



Submission to
Senate Rural and Regional Affairs and Transport
References Committee Inquiry into the effect on
Australian pineapple growers of importing fresh
pineapple from Malaysia

July 2012

About Growcom

Growcom is the peak representative body for the fruit and vegetable growing industry in Queensland, providing a range of advocacy, research and industry development services. We are the only organisation in Australia to deliver services across the entire horticulture industry to businesses and organisations of all commodities, sizes and regions, as well as to associated industries in the supply chain. We are constantly in contact with growers and other horticultural business operators. As a result, we are well aware of the outlook, expectations and practical needs of our industry.

The organisation was established in 1923 as a statutory body to represent and provide services to the fruit and vegetable growing industry. As a voluntary organisation since 2003, Growcom now has grower members throughout the state and works alongside other industry organisations, local producer associations and corporate members. To provide services and networks to growers, Growcom has about 30 staff located in Brisbane, Bundaberg, Townsville, Toowoomba and Tully. We are a member of a number of state and national industry organisations and use these networks to promote our members' interests and to work on issues of common interest.

Summary

The provisional final Import Risk Analysis (IRA) released by DAFF Biosecurity in June 2012 recommended that imports of fresh, decrowned pineapple should be allowed from all commercial production areas of Malaysia, subject to a range of quarantine conditions. It is the industry's position that DAFF Biosecurity has significantly underestimated the risk posed by the potential introduction of a bacterial pathogen that causes serious fruit disorders and crop failure.

The pathogen that causes bacterial heart rot and fruit collapse is common in areas of Malaysia from where any imported fruit would originate. The bacteria can't be detected in its latent phase, and there is a significant risk that infected fruit could be imported despite the recommended control measures. If this bacterium was to be introduced to our pineapple growing areas, it would cause severe crop losses and threaten the sustainability of the industry. According to the industry's National Biosecurity Plan, developed in partnership with DAFF, this bacterium is one of the pineapple industry's greatest biosecurity threats.

Growcom has been working closely with the Pineapple Growers' Advancement Group (PGAG) and a number of processors to develop the industry's response to the IRA. Growcom has lodged a formal appeal based on clear departures from the regulated IRA process. The process includes additional measures that can be included in the risk analysis in situations where there is scientific disagreement over the level of risk, or where there is a clear need for additional research. Both of these conditions are present in this case, and the failure of DAFF Biosecurity to apply these additional measures has resulted in a poor decision based on insufficient information.

About the Australian pineapple industry

Australian pineapples are grown year round, with approximately 44,000 tonne of fresh fruit and 41,000 tonne of processed fruit marketed in 2009-10 (Pineapple Industry Strategic Plan 2011). It is currently estimated that there are 114 production businesses in Queensland. Key production districts include North Queensland, Yeppoon, Cawarral, Bundaberg, Maryborough, Hervey Bay, Mary Valley, Nambour, Glasshouse Mountains, Beerwah, Wamuran and Elimbah.

Australia supplies 0.5 per cent of fresh pineapple world production and a negligible proportion of fresh pineapple world exports. More than 70 per cent of fresh pineapples are packed and marketed through four primary packhouses. There is one primary pineapple processor; Golden Circle, acquired by Heinz Australia in 2008. However, there are at least two small scale processing operations dealing with fresh cuts. The industry is becoming an increasingly fresh-market based industry, due to new fresh-market varieties and competition with imported processed fruit.

Approximately 60 per cent of pineapple plantings are Smooth Cayenne and Queen (Rough leaf) varieties, and 40 per cent of plantings are of hybrid varieties. Increased plantings of hybrid varieties, which have higher sugar to acid ratios and greater eating consistency, are expected (Pineapple Industry Strategic Plan 2011). Current hybrid varieties include 73-50, MD2 (73-114), which are marketed under various proprietary brand names, and Aus-Jubilee and Aus-Carnival.

The gross value of production of Australian pineapples at the farm gate is currently estimated at \$79 million.

There are approximately 300 on-farm employees, the major processor with 430 employees and several packhouses.

Industry preparedness to bacterial fruit collapse and heart rot

National Pineapple Industry Biosecurity Plan

The National Pineapple Industry Biosecurity Plan was published in July 2008 with assistance from Plant Health Australia. The plan was a collaborative effort between Growcom, the Pineapple Industry, Horticulture Australia Ltd (HAL), Department of Agriculture, Fisheries and Forestry QLD (DAFFQ, formerly DEEDI), the Australian Quarantine Inspection Service (AQIS, DAFF) and the Office of the Chief Plant Protection Officer (OCPPO, DAFF).

