New South Wales

INDUSTRY & INVESTMENT NSW

DGO09/975

Dr Colin Grant
Chief Executive
Biosecurity Australia
GPO Box 858
CANBERRA ACT 2601

Dear Dr Grant

I refer to the release by Biosecurity Australia in October 2009 of the Draft Import Risk Analysis report for fresh apple fruit from the United States of America Pacific Northwest States for which stakeholder comment was requested.

Technical review undertaken by experts in Industry & Investment NSW indicates that Biosecurity Australia has underestimated the likelihood and consequences of risk that NSW would incur in some instances if apple fruit were to be imported into Australia from the United States. Exotic pest and disease introductions may still occur despite mitigation measures being imposed.

The submission from Industry & Investment NSW is presented with this letter.

Gaps have been identified concerning mites and fungal and bacterial pathogens. The issue of the risk of introduction of potentially resistant biotypes from overseas even if the species is present in Australia has again been raised.

I would appreciate your department providing an itemised synopsis of the points raised in our submission and your response to each of these as you progress to finalise the IRA for fresh apple fruit from the Pacific Northwest States of the United States of America.

Yours sincerely

RICHARD SHELDRAKE
DIRECTOR-GENERAL

Level 6, 201 Elizabeth Street SYDNEY NSW 2000 PO Box K220 Haymarket NSW 1240
Telephone (02) 8289 3903 Facsimile (02) 9283 7201 Website www.industry.nsw.gov.au

Comments on the draft Import Risk Analysis report: Fresh apple fruit from United States of America Pacific Northwest States

December 2009

Submission to Biosecurity Australia

by Industry & Investment NSW

Title: Comments on the draft Import Risk Analysis report: Fresh apple fruit from the United States of America Pacific Northwest States

Submission to Biosecurity Australia by Industry & Investment NSW.

Disclaimer:
The information contained in this publication is based on knowledge and understanding at the time of writing (November 2009). However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of Industry & Investment NSW or the user's independent advisor.

Acknowledgements:
Significant contributions to the technical content of this document were made by M. Schwinghamer, E.E. Lazar and D.K. Knihinicki.

File reference: TRIM 2008/02517 DGO09/975 INT09/61461

CONTENTS

General summary

Industry & Investment NSW has technical objections to the recommendation that fresh apple fruit from the United States of America Pacific Northwest States be permitted into Australia.

Some of the concerns raised in the submission are summarised below.

Stakeholder resources

- There seems to be a disconnect between the level of concern nationally regarding certain exotic pests and diseases and trade recommendations which underestimate biosecurity risks to Australia. Federal and state governments have committed considerable expenditure to eradication of exotic pests and diseases and to biosecurity preparedness, training and awareness. Industry organisations are also expected to meet their share of these significant financial obligations. The capacity of Australia to respond to incursions is being tested in terms of present and future skills, resources and funding. Eradication programs are long term investments.

- Many of the comments made in previous submissions by NSW to Biosecurity Australia on the importation of fruit to Australia continue to be relevant, in the absence of advice to the contrary from Biosecurity Australia. Where specific comment has not been included in this submission, reference should be made to the previous submissions.

Pathogens

Pathogens of particular concern are those with an increased likelihood of being introduced into Australia and establishing and spreading.
Such pathogens are characterised by being able to:

  - survive for long periods of time on hosts at low temperatures
  - develop resistance to chemical treatments
  - cause late infection on fruit and therefore be more likely to cause latent infection
  - infect as a postharvest pathogen where no chemical treatment is available.

- The risk of importing *Erwinia amylovora* to Australia is unacceptable and exceeds the risk assessed in the IRA for fresh apples from New Zealand. The Pacific Northwest IRA notes that *Erwinia amylovora* is claimed to be one of the most serious diseases of modern apple production in Washington and that outbreaks are frequent and devastating because of highly susceptible varieties and current orchard management practices. Furthermore, survival of the pathogen in a viable but non-culturable state is acknowledged as is the risk of establishment in Australia because the timing of imports of apples from the United States will coincide with flowering of rosaceous hosts in Australia.

