

CHAPTER TWO

A citrus canker outbreak in Emerald, Queensland

What is citrus canker?

2.1 Citrus canker is a highly contagious plant disease caused by the bacterium *Xanthomonas axonopodis* pv. *citri*. Citrus canker affects plants in the Rutaceae family, including those from the genera *Citrus*, *Fortunella* and *Poncirus*.¹

Strains

2.2 There are a number of distinct types of citrus canker disease caused by various pathovars and variants of the bacterium. The Asiatic variety of citrus canker (Canker A), is caused by a group of strains originally found in Asia and is the most widespread and severe form of the disease. While grapefruit, lime and trifoliolate orange stock are particularly susceptible to Canker A, it also affects most other varieties of citrus, including mandarin, tangerine, satsuma and kumquat. Minor genetic variations of citrus canker strains have been detected in the A strains in Florida and other citrus growing regions of the world.

2.3 The canker most commonly called Cancrosis B is caused by a group of strains originally found in South America. This canker affects lemons, Mexican lime, sour orange, and pummelo and is easily distinguished from strains of the Canker A group.

2.4 A strain referred to as Cancrosis C has also been isolated, after being found in Mexican lime in Brazil. The only other known host for this particular bacterium is sour orange and strains of this particular group are not easily differentiated from the Cancrosis B group.

2.5 A fourth group of strains, known as A*, has been found in Oman, Saudi Arabia, Iran and India. This group, which is limited in host range to Mexican lime, appears to be quite distinct from the common A strains.

2.6 In 1981 there were reports of an additional strain – also found to affect Mexican limes, in Mexico – named Canker D. However, the official identification of this particular strain remains controversial.

1 The information regarding citrus canker included in this Chapter is based on material contained in the *National Citrus Industry Biosecurity Plan: Pest Risk Review*, Plant Health Australia, March 2004; the Department of Primary Industries and Fisheries (Queensland) website, www.dpi.qld.gov.au/health and the United States Department of Agriculture's website, www.aphis.usda.gov/ppq/ep/citruscanker/background.html

2.7 The symptoms of the various strains are generally similar, and a specific strain may only be distinguished by scientific testing.

Symptoms

2.8 Citrus canker has characteristic symptoms which can appear on the leaves, stems and fruit of an infected plant. Typically, small yellow marks (approximately the size of pin heads) appear on the leaves. These develop into small, pimply, watery spots which become more spongy and scab-like over time and progress from white to tan as they grow.

2.9 Young lesions appear raised on both leaf surfaces, but are usually more apparent on the lower surface. As the lesions age and thicken, they become corky and often develop a brown, crater-like depression in the centre. The edges of the lesions are frequently watery and yellow-brown in appearance, fading to green, with a surrounding yellow ring or halo.

2.10 Following leaf infection, the symptoms typically spread onto stems, and eventually to branches. Cankers can occur on woody stems, the bark may develop discoloured areas, and dieback of stems coupled with internal reddening can occur. Ripening fruit on infected trees are also targets for infection and affected fruit may develop scabs or pitting.

2.11 In the initial stages of the disease, lesions on the rind of fruit often resemble large oil glands. These lesions then gradually darken and become scab-like or cork-like in texture. Typically, lesions are round, and occur either singly or in groups.

2.12 Canker lesions can vary in size between 5-10mm depending on host susceptibility and the number of infection cycles. When conditions are dry, lesions remain corky or spongy in appearance. When exposed to wet conditions, however, lesions can expand rapidly, and take on a flatter, water-soaked appearance.

2.13 Historically, citrus canker has had a serious impact on local citrus industries whenever infections have been detected. A serious citrus canker infection can cause defoliation, dieback, and premature fruit drop. The disease can also retard the growth of young trees and set back maturity for several years. Most significantly, the leaf, stem and fruit blemishing directly reduces both the quantity and quality of fruit, and leads to infected fruit becoming less valuable or completely unmarketable.

Life cycle and means of transmission

2.14 New outbreaks of citrus canker usually occur when new shoots are emerging or when fruit are at an early stage of development. Canker bacteria can enter through a plant's stomatal openings (the pores in the surface of leaves through which air normally enters the leaves), or through natural openings and wounds. A plant's susceptibility to infection can decline with maturity and the first ninety days after petal fall are the most critical for fruit infection.