The pathogen that causes bacterial fruit collapse was listed as one of five priority threats and allocated the highest level of risk. The level of threat was estimated as high for entry potential, establishment potential, spread potential, economic impact and overall risk.

The threat analysis for this pathogen included in the Biosecurity plan reveals that:

- Pest entry is very likely or certain.
- The pest has potential to survive and become established throughout most or all of the range of hosts. Distribution is not limited by environmental conditions that prevail in Australia. Based upon its current world distribution, and known conditions of survival, it is likely to survive in Australia wherever major hosts are grown.
- The pest has potential for natural spread to all production areas.
- There is severe impact on standing crop, with significant host mortality and/or storage losses.

The estimate of risk from this pathogen in the Industry Biosecurity Plan is in stark contrast to that presented in the IRA prepared by DAFF Biosecurity.

Industry awareness fact sheet

The industry, with assistance from Plant Health Australia and as part of the federal government requirements for biosecurity preparedness, has produced a fact sheet on bacterial heart rot and fruit collapse. The fact sheet provides essential awareness material for growers and other stakeholders within the industry.

National diagnostic standard for detection of *Erwinia chrysanthemi* (pineapple strain *Dickeya* sp.)

Growcom, through Plant Health Australia, has registered a request that a national diagnostic standard be commissioned for the detection of *Erwinia chrysanthemi* (pineapple strain *Dickeya* sp.). National diagnostic standards are commissioned and funded by the Sub-committee for Plant Health Diagnostic Standards (SPHDS) overseen by Australia's Plant Health Committee. As yet, this work is not commissioned and there is no certainty that there are funds available to complete the diagnostic standard.

The Plant Biosecurity Cooperative Research Centre (PBCRC)

The current phase of the PBCRC has a major project funded to investigate plant pathogenic bacteria of biosecurity concern to Australia. Growcom, on behalf of the Australian pineapple industry, has approached the PBCRC to have *Erwinia chrysanthemi* (pineapple strain *Dickeya* sp.) included in this research and has communicated with key research collaborators in Hawaii to facilitate the work. Negotiations to initiate this research are ongoing.

Scientific and technical weaknesses of the Import Risk Analysis

Background

The main point of contention with the provisional final IRA is the potential introduction of the pathogen *Erwinia chrysanthemi*, recently renamed *Dickeya sp.*, referred to by Biosecurity Australia as *Erwinia chrysanthemi* (pineapple strain *Dickeya sp.*).

- This bacterial pathogen causes Bacterial Fruit Collapse and Heart Rot in pineapples in Malaysia and **is not present** in Australia.
- In early studies, it was reported that up to 40 per cent of plants/fruit can be affected in severe outbreaks in sensitive cultivars. Current levels of infection are unknown.
- These diseases were first detected in Malaysia and are now known to occur in the Philippines, Brazil, Costa Rica and Hawaii. The spread of the pathogen to Hawaii was suspected to be via the movement of infected pineapple planting material.
- History shows that once established, these diseases are incredibly difficult to manage and continue to cause significant cost burdens to not only growers but the whole supply chain.
- If introduced into Australia, significant efforts would be required to contain and eradicate these devastating diseases in order to protect our industry. This would be at considerable expense to both industry and government.
- The Australian pineapple industry prepared their Biosecurity Plan and rated the entry potential, establishment, spread and economic impact for these diseases as **high**.
- In the provisional final IRA, DAFF Biosecurity has rated the probability of entry and distribution as low but concedes that the probability of establishment and spread is high. They considered the consequences as moderate and gave an unrestricted risk estimate of very low.

Scientific and technical issues

In our submissions to the various different drafts of the IRA, Growcom has relied on a scientific panel with a wide range of relevant expertise. Scientists consulted during the process have included:

- Dr Ken Pegg (Plant Pathologist, over 40 years experience)
- Mr Col Scott (Pineapple Agronomist, over 40 years of experience)
- Dr Garth Sanewski (Pineapple Breeder, over 20 years of experience)
- Mr Simon Newett (Pineapple Extension Officer, over 15 years of experience)
- Dr Cherie Gambley (Plant Pathologist, over 15 years of experience)
- Dr Jay Anderson (Plant Pathologist, over 10 years of experience)
- Dr Anthony Young (Plant Pathologist, over 10 years of experience).

