
Epicoccum nigrum Link	Cereal leaf spot	Mujica *et al*., 1980	APPD, 2004	No
Erysiphe necator (Schwein.)	Grapevine powdery mildew	Latorre *et al*., 1996	APPD, 2004	No
Fusarium culmorum (W.G. Sm.) Sacc.	Damping off	CABI, 2004	APPD, 2004	No
Mucor racemosus Fres.	Spongy storage rot	Mujica *et al*., 1980	APPD, 2004	No
Nectria cinnabarina (Tode) Fr.	Nectria twig blight	Mujica *et al*., 1980	APPD, 2004 (except WA)	Yes
Peziza ascoboloides		Mujica & Vergara, 1945		Yes
Phaeoacremonium inflatipes (Pin)	Grapevine decline fungus	Farr *et al*., 2005		Yes
Phaeomoniella chlamydospora (W. Gams, Crous. M.J. Wingfield & L. Mugnai) Crous & Gams	Grapevine decline fungus	Auger *et al*., 2004	Edwards & Pascoe, 2003	No
Phoma betae A.B. Frank[14]		Mujica & Oehrens, 1967	APPD, 2004	No
Phoma sp.	Fruit rot	Pszczólkowski *et al*., 2003	Shivas, 1989; Barbetti & Wood, 1978[15]	No

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Phomopsis viticola (Sacc.) Sacc.	Phomopsis cane and leaf spot	Mujica *et al*., 1980; SAG, 2003	Merrin *et al*., 1995; van Niekerk *et al*., 2005 (except WA)	Yes
Phytophthora cinnamomi Rands	Crown and root rot	Latorre *et al*., 1997	Marks *et al*., 1975	No
Phytophthora cryptogea Pethybridge & Lafferty	Damping off	SAG, 2003	APPD, 2004	No
Phytophthora drechsleri Tucker	Fruit rot	Latorre *et al*., 1997	APPD, 2004	No
Plasmopara viticola (Berkeley & Curtis) Berl. & de Toni	Downy mildew	Macenauer, 1993	Nicholas *et al*., 1994	No
Pleospora herbarum (Fr.) Rabenh.	Bunch rot	Mujica *et al*., 1980	APPD, 2004	No
Pythium debaryanum Hesse	Damping off	Mujica *et al*., 1980	Marks & Kassaby, 1974	No
Pythium middletonii Sparrow		UKNCC, 2004	APPD, 2004	No
Rhizopus stolonifer (Ehrenb.: Fr.) Vuill.	Bunch rot	Latorre *et al*., 2002	APPD, 2004	No
Rosellinia necatrix Prill	Rosellinia root rot	SAG, 2003	APPD, 2004	No
Sclerotinia sclerotiorum (Lib.) De Bary	Collar rot	Farr *et al*., 1989	APPD, 2004	No
Stereum hirsutum (Willd. Ex Fr.) S.F. Gray	Esca	SAG, 2003	APPD, 2004	No
Talaromyces wortmannii (Klöcker) C.R. Benjamin	Blue mould rot	Soto *et al*., 1973	APPD, 2004 (except WA)	Yes
Trichothecium roseum (Pers.) Link.	Pink mould rot	Soto *et al*., 1973	APPD, 2004	No
Ulocladium atrum Preuss	Ulocladium blight	Soto *et al*., 1973	APPD, 2004	No
Verticillium dahliae Kleb.	Verticillium wilt	Latorre *et al*., 1996	APPD, 2004	No
Nematodes				
Helicotylenchus dihystera (Cobb) Sher.	Spiral nematode	Allen *et al*., 1971	McLeod *et al*., 1994; Hodda, 2002	No
Helicotylenchus pseudorobustus (Steiner)	Spiral nematode	CABI, 2004	EPPO, 2004	No
Meloidogyne arenaria (Neal) Chitwood	Root knot nematode	SAG, 2003	McLeod *et al*., 1994	No
Meloidogyne ethiopica Whitehead	Root knot nematode	Carneiro *et al*., 2004		Yes
Meloidogyne hapla Chitwood	Root knot nematode	SAG, 2003	McLeod *et al*., 1994	No

[14] Not listed in Boerema 2004 as possible host.

[15] In Australia *Phoma vitis* Bonord has been recorded on *Vitis* species.

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Meloidogyne incognita (Kofoid & White) Chitwood	Root-knot nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Meloidogyne javanica (Treub) Chitwood	Root-knot nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Mesocriconema xenoplax (Raski) Luc & Raski	Ring nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Paratylenchus nanus Cobb	Pin nematode	Allen *et al*., 1971	McLeod *et al*., 1994 (except WA)	Yes
Paratylenchus vandenbrandei de Grisse	Pin nematode	Allen *et al*., 1971	McLeod *et al*., 1994 (except WA)	Yes
Pratylenchus neglectus (Rensch) Filipjev & S. Stekhoven	Root-lesion nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Pratylenchus thornei Sher & Allen	Root-lesion nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Pratylenchus vulnus Allen & Jensen	Root lesion nematode	SAG, 2003	McLeod *et al*., 1994	No
Tylenchulus semipenetrans Cobb	Root nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Xiphinema americanum Cobb	Dagger nematode	Allen *et al*., 1971	McLeod *et al*., 1994	No
Xiphinema index Thorne & Allen	Dagger nematode	Allen *et al*., 1971	Restricted distribution (McLeod *et al*., 1994)	Yes
Phytoplasma				
Amarillamiento de Elqui	Grapevine yellows phytoplasma	Pearson & Goheen, 1994		Yes
Viruses				
Alfalfa mosaic *alfamovirus*	Alfalfa mosaic	CABI, 2004	EPPO, 2004	No
Arabis mosaic *nepovirus*	Arabis mosaic	SAG, 2003	Sivapalan *et al*., 2001 (Except WA)	Yes
Cherry leaf roll *nepovirus*	Ash mosaic virus	Herrera & Madariaga, 2001	Brunt *et al*., 1996 (except WA)	Yes
Cucumber mosic *cucumovirus*	Cucumber mosaic	CABI, 2004	EPPO, 2004	No
Grapevine corky bark associated *closterovirus*	Stem pitting of grapevine	SAG, 2003		Yes

Pest	Common name	Presence in		Consider further (yes/no)
		Chile	Australia	
Grapevine fanleaf *nepovirus*	Grapevine court-noué virus	Herrera & Madariaga, 2001	Sivapalan *et al*., 2001 (except WA)	Yes
Grapevine leaf roll associated *closterovirus*	Grapevine leafroll disease	Herrera & Madariaga, 2001	Habili *et al*., 1996	Yes[16]
Strawberry latent ringspot *nepovirus*	Strawberry latent ringspot	SAG, 2003	Sivapalan *et al*., 2001(except WA)	Yes
Tomato ringspot *nepovirus*	Grapevine yellow vein	Herrera & Madariaga, 2001	Sivapalan *et al*., 2001(except WA)	Yes[17]
Tomato spotted wilt *tospovirus*		CABI, 2004	EPPO, 2004	No

[16] Uncertain as to which viruses/strains are present in Chile.

[17] Uncertain as to which viruses/strains are present in Chile.

Appendix 1B: Pest categorisation for table grapes from Chile – association with table grape bunches

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
ARTHROPODS					
Acari (mites)					
Brevipalpus chilensis Baker [Acari: Tenuipalpidae]	False red mite	Yes	This species has been intercepted on the fruit pathway.	SAG/USDA 2002	Yes
Eotetranychus lewisi (McGregor) [Acari: Tetranychidae]	Lewis spider mite	No	Feeds on leaves of pointsettia and on fruit of citrus. No information can be found to support its association with table grape bunches. There have been no interceptions of this mite on Chilean table grapes exported to New Zealand.	Jeppson *et al.*, 1975	No
Oligonychus punicae (Hirst) [Acari: Tetranychidae]	Avocado brown mite	No	Feeds on the upper leaf surface of avocado. During heavy infestations, the entire leaf surface may be attacked. The same type of attack is expected on *Vitis vinifera* leaves. No information can be found to support its association with table grape bunches. There have been no interceptions of this mite on Chilean table grapes exported to New Zealand.	Jeppson *et al.*, 1975	No
Oligonychus vitis Zaher & Shehata [Acari: Tetranychidae]	Table grape red mite	No	Primarily feeds on foliage and lays eggs on the bases of leaf buds or in scars in wood. Larvae move towards leaves and are found on upper and lower surfaces of leaves and shoots. No information can be found to support its association with table grape bunches. There have been no interceptions of this mite on Chilean table grapes exported to New Zealand.	Gonzalez, 1983	No

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
Oligonychus yothersi McGreg. [Acari: Tetranychidae]	Avocado red mite	No	Feeds on the upper leaf surface. During heavy infestations, the entire leaf surface may be attacked. The same type of attack is expected on *Vitis vinifera* leaves. No information can be found to support its association with table grape bunches. There have been no interceptions of this mite on Chilean table grapes exported to New Zealand.	Jeppson *et al.*, 1975	No
Panonychus citri (Mc Gregor) [Acari: Tetranychidae]	Citirs red mite	No	Feeds on the leaves of *Citrus* spp. Heavy infestations may result in leaf and fruit drop, twig dieback and even death of limbs. No information can be found to support its association with table grape bunches. There have been no interceptions of this mite on Chilean table grapes exported to New Zealand.	Wu & Lo, 1990; Jeppson *et al.*, 1975	No
Tetranychus desertorum Banks [Acari: Tetranychidae]	Tetranychid mite	No	Major pest of cotton. No information can be found to support its association with table grape bunches. There have been no interceptions of this mite on Chilean table grapes exported to New Zealand.	Jeppson *et al.*, 1975	No
Coleoptera (beetles, weevils)					
Athlia rustica (Erichson) [Coleoptera: Scarabaeidae]	Brown beetle	No	Primarily feeds on leaves and buds.	Gonzalez, 1983	No
Callideriphus laetus Bl. [Coleoptera: Cerambycidae]	Peumo borer	No	Primarily feeds on downed logs, stumps, dead or dying branches. It has been recorded as using grapevines as a host.	EFPIS, 1998; Klein Koch & Waterhouse, 2000	No
Dexicrates robustus (Blanchard) [Coleoptera: Bostrichidae]	Wood borer	No	An incidental pest of grapevines, associated with trunks and branches.	Gonzalez, 1983	No
Geniocremnus chiliensis (Boheman) [Coleoptera: Curculionidae]	Tuberous pine weevil	Yes	Native Coleopteran that can be found rarely feeding on leaves in grapevines. Cannot fly, larvae are subterranean. May be associated with clusters	SAG, 2002	Yes

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
			as for *Naupactus xanthographus.*		
Micrapate humeralis (Blanchard) [Coleoptera: Bostrichidae]	Mesquite borer	No	A borer of carob tree branches (*Prosopis chilensis*), occasionally found in grapevines.	SAG, 2002	No
Micrapate scabrata (Erichson) [Coleoptera: Bostrichidae]	Vine borer	No	Adults bore holes into the bases of the buds and vine trunks where eggs are laid. The larvae penetrate into the wood and construct a gallery in which they live and feed. This species mainly affects buds, branches and shoots. Overwinters as larvae, pupae and adults.	Gonzalez, 1983	No
Naupactus xanthographus (Germar) [Coleoptera: Curculionidae]	Fruit tree weevil	Yes	Larvae damage the roots of grapevines and adults are known to be found on foliage. Has been detected in table grapes exported to the USA from Chile.	Gonzalez, 1983; Ripa, 1994	Yes
Neoterius mystax (Blanchard) [Coleoptera: Bostrichidae]	Fence borer	No	An opportunistic borer pest of vines. Found in trunks and branches.	Gonzalez, 1983	No
Otiorhynchus sulcatus (Fabricius) [Coleoptera: Curculionidae]	Black vine weevil	No	Larvae feed on roots in the soil. Adults feed on foliage, as well as bunch stems. Adults feed at night and hide under the bark or under debris on the ground during the day. When disturbed, adults drop to the ground. This species has not been intercepted on table grape bunches exported from California (where it is present) to Australia in three seasons of trade.	CABI, 2004; Day & Lewis, 2003	No
*Otiorhynchus rugosostriatus (*Goeze) [Coleoptera: Curculionidae]	Rough strawberry weevil	No	Larvae feed on roots and adults feed on leaves throughout the summer and are nocturnal. Overwintering occurs as fully-grown larvae, pupae or adults, in the topsoil or soil debris.	NRC, 2002; Antonelli *et al.*, 1988	No
Pantomorus ruizi (Brèthes) [Coleoptera: Curculionidae]	Alfalfa root weevil	No	Adult feeds on foliage, larvae are of a subterranean habit.	SAG, 2002	No
Platyapistes venustus (Erichson) [Coleoptera: Curculionidae]	Green weevil	No	Associated with leaves and buds.	Gonzalez, 1983	No

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
Diptera (flies)					
Ceratitis capitata (Wiedemann) [Diptera: Tephritidae]	Mediterranean fruit fly	Yes	Chile is considered a pest free area for this pest but it could be associated with the pathway if it became established. Causes damage to a wide range of unrelated fruit, primarily through oviposition into the fruit where larvae feed internally.	Hancock *et al*., 2000	Yes
Hemiptera (aphids, leafhoppers, mealybugs, scales, true bugs)					
Aphis fabae Scopoli [Hemiptera: Aphididae]	Black bean aphid	No	Young colonies consist of matt black aphids on young shoots. Older colonies spread over most of the aerial parts of the plant. This pest has not been intercepted on table grapes exported from California (where it is present) to Australia in three seasons of trade.	Blackman & Eastop, 1984	No
Aphis illinoisensis Shimer [Hemiptera: Aphididae]	Grapevine aphid	No	Damages young shoots, leaves. When populations are high, some may feed on the developing fruit clusters, causing some berries to drop. This species is not associated with the mature table grape bunches.	Sorenson, 2005	No
Balclutha aridula (Linnaeus) [Hemiptera: Cicadellidae]	Ballica leafhopper	No	Little is known about this species. Other species of leafhopper found on grapes feed on leaves. Heavily damaged leaves lose their green colour, dry up and may fall off the vine. Leafhopper production of honeydew can result in spotting of fruit. Overwinter as adults, and are found on newly emerged grape leaves. Adults and nymphs feed on leaves by puncturing leaf cells and sucking out nutrients.	USDA, 2002	No
Diaspidiotus ancylus (Putnam) [Hemiptera: Diaspididae]	Putnam scale	No	Heavy infestations can kill twigs and branches.	Arancibia *et al*., 1990	No
Icerya palmeri Riley-How	Margarodes	Yes	Little information is available on this species. In	Morales, 1991; NZ	Yes

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
[Hemiptera: Margarodidae]	scale		general, Margarodidae live on a wide variety of hosts, especially woody plants. Damage to the plant is caused by sap depletion, introduction of toxins and the production of honeydew hindering photosynthesis. Scales have been intercepted on table grapes imported from Chile into New Zealand.	MAF, 2002a	
Leptoglossus chilensis (Spin.) [Hemiptera: Coreidae]	Brown Chilean leaf-footed bug	No	Little information is available on the biology of this pest. Other species of this genus primarily feed on shoots. Has been recorded as causing fruit damage on citrus. Punctures the fruit of citrus and sucks juice. There have been no interceptions of this species on Chilean table grapes exported to New Zealand.	Fasulo & Stansly, 1999	No
Margarodes vitis (Philippi) [Hemiptera: Margarodidae]	Grape ground pearl	No	This species is subterranean (except for adult males) and live on roots. Males live for up to 14 days and appear above ground for a short time.	CABI/EPPO, 1997	No
Parthenolecanium corni (Bouché) [Hemiptera: Coccidae]	European fruit lecanium scale	Yes	*Vitis* spp. are host plants for this species. Males are winged. Crawlers settle and feed on leaf undersides, but later stages often migrate to stems and branches. Scales have been intercepted on table grapes imported from Chile into New Zealand.	WVU 2000; NZ MAF, 2002a	Yes
Pseudococcus calceolariae (Maskell) [Hemiptera: Pseudococcidae]	Citrophilus mealybug	Yes	When *P. calceolariae* shelter in fruit, for example, within the calyx, around the stalk, or under fruit sepals, they are often hidden from view. *Vitis vinifera* is a primary host for this species.	CABI, 2004	Yes
Pseudococcus maritimus (Ehrhorn) [Hemiptera: Pseudococcidae]	Grape mealybug	Yes	Overwintered first instar nymphs feed at bases of shoots or pedicels of grape clusters. This mealybug contaminates grapes with one or more of the following: the cottony ovisac, eggs, immature larvae, adults, and honeydew or black	Flaherty *et al.*, 1982; Pfeiffer & Schultz, 1986	Yes

