

Joan Webber¹, Clive Brasier¹, Susan Kirk¹, Sandra Denman¹ and Ben Jones²

¹Forest Research, Alice Holt Lodge, Farnham, Surrey, GU10 4LH, UK

²Forestry Commission, Polwhele, Truro, TR4 9AD, UK

joan.webber@forestry.gsi.gov.uk

Introduction

First reported in 2003, *Phytophthora kernoviae* (Pk) is one of several invasive tree Phytophthoras recently arrived in the UK which pose a threat to trees (Brasier *et al.* 2005). It has established to some extent, primarily in the south west of England but with smaller outbreaks in south Wales and more recently in the west of Scotland (Fig. 1). It is found in both planted woodland-gardens and woodlands where rhododendrons (mainly *Rhododendron ponticum*) dominate; foliage of rhododendron tends to be highly susceptible and supports abundant sporulation by Pk (Denman *et al.* 2006). There is little doubt that this host has played a key part in the spread of this pathogen in the natural environment and subsequent infection of trees.

However, late in 2007, *P. kernoviae* was found infecting the heathland plant *Vaccinium myrtillus* (common names bilberry, blaeberry or European blueberry) in the natural environment. *V. myrtillus* is a native plant of Great Britain and occurs in lowland and upland heathlands but also in the understorey of some woodlands, in peat bogs and some grasslands.

Study sites

- ▶ **Site 1 in the south west of England:** In January 2008, *V. myrtillus* growing in an ancient semi-natural woodland was confirmed to be infected by Pk, possibly as a result of inoculum spread from *R. ponticum* also present on site.
- ▶ **Site 2 in the south west of England:** In March 2008, *V. myrtillus* plants on an open heathland area were also confirmed infected by Pk. The nearest infected rhododendron site was 10km distant.

Approach

- ▶ Time and type of symptom development on affected *Vaccinium* were recorded at both sites.
- ▶ At site 2, detailed sampling of *V. myrtillus* plants was undertaken based on 12m x 12m grids. At 3m intersections on the grid, 1–3 *V. myrtillus* plants were removed, separated into three different plant portions (1) leaves/stem/rhizome, (2) roots and (3) litter, and then tested for the presence of Pk using baiting and direct isolation.

Results

- ▶ *Vaccinium* is deciduous, so in winter (December/January) symptoms were limited to numerous black lesions on the green stems (Fig. 2).
- ▶ Repeat checks in January, March, June, September, October revealed that foliar symptoms did not become evident until late summer to autumn. This contrasts to Pk infection of rhododendron, when foliar symptoms develop in spring and early summer.



Fig. 2 Blackening and necrosis of leaves and stems (arrowed) of *Vaccinium myrtillus* as a result of infection by *P. kernoviae*. Photograph taken in November 2008



Fig. 1 Map of current distribution of *P. kernoviae*.

- ▶ Using the grid system for sampling in October (Fig. 3) Pk was isolated from 80% of the symptomatic leaves/stems. More than half of the confirmed infected plants also had roots that yielded Pk, whilst most of the litter samples yielded Pk. The pathogen was also obtained from some plants without visible symptoms, so estimates of the infection incidence based on symptomatic plants may underestimate the area of affected *V. myrtillus* on infected sites.

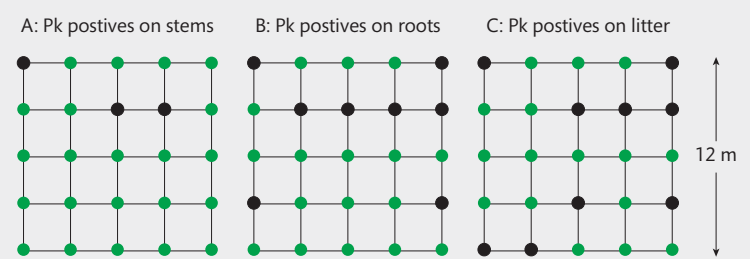


Fig. 3 A-C, example of 'stacked' grids used to sample stems, roots and leaf litter at the same co-ordinates on the grid. Each grid was 12 x 12m; ● indicates -ve for *P. kernoviae*, ● indicates +ve for *P. kernoviae*.

Conclusions

The British Isles supports around 20% of the world's lowland heathland and 75% of upland heath. The total resource in GB amounts to more than 1 million ha. Therefore any pathogen that impacts on *Vaccinium myrtillus*, a key species of heathland habitat, could be highly significant. Since this work was completed the extent of infected *V. myrtillus* has spread considerably at sites 1 and 2, and a further three similar sites have been identified (Fig. 1). The absence of any infected rhododendrons on some of the sites indicates that *V. myrtillus* infection has occurred directly through movement of inoculum from more distant disease foci, either via climatic events (wind-driven rain) or by human vectors.

References

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- Denman, S., Kirk, S.A., Whybrow, A., Orton, E., Webber, J.F. (2006) *Phytophthora kernoviae* and *P. ramorum*: host susceptibility and sporulation potential on foliage of susceptible trees. *EPPO Bulletin* **36** (2), 373–376.

Acknowledgements

This study was funded by the Forestry Commission.