# Fire blight: a biosecurity threat to the Australian Nursery Industry

## Background

Fire blight, caused by the bacterium *Erwinia amylovora,* was first recorded on apple in the Hudson valley of New York in 1870, and has become one of the world's most devastating plant diseases. In the mid-nineteenth century it caused enormous damage in apple and pear orchards in the United States and Canada " blackening and blighting whole orchards - even whole valleys – in a single night " (Carefoot and Sprott, 1967). The bacterium is a native pathogen of wild rosaceous hosts which include hawthorn, serviceberry and native ash in eastern North America. Fire blight has now spread to many of the apple and pear growing regions of the world. It is also a serious disease of many ornamental and nursery plants.

Australia has strict quarantine laws on the entry of plant material that could introduce *Erwinia amylovora.* However, in 1997 the




**Fig. 1.** Symptoms of fireblight stem dieback a) including bacterial ooze from petioles (Brendon Rodoni, DPI Victoria, b) early symptoms on Waterer's coteneaster (R. Grimm, bugwood.org) and c) apple (Christine Horlock - QDAFF).

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disease was detected in the Royal Botanic Gardens in Melbourne affecting *Cotoneaster* and *Sorbus sorbus* (mountain ash) and subsequently eradicated (Jock *et al.,* 2000).

## Host range

*Erwinia amylovora* affects some 75 different plant species, all being in the Rosaceae family. The major economic hosts include many varieties of apple and pear. However there are many other host plants of fire blight which are common in parks and home gardens in Australia. The major host genera and number of species present in Australia are *Amelanchier* (6), *Aronia* (3), *Chaenomeles* (5)*, Cotoneaster* (30), *Crataegus* (19), *Cydonia* (3), *Eriobotrya* (1), *Heteromeles* (1), *Malus* (17), *Mespilus* (1), *Photonia* (4), *Pyracantha* (8), *Pyrus* (9), *Raphiolepis* (2), *Sorbus* (23), *Stranvaesia* (2).

Other genera which can be hosts under unusual circumstances are *Aruncus*, *Fragaria*, *Prunus*, *Rosa, Rubus*, and *Spirea.* Native rosaceous plants in the genera *Rubus*, *Geum*, *Aphanes* and *Acaena* are widespread in Australia but there is no information on their susceptibility to Fire blight (Biosecurity Australia, 2007). The establishment of fire blight in Australia would impact the amenity value of these host plants and directly affect the nursery trade supplying the plants.

## Symptoms

Fire blight causes severe blighting of blossoms, leaves and shoots making plants appear as though they have been scorched by a flame thrower. Dead blackened leaves remain attached to branches for a growing season.  Initial symptoms include blackened blossoms or fruit clusters and black twisted twigs which often form a shepherd's crook at the end of each infected shoot.  Cankers develop on branches and shoots and are initially apparent as reddish coloured streaks which progressively become brown and then black.

Cankers occurring on lower branches may extend to the stem base, killing the plant.  During wet, humid conditions cankers exude a sticky ooze filled with bacteria. An amber coloured bacterial ooze is often evident on infected fruit such as apple (Horlock and Persley, 2009).


**Fig. 2.** Tip dieback and brown wilting of leaves of a) apple, b) loquat and c) cotoneaster. Photos courtesy of a) Christine Horlock, QDAFF, b) Florida Division of Plant Industry Archive, Florida Department of Agriculture and Consumer Services and c) by R. Grimm. (b) and c) from Bugwood.org.

## Current global distribution

For many years the disease was confined to North America. Since 1910 the pathogen has spread to most apple and pear producing regions of the world including New Zealand, Mexico, United Kingdom, Poland, Denmark, the Netherlands, Guatemala, most of the European Union, the Middle East and small areas of Asia.

In 1997 fire blight was found in the Melbourne Royal Botanic Gardens but was successfully eradicated. Australia is now considered free of the disease.

## Potential distribution in Australia

*Erwinia amylovora* requires warm temperatures (21-28°C) and high humidity to multiply and thus disease epidemics occur in warm moist conditions. These conditions occur in coastal areas of south-eastern and south-western mainland Australia as well as in Tasmania. All apple and pear growing areas in Australia are considered high risk areas for fire blight occurrence.

## Disease cycle and spread

The pathogen survives over winter in living tissue along edges of the previous season's cankers. In spring, when the weather is warm and moist, plants resume growth and bacteria begin to multiply. They are dispersed in rain or by insects to new infection sites (open blossoms, shoot tips or young leaves). Young succulent plant tissues are most susceptible to infection. Hail storms can injure plant tissue and provide ideal wounds through which infection can occur. Insects play a major role in the spread of the bacteria. Pollinating insects such as honey bees visit contaminated blossoms and are very efficient vectors for spread of the bacteria over moderate distance (i.e. a few kilometres). Birds will also carry the bacteria on their feet and beaks. Short distance spread occurs by splash dispersal of bacteria in rain drops and irrigation water, wind-driven rain and on pruning tools. Long-distance dispersal occurs by transporting infected nursery plants, budwood or fruit and contaminated machinery.

**Fig. 3.** Fire blight infection has causes the death of flowers, stems and leaves, and a large and may cause brown cankers. Photos by Christine Horlock QDAFF

## Potential impact on the Australian nursery industry

*Erwinia amylovora* is likely to enter Australia through infected plant material as part of the intensive international nursery trade. Besides its effect on commercial apple and pear crops, many ornamental species commonly grown in parks and gardens are known to be susceptible. The disease would reduce their amenity value and directly affect nurseries supplying these plants. There is also the possibility that a number of native plant species will be affected.

## Protecting your nursery from fire blight

Should *Erwinia amylovora* gain entry into Australia, eradication will only be possible if it is detected very quickly after establishment. Developing familiarity with the characteristic symptoms of fire blight is therefore essential. All plant material being introduced into production nurseries must be carefully inspected for symptoms of the disease. Adopting best management practices in your nursery will help to minimise biosecurity threats such as fire blight, as well as improve overall pest and disease management. Ensure that nursery staff are familiar with the symptoms of all exotic pests and diseases likely to impact the nursery. Be vigilant and always practice strict nursery hygiene. Remember the costs of fire blight and other biosecurity threats to your nursery are potentially enormous.

**If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881.**

Fig. 4. Fruit include fruit rot and bacterial ooze, however these symptoms are relatively rare as fire blight often causes death of flowers. Apple and pear photos by Brendon Rodoni (DPI Vic) and Trevor Ranford (SARDI), respectively.

## References


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