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
			sooty mould growing on honeydew.		
Tettigades chilensis Amyot & Serville [Hemiptera: Cicadidae]	Common cicada	No	Primarily feeds on roots and branches.	Gonzalez, 1983	No
Hymenoptera (ants, wasps)					
Ametastegia glabrata Fallen [Hymenoptera: Tenthredinidae]	Sawfly	No	Larvae bore into the woody stems of grapevines to pupate.	Carillo *et al*., 1990	No
Polistes buyssoni Brethes [Hymenoptera: Vespidae]	Paper wasp	No	Adult wasps feed on mature fruits, extracting pieces of pulp. This species is considered a transient pest and is not likely to be associated with the harvested table grape bunches. This species has not been intercepted on Chilean table grapes exported to New Zealand.	Gonzalez, 1983	No
Vespula germanica (Fabricius) [Hymenoptera: Vespidae]	European wasp	No	Wasps may break open the skins of grape berries in order to lick out the sweet contents. This species is considered a transient pest and is not likely to be associated with the harvested table grape bunches. This species has not been intercepted on Chilean table grapes exported to New Zealand.	VTED, 2003	No
Isoptera (termites)					
Neotermes chilensis (Blanchard) [Isoptera: Kalotermitidae]	Chilean termite	No	When attacking the vine, termites feed on the heartwood (dead tissue) and usually avoid the living sapwood.	Rust, 1992	No
Lepidoptera (moths, butterflies)					
Accuminulia buscki Brown [Lepidoptera: Tortricidae]	Tortricid leafroller	Yes	Feeds on berries.	Brown, 1999	Yes
Accuminulia longiphallus Brown [Lepidoptera: Tortricidae]	Tortricid leafroller	Yes	Nothing is known of the biology of this species. As other *Accuminulia* species are known to bore into fruit, this species would potentially remain on the pathway.	Brown, 1999	Yes

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
Chileulia stalactitis (Meyrick) [Lepidoptera: Tortricidae]	Grape berry moth	Yes	Larvae spin silk webs for protection and feed in several green berries in the cluster before becoming fully grown. Larvae pupate in folded cutout portions of the leaves on the vine or ground.	WVU, 2000; Weigle *et al.,* 2000	Yes
Copitarsia consueta (Walker) [Lepidoptera: Noctuidae]	Copitarsia cutworm	No	Climbing cutworms is a general term applied to a number of moth larvae that feed on grape buds. Climbing cutworms are sporadic pest of grapes. Larvae hide during the day under the bark and in the soil litter under the vines and come out at night to feed.	URI, 2003; Weigle *et al*., 2000	No
Copitarsia turbata (Herrich-Schaffer) [Lepidoptera: Noctuidae]	Copitarsia cutworm	No	Climbing cutworms is a general term applied to a number of moth larvae that feed on grape buds. Climbing cutworms are sporadic pest of grapes. Larvae hide during the day under the bark and in the soil litter under the vines and come out at night to feed.	URI, 2003; Weigle *et al*., 2000	No
Hyles annei (Guérin-Méneville) [Lepidoptera: Sphingidae]	Vine hornworm	No	Larvae feed on foliage and pupation is subterranean.	SAG, 2002	No
Hyles euphorbiarum (Guérin-Méneville & Percheron) [Lepidoptera: Sphingidae]	Palqui hornworm	No	Occasional pest of vines. Can cause serious defoliation of individual plants.	Gonzalez, 1983	No
Paracles rudis (Butler) (Chilesia rudis Butler) [Lepidoptera: Arctiidae]	Red grape caterpillar	No	The larvae are phytophagous and consume leaves and buds. Eggs are laid among tufts of grass.	Angulo, 2003	No
Peridroma saucia (Hübner) [Lepidoptera: Noctuidae]	Variegated cutworm	No	Primarily feed on leaves, stems, growing points, and inflorescences of agricultural crops and low growing fruit trees. Eggs are usually laid on twigs and stems rather than on leaves.	CABI, 2004	No
Proeulia auraria (Clarke) [Lepidoptera: Tortricidae]	Chilean fruit tree leaf folder	Yes	Larvae of the genus *Proeulia* are leaf rollers, also reported as feeding on the surface and boring into the fruit of host plants.	Brown & Passoa, 1998; Brown, 1999	Yes

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
Proeulia chrysopteris (Butler) [Lepidoptera: Tortricidae]	Fruit leaf folder	Yes	Larvae of the genus *Proeulia* are leaf rollers, also reported as feeding on the surface and boring into the fruit of host plants.	Brown & Passoa, 1998; Brown, 1999	Yes
Proeulia triquetra Obraztsov [Lepidoptera: Tortricidae]	Grape leaf roller, fruit tree leaf roller	Yes	Larvae of the genus *Proeulia* are leaf rollers, also reported as feeding on the surface and boring into the fruit of host plants.	Brown & Passoa, 1998; Brown, 1999	Yes
Spodoptera frugiperda J.E. Smith [Lepidoptera: Noctuidae]	Fall armyworm	No	Larvae feed on leaves. Pupation occurs in an earthen cell or rarely between leaves on the host plant.	CABI/EPPO, 1997	No
Orthoptera (crickets, grasshoppers, katydids)					
Achaeta fulvipennis Brown [Orthoptera: Gryllidae]	Cricket	No	Feeds on foliage of several hosts and is found principally in ground cover.	Zanin, 1995	No
Dichroplus maculipennis (Blanchard) [Orthoptera: Acrididae]	Spotted wing grasshopper	No	This species is phytophagous, invading crops, fodder, gardens and orchards. Oviposits in dry, uncultivated land.	Uvarov, 1977	No
Schistocerca cancellata (Serville) [Orthoptera: Acrididae]	South American locust	No	An opportunistic feeder on leaves and buds.	Gonzalez, 1983	No
Thysanoptera (thrips)					
Drepanothrips reuteri Uzel [Thysanoptera: Thripidae]	Grape thrips	Yes	Table grapes are susceptible to thrips damage. *D. reuteri* causes severe damage to both foliage and grape bunches, scarring berries with their feeding.	Flaherty *et al.*, 1982; Ripa, 1994; UC, 2000	Yes
Frankliniella australis Morgan [Thysanoptera: Thripidae]	Chilean flower thrips	Yes	Feeds around the sepals and calyces of blossoms and may cause scarring of fruit. May also affect leaves and shoots. Found on grapevines mainly during period of inflorescence. The remainder of the time it inhabits any plant, which allows the development of nymphs and adults.	Gonzalez, 1983	Yes
Frankliniella occidentalis (Pergande) [Thysanoptera: Thripidae]	Western flower thrips	Yes	Cause serious shoot stunting and leaf distortion, followed by berry scarring.	Lewis, 1997	Yes

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
CONTAMINATING PESTS					
Latrodectus mactans (Fabricius) [Araneae: Theridiidae]	Black widow spider	Yes (contaminating pest)	Although this species feeds on fauna rather than on table grapes directly, it has been recorded as having been imported into Ireland, and more recently into New Zealand, with table grape shipments from California.	Ross, 1988; NZ MAF, 2002b	Yes
PATHOGENS					
Fungi					
Alternaria vitis Carva	Grapevine alternariosis	No	Infects leaves and produces lesions on leaves. Causes leaf spots and defoliation.	Suhag *et al*., 1983	No
Armillaria mellea (Vahl.: Fr.) Kumm	Armillaria root rot, honey root rot	No	*Armillaria mellea* is a soilborne fungus that causes root rot of a wide variety of plants including table grapes.	Elkins *et al*., 1998	No
Nectria cinnabarina (Tode) Fr.	Nectria twig blight	No	*Nectria cinnabarina* acts mostly as a saprophyte, living on dead plant tissue, and as such is not generally considered a serious pathogen. However, it is also weakly pathogenic, colonizing stems and branches weakened by mechanical injury, physiological stress, or other disease.	Funk, 1981	No
Phaeoacremonium inflatipes (Pin)	Grapevine decline fungus	No	*Phaeoacremonium inflatipes* is a soil-borne fungus that causes decline in young vines. Affected plants showed low vigour, undersized trunks, short internodes, uneven wood maturity, sparse foliage, and stunted chlorotic leaves with interveinal chlorosis and necrosis.	Scheck *et al*., 1998	No
Talaromyces wortmannii (Klöcker) C.R. Benjamin	Blue mould rot	No	Primarily reported from soil and seeds.	Friday & Harley, 2000	No
Peziza ascoboloides		No	Most species of this genus occur on soil and are occasionally reported in association with a vascular plant.	Farr *et al*., 1989	No

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
Phomopsis viticola (Sacc.) Sacc.	Phomopsis cane and leaf spot	Yes	Fungal disease common in cooler grape growing regions. Spread occurs during wet weather. Berry infection is favoured by long (20-30 hr) wet periods at flowering.	Nicholas *et al*., 1994	Yes
Nematodes					
Paratylenchus nanus Cobb	Pin nematode	No	All stages occur in the soil as migratory root ectoparasites.	Bell & Watson, 2001	No
Meloidogyne ethiopica Whitehead	Root knot nematode	No	Other species of genus are migratory root ectoparasites; all stages feed at root tips.	CABI, 2004	No
Paratylenchus vandenbrandei de Grisse	Pin nematode	No	All stages occur in the soil as migratory root ectoparasites.	Lehman, 2002	No
Xiphinema index Thorne & Allen	Dagger nematode	No	All stages occur in the soil as migratory root ectoparasites.	CABI, 2004	No
Phytoplasmas					
Amarillamiento de Elqui	Grapevine yellows phytoplasma	No	Grapevine yellows disease shows the symptoms of *flavesence doree*. The leaves harden, roll slightly abaxially and tend to overlap. The brittle leaves first become golden yellow or red (depending on cultivars) on plant parts most exposed to sun. Later in summer, creamy spots appear along the main veins. These cream-coloured spots generally become necrotic. Sometimes, angular spots occur, which are yellow in white-fruited cultivars and red in black-fruited cultivars.	Pearson & Goheen, 1994	No
Viruses					
Arabis mosaic *nepovirus*	Arabis mosaic	No	Causes mosaics, mottling and chlorotic ringspots and sometimes necrosis. Symptoms disappear soon after infection (but plants may remain stunted).	Brunt *et al*., 1996	No
Cherry leaf roll *nepovirus*	Ash mosaic virus	No	Causes chlorotic ringspots, leaf patterns and/or	Brunt *et al*., 1996	No

Pest	Common name	Associated with table grape cluster (yes/no)	Comment	Reference	Consider pest further? (yes/no)
			yellow vein netting. Virus transmitted by mechanical inoculation; transmitted by grafting; not transmitted by contact between plants.		
Grapevine corky bark associated *closterovirus*	Corky bark of grapevine	No	Causes pits and grooves in the trunk and is transmitted by a vector. Transmitted by grafting. Transmission by contact between plants, seed or pollen has not been reported.	Brunt *et al*., 1996	No
Grapevine fanleaf *nepovirus*	Grapevine court-noué virus	Yes	May be associated with the endosperm of grape seeds, but is not known to be transmissible by grape seeds. The virus is transmissible by nematode vectors and mechanical inoculation. No restrictions are placed on grapes being moved from the Rutherglen area because of this virus.	CABI, 2004; Habili *et al.,* 2001	No
Grapevine leaf roll associated *closterovirus*	Grapevine leafroll disease	Yes	Grapevine leafroll associated viruses are phloem-restricted viruses. Once the grape bunch has been severed from the vine, collapse and desiccation of the peduncles associated with the bunch will begin. It is not believed that insect vectors (mealybugs, soft scales) will feed on latex from the severed peduncles. It is also believed that, except under very exacting laboratory conditions, peduncles would not be propagatable.	CABI, 2004	No
Tomato ringspot *nepovirus*	Grapevine yellow vein	No	No evidence to suggest this virus is seed borne in table grapes.	CABI, 2004	No

Appendix 1C: Potential for establishment or spread and associated consequences for pests of table grapes from Chile

Scientific name	**Common name**	**Potential for establishment or spread in the PRA area**		**Potential for consequences**		**Consider pest further? (yes/no)**
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
ARTHROPODS						
Acari (mites)						
Brevipalpus chilensis Baker [Acari: Tenuipalpidae]	Chilean false red mite (CFRM)	Feasible	Wide host range (Ripa & Rodriguez, 1989) and multivoltine, with four to five generations per year (Gonzalez, 1968).	Significant	CFRM may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.	Yes
Coleoptera (weevils)						
Geniocremnus chiliensis (Boheman) [Coleoptera: Curculionidae]	Tuberous pine weevil	Feasible	Restricted host range and native to Chile (SAG, 2002).	Significant	Weevils may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.	Yes
Naupactus xanthographus (Germar) [Coleoptera: Curculionidae]	South American fruit tree weevil	Feasible	SAFTW has a wide host range including apple, avocado, citrus, custard apple, loquat, kiwifruit, olive, stone fruits and walnuts (Gonzalez, 1983; Ripa, 1986).	Significant	Weevils may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.	Yes

Scientific name	Common name	Potential for establishment or spread in the PRA area		Potential for consequences		Consider pest further? (yes/no)
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
Diptera (flies)						
Ceratitis capitata Wiedemann) [Diptera: Thripidae]	Mediterranean fruit fly; Medfly	Feasible	Polyphagous, with a wide host range. Strong flyer- adults can fly up to 20 km (Fletcher, 1989). Females pierce the skin of fruit and lay eggs. Larvae feed internally on fruit (Knapp, 1998).	Significant	Medfly increase production costs by domestic and international trading restrictions imposed on fruit from areas where fruit fly becomes established.	Yes
Hemiptera (aphids, leafhoppers, mealybugs, psyllids, scales, true bugs and whiteflies)						
Icerya palmeri Riley-How [Hemiptera: Margarodidae]	Margarodes scale	Feasible	Other species of this genus have wide host range and already established in some parts of Australia.	Significant	Scales can cause direct harm to a wide range of plant hosts (Gill, 1988). In addition to the direct feeding damage, the honeydew excreted forms a substrate for the growth of black sooty moulds.	Yes
Parthenolecanium corni (Bouché) [Hemiptera: Coccidae]	European fruit lecanium	Feasible	EFLS is highly polyphagous, attacking some 350 plant species placed in 40 families (Ben-Dov, 1993). This species is already established in New South Wales, Tasmania, and Victoria (AICN, 2004).	Significant	EFLS is a pest of a range of fruit and nut trees and ornamentals. It seriously infested hazel trees in Greece (Santas, 1985).	Yes
Pseudococcus calceolariae (Maskell) [Hemiptera: Pseudococcidae]	Citrophilus mealybug	Feasible	Wide host range (Ben-Dov, 1994), high reproductive rates (Rotundo *et al*., 1979) and already established in New South Wales, Queensland, South Australia, Tasmania and Victoria (AICN, 2004).	Significant	Infested fruit is downgraded for fresh markets (Howitt, 2001).	Yes

Scientific name	Common name	Potential for establishment or spread in the PRA area		Potential for consequences		Consider pest further? (yes/no)
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
Pseudococcus maritimus (Ehrhorn) [Hemiptera: Pseudococcidae]	Grape mealybug	Feasible	Wide host range (Ben-Dov, 1994), high reproductive rates (Grimes & Cone, 1985).	Significant	Honeydew secreted by mealybug support the growth of dark sooty mould fungus. Table grapes with sooty mould are downgraded for fresh market (Pfeiffer & Schultz, 1986).	Yes
Lepidoptera (butterflies, moths)						
Accuminulia buscki Brown [Lepidoptera: Tortricidae]	Tortricid leafroller	Feasible	Larvae of this pest are polyphagous and native to Chile (Brown & Passoa, 1998).	Significant	Larval feeding can result in cosmetic degradation of fruit (Brown, 1999).	Yes
Accuminulia longiphallus Brown [Lepidoptera: Tortricidae]	Tortricid leafroller	Feasible	Larvae of this pest are polyphagous and native to Chile (Brown & Passoa, 1998).	Significant	Larval feeding can result in cosmetic degradation of fruit (Brown, 1999).	Yes
Chileulia stalactitis (Meyrick) [Lepidoptera: Tortricidae]	Grape berry moth	Feasible	Larvae of this pest are polyphagous and native to Chile (Brown & Passoa, 1998).	Significant	Larval feeding can result in cosmetic degradation of fruit (Brown, 1999).	Yes
Proeulia auraria (Clarke) [Lepidoptera: Tortricidae]	Chilean fruit tree leafroller	Feasible	Wide host range (Brown, 1999; Artigas, 1994) and high reproductive rates (Campos *et al*., 1981). The genus *Proeulia* is capable of flight with some species known to fly throughout the year (Gonzalez, 1983).	Significant	*Proeulia* spp. may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.	Yes

Scientific name	Common name	Potential for establishment or spread in the PRA area		Potential for consequences		Consider pest further? (yes/no)
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
Proeulia chrysopteris (Butler) [Lepidoptera: Tortricidae]	Fruit leaf roller	Feasible	Wide host range (Brown, 1999; Artigas, 1994) and high reproductive rates (Campos *et al*., 1981). The genus *Proeulia* is capable of flight with some species known to fly throughout the year (Gonzalez, 1983).	Significant	*Proeulia* spp. may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.	Yes
Proeulia triquetra Obraztsov [Lepidoptera: Tortricidae]	Grape leaf roller	Feasible	Wide host range (Brown, 1999; Artigas, 1994) and high reproductive rates (Campos *et al*., 1981). The genus *Proeulia* is capable of flight with some species known to fly throughout the year (Gonzalez, 1983).	Significant	*Proeulia* spp. may potentially increase production costs by triggering specific controls as these are of quarantine concern to important trading partners.	Yes
Thysanopetra (thrips)						
Drepanothrips reuteri Uzel [Thysanoptera: Thripidae]	Grape thrips	Feasible	Polyphagous pests and high reproductive rates (Mound & Teulon, 1995).	Significant	Damage plants directly by feeding and laying eggs on the plant, and indirectly by acting as vectors for viruses.	YES
Frankliniella australis Morgan [Thysanoptera: Thripidae]	Chilean flower thrips	Feasible	Polyphagous pests and high reproductive rates (Mound & Teulon, 1995).	Significant	Damage plants directly by feeding and laying eggs on the plant, and indirectly by acting as vectors for viruses.	YES

Scientific name	Common name	Potential for establishment or spread in the PRA area		Potential for consequences		Consider pest further? (yes/no)
		Feasible/ not feasible	Comments	Significant/ not significant	Comments	
Frankliniella occidentalis (Pergande) [Thysanoptera: Thripidae]	Western flower thrips (WFT)	Feasible	Polyphagous pests and high reproductive rates (Mound & Teulon, 1995).	Significant	WFT damage plants directly by feeding and laying eggs on the plant (Childers & Achor, 1995), and indirectly by acting as vectors for viruses.	Yes
CONTAMINATING PESTS						
Latrodectus mactans (Fabricius) [Araneae: Theridiidae]	Black widow spider	Feasible	Some species of *Latrodectus* are already established in Australia. It could spread into new areas as a contaminant.	Significant	Spiders are considered as having an impact on human health and potential impact on the environment.	Yes
PATHOGENS						
Fungi						
Phomopsis viticola (Sacc.) Sacc.	Phomopsis cane and leaf spot	Feasible	Narrow host range (Erincik *et al*., 2001). Long distance dispersal to new areas occurs primarily through the transfer of infected or contaminated propagation materials (Hewitt & Pearson, 1988; Creecy & Emmett, 1990).	Significant	*Phomopsis viticola* is a serious pathogen of grapes in several viticultural regions of the world (Machowicz-Stefaniak *et al*., 1991; Nair *et al*., 1994).	Yes

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APPENDIX 2: PEST PLANT CATEGORISATION

2A Methodology for pest plant categorisation

2B Pest plant categorisation for table grapes from Chile – status in Australia

2C Pest plan categorisation for table grapes from Chile – association with table grape bunches

Appendix 2A: Methodology for pest plant categorisation

The quarantine status of pest plants for Australia was determined using a categorisation process to examine whether the criteria for a quarantine pest plant is satisfied. Appendix 2B lists all species known to be associated with Chilean table grape vineyards. For each Chilean species reported, information is provided regarding its presence and distribution in Australia. Pest plant species not recorded in Australia were automatically considered further in Appendix 2C. Biosecurity Australia considered any information provided by States and Territories when categorising pest plants. The process of pest plant categorisation is outlined in steps 1 to 3 below:

Step 1: Consult Schedule 4 Part 2 of the Quarantine Proclamation 1998

The principal Commonwealth legislation regulating quarantine in Australia is the *Quarantine Act 1908*. Within the Act, the *Quarantine Proclamation 1998* addresses quarantine by including measures that act to prevent or control the introduction, establishment or spread of diseases or pests that will or could cause significant damage to humans, animal, plants, environment or economic activities.