2.15 Later infection results in the formation of small and inconspicuous pustules only. Latent infections can occur on shoots infected in autumn just before dormancy, with over-wintering bacteria forming lesions the following spring.

2.16 The citrus canker bacterium can survive for up to ten months in lesions on citrus. The bacterium can also survive for long periods in diseased plant tissue (including discoloured bark tissue on tree trunks and limbs) in plant debris, as an epiphyte² on host and non-host plants, as a weak saprophyte³, on straw mulch or in soil. The viability of the bacteria decreases rapidly with exposure to sunlight or with contact with soil micro-organisms. The bacterium does not survive well on the surface of citrus leaves or in buried leaf litter. Dry, diseased leaves can, however, harbour the bacteria for two to three months.

2.17 Over-wintering lesions, especially those formed on angular shoots, are the most important source of inoculum for the following season. During spring rains, dormant bacteria within the cankers multiply, ooze out of lesions, and spread to new shoots and leaves and, when aided by wind and rain, can spread to other plants in the area.

2.18 There is a higher risk of fresh infections from over-wintered lesions in leaf or stem tissues where the initial infection occurred in autumn. Because infections initiated in autumn are the freshest before entering winter, they will carry a higher bacterial load than lesions formed in summer, for instance. Similarly, bacterial levels in susceptible host plants will be higher than in a tolerant variety. However, bacterium is able to survive in low levels through winter in the lesions formed the previous spring, provided conditions are mild.

2.19 Infection of young leaves in late autumn, prior to the plant entering dormancy, can occur without the development of symptoms. As environmental conditions become more favourable, bacterial populations increase, canker lesions are formed and a new infection cycle can commence.

2.20 The most destructive phase of the disease tends to be after heavy rains, (particularly during spring) and when the average temperature is greater than 20 degrees centigrade. Dispersal of the citrus canker bacterium within a tree canopy is aided by free moisture. Over short distances, wind-driven rain, air currents, insects, birds and human movement can spread the canker pathogen. Overhead or spray irrigation can escalate the rate of disease spread in an orchard.

2.21 Over longer distances, dispersal is most common when infected plant material is moved between areas. This includes bud wood, rootstock, seedlings and budded

2 A plant (such as a tropical orchid or staghorn) that grows on another plant upon which it depends for mechanical support but not for nutrients

3 An organism, especially a fungus or bacterium, that grows on and derives its nourishment from dead or decaying organic matter

trees, but less commonly fruit or leaves. Movement of straw or mulch, contaminated clothing, tools, harvest and post-harvest equipment are also potential sources of infection. However, the bacteria responsible for citrus canker is able to survive on inanimate objects for less than 72 hours, which means that if the contaminated item immediately comes into contact with host plant material, there is an increased risk of spreading the disease.

Prevalence of citrus canker

2.22 Citrus canker is not an endemic bacterial disease in Australia, however it has had a serious impact on citrus industries in other parts of the world.

2.23 Citrus canker is believed to have originated in areas of South-east Asia and India, and has since spread to most parts of the world. It is common in many tropical and subtropical citrus growing areas of the world including Japan, some parts of west and central Africa, the Middle East, southern Asia (including Indonesia), the Pacific Islands (including Papua New Guinea), some areas of South America and Florida in the United States.

2.24 The disease is particularly widespread in China, Japan, Malaysia and Vietnam and is also present on Christmas and Cocos Islands.

2.25 Australian citrus growing areas with climatic conditions particularly suited to the establishment of citrus canker include the Central Burnett region of Queensland, the Central Coast region of New South Wales and Darwin in the Northern Territory. Other major citrus production areas, such as the Riverland, Riverina and Sunraysia districts are situated in much drier regions, making them less suitable areas climatically for the establishment of the canker bacterium.

Previous Australian outbreaks

2.26 The first recorded outbreak of citrus canker was in the Northern Territory in 1912. The initial occurrence of the disease took 11 years to fully eradicate and resulted in the destruction of every citrus tree north of latitude 19 degrees south.

