16. Botryodiplodia Canker of Elms

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Botryodiplodia canker of elms is caused by the fungus *Botryodiplodia hypodermia.*

Hosts and Distribution

Botryodiplodia canker has been found on American, Siberian, English, and smooth-leaved elms in the United States; it occurs principally on Siberian elm in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Minnesota, and Montana. In 1979, *B. hypodermia* was recovered from 256 of 609 Siberian elm cankers collected in 56 counties in four States in the northern Great Plains.

Symptoms and Signs

The surface of Siberian elm bark infected with *B. hypodermia* becomes reddish-brown to black, and frequently splits longitudinally (fig. 16–1). The outer bark may become loose and coil back upon itself. Infected inner bark tissues turn reddish-brown to brownish-black, and become water-soaked and very soft. The cambium and sapwood immediately beneath infected bark becomes red brown; this discoloration ends at the margins of the canker (fig. 16–2). When the fungus girdles an infected stem, the cambium is killed, the foliage wilts, and stem tissue distal to the canker dies. Adventitious sprouts often develop below girdling cankers, giving infected trees a bushy appearance.

Yellow foliar symptoms on American elm, which superficially resemble those of Dutch elm disease, may be caused by *B. hypodermia.*

The fungus produces numerous globose to flask-shaped fruiting bodies (pycnidia) on patches of dying and dead bark near canker margins (fig. 16–1). They appear as small, black, pimple-like eruptions in bark tissues (fig. 16–3). Both one-celled hyaline conidia and two-celled brown conidia may develop in pycnidia. Nearly all *B. hypodermia* conidia from cankers in the Great Plains are one-celled, hyaline, and measure 20–32 by 15–18 μm (fig. 16–4).

Disease Cycle

Growth and spore production by *B. hypodermia* are op-

Figure 16–1. Natural canker originating at dead branch on windbreak tree.

Figure 16–2. Red-brown discoloration of inner bark and sapwood at junction of infected and healthy (nondiscolored) stem tissues of Siberian elm.

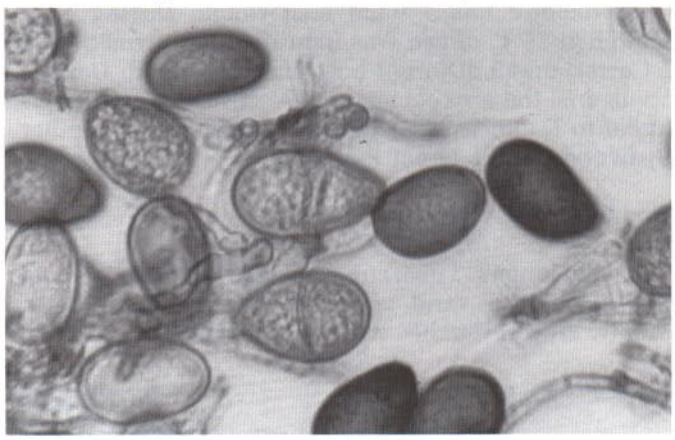
timum at 77° F in vitro on potato dextrose agar. Conidia are exuded from pycnidia after rains and are probably dispersed in water droplets or by wind. Wounded bark is infected readily during the growing season of the host. Infections of wounded Siberian elm bark in early spring, late fall, and winter months usually produce small cankers that are callused over during the next growing season. Girdling cankers develop rapidly during dry summer months when demand for water is high and temperatures range from 61° to 86°F. Pycnidia develop predominantly in the fall in dead or dying bark. The fungus overwinters as fruiting bodies or mycelium in cankered bark.

Factors contributing to stress, including drought and winter injury, appear to increase susceptibility of elms to infection by *B. hypodermia*. Some herbicides, such as 2,4-D, alter the normal development of bark tissues in Siberian elm and may increase its susceptibility to infection.

Virulence of isolates of *B. hypodermia* varies. Typical isolates, which have dark gray to black mycelium in culture, cause greater disease development on Siberian elm than do atypical isolates. Atypical isolates have gray to white mycelium in culture and their cirrhi are white and contain aseptate hyaline spores when first extruded from pycnidia.

Figure 16-3. Extensive pycnidia development on dead bark of Siberian elm sapling 44 days after inoculation with *B. hypodermia*.

Figure 16-4. One-celled conidia, 200X.



Damage

B. hypodermia is the most damaging canker pathogen of Siberian elm in the Great Plains. It causes dieback and death of infected trees, and has severely limited the usefulness of this species in windbreaks. Because infection in windbreaks frequently occurs on large branches and boles of trees, major branches and entire trees are girdled and killed. Damage is most severe during dry summer months in the central Plains. In a seasonal inoculation study in south central Nebraska, 44 of 48 trees inoculated during the period July through September subsequently died or had extensive branch dieback.

Control

Control of canker diseases involves both disease prevention and treatment of the disease. Disease prevention involves growing vigorous trees to prevent entrance of pathogens into the bark. Wounds are essential for the establishment of *B. hypodermia* infections. Thus, the best preventive measure is to avoid wounds, especially in the immediate area of active cankers containing fungus spores.

New plantings should be established on good sites with vigorous planting stock, and weeds should be controlled for several years after planting. Improve vigor of landscape trees by deep watering, especially during dry summer months, and maintain good drainage. Sunscald on newly planted trees may be prevented by wrapping the boles with burlap, kraft paper, or special tree-wrapping paper.

Genetic variation in resistance to *B. hypodermia* has been observed in Siberian elm nursery stock. This genetic resistance is being incorporated into a tree improvement program in North Dakota, and will be available in future cultivars of Siberian elm.

Treatment of the disease involves pruning dead, dying, or severely cankered branches from infected trees during winter or before spring rains to prevent fungal spores from splashing to new infection sites. Severely infected or dead cankered trees should be removed and destroyed, because they may otherwise serve as a reservoir of spores for several years.

Selected References

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