Schedule 4 Part 2 of the Quarantine Proclamation is a list of plant species that are quarantinable pests. Seeds or propagules of these species are not permitted entry into Australia and are required to be considered for further assessment in the IRA.

Plant species listed in Schedule 4 Part 2?	If **Yes**, the species must be considered further in Appendix 2C.
	If **No**, refer to Schedules 5 and 6 of the *Quarantine Proclamation 1998*.

Step 2: Schedule 5 of the Quarantine Proclamation 1998

Schedule 5 of the Quarantine Proclamation is a list of seeds and propagules that are permitted entry into Australia. These species are exempt from the requirement for an import permit or import conditions (e.g. treatments, additional declarations, etc.).

Is the plant species listed in Schedule 5?	If **Yes**, and if the species is permitted in Western Australia, the species is not considered further in Appendix 2C.
	If **No**, or not permitted in Western Australia, must be considered further in Appendix 2C.

Step 3: Schedule 6 of the Quarantine Proclamation 1998

Schedule 6 outlines the kinds of plants that must not be permitted. The importation into Australia of a plant or plant part of a kind mentioned in Schedule 6 (whether or not capable of being used for propagation) is prohibited unless the Director of Quarantine has granted a permit for the importation.

Is the plant species listed in Schedule 6? If **Yes**, the species must be considered further in Appendix 2C.

If **No**, the species is not considered further in Appendix 2C.

Appendix 2B: Pest plant categorisation for table grapes from Chile – status in Australia

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Achillea millefolium L.	Yarrow; milfoil	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Agrostis stolonifera L.	Creeping bent grass, blown grass	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Aira caryophyllea L.	Silvery hairgrass	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Allium vineale L.	Crow garlic, wild onion	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Amaranthus albus L.	Tumbleweed	Matthei, 1995	Widespread.	No	Yes	No	No
Amaranthus deflexus L.	Spreading amaranthus	Matthei, 1995	NSW, SA, Tas, Vic. Not permitted in WA	No	Yes	No	Yes
Amaranthus retroflexus L.	Redroot amaranth	Matthei, 1995	Widespread southern Australia	No	Yes	No	No
Amaranthus viridis L.	Green amaranth	Matthei, 1995	Widespread	No	Yes	No	No
Ambrosia artemisiifolia L.	Annual ragweed	Matthei, 1995	Widespread	Yes	No	No	Yes
Amsinckia calycina (Moris) Chater	Yellow burrweed	Matthei, 1995	Widespread. Not permitted in WA	Yes	No	No	Yes
Anagallis arvensis L.	Scarlet pimpernel	Matthei, 1995	Widespread	No	Yes	No	No
Apium nodiflorum Reichb.(L.) Lag.	Fool's Watercress	Matthei, 1995	Not in Australia. Not permitted in WA	No	Yes	No	Yes

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Arctotheca calendula (L.) Levyns	Capeweed	Matthei, 1995	Widespread	No	Yes	No	No
Artemisia absinthium L.	Wormwood	Matthei, 1995	Widespread garden escapee (AVH, 2005)	No	Yes	No	No
Avena barbata Link	Bearded oat	Matthei, 1995	Widespread	No	No	No	No
Avena fatua L.	Wild oat	Matthei, 1995	Widespread	No	No	No	No
Avena sterilis L.	Sterile oat	Matthei, 1995	Widespread	No	No	No	No
Avena strigosa Schreb.	Sand oat	Matthei, 1995	Widespread	No	No	No	No
Bidens aurea (Ait.) Sherff	Arizona beggarsticks	Kogan, 1989	Not in Australia. Not permitted in WA	No	No	No	Yes
Bidens pilosa L.	Cobbler's pegs	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Boerhavia erecta L.	Erect spiderling	Marticorena & Quezada, 1985	Not in Australia. Not permitted in WA	No	No	No	Yes
Brassica napus L.	Canola, wWinter rape	Matthei, 1995	Widespread	No	Yes	No	No
Brassica rapa L.	Common mustard, Turnip	Matthei, 1995	Widespread	No	Yes	No	No
Bromus catharticus Vahl.	Prairie grass	Matthei, 1995	Widespread	No	Yes	No	No
Bromus diandrus Roth.	Great brome	Matthei, 1995	Widespread	No	Yes	No	No
Bromus hordeaceus L.	Soft brome	Matthei, 1995	Widespread	No	Yes	No	No

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Bromus lanceolatus Roth.	Mediterranean brome	Matthei, 1995	Widespread	No	Yes	No	No
Bromus madritensis L.	Madrid brome	Matthei, 1995	Widespread	No	Yes	No	No
Bromus racemosus L	Brome grass	Matthei, 1995	NSW, Vic. Not permitted in WA	No	Yes	No	Yes
Bromus secalinus L.	Brome grass	Matthei, 1995	NSW. Not permitted in WA	No	Yes	No	Yes
Bromus sterilis L.	Brome grass	Matthei, 1995	Widespread	No	Yes	No	No
Bromus tectorum L.	Drooping brome	Matthei, 1995	NSW, Vic. Not permitted in WA	No	Yes	No	Yes
Calandrinia compressa DC.	Parakeelya	Matthei, 1995	Not in Australia. Not permitted in WA	No	Yes	No	Yes
Calendula arvensis L.	Field marigold	Matthei, 1995	Eastern Australia. Not permitted in WA	No	Yes	No	Yes
Calystegia sepium (L.) R.Br.	Greater bineweed	Matthei, 1995	All states except NT. Not permitted in WA	No	Yes	No	Yes
Capsella bursapastoris (L.) Medik.	Shepherd's purse	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Cardamine hirsuta L.	Common bittercress	Matthei, 1995	Widespread	No	No	No	No
Cardaria draba (L.) Desv. [now *Lepidium draba* L.]	Hoary cress	Matthei, 1995	Widespread. Not permitted in WA	No	Yes	No	Yes
Carduus nutans L.	Nodding thistle	Matthei, 1995	Widespread. Not permitted in WA	Yes	No	No	Yes
Carduus pycnocephalus L.	Slender thistle	Matthei, 1995	Widespread	No	Yes	No	No

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Carthamus lanatus L.	Saffron thistle	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes
Cenchrus echinatus L.	Mossman river grass	Matthei, 1995	Widespread	Yes	No	No	Yes
Cenchrus incertus Curt.	Spiny burrgrass	Matthei, 1995	Widespread. Not permitted in WA	Yes	No	No	Yes
Centaurea solstitialis L.	St Barnaby's thistle, pPineapple weed	Matthei, 1995	Widespread	No	Yes	No	No
Chamaesyce hirta (L.) Millsp. [now *Euphorbia hirta* L.]	Spurge	Matthei, 1995	Widespread	No	No	No	No
Chenopodium album L.	Fat hen	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Chenopodium ambrosioides L.	Wormseed, Mexican tea	Matthei, 1995	Widespread	No	Yes	No	No
Chenopodium ficifolium Sm.	Figleaf goosefoot	Matthei, 1995	Recorded in Qld early last century but not since. Not permitted in WA	No	No	No	Yes
Chenopodium murale L.	Nettle-leaved goosefoot	Matthei, 1995	Widespread	No	No	No	No
Chloris gayana Kunth	Rhode grass	Matthei, 1995	Widespread	No	No	No	No
Chloris virgata Sw.	Feathertop Rhode grass	Matthei, 1995	Widespread	No	No	No	No
Chrysanthemoides monilifera (L.) Norl	Boneseed, bitou bush	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes
Chrysanthemum segetum L.	Corn daisy	Matthei, 1995	Widespread	No	Yes	No	No

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Conium maculatum L.	Hemlock	Matthei, 1995	Widespread. Not permitted in WA	No	Yes	No	Yes
Convolvulus arvensis L.	Field bineweed	Matthei, 1995	Widespread. Not permitted in WA	No	Yes	No	Yes
Conyza bonariensis (L.) Cronquist	Flaxleaf fleabane	Matthei, 1995	Widespread	No	No	No	No
Cuscuta suaveolens Ser.	Fringed dodder	Matthei, 1995	Widespread. Not permitted in WA	Yes	No	No	Yes
Cynodon dactylon (L.) Pers.	Couch grass	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Cynosurus echinatus L.	Rough dogstail	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Cyperus rotundus L.	Nutgrass	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Dactylis glomerata L.	Cocksfoot	Matthei, 1995	Widespread	No	Yes	No	No
Datura stramonium L.	Common thornapple	Matthei, 1995	Widespread. Not permitted in WA	Yes	No	No	Yes
Delairea odorata Lem. (Now *Senecio mikanioides* Otto ex. Walp.)	Cape ivy, German ivy	Matthei, 1995	Widespread under *Delairea*	No	No	No	No
Digitaria ischaemum Muhl.	Smooth summer grass	Matthei, 1995	SA, NSW, Vic. Not permitted in WA	No	No	No	Yes
Digitaria sanguinalis (L.) Scop.	Crabgrass	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Diplotaxis muralis (L.) DC.	Wall rocket	Matthei, 1995	Widespread	No	Yes	No	No

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Echinochloa crusgalli (L.) P.Beauv.	Barnyard grass	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Echium plantagineum L.	Paterson's curse	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes
Echium vulgare L.	Viper's bugloss	Marticorena & Quezada, 1985	SA, NSW, Vic, Tas. Not permitted in WA	No	No	No	Yes
Equisetum bogotense Kunth	Horsetail	Matthei, 1995	Not in Australia. Not permitted in WA	No	Yes? Does not have seeds	No	Yes
Eragrostis virescens J.Presl & C.Presl [now *Eragrostis mexicana* Link subsp. *virescens* (Presl) S.D.Koch & I.Sánchez Vega]	Mexican lovegrass	Matthei, 1995	Widespread (under *mexicana*). Not permitted in WA	No	No	No	Yes
Erodium botrys (Cav.) Bertol.	Long storksbill	Matthei, 1995	Widespread	No	Yes	No	No
Erodium cicutarium (L.) L'Her. ex Aiton	Common storksbill	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Erodium moschatum (L.) L'Her. ex Aiton	Musky storksbill	Matthei, 1995	Widespread	No	No	No	No
Eruca vesicaria (L.) Cav.	Roquette, salad rocket	Matthei, 1995	At least NSW, Vic	No	Yes	No	No
Euphorbia cyathophora Murr.	Painted spurge	Matthei, 1995	Widespread. Not permitted in WA	No	Yes	No	Yes
Euphorbia falcata L.	Sickleleaf spurge	Matthei, 1995	NSW, SA. Not permitted in WA	No	No	No	Yes
Euphorbia helioscopia L.	Sun spurge	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Euphorbia lathyris L.	Caper spurge	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Euphorbia maculata L.	Eyebane	Matthei, 1995	NSW, SA. Not permitted in WA	No	No	No	Yes
Euphorbia peplus L.	Petty spurge	Matthei, 1995	Widespread	No	No	No	No
Euphorbia platyphyllos L.	Broad-leaved spurge	Matthei, 1995	Possibly only Vic. Not permitted in WA	No	No	No	Yes
Festuca arundinacea Schreb.	Tall fescue	Matthei, 1995	Widespread	No	Yes	No	No
Galega officinalis L.	Goat's rue	Marticorena & Quezada, 1985	At least Qld, NSW	No	Yes	No	No
Galinsoga parviflora Cav.	Potato weed	Matthei, 1995	Widespread	No	No	No	No
Galium aparine L.	Cleavers	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes
Geranium dissectum L.	Cutleaf cranesbill	Matthei, 1995	Widespread	No	Yes	No	No
Geranium molle L.	Dove's foot cranesbill	Matthei, 1995	Widespread	No	Yes	No	No
Geranium robertianum L.	Herb Robert	Matthei, 1995	SA, NSW, Vic	No	Yes	No	No
Glechoma hederacea L.	Ground 'ivy'	Matthei, 1995	Not in Australia. Not permitted in WA	No	Yes	No	Yes
Holcus lanatus L.	Yorkshire fog	Matthei, 1995	Widespread	No	Yes	No	No
Hordeum jubatum L.	Foxtail barley	Matthei, 1995	Not in Australia. Not permitted in WA	No	No	Yes	Yes
Hordeum marinum Huds.	Sea barley grass	Matthei, 1995	Widespread	No	No	Yes	Yes

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Hordeum murinum L.	Wild barley	Matthei, 1995	Widespread	No	No	Yes	Yes
Hordeum secalinum Schreb.	Meadow barley	Matthei, 1995	NSW, Vic. Not permitted in WA	No	No	Yes	Yes
Hypericum perforatum L.	St John's wort	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes
Hypochaeris glabra L.	Smooth cat's ear	Matthei, 1995	Widespread	No	No	No	No
Juncus procerus E. Mey.	Rush	Matthei, 1995	Widespread. Not permitted in WA	No	No	No	Yes
Kickxia elatine (L.) Dumort	Twining toadflax	Matthei, 1995	Widespread	No	No	No	No
Lactuca serriola L.	Prickly lettuce	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Lamium amplexicaule L.	Deadnettle	Matthei, 1995	Widespread	No	Yes	No	No
Lolium multiflorum Lam.	Italian ryegrass	Matthei, 1995	Widespread	No	Yes	No	No
Lolium perenne L.	Perennial ryegrass	Matthei, 1995	Widespread	No	Yes	No	No
Lolium temulentum L.	Bearded rye grass	Matthei, 1995	Widespread	No	Yes	No	No
Lotus uliginosus L. Schk.	Large bird's foot trefoil	Matthei, 1995	WA, SA	No	Yes	No	No
Malva nicaeensis All.	Mallow of Nice	Marticorena & Quezada, 1985	Widespread. Not permitted in WA	No	Yes	No	Yes
Matricaria matricarioides (Less.) Porter	Chamomile	Matthei, 1995	Widespread	No	Yes	No	No

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Modiola caroliniana (L.) G. Don.	Red-flowered mallow	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Orobanche ramosa L.	Branched broomrape	FAO, 2003	SA only. Not permitted in WA	Yes	No	No	Yes
Oxalis corniculata L.	Yellow wood sorrel	Matthei, 1995	Widespread	No	Yes	No	No
Oxalis pescaprae L.	Soursob	Matthei, 1995	Widespread	No	Yes	No	No
Panicum capillare L.	Witchgrass	Matthei, 1995	Widespread	No	No	No	No
Panicum miliaceum L.	Millet panic	Matthei, 1995	Widespread	No	No	No	No
Paspalum dilatatum Poir.	Paspalum, Watergrass	Marticorena & Quezada, 1985	Widespread	No	Yes	Yes	Yes
Paspalum distichum L.	Buffalo quick paspalum	Matthei, 1995	Widespread	No	Yes	Yes	Yes
Pastinaca sativa L.	Parsnip	Matthei, 1995	Widespread	No	Yes	No	No
Pennisetum clandestinum Hochst. ex Chiov.	Kikuyu grass	Matthei, 1995	Widespread	No	No	No	No
Persicaria hydropiper (L.) Spach [syn. *Polygonum*]	Water pepper	Matthei, 1995	Widespread	No	Yes	No	No
Persicaria lapathifolia (L.) Gray	Pale smart weed	Matthei, 1995	Widespread. Not permitted in WA	No	Yes	No	Yes
Persicaria maculosa S.F.Gray [now *Polygonum persicaria* L.]	Red shank	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Physalis pubescens L.	Downy groundcherry	Matthei, 1995	Widespread	No	Yes	Yes	Yes