- European canker was highlighted as a pathogen of concern when Industry & Investment NSW reviewed the IRA for apples from New Zealand. Symptomless latent infections of European canker in apple fruit remain a potential pathway for the introduction of this exotic disease to Australia where the wide host range of commercial and amenity trees would encourage establishment and spread. Area freedom, the proposed criterion for risk mitigation, is an unrealistic benchmark for a pathogen that has effective air dispersal mechanisms and can infect without symptoms being evident.

  Allowing fruit sourced from areas of low pest prevalence is a suggested management option for this pathogen. ISPM 22 defines an area of low pest prevalence as one where a specific pest occurs at low levels. This means that the production area **is** infected with the pest. In cases where trade might occur between areas of similar or greater pest status with regard to the specific pest, then the provision is understandable but where trade is proposed from an area where a pest is present (eg United States) to a country where the pest is exotic (eg Australia), the risks of entry, establishment and spread are much greater. The risks and implications for Australia if European canker were introduced far outweigh the risk to the United States of potentially, if even inadvertently, exporting the pathogen.

- A pest risk analysis should be undertaken for *Phytophthora* species. A number of *Phytophthora* species can infect pome fruits and in fact, pear fruit is commonly used to bait many *Phytophthora* species from soil or plant material. *Phytophthora ramorum*, for example, is an exotic pathogen of major concern to Australia and is present in the Pacific Northwest of the United States.

- Many *Phytophthora* species are comprised of distinct pathotypes that vary in aggressiveness on different hosts. Exotic pathotypes are a concern even for species that have been recorded in Australia.

- Aggregating genera for pest risk assessment assumes that because the group has similar aetiology all component organisms pose an equivalent biosecurity risk and that an incursion of any of them would have identical consequences. Separate risk analyses should be carried out to deal with the likely existence of variations in virulence.

- Further consideration should be given to the risk presented by exotic postharvest diseases. Postharvest pathogens are not host-specific, can survive as latent infections and can adapt rapidly to infect new hosts. Furthermore, the number of postharvest treatments available in Australia is limited so that if these diseases become established they will be difficult to control. Many of these pathogens are known to develop resistance to the fungicides that are commercially available.

Pests

- The IRA notes that “various mite, mealybug and thrips species have been considered in previous import risk analyses and policy extensions undertaken by Biosecurity Australia” (p 247). Similarly, Industry & Investment NSW has responded with technical comment on various mite, mealybug and thrips species in previous submissions and our comments still apply.

  Examples include:
    - that the IRA has dealt with some of the mite issues in a superficial manner by lumping information about different species together
    - some spider mites and eriophyoid species have been omitted
    - there is no indication of specific standards for visual inspection and, if these procedures are documented, whether they are available for expert scrutiny.

- Industry & Investment NSW was instrumental in developing the use of predatory mites to control endemic pest mites in apples. Introductions of new pest mite species threaten the effectiveness of current programs. In contrast to random introductions through trade and quarantine breaches if risks are understated and mitigation is ineffective, any deliberate release into the Australian environment is constrained by regulations and controls which require thorough prior research.

Pest risk management

- Visual inspection
  Among the issues which might impact on the effectiveness of visual inspection as risk mitigation measures are
    - latent infection
    - inspection lot sizes
    - taxonomic rigour

- Disinfection
  When using chlorine solution as a disinfection treatment for postharvest purposes knowledge of the growth stage and potential location of the pathogen must be coupled with awareness of the mode of action of the chemical.

- Knowledge gaps
  - Lack of knowledge of certain pests and applicable mitigation measures is acknowledged in the IRA. This is turn raises other questions such as

    What will be the impact on the IRA, on trade and on Australia's biosecurity if the IRA is accepted with provisos but a subsequent determination on these pests indicates that the risk cannot be adequately mitigated?

  - The IRA assumes that for some pests and diseases their prevalence in the Pacific Northwest is similar to their prevalence in New Zealand. There is often no justification presented for the assumption. Again questions are raised:

    If the assumption is incorrect what are the implications for the validity of this IRA?

    As this IRA is not an extension of existing policy, why are New Zealand circumstances relevant?

Viruses and viroids

Industry & Investment NSW accepts that the way that the IRA deals with virus and viroid diseases is reasonable in that the virus species of greatest economic concern are ones that have been recorded in Australia. Also, the risk for establishment and spread from fruit is negligible or very low in all but a few cases. Exceptions are *Tobacco necrosis virus* which could be acquired from fruit waste by a soil borne virus vector, and *Apple scar skin viroid* which could be transmitted via germinated apple seed or contaminated cutting tools.