Collectively, this group has over 120 publications in peer-reviewed journals in the area of plant pathology.

By contrast, the credibility of the scientists used to prepare and review the IRA is unknown as the document authors are not identified. Instead, the publication is simply attributed to DAFF Biosecurity.

The ease with which DAFF Biosecurity has dismissed the expert advice provided by a number of established scientists on behalf of the industry is concerning.

Specific areas where the Growcom scientific panel disagrees with assessments provided by DAFF Biosecurity are discussed below. The disagreements mostly involve which scientific studies are considered appropriate for inclusion in the review and the interpretation of the results of these studies. DAFF has indicated if there are no specific studies available for certain factors essential to the evaluation of risk, then they do not need to consider these factors at all. For example, if there are no specific studies on host range of the bacterium, then DAFF Biosecurity considers that host range, which is a critical factor for survival, establishment and spread of a bacterium, does not need to be considered in the risk ratings. This is poor risk management practice and violates recognised procedures for the identification and quantification of potential threats. This is also poor scientific practice and would not pass a peer-review process.

Furthermore, the Growcom scientific panel contests there is sufficient information in the literature, on related species and genera, to evaluate some of these factors. The studies cited in the provisional final IRA review are included at the discretion of DAFF and are at times contradictory.

- The discussion in relation to resistant varieties having low disease severity reflects poor scientific understanding. Resistant varieties are by definition resistant to infection and therefore would have less disease. Later in the document, DAFF refers to DNA-based methods to evaluate survivability and host range. Detection of DNA is not necessarily an indicator of live organisms and can also be a poor indicator of host range if used inappropriately. These points cast concerns on the reliability of the scientific interpretation by DAFF.
- The Growcom scientific panel referenced research on survivability of *Erwinia chrysanthemi* in water in Australia. DAFF discounted this point because studies were not conducted specifically on the 'pineapple strain' of this species. However, by contrast DAFF goes on to use research outcomes for survival in soil which was conducted on *Erwinia* sp. other than the 'pineapple strain'.
- DAFF notes bacterial strains isolated from irrigation water in Hawaii were non-pathogenic on pineapple but this does not preclude pathogenic strains being present in the water and simply not isolated. It is not direct evidence of non-survival of the 'pineapple strain' in this water, merely that it wasn't detected. Furthermore, DAFF accepts the findings of Lim (1974) but discounts a later paper by the same author stating his earlier work was limited to one soil type and may not be indicative of other soil types.
- The isolate of *Dickeya* sp. present in soil from a pineapple field which was capable of inducing corn stalk rot is direct evidence of survival of an organism which is very closely related to the 'pineapple strain'. To discount this evidence because it was not specifically detection of the 'pineapple strain' is poor scientific practice. It is also another example of inconsistent standards of

evidence applied by DAFF Biosecurity; on the same page, DAFF Biosecurity cites another example of 'soft rot *Erwinias*' but not specifically the 'pineapple strain' to support their viewpoint.

- DAFF discounts honey bees, native bees and noisy miner birds as possible vectors for the bacterium because there are no reports of these organisms visiting infected fruit waste or carrying the bacterium. Given two of these organisms are Australian endemic species and are unlikely to occur in Malaysia or Hawaii, how would it be possible to directly evaluate this? Again, no evidence is not evidence that it would not occur if the opportunity arose.
- DAFF states that it has not been demonstrated convincingly using molecular data that the 'pineapple strain' can infect other hosts. Molecular data used for bacterial taxonomy is notoriously poor at indicating host ranges. Even very small genetic changes between isolates of the same organism can affect pathogenicity, this is why terms such as 'severe strain' etc. exist in the literature. It is very unlikely the molecular methods currently available for the *Dickeya* or *Erwinia* genera would be sufficiently sophisticated to discriminate pathogenicities. Unless specific pathology tests are performed, the host range of the 'pineapple strain' will remain very poorly understood. Host infection is a biological process involving the host, the bacterium and the environment; thus genetics of the bacterium alone is an insufficient indicator of infection.
- By contrast, molecular taxonomy can be a very reliable predictor of general traits within a genus or group of related genera such as bacterial survival in the environment. DAFF appears to discount some studies on related species or genera in relation to this point but then includes others to support their own view. Again, this is a contradictory approach and evidence of poor interpretation of plant pathology research.
- In relation to potential infection of bromeliad species including *Aechmea fasciata* which is used widely in the Australian nursery industry, DAFF note that there are no reports of the 'pineapple strain' infecting these species. However, there are no references provided with details of studies which have challenged these plants species with the bacterium. As a result, realistic evaluation of their host potential is not possible.
- Emphasis is put on over 60 years of research in Malaysia and elsewhere demonstrating there are no alternative hosts of the bacterium. However, given the difficulty in typing strains or isolates and recent changes in taxonomy, it is very hard to evaluate such literature with any confidence. The Growcom scientific panel maintain that the host range of the 'pineapple strain' is very poorly understood.
- Furthermore, we are concerned that DAFF Biosecurity has not acknowledged the likelihood that bacterial heart rot and fruit collapse emerged in Malaysia. Given the centre of diversity of pineapple is Central America not Malaysia, it is reasonable to conclude that the 'pineapple strain' was present in Malaysia prior to the introduction of pineapple into that country. This would only be possible if the bacterium could survive on another host, suggesting that the host range of the bacterium is greater than DAFF believes.