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Picris echioides L.	Bristly oxtongue	Matthei, 1995	Widespread	No	Yes	No	No
Plantago lanceolata L.	Plantain, rRibwort	Marticorena & Quezada, 1985	Widespread	No	Yes	Yes	Yes
Poa annua L.	Annual poa	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Poa pratensis L.	Kentucky bluegrass	Matthei, 1995	Widespread	No	Yes	No	No
Polygonum aviculare L.	Knotweed	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Portulaca oleracea L.	Purselane, pigweed	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Prunella vulgaris L.	Self-heal	Matthei, 1995	Widespread	No	Yes	No	No
Ranunculus arvensis L.	Corn buttercup	Matthei, 1995	SA, NSW, Tas	No	No	No	Yes
Ranunculus muricatus L.	Sharp fruited buttercup	Matthei, 1995	Widespread	No	No	No	No
Ranunculus parviflorus L.	Small-flowered buttercup	Matthei, 1995	South eastern Australia. Not permitted in WA	No	No	No	Yes
Ranunculus repens L.	Creeping buttercup	Matthei, 1995	Eastern Australia. Not permitted in WA	No	Yes	No	Yes
Raphanus raphanistrum L.	Wild radish	Matthei, 1995	Widespread	No	Yes	No	No
Raphanus sativus L.	Radish	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Rapistrum rugosum (L.) All.	Turnip weed	Matthei, 1995	Widespread	No	No	No	No

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Rubus ulmifolius Schott	Blackberry	Marticorena & Quezada, 1985	Widespread	No	Yes	Yes	Yes
Rumex acetosella L. [now *Acetosella vulgaris* Fourr.]	Dock	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Rumex conglomeratus Murray	Clustered dock	Matthei, 1995	Widespread	No	No	No	Yes
Rumex crispus L.	Curled dock	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Rumex longifolius DC. [now *R. hydrolapathum* Huds.]	Great water dock, long leaved dock	Matthei, 1995	Not in Australia. Not permitted in WA	No	No	No	Yes
Salsola kali L. (varieties other than *S. kali* L. var. *kali*)	Prickly saltwort	Matthei, 1995	*Salsola kali* in the strict sense (*S. kali* var. *kali*) is not found in Australia	No	No	No	No
Senecio sylvaticus L.	Wood groundsel, mountain groundsel	Matthei, 1995	Not in Australia. Not permitted in WA	No	No	No	Yes
Senecio spp. (Asteraceae)	Fireweeds, groundsels	NZ MAF, 2005	Not permitted in WA	*S. pterophorus*	Some species	No	Yes
Setaria pumila (Poir.) Roem. & Schult.	Queensland pigeon grass	Matthei, 1995	Widespread	No	No	No	No
Setaria verticillata (L.) P.Beauv.	Whorled pigeon grass	Matthei, 1995	Widespread. Under official control in NSW	No	No	No	Yes
Setaria viridis (L.) P.Beauv.	Green pigeon grass	Matthei, 1995	NSW, SA, Tas, Vic	No	No	No	No
Silene gallica L.	French catchfly	Matthei, 1995	Widespread	No	Yes	No	No
Silybum marianum (L.) Gaertn.	Variegated thistle	Matthei, 1995	Widespread. Not permitted in WA	No	Yes	No	Yes

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Solanum nigrum L.	Black nightshade	Marticorena & Quezada, 1985	Widespread	No	Yes	Yes	No
Sonchus arvensis L.	Corn sowthistle	Matthei, 1995	Qld, SA. Not permitted in WA	Yes	No	No	Yes
Sonchus asper Vill.	Rough sowthistle	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Sonchus tenerrimus L.	Clammy sowthistle	Matthei, 1995	Widespread	No	Yes	No	No
Sorghum halepense (L.) Pers.	Johnson grass	Marticorena & Quezada, 1985	Widespread. Not permitted in WA. Under official control in NSW, NT, WA	No	No	Yes	Yes
Spergula arvensis L.	Corn spurry	Matthei, 1995	Widespread	No	No	No	No
Stellaria media (L.) Vill.	Chickweed	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Taeniatherum caput-medusae Boiss [*Taeniatherum caput-medusae* (L.) Nevski? Now also known as *Taeniatherum crinitum* (Schreb.) Nevski var. *caput-medusae* (L.) J.K.Wipff]	Medusa-head	Matthei, 1995	Not recorded in Australia under either name. Not permitted in WA	Yes	No	No	Yes
Taraxacum officinale Weber	Dandelion	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Tribulus terrestris L.	Caltrop	Matthei, 1995	Widespread	No	Yes	No	No
Typha spp.	Bulrushes	NZ MAF 2005	Not permitted in WA	No	No	No	Yes

Scientific name	Common name	Presence in		Listed on Schedule 4 Part 2? (Yes/No)	Listed on Schedule 5? (Yes/No)	Listed on Schedule 6? (Yes/No)	Consider pest further? (Yes/No)
		Chile	Australia (APNI/AVH, 2005)				
Urtica dioica L. var. *mollis* [now *Urtica dioica*]	Stinging nettle	Matthei, 1995	Eastern Australia	No	Yes	No	No
Urtica urens L.	Dwarf nettle	Marticorena & Quezada, 1985	Widespread	No	Yes	No	No
Veronica anagallisaquatica L.	Blue water speedwell	Marticorena & Quezada, 1985	Widespread. Not permitted in WA	No	Yes	No	Yes
Veronica arvensis L.	Wall speedwell	Matthei, 1995	Widespread	No	Yes	No	No
Veronica persica Poir.	Creeping speedwell	Matthei, 1995	Widespread	No	Yes	No	No
Vicia sativa L.	Common vetch	Marticorena & Quezada, 1985	Widespread	No	No	No	No
Xanthium spinosum L.	Bathurst burr	Marticorena & Quezada, 1985	Widespread. Not permitted in WA	No	No	No	Yes

Appendix 2C: Pest plant categorisation for table grapes from Chile –association with table grape bunches

Scientific name	**Common name**	**Available information (i.e. habit, reproduction, etc.)**	**Final assessment**	**Considered to be on export pathway? (yes/no)**
Amaranthus deflexus L. (Amaranthaceae)	Spreading amaranthus, prostrate amaranthus	Prostrate or scrambling short-lived perennial weed of disturbed sites. Flowering summer-autumn; fruit spongy/membranous, seeds copious, glossy, round 1-1.2 mm diam. From South America, not common but now recorded for SA, NSW, VIC, TAS (AVH, 2005; Flora of North America, 2005; Harden, 1990, 1:252; Lazarides & Hince, 1993).	Seed dispersal mainly through volume and gravity; peak flowering is summer-autumn. Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Ambrosia artemisiifolia L. (Asteraceae)	Annual ragweed	Annual, shallow rooted, erect herbs to 2m high. Flowering late summer-early autumn (March to April in Australia). Achenes are surrounded by persisting, beaked and/or spined bracts to 3 mm long, and adhere to any fibrous surface. Common roadside weed from the Americas, now widespread in Australia (AVH, 2005; Harden, 1992; 3:268; Lazarides & Hince, 1993).	Flowering late summer - autumn. Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Amsinckia calycina (Moris) Chater (Boraginaceae)	Yellow burrweed	Annual, erect herbs to 0.5 m, peak flowering spring. Fruit is a group of 4 nutlets surrounded by a bristled, persisting calyx. Dispersal of fruit unit through movement of contaminated farm equipment, contaminated seed, fodder and stock. Widespread weed of cultivated land in South America, now spread across Australia (AVH, 2005; Harden, 1992; 3: 393; Lazarides & Hince, 1993).	Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Apium nodiflorum (L.) Lag. (Apiaceae)	Fool's Watercress, European mudwort	Perennial prostrate, stoloniferous herb, partially submerged in water in shallow ponds and other wet places. Fruit separating into 2 indehiscent mericarps from the central carpophore. Not recorded for Australia (Burton, 2002).	Main method of spread is through the rooting of nodes under water.	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
Bidens aurea (Ait.) Sherff. (Asteraceae)	Arizona beggarticks	Spreading, woody perennial with erect, slender stems rising to 1.3 m tall, flowering in autumn. Numerous achenes, each 4-angled with a two-pronged, barbed pappus that adheres easily to any fibrous surface which is main method of dispersal. Not recorded for Australia (Harden, 1992, 3: 278; Plant Finder 2005).	Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Boerhavia erecta L. (Nyctaginaceae)	Erect spiderling	Annual, slightly woody, erect and decumbent herbs, flowering early summer to mid-autumn, fruits indehiscent, conspicuously ribbed, obconic, 3.5 x 3.5 mm, mucilaginous when wet, 1-seeded. Tropics and warm temperate areas on wetter sites. Not recorded in Australia (Flora of North America (taxon_id=220001767).	Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Bromus racemosus L (Poaceae)	Brome grass	Tufted, erect, annual grass to 1 m high, common on disturbed ground. Flowers spring. Fruit is an indehiscent 1-seeded caryopsis tightly enclosed within the lemma. Distance dispersal by awns on the lemmas to 9 mm long, attaching to fibrous surfaces. Common, NSW, VIC (AVH, 2005; Harden, 1993; 4*:* 632)	Dispersal mechanism unlikely to result in contamination of grape bunches	No
Bromus secalinus L. (Poaceae)	Brome grass, Rye brome	Tufted, erect, annual or biennial grass to 1 m on disturbed sites, flowering spring. Dispersal by 'hooked' awns (to 8 mm long) on seed unit that adheres to fibrous surfaces. Native to the Mediterranean. Recorded in QLD, NSW (AVH, 2005; Harden, 1990;4*:* 632)	Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Bromus tectorum L. (Poaceae)	Drooping brome, cheat grass	Tufted, erect, or spreading annual grass to 0.6 m high, on roadsides and waste areas, flowers spring. Seed unit dispersed mainly by awns up to 18 mm long on lemmas up to 13 mm long, attaching to fibrous surfaces. Originally from the Mediterranean, now recorded SA, Qld, NSW, Vic Tas. (AVH, 2005; Harden, 1993; 4*:* 631; Lazarides & Hince, 1993; Weedsabc, 1986).	Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Calandrinia compressa Schrad. ex DC. (Portulacaceae)	Parakeelya	Mat forming, fleshy, spreading ephemeral herbs flowering summer; fruit dehiscent capsules with numerous smooth or patterned seeds. This species endemic to Chile. Not in Australia (Gutiérrez *et al*., 2000; Harden, 1990; 1: 181; Huxley, 1997; IPNI, 2005).	Dispersal mechanism indicates that seeds may contaminate grape	Yes

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
			bunches.	
Calendula arvensis L. (Asteraceae)	Field marigold	Cosmopolitan, viscid, annual herb to 30 - 40 cm, flowering spring. Fruit a beaked, 1-seeded achene (cypsela) to 2 mm long, +/- crested spines to 5 mm, without a pappas. Recorded in every state and territory except WA and NT. Cosmopolitan weed well established in Australia - distribution has not changed markedly since 1990 (AVH, 2005; Harden, 1992; 3: 314; Huxley, 1997; IPNI 2005; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Calystegia sepium (L.) R.Br. (Convolvulaceae)	Wild morning glory, bindweeds	Previously in the genus *Convolvulus*. Perennial climbing or scrambling weeds spreading rapidly by rhizomes. Flowering summer, fruit a subglobose capsule containing numerous smooth seeds. Widespread in disturbed sites across Australia and the temperate world (AVH, 2005; Harden, 1992; 3*:* 382; Huxley, 1997; Lazarides & Hince, 1993).	Dispersal mechanism unlikely to result in contamination of grape bunches.	No
Cardaria draba	See *Lepidium draba*			
Carduus nutans L. (Asteraceae).	Nodding thistle	Cosmopolitan, perennial thistle to 2 m high, flowering spring, summer and autumn. A prolific achene producer. The pappus is 15 - 20mm long and has finely toothed bristles which adhere to any fibrous surface. From Europe, now widespread across Australia (AVH, 2005; Harden, 1992; 3*:* 321; Lamp & Collet 1989; Lazarides & Hince, 1993).	Wind assisted long distance dispersal by bristles on the pappus (up to 20 mm long) may result in seed contaminating grape bunches.	Yes
Carthamus lanatus L. (Asteraceae)	Saffron thistle	Widespread, annual, woolly thistle growing to 80 cm high, flowering late spring, early summer. Achene pappus 7 – 10 mm long with scales (not bristles) that adhere to passing animals and clothing. From the Mediterranean, now widespread across Australia (AVH, 2005; Harden, 1992;3*:* 328; Lamp & Collet 1989; Lazarides & Hince, 1993).	Wind assisted long distance dispersal via the seed pappus (up to 10 mm long) may result in seed contaminating grape bunches.	Yes
Cenchrus echinatus L. (Poaceae)	Mossman river grass	Tufted annual to 0.9 m high, flowering summer, the fruit/seed enclosed in a spiny involucre that thickens and fuses to form a spiny burr 4 – 10 mm long, which adheres to fibrous materials.	Dispersal mechanism indicates that seed is unlikely to contaminate	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
		From the Americas, now widespread in Australia (AVH, 2005; Harden, 1993; 4*:* 502; Lazarides & Hince, 1993).	grape bunches.	
Cenchrus incertus Curt. (Poaceae)	Spiny burr grass	Tufted annual to 0.8 m high, flowering summer, the fruit/seed enclosed in a spiny involucre that thickens and fuses to form a burr with rigid spines. The burrs easily detach from the plant when mature and adhere to any fibrous surface. A common weed from tropical America now recorded in sandy areas inland of all states except TAS (AVH, 2005; Harden, 1993; 4*:* 502; Lamp & Collet, 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Chenopodium ficifolium Sm. (Chenopodiaceae)	Figleaf goosefoot	Annual, 'mealy' surfaced herb to 60 cm tall, flowering summer; fruit up to 2 mm in diam. with 5 persisting, overlapping sepals; seed to 1.5 mm diam., disc shaped, smooth, usually remaining enclosed in fruit. A common weed of wastelands in Europe and western and central Asia. Not recorded for Australia (Reed, 1977).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Chrysanthemoides monilifera (L.) Norl. (Asteraceae)	Bitou bush, boneseed	Erect, perennial, densely branched shrub 1 – 3 m high. Peak flowering is July to October, the 1 seeded fruit is a black or purple fleshy drupe to 7 mm diam.; bird/animal dispersed. Introduced from South Africa, already widespread in Australia (AVH, 2005; Huxley, 1997; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed may contaminate grape bunches.	Yes
Conium maculatum L. (Apiceae)	Hemlock	Erect, mostly annual herbs, stems to 2.5 m high; flowers spring to early summer with peak seed drop (90%) autumn to winter, the remainder in early spring. Dispersal is by water, mud, wind, animal fur, human clothing, boots, and machinery. From temperate Eurasia, now fairly common in Australia in damper disturbed sites (AVH, 2005; Cal-IPC 2005; Huxley, 1997; Lamp & Collet, 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed may contaminate grape bunches.	Yes
Convolvulus arvensis L. (Convolvulaceae)	Field bineweed	Perennial, twining and climbing from creeping rootstock. Spread is mainly through underground rhizomes. Flowering in late spring -summer, fruit a subglobose capsule containing numerous smooth seeds. Widespread in disturbed sites across Australia (AVH, 2005; Harden, 1992; 3*:* 383; Lamp	Spread mainly through rhizomes. Dispersal mechanism indicates that seed is unlikely to	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
		& Collet 1989; Lazarides & Hince, 1993)	contaminate grape bunches.	
Cuscuta suaveolens Ser. (Cuscutaceae)	Fringed dodder	Parasitic twiner mostly on cultivated legumes; leafless, stem twining, clasping host through haustoria; flowering summer. Reproduction from parasitic stem fragments and seed, globose seeds nearly 2 mm long and almost as wide. From South America, widespread in Australia (AVH, 2005; Harden, 1992; 3*:* 374 [under Convolvulaceae]; Lamp & Collet 1989; Lazarides & Hince, 1993; Reed, 1977).	Reproduction from parasitic stem fragments and seed. No evidence that *Vitus* spp. are hosts.	No
Datura stramonium L.	Common thornapple	Stout, annual herb to 1.2 m high, flowering late summer. Fruit a spiny globular capsule up to 4.5 cm long containing numerous seeds. Widespread throughout Australia (AVH, 2005; Harden, 1992; 3*:* 371; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Digitaria ischaemum (Schreb.) Schreb. (Poaceae)	Smooth summer grass	Spreading annual grass to 0.4 m high, flowering summer; fruit (mainly autumn) is an indehiscent 1-seeded caryopsis tightly enclosed within the lemma; fertile lemma to about 2.5 mm long without adornment. Well established NSW, SA, Vic (AVH, 2005; Harden, 1993; 4: 460).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Echium plantagineum L. (Boraginaceae)	Paterson's curse, Salvation Jane	Annual, rarely biennial herbs to 1 m high, flowering September to January. Fruit a four beaked mericarp that splits to reveal numerous seeds; seed to 3 mm long, three sided, tubercular. Seed not wind dispersed. Weed of degraded pastures, roadsides and neglected areas. Widespread throughout Australia (AVH, 2005; Harden, 1992; 3*:* 398; Lamp & Collet 1989; Lazarides & Hince, 1993; Reed 1977)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Echium vulgare L.	Viper's bugloss	Very similar morphologically to *E. plantagineum* but differs in stamen structure. Flowers several weeks later than *E. plantagineum*, spring to early summer. Fruit a four beaked mericarp that splits to reveal numerous seeds; seed to 3 mm long, three sided, wrinkled/pitted, usually dispersed as a contaminant of hay or grain. Weed of degraded pastures, roadsides and neglected areas, NSW, SA, Vic, Tas (AVH, 2005; Harden,	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No