This IRA ranks the unrestricted risk estimate for *Apple scar skin viroid* as greater than the unrestricted risk estimate that was determined in the IRA for apples from China, although, at Very low it still falls below Australia's appropriate level of protection (ALOP). Evidence that the viroid can be transmitted through seed of fruit from infected trees was cited as contributing to increasing the risk ranking in this IRA.

Of interest are the differences in the rankings between the two IRAs for this pathogen

Component	USA	China
Probability of importation	Moderate	High
Probability of spread	Low	Very low
Consequences	Moderate	Low
Unrestricted risk	Very low	Negligible

If, the probability of importation from the United States was reassessed as High to align with the IRA from China and all other levels are retained because of recent advances in knowledge of the pathogen, then the unrestricted risk would be raised to Low and specific risk management measures would be required. The major difference in content between the supporting information for probability of importation of the viroid from the United States compared with China appears to be statements about the prevalence of the pathogen in China in the 1950s and 1960s. Comments about the potential presence of asymptomatic fruit, latent infection and infected tolerant cultivars are similar for both documents. Consequently, an unrestricted risk estimate of Low would be reasonable and mitigation measures should be required.

It seems unrealistic to state categorically that "fruit growers will not use volunteer plants for grafting or budding, nor are they likely to use orchard equipment on volunteer plants" (p203). These assumptions should be reconsidered.

Phytophthora diseases

Pest risk analyses were not presented for any phytophthora diseases despite the fact that five species that are ordinarily soil borne root pathogens were identified has having potential to be on pathway and able to infect fruit if zoospores are splashed onto fruit. The reason for not presenting a pest risk analysis is the reported occurrence of these five species in Australia.

However, technical experts advise that the pest risk analysis process should be undertaken for at least one *Phytophthora* species, namely *Phytophthora ramorum*, which is not in the pest list, for the following reasons.

- The number of *Phytophthora* species that can infect fruit of apple and the related species, pear, is greater than the number that cause important pre- or postharvest diseases or tree diseases. Pear fruit can be used to bait many phytophthora species from soil or plant material. These species include *P. ramorum* which is an exotic pathogen of major concern to Australia and which occurs in the Pacific Northwest of the United States.

- *Phytophthora ramorum* infects and causes diseases in numerous families of plants, although the only record for *Malus* is experimentally infected crab apple.

- There is a definite possibility that discarded fruit waste could lead to establishment of *Phytophthora* in soil and thence infect host plants. Some of the *Phytophthora* species which cause important diseases in a limited number of hosts can survive on a wide range of hosts or even dead plant tissue in soil.

- Packing of apples in the United States involves floating them in water as a first step. This might provide an avenue for infection by zoospores, depending on the source of the water.

- Many *Phytophthora* species are comprised of distinct pathotypes that vary in aggressiveness on different hosts. Exotic pathotypes are a concern even for species that have been recorded in Australia.

European canker

In responding to previous IRAs, Industry & Investment NSW raised concerns that European canker, *Neonectria ditissima*

- has a latent phase in both fruit and twigs where it can remain symptomless for up to four years
- would be shielded from disinfestation and detection at inspection if present as symptomless latent infection in fruit
- has effective long distance non-vectored dispersal spore mechanisms which are readily produced in infected fruit
- cannot be cost-effectively detected in infected but symptomless host material, and
- has an extensive host range which will have serious implications for urban and residential landscapes were it to establish in Australia.

The IRA report for apples from New Zealand noted that European canker was detected in four orchards in Spreyton, Tasmania in 1954 but was eradicated by 1991. The report did not include any indication of costs of the eradication program, but, if the time required to achieve eradication is taken as a benchmark, the costs span many years and would be large. These eradication costs become a significant risk factor for this pathogen and should be considered in this risk analysis.

European canker poses a particular threat to NSW. NSW has an elevated risk of incursion primarily because climates in the NSW apple production areas are conducive to the establishment and spread of the pathogen. Changes in the fungicide use spectrum in NSW orchards, consistent with integrated fruit production practices, also increase the level of risk.