2.27 In 1984, a program to eradicate citrus canker from Thursday Island was initiated following the detection of the disease. Over a two year period a total of 10 citrus trees were found to have canker symptoms and were destroyed. No symptoms of citrus canker have been observed on Thursday Island since February 1986, and the disease was declared eradicated in September 1988.

2.28 Citrus canker was detected in the Northern Territory again in 1991 and 1993. These incursions, at the Lambell's Lagoon subdivision, about 50 kilometres from Darwin, affected a small number of pummelo citrus trees. All affected trees were destroyed, and the area was intensively monitored for two years. Citrus canker was officially declared eradicated in the Northern Territory in 1995.

2.29 The 1991-1993 incidence of citrus canker in the Northern Territory was the last confirmed outbreak of citrus canker in Australia until the disease was found in an orchard in Emerald, Queensland in late June 2004.

2.30 The importation of propagation material or fresh fruit from overseas is one of the most likely ways citrus canker has been able to enter Australia. Travellers to Australia who illegally import citrus plant material have been identified as one of the primary risk pathways for the introduction of citrus canker into the country. Authorities regularly intercept material infected with citrus canker from air flight passenger baggage coming in from Asia and arriving in Brisbane, Sydney or Melbourne. Infected material has also been found in postal items.⁴

Plant protection in the Australian federal system

Cooperation between the Commonwealth and the states

2.31 In the Australian federal system, the Commonwealth and the states share responsibility for plant protection. The Commonwealth *Quarantine Act 1908*, the *Quarantine Proclamation 1998* and the *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection) Act 1999* operate alongside state legislation to cover all issues relating to plant protection matters in Australia.

Department of Agriculture, Fisheries and Forestry

2.32 All investigations into allegations of illegal importation of plant material are conducted under the Commonwealth's Quarantine Act, which is administered by the Department of Agriculture, Fisheries and Forestry (DAFF). The Act provides for:

- 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;
- the declaration of a quarantinable disease;
- the declaration of a quarantine area; and
- a prohibition on the removal of plants and goods from any part of Australia.

2.33 In addition to administering the Quarantine Act, DAFF meets its quarantine obligations through:

- risk assessments and scientific advice provided by Biosecurity Australia (BA);

4 *National Citrus Industry Biosecurity Plan: Pest Risk Review*, Plant Health Australia, March 2004, p. 9

- quarantine measures applied by the Australian Quarantine and Inspection Service (AQIS) at points of entry into Australia;
- involvement in specific measures at the immediate post-border level.

2.34 A key role of the department is the national coordination of responses to emergency pest and disease outbreaks which is handled by the Product Integrity Animal and Plant Health Division of DAFF.⁵

State powers and legislation

2.35 Each state and territory jurisdiction has separate quarantine and/or plant health legislation which prescribes their responsibilities and powers. While all those involved agree that uniform legislation across the states and the commonwealth would provide a stronger framework for emergency management, that uniformity is still some way off, and the Commonwealth, states and industry are yet to agree on the best way to achieve it.

2.36 According to DAFF:

Overall, the State agencies are reasonably well placed in terms of their legislative powers to respond to new pest incursions. However, there are some areas where actions to contain or eradicate an outbreak may be constrained by legislation, namely:

Few States have specific powers to destroy healthy plants or to establish buffer zones to prevent the spread of an outbreak.⁶

2.37 The committee was concerned to hear that only Tasmania and Victoria have passed the necessary legislation to restrict the movement of people into or out of an area affected by a pest. The committee strongly urges all states to learn from the experience afforded by the citrus canker outbreak in Queensland and to review their legislation in consultation with other states and the relevant commonwealth agencies. A swift response to any disease outbreak is crucial and it is often only possible on the basis of sound legislation.

2.38 In relation to pest incursions and quarantine issues, state agencies have primary responsibility for:

- post-entry surveillance and any incursions that occur in their jurisdiction;
- inter and intrastate quarantine operations;
- the detection of new pest and disease outbreaks; and
- the collection of data on the status of animal and plant health.

