

VARIATIONS IN SUSCEPTIBILITY TO DOTHISTROMA NEEDLE BLIGHT AND PINE PITCH CANKER SCOTTISH POPULATIONS OF SCOTS PINE

Stuart Fraser^{1,5}, Steve Woodward¹, Anna Brown², Eugenia Iturritxa³,
Julio Casero Diez⁴, and Jorge Martín-García⁴

Pinus sylvestris is the national tree of Scotland, where it occurs naturally in a number of fragmented remnant populations. These populations show local adaptation in several traits, including susceptibility to pests and pathogens.

Experiments were undertaken to investigate among-population variation in susceptibility to two important diseases. The first, dothistroma needle blight (DNB), caused by *Dothistroma septosporum*, is already an important disease in British pine plantations. The second, pine pitch canker (PPC), caused by *Fusarium circinatum*, is an important future threat to UK forestry, being established in pine plantations and forest nurseries on the Iberian Peninsula.

Artificial inoculations with *D. septosporum* suggested that among-population variation in susceptibility exists within native Scottish *P. sylvestris*. Natural infection experiments at two field sites in Scotland, however, indicated that apparent relative susceptibility of *P. sylvestris* populations to DNB was not stable between sites or between years. When DNB severity was greatest in the field, the relative susceptibilities of populations correlated with those seen in artificial inoculation experiments. This variation was unrelated to the relative-continentiality of populations.

Variations in susceptibility to PPC of 2–3 year old plants was examined in inoculations made in Phytotrons in Palencia and in glasshouses in Vitoria, Spain. Inoculation resulted in

resin bleeding in most plants. Variations in susceptibility to *F. circinatum* between populations was unclear: most plants died within 80 days of inoculation. Numbers of survivors were greatest in the North Central population. Small numbers from 4 populations remained alive at 132 days after inoculation. Glasshouse inoculations largely corroborated the results of the Phytotron experiments: a few plants survived inoculations, but most died within the first 90 days after inoculation. Field inoculations, carried out in an area of Cantabria with plantations of radiata pine badly affected by PPC, gave inconclusive results, with inoculated plants often re-growing from points below the infection.

Very low numbers of *F. circinatum* conidiospores (50 in total) were required to kill most germinating *P. sylvestris* seed; greater losses occurred with increasing spore numbers. Highest rates of survival occurred in the Ballochbuie population.

Further work is required to determine the reasons for between-site variation seen in Scots pine responses to DNB and the roles of potential resistance mechanisms in this host-pathogen system. The findings presented are guiding improved DNB management in Britain. For the potential impacts of PPC, future research should focus on whether the lower susceptibility of some plants to the pathogen was due to genetic diversity in the Scottish provenance of *P. sylvestris*. Moreover, the susceptibility of Scots pine to multiple pathogens must be considered in future work.

¹University of Aberdeen, Department of Plant and Soil Science, School of Biological Sciences, Cruickshank Building, Aberdeen AB24 3UU, United Kingdom.

²Forestry Commission Scotland, Silvan House, 231 Corstorphine Road, Edinburgh, EH12 7AT, United Kingdom.

³Neiker Tecnalia, Campus Agroalimentario de Arkaute - E-01080 Vitoria-Gasteiz (Araba), Spain.

⁴Universidad de Valladolid, Departamento Producción Vegetal y Recursos Forestales, Campus Yutera Edificio E, 34071 Palencia, Spain.

⁵Present address: Scion, Whakarewarewa, Rotorua 3010, New Zealand.