The IRA assesses European canker as having an unrestricted risk rating of Low. This finding is contrary to the risk analysis presented on the PaDIL Plant Biosecurity Toolbox website which rates the risk as Moderate to High. Reasons given are that

- the fungus exhibits a wide spectrum of host diversity, affecting more than 60 tree and shrub species from more than 20 genera
- dispersal can occur by wind, water and pruning tools
- European canker is potentially present in all commercial apple and pear plantations from all temperate growing regions in the world, except Australia, and can cause crop losses of 10-60%
- latent infections can occur in fresh fruit, with entry sites particularly through the calyx.

Risk mitigation for European canker on fresh apples relies on area freedom because the pathway of greatest concern is symptomless infection of fruit that cannot be detected by inspection.

The IRA states that "orchards with any symptoms of European canker would be disqualified from export" (p xiv). However for a pathogen such as *N. ditissima*, areas of low pest prevalence should not even be considered as an option. This would, in effect, potentially reduce the Australian industry to the lowest common denominator of accepting the presence of the disease rather than maintaining the clear biosecurity benchmark that currently exists in Australia, notably freedom from disease. Furthermore, the dispersal characteristics of the pathogen make it unlikely that pest free areas or pest free places of production could be guaranteed.

The final IRA report for apples from New Zealand mentioned that spores of *N. ditissima* have been collected from non-host species in New Zealand. The report also noted that "although the disease is not common in environmental species in New Zealand, the situation could be different in Australia". In addition, the comment was made that "opportunities for damage are likely to be greater in a stressed environment". In the current drought cycle, environmental stresses are a common and very likely scenario in Australian orchards. The validity of these comments and areas of uncertainty equally apply to the disease risks for Australia of European canker from the United States.

Fire blight

It is a matter of concern that the IRA cites technical authorities on the prevalent status of fire blight in the Pacific Northwest states and yet recommends the importation of apples.

Warning alerts should be triggered by comments (pp 35-36) such as

- "*Erwinia amylovora* is abundant in the Pacific Northwest"
- fire blight "is considered one of the most serious diseases in modern apple production in Washington"
- "the bacterium can survive in a viable but non-culturable state and is able to regain culturability and pathogenicity"
- "endophytic infections in fruit are rare" – but not excluded
- "current orchard management practices, and the market demand for new apple varieties that are highly susceptible to fire blight, seem to lead to more frequent and devastating outbreaks"

The IRA mentions that:

Biosecurity Australia considers that the probability of importation of *E. amylovora* on apple fruit from the Pacific Northwest would be in the same range as that for apple fruit from New Zealand (p 36).

Does this assumption take into account the statements that

- *Erwinia amylovora* is abundant in the Pacific Northwest whereas the IRA for apples from New Zealand stated that the pathogen is widespread but more common on the North Island than the South (because of its preference for warmer temperatures) and
- technical evidence for the viable but non-culturable state has been more strongly substantiated than when the possibility was raised at the time of the New Zealand IRA and
- the "timing of imports of apples from the United States coincides with the flowering period of rosaceous hosts in Australia" which is specifically stated as being "a particularly receptive stage for *E. amylovora* infections" (p 36)?

Even if the probability of entry were comparable, the probability of establishment of *E. amylovora* in Australia is likely to be much higher for apples from the United States Pacific Northwest than for apples from New Zealand because importation of large volumes of fruit is likely to coincide with host flowering, the host family is very large and rosaceae plants very widely distributed.

Comment is made in the IRA that one of the management practices for fire blight in the Pacific Northwest includes using resistant varieties (p 36). From a grower's perspective, if fire blight were to be introduced into Australia, a double market disadvantage could be predicted. Increased disease management costs are likely to be coupled with attempting to sell less popular varieties resulting in lower market returns.

McManus & Jones (1994) [1] said *E. amylovora* is difficult to control and nearly impossible to eradicate because once established in its host, low populations persist and overwinter in symptomless tissue. Air samples collected during rain in a pome fruit nursery always contained *E. amylovora.*

1. Reference
McManus PS & Jones AL (1994) Role of wind-driven rain, aerosols and contaminated budwood in incidence and spatial pattern of fire blight in an apple nursery. *Plant Disease* 78:1059-1066

Postharvest diseases

Although there are more pre-harvest diseases than postharvest diseases and the potential for economic loss could be greater, postharvest diseases have a high likelihood of entry into Australia.

