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Risk from *Sirococcus conigenus* to understory red pine seedlings in northern Wisconsin

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Summary

Interest in development of multicohort stands of red pine *(Pinus resinosa)* in the Great Lakes region of North America prompted an investigation of the potential impact of the shoot blight pathogen *Sirococcus conigenus* (syn. *S. strobilinus)* on understory red pine seedlings. In May 2002 and 2003 healthy, 1-year-old red pine seedlings were planted in the understory of a maturing red pine plantation in northern Wisconsin in an area with a history of presence of this pathogen. Occurrence of shoot blight symptoms was recorded periodically during the summer, and in each year seedlings were harvested in fall and examined for signs of shoot blight pathogens. By fall 2002 and 2003, respectively, shoot blight incidence was 89% and 98% and most seedlings were dying. Pycnidia with conidia of *S. conigenus* were present on almost all of the symptomatic seedlings. The conifer shoot blight and canker pathogen *Diplodia pinea* (syn. *Sphaeropsis sapinea)* was also detected, though less frequently. Pycnidia of *S. conigenus* tended to be found more frequently on symptomatic current year's shoots than symptomatic previous year's shoots; the opposite was true for pycnidia of *D. pinea*. Risk from *S. conigenus* to understory red pine seedlings should be considered in any plans for development of multicohort red pine stands in areas where the pathogen is present.

Introduction

Seedling mortality and shoot blights caused by the coelomycete fungus *Sirococcus conigenus (DC.)* P. Cannon and Minter (syn. *S. strobilinus* Preuss) affect numerous conifer tree species in temperate and boreal forests in Europe and in North America. Sirococcus shoot blight of Norway spruce *[Picea abies (L.)* H. Karst] has been intensively studied in central Europe (HALMSCHLAGER et al. 2000). Other reported hosts of *S. conigenus* in northern and central Europe arc Scots *(Pinus sylvestris L.),* lodgepole *(P. contorta* Douglas ex Loud. var. *latifolia* Engelm.) and Aleppo pines *(P. halepensis* Mill.). In eastern Canada and the north-central and eastern United States, *S. conigenus* occurs on red pine *(P. resinosa* Aiton), several spruce species *(Picea* spp.) and tamarack *[Larix laricina* (Du Roi) K. Koch] (OSTRY et al. 1990). Reports from Idaho and the coastal western United States include occurrence on numerous different spruces and pines. Although shoot blight attributed to this pathogen has also been studied on hemlock *(Tsuga* sp.) in British Columbia and Alaska, differences in colony morphology and molecular markers indicate that there are two distinct host-related groups within *S. conigenus sensu lato* (SMITH et al. 2003).

Sirococcus conigenus overwinters in necrotic tissue in which pycnidia are produced. In forests, conidia are dispersed and infection occurs with rain events in the spring, at the time of shoot elongation (OSTRY et al. 1990). Inoculum typically is not disseminated far from the source and most is deposited directly below diseased trees. In nurseries, dispersal of conidia from pycnidia on diseased seedlings to adjacent seedlings is attributed to rain and irrigation splash (SMITH 1973). Infection is reportedly favoured by low light conditions (WALL and MAGASI 1976), and pycnidia can develop relatively rapidly on colonized host

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