Scientific name	**Common name**	**Available information (i.e. habit, reproduction, etc.)**	**Final assessment**	**Considered to be on export pathway? (yes/no)**
		1992; 3: 398; Lamp & Collet 1989; Lazarides & Hince, 1993)		
Equisetum bogotense Kunth (Equisitaceae: Sphenopsida)	Horsetail	Primitive, vascular plants with erect stems to 2 cm arising from a rhizome, lacking flowers and reproducing by spores. Spreading usually by rhizomes or water transmitted spores. This species endemic to South America and not recorded for Australia (Harden, 1990; 1:12; Hauke 1978).	Spread usually by rhizomes or water transmitted spores.	No
Eragrostis virescens Presl. [now *Eragrostis mexicana* Link subsp. *virescens* (Presl) S.D.Koch & I.Sánchez Vega] (Poaceae)	Mexican lovegrass	Annual, loosely tufted grass to 90 cm, flowering summer-autumn, fruit (mainly autumn) is an indehiscent 1-seeded caryopsis tightly enclosed within the lemma, lemmas to 2 mm long, without adornment. Widespread in Australia under *E. mexicana* (AVH, 2005; Harden, 1993; 4:539; Huxley, 1997; IPNI, 2005; Lazarides & Hince, 1993)	Seed production late summer-autumn therefore does not coincide with grape harvest period.	No
Euphorbia cyathophora Murr. (Euphorbiaceae)	Painted spurge	Annual herb to 70 cm high, flowering most of the year; fruit a capsule 3-4 mm long x 5-6 mm wide containing numerous round seeds to 3 mm long. Seed not wind dispersed. Prefers coastal sands. Native to tropical Americas, now widespread in coastal Australia (AVH, 2005; Harden, 1990; 1: 425; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Euphorbia falcata L. (Euphorbiaceae)	Sickle leaf spurge	Glaucous, annual herb to 30 cm high, flowering summer, fruit a capsule 2 mm long x 1.5 mm wide containing slightly striate seeds to 1.7 mm long. Roadside weed from Europe, now present in NSW, SA (AVH, 2005; Harden, 1990; 1: 426; Lamp & Collet 1989; Lazarides & Hince, 1993).	Seed production late summer-autumn therefore does not coincide with grape harvest period.	No
Euphorbia lathyrus L. (Euphorbiaceae)	Caper spurge	Stout biennial to 1 m, flowering summer; fruit a capsule 10-15 mm diam., containing ovoid seeds 6 mm long x 4 mm wide. Mainly occurs on the lighter soils of disturbed areas of temperate regions, native to Europe, now widespread in Australia (AVH, 2005; Harden, 1990; 1:425; Lamp & Collet 1989; Lazarides & Hince, 1993).	Seed production late summer-autumn therefore does not coincide with grape harvest period.	No
Euphorbia maculata L. (Euphorbiaceae)	Eyebane	Prostrate, summer annual forming mats to over 35 cm wide, flowering spring to summer; fruit a hairy capsule to 2 mm long. Seed not wind	Dispersal mechanism indicates that seed is	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
		dispersed. Native to the Americas now recorded for NSW, SA (AVH, 2005; Lazarides & Hince, 1993; Virginia Tech 2005).	unlikely to contaminate grape bunches.	
Euphorbia peplus L. (Euphorbiaceous)	Petty spurge	A widespread annual weed of cultivation to 40 cm high. Flowers most of the year, capsule 2mm long and 2 mm in diam., seeds to 1.2 mm long. A common weed of gardens, nurseries and other highly disturbed, moist areas. Widespread and common in Australia (AVH, 2005; Harden, 1990; 1:426; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Euphorbia platyphyllos L. (Euphorbiaceae)	Broad-leaved spurge	An erect annual to 0.8 m high originally from Europe including the UK but now rare. Flowers summer, capsule with 'explosive' mechanism for dehiscing but resulting seedlings tend to grow in a clump. Not recorded for Australia (Hortus III 1976; Organic weeds 2004)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches..	No
Galium aparine L. (Rubiaceae)	Cleavers	Scrambling or twining prickly annual. Flowers spring to summer, capsules to 5 mm long, covered in hooked hairs, dehiscing into 2 one-seeded mericarps. Hooked bristles on fruits attach to fibrous surfaces. Cosmopolitan weed of high rainfall areas, widespread in Australia (Harden, 1992; 3*:* 484; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Glechoma hederacea L. (Labiatae)	Ground ivy, Run-away Robin	Creeping, stoloniferous perennials forming mounds to 50 cm high and as wide, flowering summer; fruit are 4 round, smooth 'nutlets' about 2 mm long. Variagated forms in cultivation Europe and Americas. Not recorded in Australia (Huxley, 1997).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Hordeum jubatum L. (Poaceae)	Foxtail barley, squirrel tail	Highly ornamental barley grass, annual or perennial to 0.6 m high. Flowering summer, seed units in autumn have hair-like awns to 8 cm long that attach to fibrous surfaces. Americas and NE Asia, not recorded in Australia (Huxley, 1977).	Summer grass with seeds reaching maturity in autumn, late in the grape harvest period. Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
Hordeum marinum Huds.	Sea barley grass	Tufted annual to 0.3 m high, flowering spring; seed units with tapering awns 11 – 15 mm long that attach to fibrous surfaces. Originally from the Mediterranean, once an uncommon weed of saline areas, now widespread across southern Australia (AVH, 2005; Harden, 1993; 4*:* 599; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Hordeum murinum L.	Wild barley, barley grass	Tufted annual grass to 0.2 m high, flowers spring, seed unit awns 1.5 to 2.5 cm long, stiffly erect and spreading, adhering to fibrous surfaces. Originally from the Mediterranean, now widespread across southern Australia (AVH, 2005; Paczkowska & Chapman, 2000; USDA, 2005)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Hordeum secalinum Schreb. (Poaceae)	Meadow barley	Tufted annual grass to 0.8 m high, flowers spring, seed unit awns long, erect and spreading, attaching to fibrous surfaces. Originally from western and southern Europe, now recorded NSW, Vic (AVH, 2005; Peeters, 2005 Sharp & Simon, 2002)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Hypericum perforatum L. (Clusiaceae)	St John's wort	Erect, branching shrub to 1 m high, flowering summer; fruit a sticky, trilocular capsule dehiscing to reveal numerous seeds. Dispersal is by water, mud, soil, and agricultural produce, particularly hay and chaff. Widespread throughout Australia (AVH, 2005; Harden, 1990; 1:491; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanisms indicate that seed is unlikely to contaminate grape bunches.	No
Juncus procerus E. Mey. (Juncaceae)	Rush	Rhizomatous perennial rush, culms to 1.45 m long; flowers from late-spring to autumn, or after rain, capsules smooth, remaining on parent plant for many months; seeds numerous, mucilaginous when wet. Seeds commonly spread by water. Scattered in moist habitats across southern Australia (AVH, 2005; Harden, 1993; 4*:* 278).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Lepidium draba L. (under *Cardaria*) (Brassicaceae)	Hoary cress, white weed	Perennial, hoary herbs procumbent or erect to 0.15 - 0.9 m high, root system producing adventitious buds/nodes. Probably flowers all year. Fruit an indehiscent inflated silicula which breaks down into 1 or 2 –seeded units. Cosmopolitan agricultural weed now widespread	Mainly procumbent, spreading by both adventitious roots and seed encased in an	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
		throughout Australia (AVH, 2005; Harden, 1990; 1: 472; Lazarides & Hince, 1993)	indehiscent fruit. Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	
Malva nicaeensis All. (Malvaceae)	Mallow of Nice	Annual or short lived perennial herbs with erect stems to 0.5 m high. Flowering probably all year; fruit an indehiscent ridged schizocarp 5 – 8 mm diam. Native of the Mediterranean, now scattered across southern Australia (AVH, 2005; Harden, 1990; 1:324; Huxley, 1997; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Orobanche ramosa L. (Scrophulariaceae)	Branched broomrape	Annual herbs without chlorophyll, fully parasitic, attached by haustoria to the host's (a wide range of broadleaf, grain and vegetable crops particularly tomatoes, rapeseed and pulses) roots producing leafless aerial stems up to 0.2 cm, flowers in spring, fruit a 1- locular dehiscent capsule which shatters in summer releasing numerous seeds. Long-distance seed dispersal mainly via soil movement (machinery, vehicles) and stock. Originating in the Mediterranean, recorded in a small area at Murray Bridge SA only (Harden, 1992; 3: 590; Huxley, 1997; Virtue & Moerkerk, 2001).	Dispersal mechanisms indicate that seed is unlikely to contaminate grape bunches.	No
Paspalum dilatatum Poir. (Poaceae)	Paspalum, Watergrass, golden crown grass	Tufted perennial with culms reaching 1.8 m high, flowering summer to autumn, spikelets to 4 mm long, usually slightly sticky, seed units awnless. Originally from South America, now widespread across Australia (AVH, 2005; Harden, 1993; 4*:* 467; Huxley, 1977; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
Paspalum distichum L. (Poaceae)	Buffalo quick paspalum	Stoloniferous perennial to 0.5 m high, flowering summer, the seed unit to 3 mm long, awnless. Grows in or near fresh water across Australia (AVH, 2005; Harden, 1993; 4*:* 466; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Persicaria lapathifolia (L.) Gray (Polygonaceae)	Pale smart weed	Erect or ascending herb to 1.8 m high, flowering spring, summer. Fruit a nut enclosed in a persistent perianth. Widespread in damp situations across Australia (AVH, 2005; Harden, 1990; 1*:* 279; Paczkowska & Chapman, 2000).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Physalis pubescens L. (Solanaceae)	Downy ground cherry, husk tomato, strawberry tomato	Summer growing annual herbs 0.5 – 0.9 m high; fruit a globose berry enclosed by an inflated calyx, yellow to 1.5 cm, pineapple flavoured. Dispersed by birds or mechanical means. Recorded in NSW, Vic, WA (AVH, 2005; Harden, 1990; 1*:* 279; Paczkowska & Chapman, 2000).	Dispersal mechanism indicates that seed may contaminate grape bunches.	Yes
Plantago lanceolata L. (Plantaginaceae)	Plantain, ribwort	Cosmopolitan, rosetted annual herb to 0.9 m high, flowering spring-summer; fruit a 3 – 4 m long capsule containing up to 6 seeds. Widespread and abundant in Australia (AVH, 2005; Harden, 1990;1*:* 279; Paczkowska & Chapman, 2000)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Ranunculus arvensis L. (Ranunculaceae)	Corn buttercup	Slightly hairy annual herb with flowering stems to 0.6 m high, flowering spring. Fruit is a 'head' of achenes, each achene 6 – 8 mm long, beaked and with spines to 3 mm long, attaching to fibrous surfaces. Isolated occurrences recorded in NSW, SA, Tas (AVH, 2005; Harden, 1990; 1*:* 165; Lazarides & Hince, 1993)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Ranunculus muricatus L. (Ranunculaceae)	Sharp fruited buttercup	Erect or prostrate annual herb to 0.3 m, flowering spring, summer; fruit as above for *R. arvensis* except achenes 7 – 8 mm long, stoutly beaked and spines thick and tapering. Native to Mediterranean region, a common weed of gardens, lawns, wetlands and grounds/pastures across southern Australia (AVH, 2005; Harden, 1990; 1*:* 165; Paczkowska & Chapman, 2000)	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
Ranunculus parviflorus L. (Ranunculaceae)	Small-flowered buttercup	Annual spreading herb to 40 cm tall Fruit as above, achenes few, to 3 mm long, beak short, surface covered in shortly hooked tubercules. A common weed of gardens, lawns, wetlands and pastures, now established in south-eastern Australia (AVH, 2005; Green, 1994; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Ranunculus repens L. (Ranunculaceae)	Creeping buttercup	Hairy perennial with flowering stems to 0.6 m high, flowering spring-summer. Achenes to 3 mm long, smooth with a prominent beaked rim. Found in moist sites in NSW, SA, SE Qld, Tas, Vic (AVH, 2005; Harden, 1990; 1*:* 165; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Rubus ulmifolius Schott (Rosaceae)	Blackberry	Scrambling semi-deciduous shrub to 2 m, flowering spring to Summer; fruit fleshy/succulent druplets aggregated on an expanded receptacle. Bird/animal dispersed. Native to Europe, hybrids common, widespread across southern Australia (AVH, 2005; Harden, 1990; 1*:* 535; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed may contaminate grape bunches.	Yes
Rumex conglomeratus Murr. (Polygonaceae)	Clustered dock	Slender perennial herb to 0.8 m high, flowering spring; nut trigonous, the winglike valves to 3.2 mm long by 2.5 mm wide with the callus arising from the inner perianth segment covering most of the surfaces. Recorded in every State and Territory in Australia (AVH, 2005; Harden, 1990; 1*:* 290; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Rumex longifolius DC. [now *R. hydrolapathum* Huds.] (Polygonaceae)	Long-leaved dock, great water dock	Robust perennial with stems to 2 m. Inner perianth segment triangular, 5-7 mm long in 3 mm fruit, hardening with a prominent tubercule. Common on river banks in Europe, not recorded in Australia under either name (Grieve, M. (early 1900's); Huxley, 1997; IPNI, 2005).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Senecio sylvaticus L. (Asteraceae)	Wood groundsell, Mountain groundsell	Annual herb to 0.7 m, flowering in late summer; fruit a cypsela with a pappus of simple hairs that are quickly shed. Drought sensitive. Native to Europe and not recorded in Australia (Huxley, 1997).	Flowers late summer, therefore does not coincide with grape production and harvest period.	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
Senecio spp. (Asteraceae)	Fireweeds, groundsels	Annual or perennial herbs, rarely shrubs, with over 2000 species worldwide, over 100 in Australia. Flowering in warmer months, seeds mature 2 to 3 weeks after the flowers open. A mature plant produces about 50,000 seeds/achenes per annum. The achenes are beaked, sometimes ribbed, each with a pappus of fine hairs. The pappus is easily shed so dispersal by wind is usually for short distance spread. Seed of the common African daisy (*S. pterophorus*) is also dispersed in Australia in water over the ground surface, carried in mud adhering to animals, on clothing and machinery, in contaminated agricultural produce and road-making materials. Weeds of roadsides, wastelands, denuded and newly sown pastures and forest margins (Faithfull, 2004)	Dispersal mechanism of this genus indicates that seed may contaminate grape bunches. This is supported by New Zealand MAF interception data on Chilean table grapes entering New Zealand.	Yes
Setaria verticillata (L.) P.Beauv. (Poaceae)	Whorled pigeon grass	Slightly tufted annual grass to 1 m high, flowering summer. Spikelets fall in an entire unit including subtending bristles 4- 8 mm long, scabrous, adhering to fibrous surfaces. Weed of a wide range of tropical and temperate crops, now in all mainland states (AVH, 2005; Harden, 1993; 4*:* 494; Lamp & Collet 1989; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches.	No
Silybum marianum (L.) Gaertn.	Variegated thistle	Erect, robust, spiny annual or biennial thistle to 1.2 m high, flowering spring, summer. Achenes 6 – 8 mm long with pappus bristles 15 – 20 mm long that adhere to fibrous surfaces and assist wind dispersal. A cosmopolitan weed of pastures and high fertility soils. It frequently establishes on river flats, sheep camps, around stock yards and any other area of higher than normal soil nitrogen levels, especially if the area has been disturbed. (AVH, 2005; Bean, 1985; Harden, 1993; 3*:* 323; Lazarides & Hince, 1993; Paczkowska & Chapman, 2000).	Dispersal mechanism indicates that seed may contaminate grape bunches.	Yes
Sonchus arvensis L. (Asteraceae)	Corn sowthistle	Perennial herbs with taproots and creeping rootstocks, flowering mid summer and autumn; prolific production of achenes (up to 30 / head), pappus of many rows of barbellate bristles and persisting cottony hairs. Seed dispersal by wind, birds and animals. Weed of agricultural and horticultural crops. Recorded in Qld, SA (AVH, 2005; FEIS 2005;	Dispersal mechanisms indicate that seed may contaminate grape bunches. However, SAG has stated that this	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
		Lazarides & Hince, 1993).	species is only reported in Region XII, an area with no grapevine production.	
Sorghum halepense (L.) Pers. (Poaceae)	Johnson grass	Perennial grass to 2 m high with well developed creeping rhizomes, flowering summer. Spikelets 4 – 6 mm long, lemmas +/- with awns to 8 mm long that adhere to fibrous surfaces. Widespread in Australia and hybridises with grain sorghum (*S. bicolor*) (AVH, 2005; Harden, 1993; 4: 436; Lamp & Collet, 1989; Lazarides & Hince, 1993).	SAG has stated that this species has been recorded as contaminating grape bunches.	Yes
Taeniatherum caput-medusae Boiss. [probably *Elymus caput-medusae* L.]	Medusa-head	Rhizomatous perennial grass, flowering summer. Florets barbed and spikes remain intact for a long period; prolific seed producer, dispersing seed via wind, soil movement, human activities and by adhering to animals. Typically invades rangeland communities on disturbed sites. Recorded only in one region of SA (Lazarides & Hince, 1993; Sharp & Simon 2002).	SAG has stated that this species is associated with natural grasslands and road edges and is only found in coastal dry lands in Region VI in areas with no grapevine production.	No
Typha spp. (Typhaceae)	Bulrushes	!5 species worldwide, cosmopolitan. Robust, rhizomatous perennial aquatic herbs with erect, unbranched stems. Flowering summer, fruit is a small 1-seeded spongy follicle which falls before opening. Dispersal of the seed unit is by wind and water with the aid of long straight hairs persisting from the female flowers. Growing in and around fresh water, these species are major weeds of irrigation channels and particularly of rice crops (Biggs, 1987; Harden 1993)	Dispersal mechanism of this genus indicates that seed may contaminate grape bunches. This is supported by New Zealand MAF interception data on Chilean table grapes entering New Zealand.	Yes
Veronica anagallis-aquatica L. (Scrophulariaceae)	Blue water speedwell	Perennial herb to 0.8 m high, flowering spring-summer; fruit a globose capsule to over 4 mm in diam. Fairly common weed growing in or near water with seeds mainly water dispersed. Recorded in most States and Territories in Australia (AVH, 2005; Harden, 1992; 3:579; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches	No