Coprinus rot (*Coprinus psychromorbida*), Sphaeropsis rot (*Sphaeropsis pyriputrescens*) and Mucor rot (*Mucor mucedo*) are postharvest diseases with the potential to cause significant detrimental consequences to producers. Losses of up to 50%, according to the biology of the pathogen, have been cited [1].

The ranking of these diseases should be reconsidered for the following reasons:

- Most postharvest pathogens are not host-specific and can adapt rapidly to infect a new host.
- Many postharvest pathogens survive as latent infections, even at temperatures lower than those experienced for fruit in cold storage.
- There are a limited number of postharvest treatments available in Australia and many of the pathogens have the potential to develop resistance to the fungicides that are commercially available.
- Most postharvest diseases once established are difficult to control by chemical treatments due to chemical use restrictions in Australia that may not apply in other countries.
- Damage to fruit quality due to postharvest diseases will have a high impact on the economic return for growers (including unmarketable products, diminished domestic and export long distance market access).
- The cost of postharvest losses is important because the value of the product increases several times from the farm gate to the final consumer. In dollar terms postharvest losses can be extremely significant.

[1] References

Wills R, McGlasson B, Graham D & Joyce D (1998) *Postharvest: An Introduction to the Physiology and Handling of Fruit, Vegetables and Ornamentals.* University of New South Wales Press Ltd. Sydney. 262.

Cook RL (2002) *Postharvest Technology of Horticultural Crops*. AA Kader (Ed.) Univ. California Agric. Nat. Resources Publ. Oakland. 5.

Kader AA (2002) *Postharvest Technology of Horticultural Crops*. AA Kader (Ed.) Univ. California Agric. Nat. Resources Publ. Oakland. 39.

Mites

Probably the most important families of plant-feeding mites worldwide are the Tetranychidae (spider mites) and the Eriophyidae (eriophyoid mites). The IRA has addressed species from both families to a degree. However, as mentioned in commenting on previous IRAs, issues relating to mites have not been addressed in sufficient detail. Examples include:

- lumping information about different species of spider mites together
- not accounting for varying resistance levels in different mite species and sub-species
- not specifying standards and documenting procedures for how visual inspections will be undertaken once the fruit reaches Australia

The only mite that this IRA addresses in particular detail is *Cenopalpus pulcher,* in the family Tenuipalpidae, commonly known as the flat scarlet mite. This mite was discussed in the Industry & Investment NSW submission on the IRA for apples from China. A number of spider mite and eriophyoid species have not been included in the current IRA and further information is provided below.

Spider mites

The IRA mentions that spider mites have been intercepted on fruit imports from New Zealand on numerous occasions (p 44) yet the unrestricted risk estimate is determined as Very low and specific risk management measures are not required. The evidence of interceptions from New Zealand shows that spider mites can survive packing house procedures. Even though transit from the United States is longer than from New Zealand, spider mites could feasibly remain viable if they enter an over-wintering phase and remain in the calyx area of fruit.

Three species of spider mite, *Tetranychus mcdanieli*, *T. pacificus* and *T. turkestani* have been lumped together for assessment. This means that each species is being treated superficially. Contrary to the IRA which claims *T. mcdanieli* as the most economically imported spider mite assessed, *T. turkestani* has been found on more than 200 different hosts plants (Bolland *et al*. 1998) including common backyard hosts. *Tetranychus pacificus* and *T. mcdanieli* have been recorded from 15 and 35 different host plants, respectively. One of the 200 host plants for *T. turkestani* is cotton, an important crop in Australia where an ongoing battle is being fought against development of pesticide resistance in *T. urticae*. Another mite pest such as *T. turkestani* would not be welcome. The problem with *T. turkestani* is that, morphologically, this species is very similar to *T. urticae* (Melott & Krantz, 2007) a common, non-quarantine pest. It is a definite possibility that *T. turkestani* could be misidentified upon visual inspection as *T. urticae* and disregarded as an exotic at the Australian border.

Seven spider mite species that are absent from Australia have not been addressed in this IRA. Two of the species are important pests belonging to the genus *Tetranychus*, namely *T. mexicanus* (McGregor, 1950) and *T. schoenei* McGregor, 1941.

