

28. Powdery Mildew

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Hosts

Powdery mildew diseases of hardwoods are primarily caused by fungi in the genera *Erysiphe*, *Phyllactinia*, *Pleochaeta*, and *Podosphaera*. Many of the fungi in these genera were previously classified as *Microsphaera*, *Sphaerotheca*, and *Uncinula*. Hardwood species commonly affected by powdery mildew include dogwood, yellow-poplar, oak, sycamore, cherry, maple, black walnut, hickory, buckeye, elm, and cottonwood.

Distribution

Powdery mildew diseases occur on hardwood seedlings grown throughout the United States. Worldwide, more than 500 fungi cause powdery mildew on 7,000 different plant species.

Damage

Infection of seedling leaves by powdery mildew can result in leaf distortion, chlorosis, reduced photosynthesis, and partial defoliation. Early infection and severe disease can result in reduced growth.

Diagnosis

White, powder-like colonies form on the surface of leaves and occasionally stems in the spring and early summer (figs. 28.1 and 28.2). In some species, these light-colored colonies can become brownish with age. Powdery mildew often affects the upper leaf, but can be found on the underside of the leaf as well. The powdery appearance of the disease is the result of conidia. These spores are produced in chains or singly during the asexual reproduction stage in the genera *Oidium*, *Ovulariopsis*, and *Streptopodium*.



Figure 28.1—Flowering dogwood affected by a powdery mildew fungus. Photo by Michelle M. Cram, USDA Forest Service.

The conidia are single-celled, colorless, and in the range of 20 to 50 by 12 to 20 microns. Diagnosis of these fungi to species is based on the individual characteristics of the conidiophores, conidia, and host.

Chasmothecia (syn. cleistothecia) are produced during the sexual reproduction stage on the surface of the plant, in or on the mycelia mat. Chasmothecia are spherical, typically 0.1 to 0.2 mm in diameter and change from colorless to yellow,



Figure 28.2—Powdery mildew fungus on Norway maple. Photo by Glen R. Stanosz, University of Wisconsin-Madison.

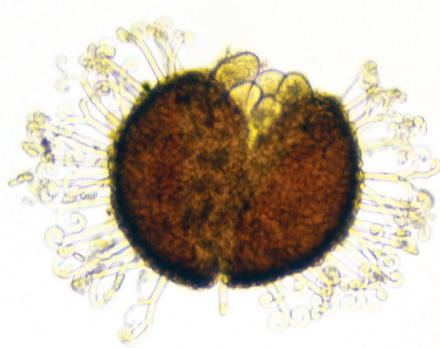


Figure 28.3—*Chasmothecium* broken open to show asci and ascospores. Photo by Glen R. Stanosz, University of Wisconsin-Madison.

then to brown, and finally to black. They have appendages to assist in anchorage and dispersal that are straight, flexuous, branched, or hooked. Chasmothecia and their appendages are barely visible with the naked eye, but seen more easily with a hand lens. Ascospores of the sexual stage are borne within one or more sac-like structures called asci (singular is ascus) that develop within the chasmothecia (fig. 28.3). Species identification is based on the characteristics of the chasmothecia including appendage type and ascus number and size.

Biology

Cool evenings and warm, humid days favor the development of powdery mildew. Typically, powdery mildew occurs when ascospores or conidia germinate, followed by infection of the host epidermal cells. Only a few species will parasitize the internal cells (mesophyll and palisade cells) of the host. Under favorable conditions of 15 to 28 °C (59 to 82 °F) new generations of conidia are

produced every 4 to 6 days. These spores move by air and water to new infection sites and can germinate on dry surfaces. There are three patterns of the disease cycle. In warm regions, the fungi produce conidia throughout the year, creating multiple overlapping cycles of the disease. In temperate regions, these fungi survive winters and hot, dry summers by producing chasmothecia. As conditions become favorable again for disease development, ascospores are released to initiate new infections. A third type of disease cycle includes the overwintering of mycelium in the buds of woody plants or in mild climates on the leaves of evergreens. When the infected buds break and the new shoots develop, conidia are produced to initiate new infections.

Control

Cultural

Frequent irrigation and high seedling density enhances development of powdery mildew by maintaining high

humidity over a longer period of time. Encourage rapid drying of foliage by irrigating in the morning and consider lower seedling densities. Because succulent tissues are highly susceptible, avoid over-fertilization with nitrogen. Reduce potential spring inoculum in the nursery by incorporating any infected plant debris into the soil after lifting.

Chemical

The use of fungicides during the spring and into the summer may be needed for powdery mildew control for some hardwood species. Early control of powdery mildew can be important to avoid damage and growth loss. Because host ranges of individual powdery mildew fungi vary considerably, a correct identification can help determine the need to protect other species being produced in the vicinity of diseased trees. Rotate fungicides with different modes of action to avoid development of resistance in powdery mildew fungi.

Selected References

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