Scientific name	Common name	Available information (i.e. habit, reproduction, etc.)	Final assessment	Considered to be on export pathway? (yes/no)
Xanthium spinosum L. (Asteraceae)	Bathurst burr	Annual herbs to 1 m high, flowering most of the year. Female flower heads form a burr 10 – 12 mm long with the persisting involucral bract tips becoming numerous hooked spines to 3 mm long. Burr is dispersed as a unit containing the achenes. Dispersal by attachment to fibrous surfaces. Native to South America and now widespread throughout Australia (AVH, 2005; Harden, 1993; 4: 668; Lazarides & Hince, 1993).	Dispersal mechanism indicates that seed is unlikely to contaminate grape bunches	No

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APPENDIX 3: DATA SHEETS FOR QUARANTINE PESTS

3.1 Arthropods

3.1.1 Chilean False Red Mite

Brevipalpus chilensis Baker [Acari: Tenuipalpidae] – Chilean false red mite

Hosts: *Actinidia chinensis* (kiwi fruit); *Ampelopsis* sp.; *Annona cherimola* (cherimoya); *Antirrhinium* sp.; *Catalpa speciosa*; *Chrysanthemum* sp.; *Citrus limon* (lemon); *Citrus sinensis* (orange); *Cydonia oblonga* (quince); *Diospyros kaki* (persimmon); *Ficus carica* (fig); *Garcinia* sp.; *Jasminum angustifolium*; *Lugustrum sinensis*; *Malus pumila* (apple); *Pelagonium* sp.; *Prunus armeniaca* (apricot); *Prunus dulcis* (almond); *Pyrus communis* (pear); *Rubus ideeus* (raspberry); *Strongylodon macrobotrys*; *Viburnum* sp.; *Vinca* sp.; *Vitis vinifera* (grape) (CABI, 2004; Gonzalez, 1983; Klein Koch & Waterhouse, 2000; SAG/USDA, 2002).

Distribution:

Brevipalpus chilensis: Argentina; Chile.

Interceptions: *Brevipalpus chilensis* was intercepted 153 times on commodities from Chile at US ports of entry from 1994-2002, 119 times on *Vitis* sp. (SAG/USDA, 2002). However, it has not been detected in association with table grapes imported from Chile to New Zealand in approximately 70 consignments during 3 seasons of trade (NZ MAF, 2002).

Biology: *Brevipalpus chilensis* is a small, reddish mite up to 0.5 mm long.

Brevipalpus chilensis overwinters in grapevines as groups of fertilised adult females under the bark where they hide in groves and hollows (Gonzalez, 1968; 1983; 1989). As buds swell in spring, females start to deposit eggs on shoots, leaves or in unopened buds. Populations of 900-1400 adults per leaf are reported in Chile. This species initially feeds and causes damage to *Vitis* buds and can then be found distributed through the bunch and on the underside of the leaves (Gonzalez, 1983).

While *Vitis vinifera* is its main host in Chile, *B. chilensis* is associated with the vegetative and flowering/fruiting structures of a range of horticultural, forestry, ornamental and weed hosts (e.g. those in vineyards) (Gonzalez, 1983).

Brevipalpus chilensis is recognised as a significant pest of table grapes in Chile. *Brevipalpus chilensis* assumed pest status in Chile in the 1950s following the widespread application of organophosphorus insecticides. Production losses in vineyards of up to 30% have been reported.

Specific quarantine measures are required for *B. chilensis* for the importation of table grapes from Chile into the USA (methyl bromide fumigation, CFR 319.56-2m), New Zealand (inspection using a maggi lamp, MAF Biosecurity Authority (Plants) Standard 152.02) and Peru (inspection and methyl bromide fumigation, Departmental Resolution No. 076-2003-AG-SENASA-DGSV).

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3.1.2 Weevils

Geniocremnus chiliensis (Boheman) [Coleoptera: Curculionidae] – Tuberous pine weevil

Naupactus xanthographus (Germar) [Coleoptera: Curculionidae] – Fruit tree weevil

Synonyms and changes in combination (where applicable):

<u>Naupactus xanthographus</u>: *Leptocerus xanthographus* Germar; *Pantomorus xanthographus* (Germar).

Hosts:

<u>Geniocremnus chiliensis</u>: *Vitis vinifera* (grapevine); *Pinus radiata* (Monterey pine) (Klein Koch & Waterhouse, 2000).

<u>Naupactus xanthographus</u>: There are conflicting reports (marked with *, Gonzalez, 1983, Ripa, 1986) on the host range for this species but it is considered to include: *Actinidia chinensis* (kiwi fruit); *Annona cherimola* (cherimoya, custard apple); *Beta vulgaris*; *Citrus limon* (lemon); *Citrus sinensis* (orange); *Conium maculatum*; *Cydonia* (quince); *Diospyros kaki* (persimmon); *Eriobotrya japonica* (loquat); *Foeniculum vulgare* (fennel); *Juglans regia* (walnut); *Lucuma bifera**; *Malus domestica* (apple); *Medicago sativa* (alfalfa, lucerne); *Mespilus germanic*; *Olea europaea* (olive); *Persea americana* (avocado); *Phaseolus vulgaris* (bean); *Plantago major*; Prunus armeniaca* (apricot); *Prunus cerasus* (cherry); *Prunus domestica* (plum); *Prunus persica** (peach); *Prunus salicina** (Japanese plum); *Pyrus communis** (pear); *Raphanus sativus* (radish)*; *Rubus idaeus** (frambuesa, raspberry); *Rumex* sp.; *Solanum tuberosum* (papa, potato); *Sorgum halepense* (sorghum); *Taraxacum officinale* (dandelion); *Vitis vinifera** (grapevine).

Distribution:

<u>Geniocremnus chiliensis</u>: Chile.

<u>Naupactus xanthographus</u>: Argentina (Bentancourt & Scatoni, 1992), Chile (Caballero, 1972), and Uruguay (Bentancourt & Scatoni, 1992).

Interceptions: *Naupactus xanthographus* has been detected in association with table grapes exported from Chile to the USA since 1953. Prior to 1975 (when mandatory fumigation of Chilean table grapes destined for the USA was introduced), it was detected 26 times with table grapes. Between 1976 and 1982, it was reduced to 6 detections in grapes and pears. (Gonzalez, 1983).

Biology: The life stage of weevils, such as *N. xanthographus* and *O. sulcatus,* considered likely to be associated with table grapes is the adult. Larvae and eggs are primarily found in soil, bark and vegetation but adults may be associated with bunches (as demonstrated by interceptions of *N. xanthographus* during phytosanitary inspections).

Phytosanitary measures are required for *N. xanthographus* for the export of table grapes from Chile to the USA and Peru (inspection and methyl bromide fumigation, Departmental Resolution No. 076-2003-AG-SENASA-DGSV).

Naupactus xanthographus was first regarded as a pest of commercial crops in Chile in the 1930's but was not recognised as a pest of *Vitis* until the 1950's. By the 1960's was considered a serious pest of *Vitis* in Chile and also a primary pest of citrus, avocado and loquat. It is considered a secondary pest of alfalfa in Argentina. Damage due to adults is considered to be variable whereas damage due to larvae is considered to occur every year. The level of damage is proportional to the size of the population (Gonzalez, 1983).

Adult female *N. xanthographus* are 14-18mm long and the male is smaller (12-14mm) and narrower. Eggs are oval, approximately 1mm long, yellow/orangish and are laid under the bark in several clusters of 20-50 with up to 25 locations per plant. There are 6 larval stages with first stage larvae 1.3-1.5mm long through to final stage larvae, which are up to 20 mm long. Females can store male sperm within their abdomen and therefore remain capable of producing offspring in the absence of males for up to 6 months. Each female can produce up to 1000 eggs. Larvae (and pupa) are present in soil and could therefore be spread via the movement of soil or machinery/equipment that is contaminated with soil (Gonzalez, 1983).

The peaks of adult emergence for *N. xanthographus* are in September-October and December-February (Gonzalez, 1983). This overlaps with the main season for table grapes in Chile (late November-late April, i.e. late spring-mid autumn).

Little information is available on *Geniocremnus chiliensis.* SAG (2002) commented that it is native to Chile, can be found accidentally feeding on leaves in grapevines, cannot fly, is subterranean and adults can easily be detected during phytosanitary inspection.

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3.1.3 Mediterranean fruit fly

Ceratitis capitata (Wiedemann) [Diptera: Tephritidae] – Mediterranean fruit fly

Synonyms and changes in combination: *Ceratitis citriperda* Macleay; *Ceratitis hispanica* De Brême; *Pardalaspis asparagi* Bezzi; *Tephritis capitate* Wiedemann.

Hosts: *Ceratitis capitata* is a highly polyphagous species whose larvae develop in a very wide range of unrelated tropical and temperate fruits, vegetables, ornamental plants and wild hosts. Reported hosts include over 200 species from the families Anacardiaceae, Chrysobalanaceae, Cucurbitaceae, Ebenaceae, Loganiaceae, Malpighiaceae, Meliaceae, Oleaceae, Podocarpaceae, Rosaceae, Rubiaceae, Rutaceae, Sapotaceae, and Solanaceae. Hosts include: *Actinidia chinensis* (Chinese gooseberry, kiwi fruit); *Anacardium occidentale* (cashew); *Annona* spp. (custard apple); *Artocarpus altilis* (breadfruit); *Artocarpus heterophyllus* (jackfruit); *Asimina* spp. (pawpaw); *Asparagus* spp. (asparagus); *Averrhoa carambola* (carambola); *Brassica oleracea* (broccoli, cabbage, cauliflower, wild cabbage); *Cananga odorata* (ylang ylang); *Capsicum* spp. (capsicum, chilli, pepper, wild red pepper); *Citrus* spp. (citrus); *Coffea* spp. (coffee); *Cucumis* spp. (melon); *Cucurbita* spp. (marrow, pumpkin, squash); *Cydonia oblonga* (quince); *Cydonia sinensis* (Chinese quince); *Cyphomandra betacea* (tamarillo, tree tomato, tomato tree); *Diospyros decandra* (persimmon); *Diospyros ebenum* (black sapote); *Ficus* spp. (fig); *Fortunella* spp. (kumquat); *Gossypium* spp. (cotton); *Juglans* spp. (walnut); *Litchi chinensis* (litchi, lychee); *Lycopersicon esculentum* (tomato); *Malus* spp. (apple); *Mangifera indica* (mango); *Musa* spp. (banana, plantain); *Pandanus odoratissimus* (breadfruit); *Pandanus tectorius* (screw pine); *Passiflora* spp. (passion flower, passion vine); *Persea americana* (avocado); *Phaseolus lunatus* (bean); *Phoenix dactylifera* (date, date palm); *Phyllanthus acidus* (Ceylon gooseberry, Indian gooseberry, Malay gooseberry, Otaheite gooseberry, star gooseberry); *Prunus* spp. (cherry, hog plum, peach, plum, prune); *Pyrus communis* (pear); *Ribes* spp. (currant); *Robinia* spp. (locust); *Rosa* spp. (rose, roseberry); *Rosmarinus officinalis* (rosemary); *Rubus* spp. (blackberry, caneberry, dewberry, loganberry, raspberry, youngberry); *Syzygium* spp. (brush cherry, lillypilly, Malay apple); *Terminalia* spp. (tropical almond); *Vaccinium* spp. (blueberry, cranberry, huckleberry); *Vicia faba* (broad bean); *Vitis* spp. (grape) (CABI, 2004). For detailed discussion on hosts of Medfly see White and Elson-Harris (1994).

Distribution: *Ceratitis capitata* is considered to be eradicated from Chile. Albania, Algeria, Angola (restricted distribution, rd), Argentina (rd), Australia (Western Australia only), Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi (rd), Cameroon, Cape Verde, Colombia, Congo (rd), Congo Democratic Republic, Corsica, Costa Rica, Côte d'Ivoire, Croatia (rd), Cyprus, Ecuador (rd), Egypt, El Salvador (rd), Ethiopia, France (rd), Gabon, Ghana, Greece, Guatemala (rd), Guinea (rd), Honduras (rd), Israel, Italy, Jamaica, Jordan, Kenya, Lebanon, Liberia, Libya (rd), Madagascar (rd), Malawi, Mali, Malta, Mauritius, Mexico, Morocco, Mozambique (rd), Netherlands (absent, not established), Netherlands Antilles, Nicaragua, Niger, Nigeria (rd), Panama, Paraguay, Peru, Portugal, Réunion (rd), Russian Federation, Saint Helena (rd), Sao Tome and Principe (rd), Saudi Arabia, Senegal, Seychelles (rd), Sierra Leone, Slovenia (rd), South Africa, Spain, Sudan, Switzerland (rd), Syria, Tanzania, Togo, Tunisia, Turkey, Uganda, Uruguay, USA (rd), Venezuela, Yemen, Yugoslavia (rd), Zimbabwe.

Biology: A comprehensive data sheet on Mediterranean fruit fly is provided in CABI/EPPO (1997). Eggs are laid below the skin of host fruit and attacked fruit will usually show signs of oviposition punctures. The eggs hatch 2-18 days later and the larvae then feed for another 6-11 days (at 13-28ºC). Adults can be monitored by traps baited with male lures (trimedlure and terpinyl acetate but not methyl eugenol). Adult flight and infested fruit are considered to be the main means of movement and dispersal with *C. capitata* capable of flying at least 20km. *Ceratitis capitata* is an A2 pest for EPPO and is of quarantine significance throughout the world (e.g. USA, Japan). Its presence in Europe, even as temporary adventive populations, is considered to potentially lead to severe constraints of fruits to uninfested areas in other continents.

The cost of eradicating this pest from Western Australia has been estimated at $70m and the current costs incurred by South Australia due to this pest are estimated at $1.4m per annum (based on trapping, manned check point and 1.5 incursions per year) (Mumford *et al.*, 2001).

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3.1.4 Mealybugs

Pseudococcus calceolariae (Maskell) [Hemiptera: Pseudococcidae] – Citrophilus mealybug

Pseudococcus maritimus (Ehrhorn) [Hemiptera: Pseudococcidae] – Grape mealybug

Synonyms and changes in combination (where applicable):

<u>*Pseudococcus calceolariae*</u>: *Dactylopius calceolariae* Maskell, *Erium cal*ceolariae (Maskell) Lindinger, *Pseudococcus citrophilus* Clausen, *P. fragilis* Brain, *P. gahani* Green.

<u>*Pseudococcus maritimus*</u>: *Dactylopius maritimus*, *Planococcus maritimus*, *Pseudococcus bakeri*, *P. capensis*, *P. latipes*, *P. omniverae*.

Hosts:

<u>*Pseudococcus calceolariae*</u>*: P. calceolariae* is a highly polyphagous species that has been recorded from hosts in 40 plant families. Primary hosts are: *Abutilon* (Indian mallow), *Arachis hypogaea* (groundnut), *Brachychiton*, *Brassica*, *Ceanothus*, *Chenopodium* (Goosefoot), *Citrus medica* (citron), *Conium maculatum* (Poison hemlock), *Crataegus* (hawthorns), *Cydonia oblonga* (quince), *Daucus carota* (carrot), *Dodonaea viscosa* (switch sorrel), *Eugenia*, *Ficus*, *Fragaria*, *Geranium* (cranesbill), *Hedera helix* (ivy), *Helianthus*, *Heliotropium arborescens* (Cherry-pie), *Hibiscus* (rosemallows), *Juglans regia* (walnut), *Laburnum anagyroides* (laburnum), *Ligustrum*, *Lolium* (ryegrass), *Malus pumila* (apple) & *M. sylvestris* (crab-apple tree), *Malva* (mallow), *Musa paradisiaca* (plantain), *Nerium oleander* (oleander), *Palmae* (plants of the palm family), *Pelargonium* (pelargoniums), *Pinus radiata* (radiata pine), *Pisum sativum* (pea), *Pittosporum tobira* (Japanese pittosporum) & *P. undulatum* (Australian boxwood), *Polyscias*, *Prunus* spp. *Pyrus communis* (European pear), *Rheum hybridum* (rhubarb), *Rhododendron* (Azalea), *Ribes sanguineum* (Flowering currant), *Rosa* (roses), *Rubus* (blackberry, raspberry), *Schinus molle* (California peppertree), *Sechium edule*, *Solanum tuberosum* (potato), *Theobroma cacao* (cocoa), *Vitis vinifera* (grapevine) (CABI, 2004; CMI, 1980; Lamberts & Crane, 1990).