- *Eotetranychus frosti* (McGregor, 1952). This species infests several hosts including *Malus domestica*, *Rosa* spp. and *Rubus* spp. It is found in the USA and India.
- *Eotetranychus smithi* Pritchard & Baker, 1955. This species infests 23 host plants including apples, cotton, grapes and berry fruit and is found in the USA.
- *Eotetranychus willamettei* (McGregor, 1917). This species is only found in the USA on apples and pears. Twelve different hosts are mentioned including grapevines.
- *Oligonychus newcomeri* (McGregor, 1950). This species has only been found in the USA. Eighteen hosts are mentioned for this species including apples.
- *Oligonychus yothersi* (McGregor, 1914). This species was first described from the USA. Fifty-seven host plants including apples, stone fruit, coffee, eucalypts, grevilleas, avocado, mango, litchi, camellias and rhododendrons are cited.
- *Tetranychus mexicanus* (McGregor, 1950). This species was first described from the USA where it is regarded as a significant species. It has been recorded from at least 91 host plants including apples, onions, garlic, brassicas, passionfruit, sugarcane and many more economic plants and ornamentals.
- *Tetranychus schoenei* McGregor, 1941. To date this species has only been recorded from USA. It has been found on at least 49 host plants including several species of apples, stone fruit, soybeans, cotton and berryfruit.

Eriophyoid mites

Eriophyoid mites have a high potential as adventive species (Navia *et al.* 2009) [1]. Contributing factors are their potential to damage crops, vector plant diseases and develop resistance to pesticides. They have the capacity to survive adverse conditions, reproduce parthenogenically, disperse by wind and adapt to new host plants. Their small size, from 100 to 300 μm, and cryptic preferences make them difficult to detect and they can easily be distributed in world trade.

While the majority of known eriophyoid species are reported from single host species, evidence is emerging that some invasive eriophyoid mites are able to extend their host range. Navia *et al.* (2009) advise that even if a species is already present in an area, new introductions should be avoided because they may include a resistant biotype. Many species are economically significant pests and some are capable of transmitting plant viruses.

The only eriophyoid mite addressed in this IRA is the common apple rust mite, *Aculus schlechtendali* (Nalepa, 1890). It is listed in Appendix A (p 247) where the comment is made that it is known to occur in Australia and consequently dismissed from further assessment. [Incidentally, *A. schlechtendali* was not mentioned in the Appendix A draft IRA for apples from China although it was first reported in mainland China in 1995 (Navia *et al.* 2009).]

Regarding *Aculus schlechtendali*

- comment is also made (Appendix A) that

  Aculus schlechtendali was assessed as not on the fruit pathway for apples from New Zealand (Biosecurity Australia 2006a). However, APHIS (2007a) states that diapausing, overwintering deutogyne female mites may be transported on fruit.

  Generally mites can survive lower temperatures than their host plants. This evidence of the potential for survival and distribution by eriophyoid mites may be significant for all eriophyoid mite species and require further assessment on fresh fruit pathways beyond their normal host specificity.

- this mite has been named as one of seven species in which resistance to pesticides has been reported. Resistance to pesticides accentuates consequence impacts of pests due to increased difficulties in their control.

[1] Reference

Navia D, Ochoa R, Welbourn C & Ferragut F (2009) Adventive eriophyoid mites: a global review of their impact, pathways, prevention and challenges. *Exp Appl Acarol* DOI 10.1007/s10493-009-9327-2

Several other species (albeit some that are obscure) have not been addressed. These include:

- *Aculus malivagrans* (Keifer 1946). This species was first described from *Malus pumila* and, to date has only been recorded from California and Washington USA. Damage symptoms include rusting of leaves.
- *Calepitrimerus baileyi* (Keifer 1938). This mite is not present in Australia as far as records show but is found on apples in California, South Dakota and Washington USA. It is also present in New Zealand and consequently should have been assessed in the draft IRA for apples from New Zealand. It causes browning and rusting of leaves.
- *Cecidophyes malifoliae* (Parrott, 1906). This is a vagrant species which has been reported as present on apples in New York USA.
- *Eriophyes mali* Nalepa 1926. This species, known as the apple leaf blister mite, causes leaf blisters on apple and has been recorded from Washington USA and New Zealand. This species was included in the Industry & Investment submission on the draft IRA for apples from New Zealand.
- *Eriophyes* sp. Keifer 1946. It is unclear from the literature if this species has been properly described. It appears to cause deformed buds of apple in winter and spring, resulting in significant fruit loss in some years.