- Given all this uncertainty in relation to knowledge of host range and survival of the 'pineapple strain', it is surprising DAFF has provided such a low rating for risk for the probability of entry and distribution of the pathogen. Even a small change in either the probability of entry or distribution from low to moderate is quite likely with either further research or better interpretation of existing literature. Such a change would result in an appropriate level of protection (ALOP) of LOW and thus triggering the need for import conditions to mitigate the risk of potential introduction of this devastating bacterium.

Procedural deficiencies in the Import Risk Analysis

Growcom has identified several major concerns with the process used to deliver this provisional final IRA report in relation to potential introduction of *Erwinia chrysanthemi* (pineapple strain, *Dickeya* spp.). It is the Stakeholder's view that the process used in the development of the IRA departed from the ideal regulated process described in the Import Risk Analysis Handbook 2011 (the "Handbook").

The process described in the handbook includes two points from where the pathway can follow one of two options depending on available information. In both cases, DAFF Biosecurity has chosen to follow the pathway of least resistance rather than the one supported by the information available. The procedural deficiencies directly contribute to the scientific and technical weaknesses described above.

Growcom has lodged a formal appeal of the IRA based on these procedural problems. The Chair of the Import Risk Analysis Appeals Panel (IRAAP) has determined that our submission warrants consideration by an IRAAP with its findings to be reported by 21 August 2012.

1. The IRA should have followed the expanded process

The Stakeholders question why the IRA remained a standard process and not an expanded IRA process. The Handbook (Section 4.2 page 12) describes the conditions under which the IRA may follow the expanded process; when there are significant differences in scientific opinion or where importation may result in significant harm to people, animals or plants. As described in the provisional final IRA, there are clearly significant differences in scientific opinion between DAFF Biosecurity and the Stakeholder research advisory panel. There is also a high likelihood of significant harm to plants as a result of importation of these fruit. Both factors warrant a decision to use the expanded IRA process where the Eminent Scientists' Group (ESG) would be engaged to review the relevant literature and expert advice, providing a standard of scientific rigour lacking in the current IRA.

2. The “stop the clock” option should have applied

The Stakeholders believe the ‘stop the clock’ mechanism should have been applied. The handbook explains that the stop the clock option can be exercised where further information is essential to complete an IRA, or where additional research or expert advice is required. Given the paucity of information in relation to latent infection rates, host range and survivability, further research or substantial expert advice is clearly required to evaluate the risk with confidence. The small change in probability of entry or distribution from low to moderate is quite likely with further research or expert advice. This minor elevation in either criterion would result in an increase in the appropriate level of protection (ALOP) to low.

There is clearly a lack of scientific knowledge on the predicted amount of infected fruit likely to enter Australia. On DAFF Biosecurity’s own admission, results from the 2012 surveys conducted in Malaysia to ascertain current latent infection rates of bacterial heart rot were inconclusive and they again refer back to information originating from the 1970’s. This has not addressed the Stakeholders’ concerns adequately. Further scientific information is clearly required to evaluate the risk of entry of latent infected fruit with any confidence.