5 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 6

6 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 22

Plant Health Australia - PLANTPLAN

2.39 In April 2000, a joint industry and government-owned body known as Plant Health Australia (PHA) was established. PHA is a Corporations Law company with membership that includes representatives from federal, state and territory governments, and national representatives of plant industry organisations. PHA is charged with coordinating national priorities for plant health, and it has emphasised the need to develop an integrated approach to national plant health policy development and implementation. In particular, PHA has concentrated on emergency preparedness and response in the event of a plant pest incursion.⁷

2.40 PHA's approach has been to develop PLANTPLAN – an emergency plant pest response guide – as a framework for management of infrastructure, actions and communications through all sectors involved in any response to a disease.⁸ PLANTPLAN also includes a formal cost sharing agreement which covers government and industry funding arrangements in the event of Emergency Plant Pest (EPP) incursions.⁹

2.41 In accordance with PLANTPLAN guidelines, there are four phases of response to an Emergency Plant Pest (EPP) incursion:

- (i) **Investigation Phase** – A pest is detected and reported to the Chief Plant Health Manager (CPHM) of the state/territory agriculture department. The process of identification is initiated and the relevant people and organisations are notified of the suspected detection.
- (ii) **Alert Phase** – Identification of the pest is confirmed and the outbreak is declared. The Chief Plant Protection Officer (CPPO) convenes a meeting of the Consultative Committee on Emergency Plant Pests (CCEPP). The CCEPP will determine the feasibility of eradication and make a recommendation to the National Management Group (NMG). If the NMG decides to proceed with the eradication campaign, the CCEPP will oversee the preparation of an EPP Response Plan by the lead Agency(s). The resource requirements needed to implement the response and costings for the eradication program will be identified. The NMG will approve the EPP Response Plan and the national cost sharing arrangements to fund the campaign.
- (iii) **Operational Phase** – The Lead Agency(s) in the state(s)/territory(s) in which the incursion occurs will implement

7 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 7

8 Details of PLANTPLAN are at: <http://www.planthealthaustralia.com.au/plantplan/files/asp>

9 Plant Health Australia, *PLANTPLAN: Australian Emergency Plant Pest Response Plan, Version 1*, July 2004, p. ii and p. 6

and manage the EPP Response Plan overseen by the CCEPP. The Lead Agency(s) will provide regular reports to the CCEPP on the progress of the campaign. If relevant, a Scientific Advisory Panel (SAP) will evaluate the effectiveness of the response and its implementation.

- (iv) **Stand Down Phase** – After the coordinated response is completed or if a review determines that eradication is not feasible, records of expenditure and technical reports are provided to PHA so that each state and territory's share of the cost can be calculated.¹⁰

2.42 Three of the four phases listed above have been implemented in Emerald in response to the citrus canker outbreak with varying degrees of success. Since the Emerald outbreak proved to be the first opportunity to put in practice the PLANTPLAN guidelines, a number of lessons have been learnt about how the plan operates in practice, which should enable Plant Health Australia to refine the guidelines to provide a better response in the event of another emergency.

Preparedness to manage a citrus canker outbreak

2.43 In March 2004, prior to the confirmation of the outbreak of canker in Emerald, government and industry had specifically identified citrus canker as a disease that posed a possible threat to the Australian citrus industry. The Office of the Chief Plant Protection Officer in DAFF, in consultation with Australian citrus industry organisations prepared a *Draft Contingency Plan for Citrus Canker* to form the basis for the emergency management of any future disease incursion.¹¹

2.44 The Plan was based on the fire blight contingency plan, the international phytosanitary standards and the experience of the Florida Department of Agriculture and Consumer Services in dealing with citrus canker.¹²

2.45 In addition to summarising both the Australian experience and international practices to contain and/or eradicate citrus canker, the Plan identified two main principles for the eradication of citrus canker:

- (i) stopping the multiplication of bacteria on infected plants; and
- (ii) preventing contact between non-infected susceptible plants and the citrus canker bacterium.¹³

10 Plant Health Australia, *PLANTPLAN: Australian Emergency Plant Pest Response Plan, Version 1*, July 2004, p. ix

11 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 14

12 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 15

13 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 14

The National Management Group (NMG) and the CCEPP

2.46 Under PLANTPLAN, the response to the canker pest was managed jointly by the Commonwealth and the state of Queensland, under the auspices of the Primary Industries Ministerial Council/Primary Industries Standing Committee framework with the other states involved through the Citrus Canker National Management Group (NMG), a body that comprised the CEOs of all state and territory agricultural agencies and the chairs of Australian Citrus Growers and of Plant Health Australia.

