

1. *Melampsora* Leaf Rust of Cottonwood and Willow

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Cottonwoods and willows in the Great Plains are subject to loss in vigor due to leaf rust caused by *Melampsora* spp.

Hosts and Distribution

The common leaf rust of cottonwood in the Great Plains is caused by the fungus *Melampsora medusae*. In addition to cottonwood, several *Populus* hybrids and species including aspen are susceptible to this fungus. The fungus is present in the Great Plains from North Dakota to Texas. Other species of *Melampsora* infect willows.

Symptoms and Signs

The most obvious indicators of this disease are pustules (uredia) on the surfaces of leaves. These uredia are conspicuous because of the powdery masses of bright orange-yellow urediospores which they contain (figs. 1-1, 1-2). Highly susceptible trees may exhibit premature leaf drop, particularly in the lower crown, late in sum-

mer. Later, telia form on the fallen leaves. These appear as orange to brown waxy crusts.

Disease Cycle

M. medusae requires two hosts to complete its life cycle. Larch and a few other coniferous hosts are infected by basidiospores, which are produced in spring on overwintered fallen cottonwood leaves. Infected larch produce aeciospores, which infect cottonwood in early summer. The infected cottonwood produces urediospores, which can re-infect cottonwood.

Telia are produced on cottonwood leaves in the fall. The telia overwinter on fallen leaves; in the spring the teliospores germinate and produce basidia and basidiospores. The cycle is completed with infection of larch or other coniferous hosts by basidiospores.

There is evidence that, in the Great Plains, this fungus is spread primarily from north to south by urediospores. Initial infection of cottonwood in the south is later than in the north; this suggests long-distance dispersal of urediospores from the north, presumably by wind.

Figure 1-1. Branch with poplar leaves infected by *Melampsora medusae*.



Possibly, in some locations, uredia on cottonwood can survive over winter and produce urediospores the following growing season. In most areas of the Great Plains, however, it is unlikely that overwintered uredia are the source of primary infection of cottonwood.

Damage

The primary effect of the rust on poplars is premature leaf drop with accompanying loss of vigor. The early loss of leaves likely reduces carbohydrate reserves in tree roots, which may be responsible for the decline of some cottonwoods in windbreaks.

Control

The impact of this disease can be reduced by use of resistant selections. The ease with which cottonwood can be produced vegetatively makes this a practical solution. One of the resistant selections, 'Siouxland' cottonwood, is highly susceptible to canker disease fungi, and thus, is no longer recommended for Great Plains plantings. Other resistant selections are available. The recognition of pathogenic races of *Melampsora* on *Populus* species in Australia and elsewhere suggests that any 'resistant' clones may become susceptible to new races in the future.

The fungus could probably be controlled by fungicides. This would not be practical in established plantings, but may improve establishment in new windbreak plantings. In Mississippi, one application of cupric oxide controlled the rust on cottonwood in an experimental nursery.

Selected References

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Figure 1-2. Poplar leaf infected by *M. medusae*.

