27. Poplar Leaf Rusts

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Hosts

All *Populus* species are potential hosts of poplar leaf rust fungi, *Melampsora* species. Distinguishing different leaf rust species is often problematic. Complexity in leaf rust situations is related to the extensive planting of many poplar species and interspecific hybrids, natural or human-aided movement of *Melampsora* species into new geographic regions, and the occurrence of *Melampsora* races (formae speciales). Furthermore, mixed race infections on single leaves and the evolution of natural hybrids of rust fungi contribute to this complexity. A critical need exists for monitoring poplar rust populations in this intricate system. Two poplar leaf rusts are dominant in the United States. In the East, larch is the alternate host of *M. medusae*; in the West, Douglas-fir is the alternate host for *M. occidentalis*. Infection of coniferous alternate hosts is confined to young needles and the damage is usually minor.

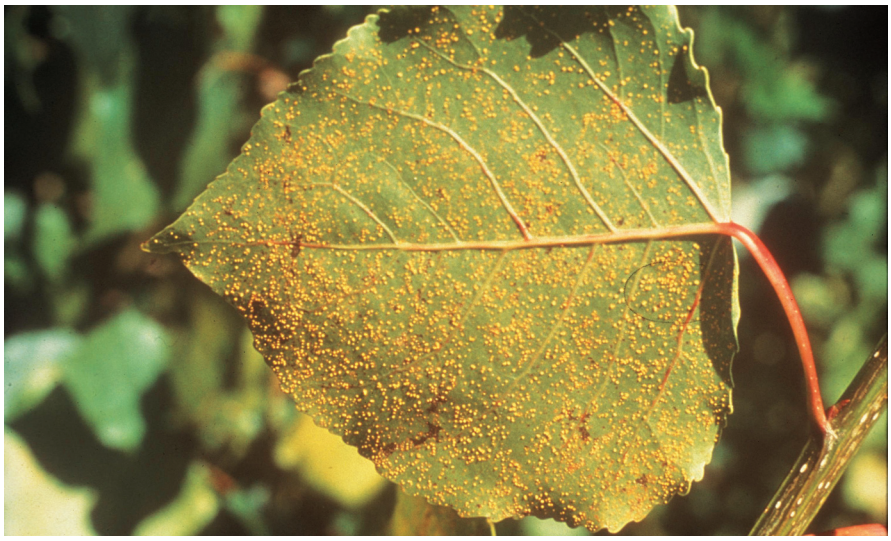

Figure 27.1—*Uredinia pustules with urediniospores of* Melampsora medusae *on poplar leaf.* Photo by Michael E. Ostry, USDA Forest Service.

Figure 27.2—*Uredinia pustules with urediniospores of* Melampsora occidentalis *on poplar leaf.* Photo by Michael E. Ostry, USDA Forest Service.

Distribution

Melampsora leaf rusts affect native and introduced hybrid poplars throughout North America.

Damage

Leaf rust can cause partial or complete defoliation by midsummer, reducing seedling vigor and quality. Premature defoliation can predispose seedlings to environmental stresses and invasion by secondary damaging agents.

Diagnosis

On poplar leaves, look for orange-yellow spore-bearing (uredinial) pustules (figs. 27.1 and 27.2). When these pustules rupture, large numbers of powdery urediniospores are released. From late summer to autumn, yellowish crusts (telia), darkening to brown, are produced among the uredinia. On conifers, yellow spots occur on needles as the aecial stage develops. When mature, the aecia rupture and release powdery aeciospores. Aecia are preceded by an inconspicuous stage (pycnia) that produce their pycniospores in droplets (fig. 27.3). The urediniospores, teliospores, and aeciospores of *M. occidentalis* are generally larger than those of *M. medusae*.

Figure 27.3—Melampsora medusae *pycniospore droplets on needles of larch.* Photo by Michael E. Ostry, USDA Forest Service.

Biology

Melampsora species require a coniferous alternate host to complete their life cycle. The conifer species varies with the rust species. Telia are produced on poplar leaves in the fall and appear as brown to black, crusty patches on fallen leaves. In spring, the teliospores in these fallen leaves germinate and produce basidiospores, which are windblown to the developing needles of coniferous hosts where infection takes place. The first fungal structures to develop on infected needles are the pycnia, which produce haploid spores (pycniospores) associated with sexual reproduction. In summer, shortly after the pycnia develop, aeciospores are produced on the needles and are windblown to poplar leaves. Yellow-orange uredinia pustules develop on infected poplar leaves and release urediniospores that are carried by wind to adjacent leaves, thus intensifying the disease on poplar hosts throughout the growing season. In the fall telia are produced, completing the annual disease cycle. Since both aeciospores and urediniospores are windborne, infection of poplars can occur at considerable distances from conifer hosts. In areas of the Southern United States where ornamental larch is grown, leaf rust epidemics can occur without need for windborne spores from larch in more northerly locations.

Control

Prevention

Planting poplar species and clones selected for resistance to the local *Melampsora* species population is the most effective practice. Growing poplars near coniferous alternate hosts will result in infection earlier in the season and increased disease severity. In the South, remove susceptible evergreen poplars to reduce the amount of overwintering uredinia. Leaf microflora and saprophytic microorganisms have been shown to be antagonistic to rusts and may function as natural biological control agents. Planting large, monoclonal beds should be avoided. This precautionary measure minimizes a new rust species or race from becoming damaging in the future.

Chemical

Application of fungicides labeled for control of Melampsora on poplar can reduce infection of leaves. Begin applying fungicidal sprays in the summer when conditions are favorable for spore development, dispersal, and infection.

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