<u>*Pseudococcus maritimus*</u>: *Annona cherimolav* (cherimoya), *Cydonia oblonga* (quince), *Hippeastrum*, *Howeia forsteriana*, *Juglans regia* (walnut), *Malus domestica* (apple), *Prunus*

armeniaca (apricot), *P. domestica* (plum), *P. persica* (peach), *Pyrus communis* (pear), *Solanum tuberosum* (potato), *Vitis vinifera* (grapevine) (CABI, 2004).

Distribution:

Pseudococcus calceolariae: Australia (except Western Australia), Chile, China, Czechoslovakia, France, Georgia (Republic), Ghana, Italy, Madagascar, Mexico, Morocco, Namibia, Netherlands, New Zealand, Portugal, South Africa, Spain, Ukraine, United Kingdom, USA.

Pseudococcus maritimus: Argentina, Azerbaijan, Brazil, Canary Islands, Chile, Egypt, Georgia, Gibraltar, Guatemala, Hawaii, Hungary, Iran, Mexico, New Zealand, Poland, Peru, South Africa, Sri Lanka, UK, USA. Reports of this species in Australia are based on misidentifications of *P. affinis*, *P. caleolariae* and *P. longispinus* (Williams, 1985).

Interceptions: This group of pests has been detected in association with table grapes imported from Chile to New Zealand (NZ MAF, 2002). *Pseudococcus maritimus* was detected in association with table grapes from California destined for Australia during the first season of trade for this commodity (APHIS/AQIS, 2003).

Biology: In general, damage to table grapes caused by mealy bugs is due to the pests contaminating clusters with cottony egg sacs, larvae, adults, and honeydew. In addition, species such as *Pseudococcus maritimus* can transmit grape viruses (UC, 2003). *Pseudococcus calceolariae* is regarded as a major pest in the Riverland region of South Australia and an occasional or minor pest in Victoria and New South Wales (Gullan, 2000).

The lifecyle of *Pseudococcus maritimus* is similar to that for most mealy bugs: egg, 1st- 4th instars, 5th instar (male) and adult. The adult male is approximately 1mm long, a weak flyer and only lives for a few days during which mating takes place. The adult female is approximately 4mm long, wingless and quite sedentary. Reproduction is sexual with females reported to produce an average of 110 eggs (Grimes & Cone, 1985). This species is considered to spread slowly in the USA but once it is present in an orchard the infestation is difficult to clean up (TFREC, 2003). In California, feeding and subsequent damage is mainly on leaves and adult females migrate to the trunk for oviposition. In California it is mainly considered as a pest of grape, pear and apricot (ScaleNet, 2003).

Pseudococcus calceolariae is oval shaped and up to 4mm long and adult females are covered in white secretions (Willams, 1985). Reproduction is sexual and there are 3-4 generations per year on citrus in Australia (Victoria and New South Wales) (ScaleNet, 2003).

Eight species of *Pseudococcus* (APPD, 2004) are reported in Australia, demonstrating the suitability of the climatic conditions for their survival.

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3.1.5 Scales

Icerya palmeri Riley-How [Hemiptera: Margarodidae] – Margarodes scale

Parthenolecanium corni (Bouché) [Hemiptera: Coccidae] – European fruit lecanium scale

Synonyms and changes in combination (where applicable):

Parthenolecanium corni: *Coccus rosarum* Snellen van Volenhoven, *C. tiliae* Fitch, *Eulecanium corni corni* (Bouché); Schmutterer, *E. fraxini* King, *E. guignardi* King, *E. kansasense* (Hunter) King, *E. rosae* King, *E. vini* (Bouché) Cockerell, *Lecanium* (*Eulecanium*) *armeniacum* Craw; Cockerell & Parrott, *L. (E.) assimile* Newstead; Reh, *L. (E.) aurantiacum* Hunter, *L. (E.) canadense* Cockerell; Cockerell & Parrott, *L. (E.) caryarum* Cockerell, *L. (E.) corylifex* Fitch; Cockerell, *L. (E.) crawii* Ehrhorn; Cockerell & Parrott, *L. (E.) cynosbati* Fitch; Cockerell & Parrott, L. *(E.) fitchii* Signoret; Cockerell & Parrott, *L. (E.) kingii* Cockerell, *L. (E.) lintneri* Cockerell & Bennett; Cockerell, L. *(E.) maclurarum* Cockerell, *L. (E.) ribis* Fitch; Cockerell & Parrott, *L. (E.) rugosum* Signoret; Cockerell, *L. (E.) tarsale* Signoret; Cockerell & Parrott, *L. (E.) vini* Bouché; King & Reh, *L. adenostomae* Kuwana, *L. armeniacum* Craw, *L. assimile* Newstead, *L. canadense* Cockerell; Cockerell, *L. caryae canadense* Cockerell, *L. corni* Bouché, *L. corni robiniarum* Marchal, *L. coryli* (Linnaeus); Sulc (misidentification), *L. corylifex* Fitch, *L. crawii* Ehrhorn, *L. cynosbati* Fitch, *L. fitchii* Signoret, *L. folsomi* King, *L. juglandifex* Fitch, *L. kansasense* Hunter, *L. lintneri* Cockerell & Bennett in Cockerell, *L. maclurae* Hunter, *L. obtusum* Thro, *L. persicae crud*um Green, *L. pruinosum armeniacum* Craw, *L. rehi* King in King & Reh, *L. ribis* Fitch, *L. robiniarum* Douglas, *L. rugosum* Signoret, *L. tarsalis* Signoret, *L. vini* Bouché, *L. websteri* King, *L. wistariae* Signoret, *Parthenolecanium corni* (Bouché); Borchsenius, *P. coryli* (Linnaeus); Sulc (misidentification).

Hosts:

Icerya palmeri: *Medicago sativa* (alfalfa), *Vitis vinifera* (grapevine) (Prado, 1991).

Parthenolecanium corni: *P. corni* is highly polyphagous, attacking some 350 plant species placed in 40 families. It attacks a wide range of crops, mostly woody fruit trees and ornamentals. Primary hosts are: *Crataegus* (hawthorns), *Malus* (ornamental species apple), *Prunus domestica* (damson), *Prunus persica* (peach), *Ribes nigrum* (blackcurrant), *Ribes. rubrum* (red currant), *Rosa* (roses), *Vitis vinifera* (grapevine) (CABI, 2004).

Distribution:

Icerya palmeri: Chile.

Parthenolecanium corni: Afghanistan, Albania, Algeria, Argentina, Armenia, Australia (except Western Australia), Austria, Azerbaijan, Belgium, Brazil, Bulgaria Canada, Chile, China, Czech Republic, , Denmark, Egypt, Finland, France, Georgia (Republic), Germany, Greece, Hungary, India, Iran, Italy, Japan, Kazakhstan, Korea (North), Korea (South), Kyrgyzstan, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Malta, Mexico, Moldova, Mongolia, Netherlands, New Zealand, Norway, Pakistan, Peru, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Syria, Tajikistan, Turkey, Turkmenistan, Ukraine, United Kingdom, USA, Uzbekistan, Yugoslavia (CABI, 2004).

Interceptions: This group of pests has been detected in association with table grapes imported from Chile to New Zealand (NZ MAF, 2002).

Biology: Natural enemies normally maintain populations of *Parthenolecanium corni* below economic thresholds in the USA but damaging populations can occur especially when natural enemies are affected by pesticide application. Host plants can be directly and indirectly affected by infestations. The honeydew that is excreted provides a substrate for the growth of black sooty moulds that can reduce photosynthesis (causing premature leaf drop) and reduce the commercial quality of the produce (CABI, 2004).

Icerya palmeri is reported in association with *Vitis* spp. in Chile (Prado, 1991) but further information on the biology of this species is not known. Females in this family (Margarodidae) have distinctly segmented bodies usually covered in a waxy secretion. Adult males are winged. Specimens can be mistaken for mealy bugs (Hill, 1975).

Parthenolecanium corni is widely distributed in temperate and subtropical regions and can be a serious pest of deciduous orchards, vines and ornamentals (Ben-Dov, 1993). This species reproduces sexually and parthenogenetically, has 1-3 generations a year. On apples females are reported as laying 502-4025 eggs each. It disperses as the first-instar crawler by wind, animal vectors and movement of infested material by humans. Life stages are mostly sedentary apart from the winged male. Crawlers settle and feed on the underside of leaves and later stages often migrate to stems and branches. Adult females are convex or hemispherical and up to 6mm long and 5mm wide. The shape, size and colour are extremely variable and depend on maturity, host and what part of the plant it has infested (CABI, 2004).

Two species of *Parthenolecanium* (APPD, 2004) are reported in Australia, demonstrating the suitability of the climatic conditions for their survival.

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3.1.6 Leafrollers

Accuminulia buscki Brown [Lepidoptera: Tortricidae] – Tortricid leafroller

Accuminulia longiphallus Brown [Lepidoptera: Tortricidae] – Tortricid leafroller

Chileulia stalactitis (Meyrick) [Lepidoptera: Tortricidae] – Grape berry moth

Proeulia auraria (Clarke) [Lepidoptera: Tortricidae] – Chilean fruit tree leafroller

Proeulia chrysopteris (Butler) [Lepidoptera: Tortricidae] – Fruit leafroller

Proeulia triquetra Obraztsov [Lepidoptera: Tortricidae] – Grape leafroller

Synonyms and changes in combination (where applicable):

Chileulia stalactitis: *Eulia stalactitis* Meyrick

Proeulia auraria: *Eulia auraria* Clarke

Proeulia chrysopteris: *Eulia chrysopteris* Meyrick, *Tortrix chrysopteris* Butler.

Hosts:

Accuminulia buscki: *Prunus armeniaca* (apricot), *Prunus domestica* (plum), *Prunus persica* (peach); *Vitis* spp. (grapevine) (Brown, 1999).

Accuminulia longiphallus: details unknown.

Chileulia stalactitis: *Austrocedrus chilensis*, *Citrus paradisi* (grapefruit), *Citrus sinensis* (orange), *Prosopis tamarungo* (mesquite), *Prunus armeniaca* (apricot), *Prunus cerasus* (cherry), *Prunus domestica* (plum), *Prunus salicina* (Japanese plum), *Vitis vinifera* (grape) (Brown & Passoa, 1998).

Proeulia auraria: This species is a general feeder on deciduous as well as on evergreen wild host plants and crops. It was first found on a native shrub, *Aristolochia chilensis* (Aristolochiaceae) and then on a variety of endemic trees belonging to the families *Myrtaceae* and *Rosaceae*, among others. Exotic host trees include ornamentals such as the sycamore (*Platanus orientalis*) and false acacia (*Robinia pseudoacacia*), Horticultural hosts include: *Actinidia deliciosa* (kiwi), *Citrus sinensis* (navel orange), *Malus pumila* (apple), *Prunus armeniaca* (apricot), *Prunus avium* (cherry), *Prunus domestica* (damson), *Prunus persica* (peach), *Pyrus communis* (European pear), *Vitis vinifera* (grapevine) (CABI, 2004).

Proeulia chrysopteris: From the wide array of native host plants in over 16 families of higher plants, this species has been slowly moving to economic crops, particularly fruit trees in the families Rosaceae, Vitaceae and Rutaceae (citrus group), *Acer pseudoplatanus* (great maple), *Actinidia deliciosa* (kiwi fruit), *Citrus sinensis* (navel orange), *Diospyros* (malabar ebony), *Malus pumila* (apple), *Mespilus germanica* (medlar), *Platanus orientalis* (plane), *Prunus armeniaca* (apricot), *Prunus domestica* (damson), *Prunus persica* (peach), *Pyrus communis* (European pear), *Simmondsia chinensis*, *Vitis vinifera* (grapevine) (CABI, 2004).

Proeulia triquetra: *Vitis vinifera* (grapevine) (Gonzalez, 1983).

Distribution:

Accuminulia buscki: Chile.

Accuminulia longiphallus: Chile.

Chileulia stalactitis: Chile.

Proeulia auraria: Chile (restricted distribution).

Proeulia chrysopteris: Chile (restricted distribution).

Proeulia triquetra: Chile.

Interceptions: This group of pests has not been detected in association with table grapes imported from Chile to New Zealand in approximately 70 consignments during 3 seasons of trade (NZ MAF, 2002). Adult and juvenile (pupa) stages (including Geometridae, Noctuidae, Pyralidae and Torticidae) were detected in association with table grapes from California destined for Australia during the first season of trade for this commodity (APHIS/AQIS, 2003).

Accuminulia buscki, was intercepted in the USA in a consignment of Chilean table grapes in 1926 (Brown, 1999). Nearly all interceptions of Lepidoptera in the USA are larvae but as the larvae of *Accuminulia* are unknown it is not possible to determine if this genus is among these interceptions (Brown, 1999).

Biology: Most larval Tortricidae are leaf rollers but a few genera are known to bore into the fruit of host plants (Brown, 1999). These genera include *Proeulia*, *Chileulia* and *Accuminulia*. This contrasts with the report of Pucat (1994) who noted that larvae of *Proeulia* are external feeders that leave the host plant before harvest. Brown and Passoa (1998) describe the larvae of *Proeulia* as polyphagous leaf rollers that are also known to feed on the surface of fruit.

Proeulia auraria and *P. triqueta* are known to destroy buds, berries and vegetative material of *Vitis* in Chile and their presence is characterised by the presence of rolled up leaves. Damage to the berries can vary from superficial to completely destroyed. *Proeulia auraria* was initially considered a pest of citrus but has grown in importance as a pest of *Vitis*. *Proeulia auraria* is the most common species of this genus in Chile and the other species are considered to be of less significance. This genus is considered to be of quarantine concern for table grapes exported from Chile to the USA (Gonzalez, 1983).

The genus *Proeulia* is capable of flight with some species known to fly throughout the year. For example, *Proeulia auraria* is an abundant native insect in Chile and flies virtually throughout the year with peaks during January and April and September-November (Gonzalez, 1983). *Proeulia* overwinters on deciduous hosts as first instar larvae protected in webs but develops throughout winter on evergreen hosts. Eggs masses are laid on leaves. Leaves and flower debris are often attached to damaged fruit and severely affected young fruit can dry and fall off (Pucat, 1994).

The genus *Accuminulia* has been recently described (Brown, 1999) and is considered to be a potential future pest problem for Chile (Gonzalez, 2000). *Accuminulia buscki* is considered to be a native species of Chile that has expanded its host range to include agricultural crops (Brown, 1999). The biology of *A. longiphallus* is not known (Brown, 1999).

Chileulia stalactitis feeds on foliage, mature fruit and developing fruit. It is considered a secondary pest of *Vitis* in Chile but is capable of causing significant damage. Damage caused to *Prunus* by this species is considered to be more significant that that caused by species of *Proeulia*. *Proeulia* species overwinters as larvae inside hollow fruit or dried up bunches. In spring it feeds on leaves and in summer on leaves and flowers. Adults begin to emerge at the beginning of winter and can frequently be seen flying during August. Eggs are laid on leaves (Gonzalez, 1983).

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3.1.7 Thrips

Drepanothrips reuteri Uzel [Thysanoptera: Thripidae] – Grape thrips

Frankliniella australis Morgan [Thysanoptera: Thripidae] – Chilean flower thrips

Frankliniella occidentalis (Pergande) [Thysanoptera: Thripidae] – Western flower thrips

Synonyms and changes in combination:

Drepanothrips reuteri: *Drepanothrips viticola* Mokvzechi

Frankliniella australis: *Frankliniella cestrum* Moulton; *Frankliniella argentinae* Moulton

Frankliniella occidentalis: *Frankliniella californica* (Moulton); *Frankliniella helianthi* (Moulton); *Frankliniella moultoni* Hood; *Frankliniella trehernei* Morgan

Hosts: Thrips are generally polyphagous pests, for example, there are 244 plant species from 62 families recorded as hosts for *F. occidentalis* (CABI/EPPO, 1997). Commercial hosts in the USA include *Allium*, *Citrus*, Cucurbitaceae, *Gladiolus*, *Lycopersicon esculentum* (tomato), and *Phaseolus, Prunus* and *Rosa*. *Drepanothrips reuteri* is only reported in association with *Vitis* (CABI, 2004).

Distribution:

Drepanothrips reuteri: Chile, France, Italy, Switzerland, Turkey, USA (California), USSR.

Frankliniella australis: Argentina, Bolivia; Chile.