Flat scarlet mite

Rigorous identification of mites to species level is essential. In the absence of careful assessment, *Cenopalpus pulcher* could be misidentified as a different genus of false spider mites, such as *Brevipalpus.*

Due to the time of year when apples would be imported, any flat scarlet mites on the fresh fruit pathway would be mated females and therefore pose a real threat for establishment. A number of plant species in different families, including widespread amenity trees are hosts of flat scarlet mite.

Industry & Investment NSW was instrumental in developing the use of predatory mites to control pest mites in apples. The introduction of a new mite threatens the effectiveness of this program. A number of predators which feed on various life stages of flat scarlet mite have been reported in international literature but many of these are not yet known in Australia.

Some examples of predatory mites against *C. pulcher* that are not known in Australia are

- *Agistemus exsertus* which preys on the eggs of flat scarlet mite
- *Euseius vignus* which feeds on flat scarlet mite, and
- *Amblyseius swirskii* and *Pronematus ubiquitus* which appear to control various tenuipalpids.

In contrast to random introductions through trade and quarantine breaches, any deliberate introduction or release into the Australian environment is constrained by regulations and controls which require thorough research prior to such an introduction occurring.

As mentioned in the current IRA (p 41), *Typhlodromus pyri* has been in Australia for many years and is present in apple orchards where it is a natural enemy of other mite species. However, there is no evidence whether it will prey upon *C. pulcher* under Australian conditions.

Thrips

The IRA lists Western flower thrips among the common arthropod pests of apples in the Pacific Northwest. It also notes that although pest management programs vary, chemical control is the main method used (p 18).

Thrips, such as Western flower thrips, can have a very short life cycle and are resistant to many insecticides. Industry & Investment NSW horticulturists and entomologists advise that considerable risks relate to the chemical resistance profiles of thrips that may be introduced on foreign commodities. The issue is not whether the species of thrips are exotic but what chemical controls have been applied and whether the resistance that has built up in thrips from other countries is different from the resistance profile of that thrips species or biotype in Australia. If so, the introduction of those thrips could override Australia's chemical control options for thrips.

Frankliniella occidentalis, Western flower thrips, is present in NSW. This thrips is currently the most significant pest in the Sydney basin. Nationally it is the target of many research projects.

Also significant in this IRA is the acknowledgement that *F. occidentalis* is a vector of several tospoviruses including *Impatiens necrotic spot virus* which is not reported from Australia.

Virus-vector pathosystems introduce another dimension in pest risk analysis where the status or presence of the vector alone is unlikely to reflect the significance of the presence of the vector plus virus.

Phytosanitary measures

Visual inspection - Latent infection

Functional criteria such as pre-harvest or postharvest characteristics should be considered in addition to the biology of a pathogen in assessing the possibility of entry of that pathogen to Australia and its likelihood of presenting as a latent infection.

Many plant pathogens undergo an extensive phase of asymptomatic latent infection before the appearance of disease symptoms. Environmental conditions, nutritional status and the stage of development of the host and the pathogen all interact to determine the appearance of symptoms.

If, for example, a specific pathogen with an asymptomatic phase exhibits a late infection on fruit and the incubation time of the pathogen on the fruit is a few months, the likelihood of entry by such a pathogen will increase considerably as symptoms are less likely to be detected by visual inspection.

In the case of European canker, for example, there is a high likelihood of symptomless presence of the pathogen as the period between infection and expression of symptoms many be many years.

Visual inspection - Lot sizes

The option of visual inspection and remedial action is presented for the management of apple leafcurling midge (*Dasineura mali*) because the unrestricted risk estimate of Low exceeds Australia's appropriate level of protection. The IRA states (p 248) that the standard inspection lot size of 600 units is "insufficient to mitigate the risk" and so proposes an inspection lot size of 3000 units. A five-fold increase in lot size above the standard amount indicates that this midge is a serious exotic pest.

- What methods are used to ensure that an inspection of this magnitude is conducted effectively for each and every piece of fruit in the lot?

