

Invasion of Xylem of Mature Tree Stems by *Phytophthora ramorum* and *P. kernoviae*¹

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Abstract

The aetiology and frequency of *Phytophthoras* in discoloured xylem tissue beneath phloem lesions was investigated in a range of broadleaved trees infected with *P. ramorum*, *P. kernoviae* and several other *Phytophthoras*. Isolation was attempted from the inner surface of 81, 6 x 4 cm sterilised discoloured wood panels from 53 trees. Discolouration mostly extended 1 to 5 mm into the xylem (75 percent) but incursions of 6 to 10 mm (10 percent) and 10 to 25 mm (15 percent) were frequent. *Phytophthora* was isolated from 81 percent of the wood panels. In 66 cases, both a wood panel and an overlying phloem panel were sampled. In 56 percent of these *Phytophthora* was isolated from both the wood and the phloem panel. In 23 percent it was isolated from the wood panel only and in 8 percent from the phloem panel only.

Small 'island' phloem lesions, often in linear arrays adjacent to main lesions, were a common feature of *Fagus* and *Quercus* trees infected with *Phytophthora ramorum* or *P. kernoviae*. Island lesions were often connected by underlying strips or intermittent pits of discoloured xylem in line with the wood grain. *P. ramorum*, *P. kernoviae* and other *Phytophthoras* were successfully isolated from these connecting xylem features. *P. ramorum* and *P. kernoviae* were also recovered from discoloured tissue 5 to 25 mm below exposed xylem surfaces 12 to 24 months after the overlying phloem was removed.

These results show that *Phytophthoras* commonly occupy xylem beneath phloem lesions; that they can perennate in xylem tissue; that they can spread in xylem tissue ahead of phloem lesions; and indicate that they may initiate new phloem lesions in this way. Such colonisation must lead to at least local xylem dysfunction. It is recommended that, if xylem discolouration is present, isolation of *Phytophthora* should be attempted from the xylem as well as the bark. Also, that removal of infected outer sapwood should be undertaken during excision of *Phytophthora* bleeding lesions for disease control and in protocols aimed at preventing national or international spread of tree stem *Phytophthoras*.

The results from this work are covered in more detail in Brown, A.V.; Brasier, C.M. 2007. Colonization of tree xylem by *Phytophthora ramorum* and *P. kernoviae* and other *Phytophthora* species. Plant Pathology. 56: 227–241.

Key words: *Phytophthora*, bark lesions, bleeding cankers, phloem, tree stem diseases, wood, xylem.

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