Frankliniella occidentalis: Indigenous to North America (Canada, Mexico, continental USA). Began to spread internationally in about 1980 and has now been reported from countries in all continents of the world (CABI/EPPO, 1997). Albania (restricted distribution, rd), Argentina, Australia (rd), Austria, Belgium, Brazil, Bulgaria (rd), Canada (rd), Chile, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic (rd), Denmark (rd), Dominican Republic, Ecuador, Estonia (rd), Finland, France (rd), Germany (rd), Greece (rd), Guatemala, Guyana, Hungary, Ireland, Israel, Italy, Japan (rd), Kenya, Korea, Kuwait, Lithuania, Macedonia, Malaysia, Malta (rd), Martinique, Mexico (rd), Netherlands, New Zealand (rd), Norway (rd), Peru, Poland (rd), Portugal (rd), Puerto Rico, Réunion, Romania, Russian Federation (rd), Slovakia, Slovenia (rd), South Africa, Spain, Sri

Lanka, Swaziland, Sweden, Switzerland, Turkey (rd), United Kingdom, USA, Venezuela, Zimbabwe.

Interceptions: This group of pests (Thysanoptera) has not been detected in association with table grapes imported from Chile to New Zealand in approximately 70 consignments during 3 seasons of trade (NZ MAF, 2002) nor in association with table grapes from California destined for Australia during the first season of trade for this commodity (APHIS/AQIS, 2003).

Biology: A comprehensive data sheet on *Frankliniella occidentalis* is provided in CABI/EPPO (1997).

This group of pests can directly affect plant production by reducing yield and quality or transmitting viruses. Indirectly their presence on a crop can result in access to particular markets being denied (CABI, 2004). Thrips are recognised as vectors of a range of plant viruses, for example tomato spotted wilt virus (TSWV) and tobacco streak *ilarvirus* (TSV) by *F. occidentalis.* Only nymphs can acquire the virus and they remain infective for 3-10 days (CABI/EPPO, 1997).

Drepanothrips reuteri has been recorded as representing a major (e.g. 70%) part of the thrips populations associated with table grapes in certain areas of Chile. This species, along with *F. cestrum* (*F. australis*), are considered to be significant pests of *Vitis* in Chile (Gonzalez, 1983; Ripa, 1994). *Frankliniella australis* is also a recognised pest of *Prunus* with significant reductions in production of marketable fruit reported from Chile (Ripa, 1988; Ripa & Rodriguez, 1993). In contrast to these reports, SAG (2002) commented that *F. australis* is associated with flower petals during their development and is not considered to cause economic damage.

There is some debate over the exact symptoms on *Vitis* in Chile caused by various species of thrips and whether they cause symptoms on berries in addition to vegetative plant parts (Gonzalez, 1983). *Frankliniella occidentalis* and *D. reuteri* are known to cause scarring of berries in California, which can make some white varieties unmarketable (UC, 2000).

Adult thrips are tiny, for example, the adult female of *F. australis* 1.6 to 1.8 mm of long (Gonzalez, 1983) and adults of *F. occidentalis* are generally less than 2mm (CABI/EPPO, 1997). Colouration of adults can vary, for example, pale, intermediate and dark forms of *F. occidentalis* occur at different times of the year in the USA (CABI/EPPO, 1997).

The small size of thrips allows them to secrete themselves into small crevices and tightly closed plant parts. Localised spread could occur via wind, human vectors (e.g. in hair, on clothes), on equipment/containers and international spread is possible on plants for planting and cut flowers (CABI/EPPO, 1997). Specimens of *F. australis* can be found under the bark of *Vitis* and other hosts during winter (Gonzalez, 1983). SAG (2002) considers that specimens of *F. australis* can be detected during phytosanitary inspection.

Under favourable conditions, thrips such as *F. occidentalis* can reproduce continually. Up to 15 generations per year have been recorded under glasshouse conditions with females producing 20-40 eggs each (CABI, 2004).

Frankliniella occidentalis is under official control in Northern Territory, Tasmania and parts of Victoria. Interstate restrictions on the movement of certain *F. occidentalis* host material exist in Australia. For example, the movement of cut flowers, leafy vegetables or nursery stock of *F. occidentalis* hosts into the State of Tasmania.

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3.1.8 Black widow spider

Latrodectus mactans (Fabricius) [Araneae: Theridiidae] – Black widow spider

Comprehensive biological and sanitary related information on this species (and spiders in general) is provided in a series of documents recently produced by the New Zealand Ministry of Agriculture and Forestry and Ministry of Health (see below). The Pest Risk Assessment document is particularly relevant in providing similar technical information to that presented in the data sheets for other pest groups in this IRA. Stakeholders are recommended to consult these documents for technical information on *L. mactans*.

- Pest Risk Assessment of Spiders Associated with Table Grapes from United States of America (State of California), Australia, Mexico and Chile. Ministry of Agriculture and Forestry, Wellington, New Zealand (NZ MAF, 2002a).
- Mitigation Measures for the Management of Risks Posed by Exotic Spiders Entering New Zealand in Association with Imported Table Grapes. Ministry of Agriculture and Forestry, Wellington, New Zealand (NZ MAF, 2002b).
- Towards a Health Impact Assessment Relating to Venomous Spiders Entering New Zealand in Association with Imported Table Grapes: A Discussion Document. Ministry of Health, Wellington, New Zealand (NZ MAF, 2002c).
- Review of Submissions (*to the above 3 documents*). September 2002. Ministry of Agriculture and Forestry, Ministry of Health and Department of Conservation (NZ MAF, 2002d).

These documents are available electronically at http://www.maf.govt.nz/biosecurity/pests-diseases/plants/risk/spiders-grapes/index.htm

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3.2 Pathogens

3.2.1 *Phomopsis viticola* (Sacc.) Sacc.

Synonym(s): *Phoma viticola* Sacc.; *Fusicoccum viticola* Reddick; *Phomopsis* taxon 2; *Phomopsis* type 2.

Common name(s): Phomopsis cane and leaf spot; Phomopsis cane and leaf blight; Phomopsis of grapevine.

Hosts: *Vitis vinifera* (Eurasian grapevine), *Vitis rupestris* (North American grapevine); *Vitis aestivalis* (summer grape); *Vitis labrusca* (fox grape); *Vitis rotundifolia* (Muscadine grape) and *Parthenocissus quinquefolia* (Virginia creeper) [Galet & Morton, 1988; Uecker, 1988].

Plant part affected: This pathogen is known to infect leaves, stems, inflorescences, canes, rachises and berries (Erincik *et al.*, 2001).

Distribution: *Phomopsis viticola* is present throughout viticultural areas world-wide, including: Australia (NSW, SA, Tas, Vic); Belgium; Brunei Darussalam; Canada; France; Georgia; Germany; Greece; Hungary; India; Italy; Japan; Kenya; Moldova; Netherlands; New Zealand; Portugal; Romania; Russian Federation; Serbia and Montenegro; South Africa; Switzerland; Turkey; Ukraine; United Kingdom; USA (California, New York) Yugoslavia; (Punithalingam, 1979; Hewitt & Pearson, 1988; Saber, 1998; EPPO, 2004).

Phomopsis viticola has been reported from Chile (Mujica *et al*., 1980) but it is an infrequent pest of no economic importance (SAG, 2005). The rare occurrence of this fungus is further supported as it is not listed as present in Chile in CABI (2004). In Australia, *P. viticola* has been recorded in New South Wales, South Australia, Tasmania and Victoria. *Phomopsis viticola* is present in the viticultural areas of Coonawarra, Mildura, Rutherglen, Mudgee, Hunter Valley and the Barossa Valley. Only *Diaporthe australafricana* (as *Phomopsis* taxon 1) has been recorded in the viticultural regions of Western Australia. *Diaporthe australafricana* has also been reported from the Yarra Valley (Vic), Adelaide Hills (SA), Mornington Peninsula (Vic), Hunter Valley (NSW) and Berridale (Tas) (Merrin *et al.*, 1995).

Taxonomy: *Phomopsis viticola* was initially described as *Phoma viticola* from *Vitis vinifera* canes in France in 1880 (Saccardo, 1880). Reddick (1909) described the causal agent of dead-arm *as Fussicoccum viticola* in the USA, and Shear (1911) identified the teleomorph of *F. viticola* as *Cryptosporella viticola*. *Cryptosporella viticola* has not been found since. Saccardo transferred the species to the genus *Phomopsis* as *Phomopsis viticola* (Sacc.) Sacc. in 1915 (Saccardo, 1915) and this name is now used for the causal agent of Phomopsis cane and leaf spot (CABI, 2004).

Merrin *et al*. (1995) identified two distinct taxa of *Phomopsis* on grapevines in Australia, based on morphological and cultural characteristics. *Phomopsis* taxon 2 caused dark spots with yellow halos on leaves and dark, elongated lesions on young shoots and petioles, the same symptoms caused by *P. viticola* in other parts of the world. In contrast, *Phomopsis* taxon 1 did not cause symptoms on young growth. *Phomopsis* taxon 1 produces perithecia and the teleomorph was described as *Diaporthe perjuncta* Niessl. by Phillips (1999) and as *D. viticola* Nitschke by Scheper *et al*. (2000). In Australia, only *Phomopsis* taxon 2 is known to cause the damaging symptoms of Phomopsis cane and leaf spot (Rawnsley & Wicks, 2002) and Mostert *et al*. (2001) showed a *Phomopsis* taxon 2 isolate matched with *P. viticola* isolates.

Using morphology, DNA sequences and pathogenicity data, van Niekerk *et al*. (2005) showed that *P. viticola* isolates from Australia matched with those from other countries and confirmed that *P. viticola* was a severe pathogen of grapevines. Van Niekerk *et al*. (2005) also studied the identity of isolates previously identified as *Phomopsis* taxon 1, *D. perjuncta* or *D. viticola*. The teleomorph of *Phomopsis* taxon 1 isolates from Australia and South Africa was described as a new species, *D. australafricana* Crous & J.M. van Niekerk. *Diaporthe perjuncta* was found to occur on *Ulmus campestris* and *U. glabra* in Austria and Germany, while *D. viticola* was found to occur on *Vitus vinifera* in Germany and Portugal.

Biology: Infection of grapevines generally occurs in spring at the time of bud opening (Bugaret, 1990). The disease is most destructive in geographical regions with a moderate spring climate with sufficient rain at budburst to keep the grapevines wet for several days (Hewitt & Pearson, 1988). Rain and mild temperatures are the most important environmental factors required for the disease (Bugaret, 1986). Under Australian field conditions in spring at least 10 hours of rain are required for conidium production from conidiomata, and after conidium dispersal, a further 8-10 hours or more of very high relative humidity or surface wetness are required for infection (Emmett *et al*., 2002).

Phomopsis viticola overwinters as mycelium and as conidiomata in infected tissues, particularly canes, spurs and bark, and mummified fruit bunches (Moller & Kasimatis, 1978; Pearson, 1990; Pine, 1959; Taylor & Mabbitt, 1961). The fungus can survive for up to 4.5 years on grapevines (Moller & Kasimatis, 1981). Mycelium is also known to over-winter in dormant buds (Hewitt & Pearson, 1988; Bugaret; 1990).

In spring, mature conidiomata erupt from infected tissue and during rain, water-borne alpha-conidia are exuded in the form of a cirrhus. The conidia are apparently washed, blown in water droplets, splashed or spread by insects onto young vine foliage or flower-bunches (Emmett *et al*., 1992). At an optimum temperature of about 23°C and when free water remains on the tissues or when the relative humidity approaches 100%, conidia germinate and infection of green tissue may occur within a few hours (Gärtel, 1972; Hewitt & Pearson, 1988). Infection occurs through the stomata (Gärtel, 1972), fresh wounds or directly through the cuticle (Willison *et al*., 1965).

Young tissues are mainly infected and symptoms appear 3-4 weeks after infection (Hewitt & Pearson, 1988). Leaf symptoms are seen first and shoot symptoms take longer to develop (Creecy & Emmett, 1990). The fungus mainly invades the cortex parenchyma tissue and forms pseudo-parenchymatous mats among host cells (Hewitt & Pearson, 1988) and may also invade the vascular tissue, as has been observed for *Phomopsis vaccinii* infection of blueberry twigs (Daykin & Milholland, 1990). However, it is possible that the deep lesions produced by *P. viticola* are caused by phytotoxins produced by the fungus, as has been determined for a number of species of *Phomopsis* (Mazars *et al*., 1990).

During the summer in warm, dry climates, the fungus is relatively inactive in vine tissue, but growth resumes in the autumn and the conidiomata develop (Moller *et al*., 1981; Hewitt & Pearson, 1988). Infected canes and spurs may continue to produce conidiomata and conidia for at least three seasons (Creecy & Emmett, 1990), and dead canes also may produce conidia for at least three more years (Pearson, 1990).

Phomopsis of grapevine infects a number of *Vitis* spp. Infection generally takes place early in the spring at the time of bud opening (Bugaet, 1990) when young grapevine shoots are most susceptible to infection. Young branches are most susceptible at their herbaceous terminal ends, which lengthen rapidly, placing them out of reach of the rain-splashed alpha-conidia (Eichhorn & Lorenz, 1977; Pratt, 1988).

The disease is most destructive in geographical regions with a moderate spring climate with sufficient rain after budburst to keep the grapevines wet for several days (Hewitt & Pearson, 1988). Inoculum consists of the water-borne alpha-conidia (Pine, 1958; 1959). Rain and mild temperatures are the most important environmental factors required for the disease (Bugaret, 1986). Most infection occurs during prolonged rain when shoots are at an early stage of development (Bugaret, 1990). Long periods of cool wet weather in spring create the greatest potential for crop losses from Phomopsis and 20-30 hours of rain at flowering time favours berry infection.

Epidemics of Phomopsis cane and leaf spot can occur during prolonged periods of cool wet weather during spring as the availability of alpha-conidia increases. Shoot growth slows when the mean temperature is 5-7°C and shoots 3-10 cm long are very susceptible to infection (Hewitt & Pearson, 1988). Disease occurrence from season to season varies considerably depending on the weather conditions. Successive cool wet springs can lead to a build-up of the disease (Hewitt & Pearson, 1988).

There is some debate over how the spores of *P. viticola* are dispersed. Since the alpha-conidia are mainly dispersed by water splash, the fungus spreads mostly within the vine rather than from vine to vine. Therefore, spread of the disease within the vineyard is localized, remaining close to the source of the inoculum (Hewitt & Pearson, 1988). Long distance spread of *P. viticola* to new viticultural areas occurs primarily through the transfer of infected or contaminated propagation materials such as budwood, cane cuttings and young plants (Hewitt & Pearson, 1988; Merrin *et al*., 1995). Pruning wounds made during the dormant season in normal commercial practice are poorly infected (Willison *et al*., 1965).

The distinctive symptoms commonly attributed to Phomopsis cane and leaf spot on grapevine include dark fissure-like lesions on canes, bleaching of canes and small dark spots on leaves that are surrounded by yellow halos (Pine, 1959; Taylor & Mabbitt, 1961; Hewitt & Pearson, 1988).

The leaf symptoms appear in spring on lower leaves of shoots and consist of small dark brown spots, usually less than 1 mm in diameter, surrounded by a 2-3 mm yellow halo (Taylor & Mabbitt, 1961; Hewitt & Pearson, 1988). The leaves can be distorted and parts of leaves are killed when the spots are numerous (Taylor & Mabbitt, 1961; Crecy & Emmett, 1990). Spots that become necrotic darken and drop out, giving the leaves a 'shot-hole' appearance (Hewitt & Pearson, 1988). Affected leaves, particularly those with spots on their petioles, can turn yellow and abscise (Bugaret, 1990; Crecy & Emmett, 1990). Severely affected basal leaves may also be stunted (Emmett *et al*., 1992).

The first evidence of *P. viticola* infection on emerging shoots is small spots with black centres. They usually occur on the basal portion of the shoots (Taylor & Mabbitt, 1961; Moller *et al*., 1981) within 15 days of bud opening and growth is often inhibited (Bugaret, 1990). Similar spots may appear on the flower cluster stems and if badly infected, the clusters wither (Moller *et al*., 1981; Creecy & Emmett, 1990), may become necrotic, dry and fall off (Gärtel, 1972; Hewitt & Pearson, 1988).

Leaf symptoms are one of the first signs that *P. viticola* is present within the vine. Leaves develop tiny, dark brown, necrotic lesions, surrounded by a yellow margin. Heavily infected leaves are distorted and some leaf sections killed (Emmett *et al*., 1998), stunted and fall prematurely (Gubler & Leavitt, 1992). Infected woody areas on basal portions of the cane are bleached. It is difficult to distinguish between the two types based on bleaching and the presence of pycnidia, as they show remarkable similarity (Rawnsley & Wicks, 2002). As new shoots develop, infected young shoots in the first four to six internodes develop chlorotic spots with dark centres. Tissues become disorganised and collapse, resulting in the development of dark, longitudinal lesions (Pine, 1959). The lesions eventually cause cracks in the epidermis and cortex of shoots (Gubler & Leavitt, 1992). Severe lesions cause the cane to become brittle and break off. Yield losses occurs as a result of reduced bunch set, reduction of the bunch count and reduction of the next year's cropping level (Rawnsley & Wicks, 2002).

In cool weather, late in the season, the fruit may become infected by *P. viticola*. While such infection is rare, it mainly occurs through lesions on the bunch or berry stem, although some particularly susceptible varieties may be infected directly through the skin of the young berry (Hewitt & Pearson, 1988). Usually only isolated bunches are affected, but if rain occurs just before harvest, berries can develop light brown spots which enlarge, darken (Moller *et al*., 1981; Lal & Arya, 1982) and produce conidiomata through the skin (Bugaret, 1990). These berries exude yellowish spore masses before finally shrivelling and becoming mummified (Taylor & Mabbitt, 1961; Gärtel, 1972; Moller *et al*., 1981). Infected berries may abscise from the pedicel, leaving a dry scar (Hewitt & Pearson, 1988).

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