17. Sirococcus Shoot Blight

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Hosts

Sirococcus shoot blight is attributed to three fungi previously referred to as the single species *Sirococcus conigenus* (syn. *S. strobilinus*). The species now known as *S. conigenus* most commonly damages pines, including red pine and lodgepole pine, and spruces such as Colorado blue spruce and Sitka spruce, but other conifers can also be diseased. Hemlocks and true cedars are reported *S. tsugae* hosts. *Sirococcus piceae* is known only from limited collections of spruce, and pathogenicity is yet to be confirmed.

Distribution

S. conigenus is reported from various locations in the Eastern, North-Central, and Northwestern regions of the United States, but its distribution within this range is likely discontinuous. *S. tsugae* is confirmed from the Pacific Northwest and both the Northeastern and Southeastern United States. To date, *S. piceae* has been found in both Eastern and Western Canada, but occurrence in the United States is not known.

Damage

Both *S. conigenus* and *S. tsugae* can damage seedlings of all ages, saplings, and larger ornamental and forest trees. Blighting may result in death or otherwise render seedlings unmerchantable. *S. conigenus* can be seedborne and also has been detected from asymptomatic seedlings.

Diagnosis

Infection of current year's growth can result in rapid shoot mortality, with either needle loss or dead needle retention, dependent on host and pathogen species (figs. 17.1 and 17.2). On pines, purplish stem lesions can expand to girdle and kill shoots, with curling or crooking of stems. On red pine saplings and larger trees, needles often droop near their base, turn brown to gray, and remain attached to dead shoots into the next year (fig. 17.3). Symptoms often are limited to the current year's shoot growth, or current and previous year's growth, without progression into older organs.

Asexual *Sirococcus* fruiting bodies are black flask-shaped pycnidia that can be seen with the naked eye or a hand lens. They are produced in dead needles and stems, and also on open female cones. They may be solitary or in groups, and erupt through the epidermis and cuticle (fig. 17.4). Pycnidia are sometimes numerous on needle bases and below the fascicle sheaths of dead pine needles, but on spruces may be more abundant on dead stems. Although *Sirococcus* species conidia are morphologically similar, spore examination does allow

Figure 17.1—*Needle loss and death of shoot tips of mountain hemlock infected by* Sirococcus tsugae. Photo by Glen R. Stanosz, University of Wisconsin-Madison.

Figure 17.2—*Jack pine seedlings with shoots killed by* Sirococcus conigenus. Photo by USDA Forest Service, North Central Research Station Archive, at http://www.bugwood.org.

Figure 17.3—*Sirococcus shoot blight needle droop symptoms on red pine.* Photo by Glen R. Stanosz, University of Wisconsin-Madison.

differentiation of Sirococcus shoot blight from other diseases with similar symptoms, such as Diplodia shoot blight. Conidia of these three *Sirococcus* species are colorless, fusiform, with rounded tips and rounded to slightly truncate bases, two-celled, and approximately 9 to 16 by 2 to 4 microns in size (fig. 17.5).

Sirococcus species cultures can be obtained by placing pieces of surface-disinfested, symptomatic needles or stems on malt extract agar or potato dextrose agar amended with lactic acid or streptomycin sulfate to inhibit bacterial growth. Pycnidium and conidium production may be stimulated by placing sterile host needles on the medium, with incubation in the light at 20 ºC to 24 ºC (68 ºF to 75 ºF). Molecular methods can be used to identify isolates of each of the three *Sirococcus* species associated with conifers, or detect their presence on or in host samples without the need to obtain cultures.

Biology

Sirococcus conifer pathogens survive in and sporulate on dead needles, stems, cones on diseased trees, and debris on the ground. Viable spores can be disseminated by rain splash year-round, but are most abundant during spring and early summer when young shoots are most susceptible. Spores can be splashed from seedling to seedling in nursery beds, and from overstory trees to understory seedlings and saplings. Moist weather and low light conditions reportedly favor infection.