Similarly, there is insufficient scientific evidence to adequately evaluate the survival and host range of the bacterium. DAFF Biosecurity’s response to Stakeholders concerns on these topics is contradictory and inadequate. DAFF Biosecurity discounts evidence put forward by Stakeholders because the studies were not conducted specifically on *E. chrysanthemi* (pineapple strain, *Dickeya* spp.) but then relies on its own examples from research similarly not conducted specifically on this bacterial species. Of most concern is DAFF Biosecurity’s position that a lack of evidence supports their viewpoint. In practice, no evidence is not evidence that something doesn’t occur. For example, in response to potential vectors of the bacterium DAFF Biosecurity state “other nectar feeding organisms listed above have not been shown to visit infected fruit waste or carry the inoculum”. This could simply mean the suitability of these organisms as vectors of the bacterium has not been studied, not that it would not occur. Given two of the potential vectors are Australian endemic species, it is highly unlikely their potential as vectors was ever assessed in regions where the pathogen is currently found.

In consultations that have taken place after the appeal was lodged, DAFF Biosecurity has confirmed that they are comfortable making an estimate of quarantine risk in the absence of adequate scientific information, essentially revealing that the expanded IRA and stop the clock mechanisms were never considered as options in this case. While the regulations allow DAFF Biosecurity to exercise discretion in these areas, the inflexible position taken by DAFF Biosecurity is clearly contradictory to the intention of the regulations.

3. Eradicability

The final concern is in relation to the claim made by DAFF Biosecurity (Section 4.3.6 page 56) that the disease is impossible to eradicate. The decision to eradicate a newly introduced previously exotic pest involves consideration of a range of factors including where it was detected, the degree of initial spread, the degree of potential spread prior to detection, and the predicted cost and likely benefits of an eradication

program. This decision pathway uses a number of scientific experts, state and federal biosecurity agencies and industry. For DAFF Biosecurity to pre-empt this decision is irresponsible and also may unduly influence future decision making if the bacterium is introduced into Australia. Ultimately, this premature statement could compromise the industry's efforts to control, contain and manage an outbreak, and forfeit the rights of primary producers to protect their industry. The Stakeholders strongly urge DAFF Biosecurity to reword this sentence and classify the disease as "difficult to eradicate".

Summary of procedural deficiencies

Growcom believes the process employed for assessing the Import Risk Analysis for the importation of fresh decrowned pineapple fruit from Malaysia was flawed in the following aspects.

1. An expanded IRA should have been conducted based on the fact that:
 - a. There are significant differences in scientific opinion, and
 - b. There would be significant harm to plant species if the disease were introduced.
2. The stop the clock provision was not implemented. DAFF Biosecurity has relied on old and incomplete research that does not adequately address the scientific uncertainties. The stop the clock provision should have been implemented to allow appropriate research to be conducted.
3. DAFF Biosecurity's statement on the eradicability of the pathogen is premature and may unduly influence decisions on required control measures if the pathogen is introduced.

DAFF Biosecurity's approach to IRAs

In addition to procedural problems apparent in the provisional final IRA document that are listed above, we also have a range of concerns about the general process employed by DAFF Biosecurity for the assessment of quarantine risk.

In consultation with DAFF Biosecurity, senior staff have indicated that they do not consider a lack of peer-reviewed scientific literature to be an indicator of insufficient scientific information. According to their interpretation of the IRA regulations described in both the IRA Handbook and the *Quarantine Regulations 2000*, this lack of scientific literature is therefore not considered to be a suitable trigger for either an expanded IRA process or for the stop the clock mechanism to be invoked.

This position of senior DAFF Biosecurity staff is clearly illogical. Using their reasoning, any situation where the level of risk is unknown because of a lack of appropriate scientific data will be allocated a risk level of low automatically. This will result in a systematic underestimation of the level of risk. This position and interpretation of the regulations must change.

The current IRA process, as conducted by DAFF Biosecurity, places the burden of evidence on the industry to demonstrate a significant level of risk. It is unreasonable to expect small industry groups or individual growers to have the resources and

capacity to identify and assess all potential sources of biosecurity risk from any potential originating country. This is essentially what is required under the current process where an IRA is triggered when an application is made and there are limited timeframes in which to review potential biosecurity threats for each application. In most cases, the need for a scientific analysis of a given pest or disease will not be apparent until an import application is made, and given DAFF Biosecurity's approach, this will inevitably produce a default risk estimate of "low".

According to the *Quarantine Regulations 2000*, the burden of evidence does not necessarily rest with industry. Regulation 69G(1) clarifies that where further information is required to complete an IRA and where the proponent or another party may be able to provide that information, the Chief Executive may request that the proponent or other party provide that information.