Visual inspection - Taxonomic rigour

Mite identification to species level requires good quality slide mounts of male specimens. Mites can easily be overlooked on plant surfaces or misdiagnosed in the absence of slide-making.

- Are inspection and identification procedures available for review by relevant experts and stakeholders?
- What are the criteria and specific standards that will be used?
- Is every mite which is detected on inspection identified to species level?

It is very likely that exotic *Tetranychus* spider mites could be confused with species which are established in Australia and be disregarded at the border.

Disinfection

When using chlorine solution as a disinfection treatment for postharvest purposes knowledge of the growth stage and potential location of the pathogen must be coupled with awareness of the mode of action of the chemical.

- Disease organisms on fruit may be either in the active vegetative form or in the form of spores. Chlorine will readily kill the vegetative form, but fungal spores are more difficult to kill.
- Chlorine treatment sterilises the surface of the fruit but rarely eliminates all pathogens. Many spores may remain on the surface to develop later should the opportunity arise.
- Chlorine kills only on contact, not systemically. It is effective only on exposed pathogens such as those suspended in water or in a vegetative state on the surface of produce. It does not kill pathogens below the skin or in unwetted cavities because it cannot contact them.
- Chlorination leaves no residual effect. Fruit exposed to pathogens after treatment are susceptible to reinfection.

Knowledge gaps

The IRA process implies that although stakeholders are invited to comment on the draft IRA the overall recommendation for trade to be permitted will be progressed despite gaps in knowledge of pest biology and behaviours or pest management uncertainties.

For example

- Technical advice indicates that there is currently no effective commercial option to control *Erwinia amylovora*.
- The IRA states that

  "Effective measures to manage the risks associated with *Sphaeropsis pyriputrescens, Phacidiopycnis piri, Phacidiopycnis washingtonensis* and *Truncatella hartigii* are yet to be proposed by the US, with supporting data, for review." (p xiv) and

  "In some cases, detailed efficacy data on treatments is not available. Such data need to be provided by the US before these treatments can be finalised and final import conditions developed. Finalisation of the quarantine conditions may be undertaken with input from AQIS and the Australian states and territories as appropriate" (p 243).

  What will be the impact on the IRA and on trade if the IRA is accepted with provisos but a subsequent determination on these pests indicates that the risk cannot be adequately mitigated?

- The IRA claims the "assumption that prevalence of *Dasineura mali* in the Pacific Northwest is similar to that of New Zealand" (p 248). However, no justification is presented for the assumption.

  If the assumption is incorrect what are the implications for the validity of the IRA?

  As this IRA is not an extension of existing policy, why are New Zealand circumstances relevant?

- Three pest management options are presented for *Neonectria ditissima*. These are pest free areas, pest free places of production and areas of low pest prevalence.

  Pest free areas and areas of low pest prevalence are not equivalent mitigation measures and should not be presented as if equal options.

  If Australia allows the lowest standard, namely areas of low pest prevalence, then there is no point in presenting pest free options because accepting areas of low pest prevalence is tantamount to accepting the pathogen.

The same argument applies to pest risk management of exotic moths.

- Regarding apple maggot, *Rhagoletis pomonella*, the IRA states that "no approved quarantine measures exist" and it is present in all the exporting states (p 250).
  This means that the likely impact of this pest if introduced to Australia is unresolved although it has been assessed as having an unrestricted risk estimate of Moderate, an indication that it ranks as a significant exotic pest with a high invasive potential.

Trade

- What is the trade window that will be presented to the United States? Is market access to be restricted to designated months of the year or granted for 12 months as requested by the United States (p 28)?

Continuity of operations impacts on cleaning and sanitisation of storage rooms which are documented as being cleaned "annually, when empty of fruit" (p 26). The potential carry-over of pests and diseases should be addressed.

Marketing patterns may also influence the collection of pest risk data. Provision of extra data on the likelihood of the presence of leafroller moths has been requested. The IRA suggests that the collection of data be based on the results of an examination of a 600 cut fruit sample of all lots in all packing houses during the initial trade (p 248). The implication is that this is the first season of trade, but it may not be.
No justification is given for the selection of this time-frame. It appears arbitrary and does not take into account variations in the quantity of trade that may or may not be typical for the commodity.