Pathogen of the month – August 2009

Fig. 1. Fire blight on Asian pear flowers and young fruit (a); Progression of the disease on an apple shoot (b); Apple orchard severely affected by fire blight (c) Production of exudate on a young pear shoot (d); Photograph credits JL Vanneste.

Disease: Fire blight
Classification: D: Bacteria, C: Gammaproteobacteria, O: Enterobacteriales, F: Enterobacteriaceae

Fire blight infections (Fig. 1) occur mostly during flowering. *Erwinia amylovora* enters the plant through natural openings such as nectarhodes or wounds. Infected tissues produce an abundant ooze containing bacteria, which helps the spread of the disease over short distances. The bacteria overwinter in cankers formed later in the season on infected limbs or twigs.

Distribution and Host Range:

Fire blight is present in North America, in New Zealand and is spreading throughout Western Europe and around the Mediterranean Sea. Australia has been declared fire blight-free, although the disease was found in Melbourne in 1997. *E. amylovora* causes disease mostly on plants belonging to the Maloideae (e.g. apple, pear, cotoneaster, hawthorn, quince and loquat). Only a few host plants belong to other subfamilies of the Rosaceae. Strains pathogenic to *Rubus* have been described; they do not infect apple or pear and have never been recorded outside Canada or the USA.

Impact:

Impact on production (loss of fruit or trees) is highly variable, depending mostly on climatic conditions during spring. *E. amylovora* is listed as a quarantine organism by several countries and as such its presence limits international fruit trade.

Identification and Diagnostic:

Early symptoms of fire blight on blossoms can be mistaken for bacterial blast caused by *Pseudomonas syringae* pv. *syringae*. In Korea and Japan a disease of Asian pear similar to fire blight is caused by the closely related bacterium: *E. pyrifoliae.* Similarly in Spain, a disease of European pear similar to fire blight is caused by the related bacterium *E. piriflorinigrans*. Many molecular identification protocols (e.g. PCR, real-time PCR) have been developed for the identification of *E. amylovora;* however, none of them should be used on its own for a definitive identification.

Control:

Only a few countries, including New Zealand, allow the use of the antibiotic streptomycin for control of fire blight. When used in conjunction with computer-based prediction models, these treatments can be very effective. However, strains resistant to streptomycin have been detected in every country where this antibiotic is allowed. Copper compounds can be effective in reducing fire blight but their use during spring, when most of the infections occur, is limited because of phytotoxicity. Some growth regulators, probably acting as elicitors, have been shown to reduce incidence of this disease. Biological control agents (mostly strains of *Pantoea agglomerans*, *Pseudomonas fluorescens* and *Bacillus subtilis*) have been registered for control of fire blight in Europe, the USA and New Zealand.

Further Reading:

Vanneste JL (2008) Challenges in tracking the fire blight pathogen (*Erwinia amylovora*): a case study. In Surveillance for Biosecurity. K Froud, I Popay and SM Zydenbos eds. Pp 29-36.
Spinelli *et al.* (2007) Potential and limits of acylcyclohexanediones for the control of blossom blight in apple and pear caused by *Erwinia amylovora*. Plant Pathology 56: 702-710.
Vanneste JL (2000) Fire blight the disease and its causative agent, *Erwinia amylovora*. CABI Publishing, Wallingford, UK.

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Erwinia amylovora (Burrill 1882) Winslow et al. 1920