Horse chestnut bleeding canker

Since 2004 there has been a steep increase in reports of bleeding canker of horse chestnut, associated with widespread mortality. A survey carried out by the FC in 2007 revealed that about 50% of horse chestnut trees in Britain were infected, with most affected in SE England (~70%) but far fewer in Scotland. Symptoms on affected trees include the cankers on the main stem and branches, bark cracking and death, and dieback of branches. Both white and red flowering horse chestnuts are affected, and disease levels tend to higher in urban environments than in rural areas. Although not all trees are killed by the disease, many have to be felled for safety reasons.

Research evidence has revealed

- The causal agent of bleeding canker is a pathogen new to Britain, *Pseudomonas syringae* pv *aesculi* (*Pae*); it has previously been found infecting foliage of Indian horse chestnut in north west India.
- British strains of *Pae* are all virtually identical, with 95% similarity to the Indian *Pae*.
- A quantitative real-time PCR assay has been developed to detect *Pae* in symptomatic horse chestnut tissues.
- Entire genome has been sequenced to determine genome size and number of genes.
- *Pae* belongs to a distinct clade of *P. syringae* pathovars adapted to woody hosts.
- Genomic analyses have revealed pathovar-specific genomic regions in *Pae* potentially implicated in virulence on horse chestnut trees.
- *Pae* infects via lenticels, leaf scars, nodes and other bark weaknesses, then colonises the cortex, phloem and cambium. Cankers establish during the dormant season and extend rapidly during the growing season. Dispersal is favoured by mild, wet, windy conditions.

Known evidence gaps

- Analysis of the genetic range of *Pae* in Britain and elsewhere to determine the source (dispersal routes) for British *Pae*.
- Ability of *Pae* to survive and spread in soil and water, and the routes of transmission.
- Role of *Pae*-unique genes in pathogenicity on trees.
- Whether uninfected trees have an inherited resistance to bleeding canker disease.
- Development of best management practice to deal with affected trees and minimise disease spread.
- Understanding the interaction between *Pae* infection and horse chestnut leaf miner infestations which frequently affect the same tree.

Potential impact

The major value of horse chestnut comes from its role as a shade and amenity tree, with probably only around half a million trees in woodland environments. Estimates of the landscape and recreation value for horse chestnut exceed £2m/annum, whilst biodiversity and carbon sequestration values exceed £4m/annum. With more than half of all horse chestnuts in Britain affected by the disease, there are significant associated costs of tree pruning or removal, particularly in urban landscapes.