Regulation 69G(2) states that the Chief Executive may commission additional research or expert advice if it is essential to complete the IRA. Importantly, the regulations do not specify that the research must have achieved any particular status for it to be considered under the IRA process. In addition to expert advice, it would be reasonable to expect that technical papers and unpublished manuscripts from suitable qualified researchers should be considered by DAFF Biosecurity in the IRA. However, DAFF Biosecurity has advised that scientific evidence provided by industry must be peer-reviewed and published to be considered in their assessment of risk, which places another unnecessary expectation on industry bodies.

Interactions with trade agreements

In discussions with DAFF Biosecurity, senior staff have indicated that potential future legal challenges under trade agreements influence their decisions while conducting IRAs. This is highly inappropriate and contrary to the ideal that an Import Risk Analysis should be an independent, purely scientific process. Regulation 69B in the *Quarantine Regulations 2000* defines a risk analysis in the context of an IRA as the assessment of the level of quarantine risk associated with importation (or proposed importation) and, where necessary, the assessment of risk management options. There is no reference and no scope to consider trade implications of any potential decisions made in the IRA process. The *Quarantine Act 1906* considers quarantine to include measures that prevent or control the introduction, establishment or spread of diseases or pests (Part I 4 (1) b). Again, trade implications of quarantine decisions are not considered in the Act. In considering trade implications of an IRA decision, DAFF Biosecurity is clearly stepping outside the regulations governing the IRA process.

Other information

There is a current import permit for pineapple from the Philippines, Thailand, Solomon Islands and Sri Lanka. The IRA for these permits prepared in 2003 stated there were nine species of bacteria and fungi of biosecurity concern in these countries. However, it went on to conclude that no risk review was required for any of them. One of these species is *E. chrysanthemi* (pineapple strain, *Dickeya* sp.) which was reported to occur in the Philippines (Rohrbach, 1983). The IRA for importation of fresh pineapple from these countries clearly needs to be revisited.

Conclusions

Growcom and the Australian Pineapple industry are not suggesting that pineapple imports from Malaysia must be prevented. Instead, we request a more reasonable and rigorous evaluation of risk to ensure mitigation strategies are employed and that our local industry is protected from the introduction of exotic diseases.

Growcom has identified a number of scientific, technical and procedural weaknesses in the Import Risk Analysis prepared by DAFF Biosecurity. As a result of these weaknesses, the provisional final IRA presents a poor decision based on insufficient and conflicting scientific information.

It is Growcom's view that the IRA must be repeated following an expanded process to facilitate rigorous scientific scrutiny of the evidence by the Eminent Scientists' Group and where the stop the clock option is applied if necessary to enable additional research to be conducted. Both of these options are available under the current regulations governing the IRA process and the conditions required to trigger these options are clearly present.

Further recommendations

Given that the biosecurity legislation and regulations are currently under review, this is an ideal opportunity to improve the IRA process. Growcom recommends a number of changes that will improve the integrity and transparency of the IRA process. These include:

- Clearly defined triggers for alternative IRA pathways (standard v expanded and stop the clock) so that these decisions are not simply at the discretion of DAFF Biosecurity staff.
- The ability to appeal a provisional final IRA on scientific grounds when there is clear evidence that DAFF Biosecurity has overlooked or misinterpreted important scientific information.
- Adjusted timeframes for stakeholder review/appeal that reflect the limited capacity of industry to conduct these reviews at short notice.

- Recognition that industry members are the bearers of risk, not DAFF Biosecurity and not the proponent.
- The burden of evidence for a low level of risk for any import application must rest with the proponent and/or DAFF Biosecurity, rather than the industry being required to demonstrate that the risk is not low.
- Existing IRAs from other originating countries must be reassessed in light of emerging information on the occurrence of disease.

References

Australian Government (2010) *Quarantine Regulations 2000*, prepared on 4 March 2010 incl. amendments up to SLI 2010 No. 12, Attorney General's Department, Canberra.

Australian Government Department of Agriculture, Fisheries and Forestry (2011) *Import Risk Analysis Handbook 2011*, Canberra.

Department of Agriculture, Fisheries and Forestry Biosecurity (2012) *Provisional final import risk analysis report for the importation of fresh decrowned pineapple (Ananas comosus (L.) Merr.) fruit from Malaysia*.

Lim WH (1974) Exudates from pineapple fruits as an inoculums source of *Erwinia chrysanthemi*. *MARDI Res. Bull.* 2: 17–21.

Plant Health Australia (2008) *National Pineapple Industry Biosecurity Plan* (version 1).