WILLOWPEDIA

Cornell University
College of Agriculture and Life Sciences

FACT SHEET

Botryosphaeria canker

INTRODUCTION

Willows (*Salix* spp.) are susceptible to several canker diseases that cause blighting of new shoots and girdling of branches and stems. Cankers initiated by a complex of fungi in the genus *Botryosphaeria* appear to be the most common in short rotation willow plantations of NY State. These fungi are opportunistic pathogens that incite cankers on branches, stems, and/or twigs as well as cause dieback on susceptible willows. Infection often occurs when willow shrubs are predisposed by environmental stressors (e.g., drought and frost damage), insect defoliation, or wounding.

One confusing feature of various species of *Botryosphaeria* is that many have asexual stages that are morphologically very different from other species in the genus *Botryosphaeria*. Even though the sexual stages of the two most prominent willow pathogens in New York have numerous similarities, their asexual stages are markedly different. Therefore, *Botryosphaeria* species often are indistinguishable without molecular identification. Two species, *B. dothidea* and *B. ribis*, are known pathogens of willow in the eastern United States. Therefore, the information provided here is specific to *B. dothidea* and *B. ribis*.

Roughened canker caused by *Botryosphaeria dothidea* on *Salix eriocephala*. Note: the location — terminated branch or bud — and the small groups of black stromata.

Canker caused by a *Botryosphaeria* spp. on *Salix*

HOSTS AND DISTRIBUTION

Botryosphaeria dothidea and *B. ribis* have a worldwide distribution and extremely broad host ranges. Collectively, these fungi are known to attack approximately 170 species of plants including woody angiosperms and coniferous tree species. Historical records from the eastern United States indicate that *B. ribis* has been collected on apple, currant, elderberry, elm, grape, horse chestnut, oak, pear, rose, sweetgum, tulip magnolia, walnut, and willow. Two species, *S. eriocephala* and *S. purpurea*, in short rotation plantations are apparently the only willows found to be susceptible to *B. dothidea* and *B. ribis*, so far. Both fungi most often attack stressed shrubs or trees. Therefore, the limited number of affected hosts currently found within willow plantings in NY likely is attributable to the management guidelines set forth by scientists relative to soil preferences for the production of willow, site preparation procedures, pest control, and the selection of vigorous willow species/clones as growing stock.

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SYMPTOMS AND SIGNS

The size and shape of cankers incited by *B. dothidea* or *B. ribis* varies widely according to host species, tissues attacked, and host vitality. Cankers are generally discrete, ovoid to elongate, depressed, and associated with a dead branch or twig. On smooth green stems, the inner context of the canker is light-brown to black and has a roughened appearance due to the emergence of black fruiting bodies. Old cankers may disfigure stems and appear as large swellings centered on previously killed twigs or branches. The remnants of a twig or branch often remain attached to the internal portion of the canker. Asexual fruiting bodies also can be found on the attached twig or branch and within the roughened canker surface. Wood beneath new and old cankers is orange-brown when exposed with a sharp scalpel or knife. This discoloration extends several centimeters beyond the canker margin and is indicative of *Botryosphaeria* colonization of the wood.

Black asexual fruiting bodies (pycnidia) appear on diseased bark shortly after infection and within cankers initiated the previous year. Pycnidia are embedded within black stromata (1-4 mm at the widest points) and are readily visible without a loupe. A cross-section of the black stroma will reveal several white cavities (locules). Conidia of *B. dothidea* and *B. ribis* are colorless (hyaline) and unicellular (one-celled). *B. dothidea* conidia are narrowly spindle-shaped (fusiform), measure 23-25 x 4-6 µm, and have a somewhat rounded-base. Conidia of *B. ribis* are also fusiform with rounded bases and measure 19-23 x 5-6 µm at maturity.

Although the sexual stage of either fungus is rare on infected plant tissue, flask-shaped sexual fruiting bodies (perithecia) either accompany pycnidia or form separately in fungal stroma embedded within diseased bark. Unlike the asexual spores featured, the characteristics of perithecia and the sexual spores (ascospores) produced by *B. dothidea* and *B. ribis* are nearly indistinguishable. Perithecia of *B. dothidea* and *B. ribis* are 200-500 µm and 100-400 µm in diameter, respectively, and have multi-layered walls (5-15 layers). Ascospores of *B. dothidea* are one-celled, clear, spindle- to egg-shaped, and approximately 19-24 x 7-8 µm. Likewise, the ascospores of *B. ribis* are one-celled, hyaline, spindle-shaped to ellipsoid, often have rounded ends, and measure 18-23 x 6-8 µm.

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Funding provided by New York Farm Viability Institute to LB Smart.

DISEASE CYCLE

The pathogenesis of *B. dothidea* and *B. ribis* on willow begins by the colonization of branches and twigs injured or killed by other causes. These fungi are able to colonize dead or injured plant parts as well as natural openings (e.g., lenticels and bark cracks) and remain latent there until the host is stressed by environmental conditions, competition, insect injury, or mechanical damage. *Botryosphaeria* fungi such as *B. dothidea* and *B. ribis* produce cell wall degrading enzymes that contribute to their colonizing potential and provide them with the opportunity to live and reproduce on dead tissue while colonizing living tissues. Conidia are produced in pycnidia shortly after infection and are dispersed by wind and rain to new hosts where they germinate and colonize natural openings or wounds created in the bark of susceptible hosts. Conidia germinate in the presence of high humidity or free water when temperatures permit (24-30C). The temperature optimum for *in vitro* colony growth of *Botryosphaeria* fungi is between 25º and 35º C; therefore, the greatest incidence of infection occurs during wet weather in the summer or when host plants are heat-stressed. Ascospores are wind disseminated and washed into natural openings or wounds by rain.

DAMAGE

Rotation cycles currently prescribed in willow plantations of NY State are between two or three years post-coppice. Therefore, significant damage from these pathogens to crop yields likely have been controlled or limited by rotation age. If willows are grown on rotation cycles ≥ 4 years, the continued infection of susceptible willows may result in the development of girdling cankers, significant dieback, stem death, or stool mortality. To avoid the development of *Botryosphaeria* cankers, vigorously growing and drought tolerant willows should be planted. Reducing insect damage and the removal of infected branches or stems also can reduce the potential of this disease to spread.

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