2.47 A national Consultative Committee on Emergency Plant Pests (CCEPP) was also convened to develop the control and eradication programme. The NMG made determinations to deal with the outbreak based on the advice received from the CCEPP.¹⁴ Both the CCEPP and the NMG were guided in their work by the *Draft Contingency Plan for Citrus Canker*.

2.48 The committee will comment on the operations of the NMG and of the CCEPP in Chapter 3.

The Emergency Plant Pest Response Deed

2.49 In addition to providing a set of national guidelines for responding to emergency plant pest incursions, PLANTPLAN also includes a formal cost sharing agreement which covers government and industry funding arrangements in the event of Emergency Plant Pest (EPP) incursions.¹⁵

2.50 Unfortunately, when citrus canker was detected in Emerald, the Emergency Plant Pest Response Deed (EPPRD)¹⁶ was still being developed and its signing and ratification was still fifteen months away. This had serious ramifications for the way an important part of the management response to the emergency was handled, namely, the central issue of funding the response to the pest incursion and compensating the affected growers.

2.51 After five years of negotiation, the EPPRD was ratified on 26 October 2005 by the Commonwealth government, all state and territory governments and thirteen plant industry members. In the event of a future outbreak, it will be used as a template for deciding the funding arrangements: government and plant industry signatories will share the costs, based on an assessment of the relative private and public benefits flowing from the eradication of the particular pest involved.

14 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 13

15 Plant Health Australia, *PLANTPLAN: Australian Emergency Plant Pest Response Plan, Version 1*, July 2004, p. ii and p. 6

16 Note: For full details about the Emergency Plant Pest Response Deed (EPPRD), see Plant Health Australia's website at:
http://www.planthealthaustralia.com.au/project_documents/display_document.asp?category=15&ID=211

2.52 This means that some of the problems that arose in the early phase of the emergency at Emerald should be avoided. Plant industry body Growcom submitted to the committee that the Commonwealth and state agencies at the forefront of the fight against citrus canker cooperated well and would have achieved more if the funding issue had not worked against greater cooperation:

While there has been a certain level of political manoeuvring around the outbreak, at a professional bureaucratic level there has been reasonable discussion, cooperation and cohesion among the technical and bureaucratic staff involved in responding to and managing the outbreak.¹⁷

With an agreement in place, the fundamental principles of funding the program would not have been an issue. Rather, the technical approach to responding to the outbreak... could have been the prime focus of all stakeholders.¹⁸

2.53 The committee hopes that through the implementation of the EPPRD that the type of issues listed above will be addressed in future to the satisfaction of farmers affected by pest incursions. The Deed also details the timing of cost sharing arrangements. It is proposed that funding will commence once the National Management Group endorses a recommendation from the Consultative Committee on Emergency Plant Pests (CCEPP) to eradicate a new pest incursion. The National Management Group will also make the final decision on when cost sharing should cease. This is likely to follow a recommendation from CCEPP that eradication has been achieved or is no longer technically or economically feasible.¹⁹

2.54 The committee is pleased to note that the principles underpinning the EPPRD and the guidelines for the reimbursement of owner costs include:

- growers being no worse off, or better off, as a result of reporting a suspected exotic pest incursion; and
- social justice for growers who, through no fault of their own, are seriously affected by a decision to eradicate an exotic pest.