Control

Biological

Grow nonhost species in areas of nurseries where inoculum is available.

Cultural

Eliminate inoculum sources, including host trees in windbreaks and adjacent forests, in the nursery vicinity to minimize disease. Host materials, such as twigs, needles, and cones, should not be used as soil amendments or mulches. Practices that promote shoot drying, such as early morning irrigation and decreasing bed densities, may reduce infection frequency. Do not move infested seed or diseased seedlings into or out of the nursery.

Chemical

Protectant fungicides can reduce disease incidence in nursery beds. Repeated sprays during shoot elongation may be required, however.

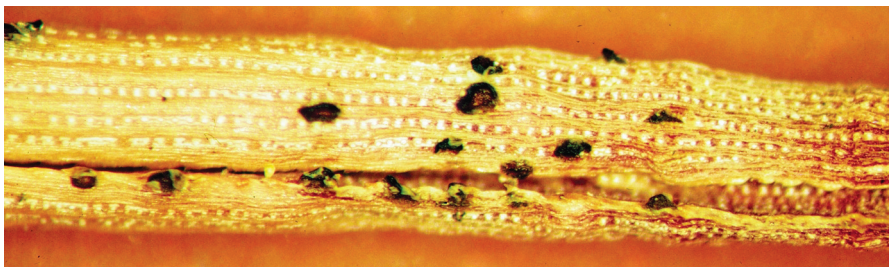

Figure 17.4—*Pycnidia of* Sirococcus conigenus *on pine needles.* Photo by USDA Forest Service, North Central Research Station Archive, at http://www.bugwood.org.

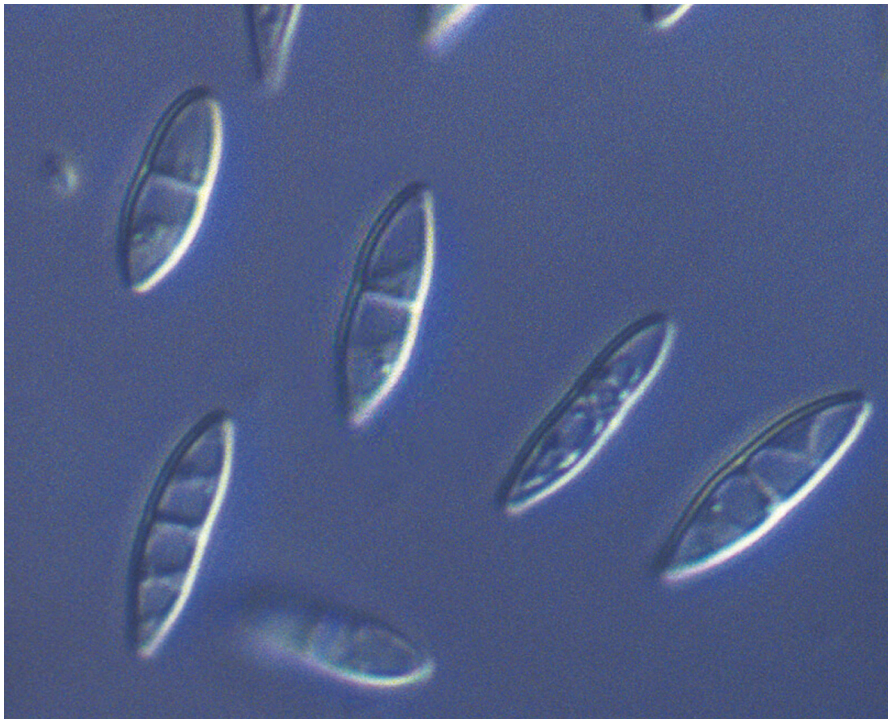

Figure 17.5—*Conidia of* Sirococcus conigenus. Photo by Glen R. Stanosz, University of Wisconsin-Madison.

Selected References

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