29. Septoria Leaf Spot and Canker of Poplar

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Sphaerulina musiva (syn. *Septoria musiva*) causes a leaf spot disease and branch and stem cankers on native and hybrid poplars (*Populus* spp.). The sexual form of this fungus is *Mycosphaerella populorum*. There are two closely related species, *S. populicola* and *M. populi*, which also cause a leaf spot disease of poplar, as well as *M. jaczewskii* and *S. aceris*, which infect caragana (*Caragana* spp.) and maple (*Acer* spp.), respectively.

Hosts and Distribution

S. musiva is indigenous throughout much of the United States and Canada and occurs across the Great Plains. This fungus causes leaf spots on native cottonwood (*P. deltoides*) and hybrid poplars. It also causes a branch and stem canker disease of hybrid poplars and introduced *Populus* species. In the North Central region of the United States hybrids among cottonwood, balsam poplar (*P. balsamifera*), black poplar (*P. nigra*), Japanese poplar (*P. maximowiczii*), black cottonwood (*P. trichocarpa*), and laurel poplar (*P. laurifolia*) are common hosts.

Symptoms and Signs

Leaf spot symptoms vary according to time of infection, host species, and age of leaves. Four types of leaf spot symptoms have been described: (a) brown, mostly circular leaf spots (1 cm in diameter) that may have a brown or yellow margin, with black, pimplelike fruiting bodies (pycnidia) clustered within; (b) small flecks, commonly with very angular margins; (c) white or silvery spots, mostly 1 to 3 mm in diameter; and (d) irregularly shaped spots that are light tan in the center with brown margins (fig. 29-1). Numerous black pycnidia are commonly clustered in the center of these large spots. Immature pycnidia are light brown and turn black when mature (fig. 29-2).

Cankers are formed on the main stem and branches of the current season's growth. Cankers are often flat-faced or have swollen marginal callus and early woundwood (fig. 29-3). The bark over young cankers is dark brown or black (fig. 29-4) and depressed.

Figure 29-1—Leaf spot symptoms on three balsam poplar leaves (Jared M. LeBoldus, Oregon State University, used with permission).

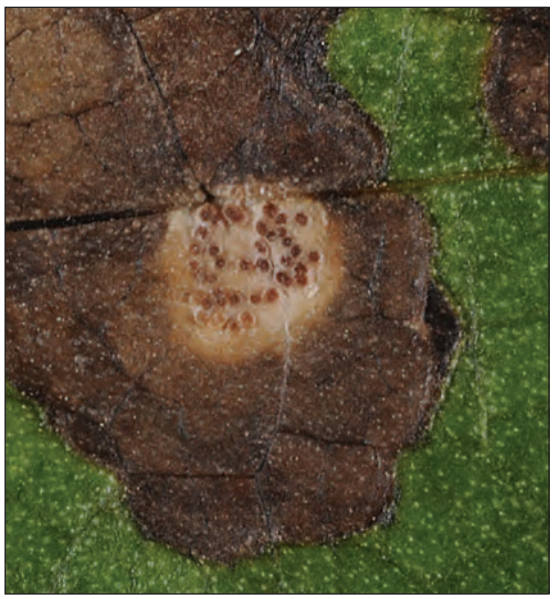

Figure 29-2—Immature asexual fruiting bodies (pycnidia) clustered in the center of a leaf spot (Jared M. LeBoldus, Oregon State University, used with permission).

Figure 29-3—Multiple cankers caused by *Sphaerulina musiva* on a seven-year-old balsam poplar stem with a broken top (Jared M. LeBoldus, Oregon State University, used with permission).

Infected cambium is killed and small black pycnidia may develop in the bark on the ashy-white central area of cankers. Continued development of cankers may result in girdling and death of affected branches and stems during late summer. Affected stems may be infected by other canker fungi, such as *Cytospora chrysosperma*, resulting in additional damage.

Two types of spores develop within fruiting bodies in infected host tissues. Asexual spores (conidia) develop in pycnidia on cankers and leaf spots throughout the growing season, and are exuded in pink or white tendrils during wet weather. Conidia are clear, cylindrical, straight or curved, and one- to four-septate, and measure 20 to 56 µm × 3 to 4 µm

Figure 29-4—Canker (necrotic lesion) caused by *Sphaerulina musiva* on a young poplar shoot (Jared M. LeBoldus, Oregon State University, used with permission).

(fig. 29-5). Sexual spores (ascospores) are produced in perithecia that develop on fallen, infected leaves. The ascospores are clear, one-septate, and 16 to 28 µm × 4.5 to 6.0 µm. Fungi other than *M. populorum* can cause similar leaf spots (listed above). Microscopic examination of spores or a molecular technique (i.e, internal transcribed spacer [ITS] sequences) is necessary to identify these pathogens.

Disease Cycle

The pathogen overwinters on fallen infected leaves and in branch cankers. In spring, ascospores from fallen leaves and conidia from cankers are discharged during wet weather. These spores are dispersed by wind and rainsplash to infect newly emerging leaf and stem tissue. Infections may occur through stipules, petioles, buds, lenticels, or bark

Figure 29-5—Asexual spores (conidia) of *Sphaerulina musiva*. Scale bar measures 20 µm (Jared M. LeBoldus, Oregon State University, used with permission).

wounds. Leaf infection usually precedes stem infection. Leaf spots develop soon after leaf emergence and the fungus spreads to stems and branches, causing cankers. Cankers begin as necrotic lesions on the current season's growth. Pycnidia usually develop shortly after and produce conidia that are dispersed and cause secondary infections. Disease development is enhanced by warm temperatures and long periods of high humidity.

Damage

S. musiva damages poplars of all ages, but damage is most severe in nursery environments, young plantations, and windbreaks. Numerous leaf spot infections can result in premature defoliation of susceptible clones. Multiple cankers can girdle stems, and affected trees are susceptible to wind breakage. Cankers are infection courts for other pathogens such as *Cytospora*, *Phomopsis*, and *Fusarium* and decay fungi, all of which can contribute to the damage.

Management

Damage caused by *S. musiva* is reduced primarily by the use of resistant cultivars. Clones resistant or moderately resistant to leaf spot may also be more resistant to stem canker and should be selected for planting. Use vigorous, disease-free planting stock for maximum early growth and to avoid introducing pathogens into new plantings.

Cultural treatments, such as cultivation or raking in the fall to remove leaf litter harboring fungal inoculum, will minimize primary infection in spring if inoculum from adjacent trees is not a factor. Planting moderately susceptible trees at a wide spacing to provide good air circulation within the canopy will reduce the duration of free moisture on leaves and minimize infection by *S. musiva*.

Selected References

LeBoldus, J.M.; Blenis, P.V.; Thomas, B.R. 2008. Clone by isolate interaction in the hybrid poplar-*Septoria musiva* pathosystem. Canadian Journal of Forest Research. 38: 1888–1896.

LeBoldus, J.M.; Blenis, P.V.; Thomas, B.R.; Feau, N.; Bernier, L. 2009. Susceptibility of *Populus balsamifera* to *Septoria musiva*: a field study and greenhouse experiment. Plant Disease. 93: 1146–1150.

Newcombe, G.; Ostry, M. 2001. Recessive resistance to *Septoria* stem canker of hybrid poplar. Phytopathology. 91: 1081–1084.

Ostry, M.E.; McNabb, H.S., Jr. 1986. *Populus* species and clones resistant to *Melampsora*, *Marssonina*, and *Septoria*. Res. Pap. NC-272, U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 7 p.