The 2004 outbreak in Emerald

2.55 On 28 June 2004, a private employee of Evergreen Farms sent a sample of what he suspected was citrus canker to the Queensland Department of Primary Industries and Fisheries (QDPI). Tests were conducted and on 2 July 2004, QDPI confirmed the sample as being infected with citrus canker in accordance with the protocols established by PLANTPLAN.²⁰ Under PLANTPLAN, Queensland was

17 *Submission 11*, Growcom, p. 6

18 *Submission 11*, Growcom, p. 10

19 Plant Health Australia, *PLANTPLAN: Australian Emergency Plant Pest Response Plan, Version 1*, July 2004, p. 7

20 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 3

responsible for developing the emergency response using the *Draft Contingency Plan for Citrus Canker* as a basis for action.

2.56 The Draft Contingency Plan advocated that, with National Management Group approval, the quarantine area to be treated should include all infested trees and all citrus canker hosts within a defined area of an infected tree, an approach based on the one used on canker infested citrus plantations in Florida and often referred to by witnesses to the inquiry as "the Florida protocol" (see **Appendix 3** for more details).²¹

2.57 In the case of Emerald, the Consultative Committee on Emergency Plant Pests (CCEPP) determined to operate at the maximum level and set the radius of the destruction zone at 600 metres.²² A quarantine area was declared and steps taken to eradicate the canker on Evergreen Farms using the so-called 'cookie-cutter' approach of destroying trees within a 600 metre radius of where citrus canker had been found, imposing a quarantine zone of 3.2 kilometre radius around it and a buffer zone involving intense surveillance of a further 3.2 kilometre radius around the quarantine zone.

2.58 While this process was being implemented, citrus canker was detected on a second property (2PH Farms) and a third (the Iddles' property) in the Emerald district on 5 October 2004 and 23 May 2005 respectively. As stated earlier, the committee decided to conduct an inquiry into the outbreak in May 2005.

Positive cooperation

2.59 The committee deals with the way in which the *Draft Contingency Plan for Citrus Canker* was implemented in response to the Emerald outbreak and reviews the operation of the various management and consultative groups set up under PLANTPLAN in the following chapter.

2.60 Inevitably, since it was the first time that those response mechanisms were being put in practice, there were some problems, which the committee will address in the next chapter. But the evidence before the committee suggests that, from the time AQIS informed the relevant Queensland state government agency of the situation, officers of QDPI and AQIS cooperated fully with each other and worked well together throughout the 2001 investigation of possible illegal importation and the management of the emergency response to the canker outbreak in 2004.

2.61 For example, an association of Queensland's fruit and vegetable growers trading as Growcom, who dealt with the government agencies involved told the Committee that:

While there has been a certain level of political manoeuvring around the outbreak, at a professional bureaucratic level, there has been reasonable

21 See Note on the Florida Protocol, Appendix 3

22 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 14

discussion, cooperation and cohesion among technical and bureaucratic staff involved in responding to and managing the outbreak.²³

2.62 Growcom welcomed the level of professionalism shown and stressed that it was absolutely essential that it be maintained because under the Emergency Plant Pest Response Deed:

... industries and governments will be looking to invest in biosecurity matters and will only do so where there is confidence in the operations and implementation of those investments.²⁴

Conclusion

2.63 The committee is strongly of the view that, as a result of the lessons learnt in Emerald, all states must ensure that they have legislation in place to ensure that appropriate compensation measures are available to affected growers. In the case of Emerald, Queensland state legislation provided for compensation only where healthy plants were destroyed to prevent the spread of the pest. DAFF told the committee:

There is no uniform position across the States on the matter of compensation for losses incurred as a result of eradication action;

For example, only the Queensland *Plant Protection Act 1989* provides for compensation of owners of healthy plants that are destroyed as part of a response programme; growers in a similar position in other States are not entitled to compensation.²⁵

2.64 Funding of the eradication programme and compensation for affected growers are issues that lie at the heart of the implementation of any emergency programme in response to a pest incursion. Not only because the issue of how the costs are shared has the potential to influence the decisions made by the Consultative Committee²⁶ but also because it determines the level of cooperation that the response team can expect from the affected growers. It is also a key element of any rebuilding program after a pest incursion has been successfully dealt with.

23 *Submission 11*, Growcom, p. 6

24 *Submission 11*, Growcom, p. 6

25 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 22

26 *Submission 12*, Department of Agriculture, Fisheries and Forestry, p. 22, Footnote No. 12