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Strumella Canker of Oaks

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Probably the first record of Strumella canker in this country was a report in 1899 of a canker on red and black oaks. Although no causal organism was identified, the disease described was typical of Strumella canker. In 1914 the canker was described further and named after the fungus *Strumella coryneoidea* Sacc. and Wint. This fungus was always associated with the disease and produced cankers in inoculation trials.

No further investigations were undertaken until the early 1930's when public works activity stimulated control studies and large-scale inoculation trials. In the same period other studies added to existing descriptions of symptoms and host range.

In 1950, the fungus *Urnula craterium* (Schw.) Fr. was suggested as the perfect stage of *Strumella coryneoidea*. In culture the two fungi were identical, and *Urnula* fruiting bodies commonly were found growing from *Strumella*-infected logs in contact with the ground. The significance of this possibility prompted inoculation trials with *Urnula* in the early 1950's. These experiments supported the premise that the two fungi are the same, for they produced identical cankers.

Distribution and Hosts

The disease is native to this country and is distributed over the Eastern United States from the southern Appalachians to northern New England. A few cankers have been reported from Minnesota, and *Strumella* fruiting bodies have been found on dead bark in Missouri, Oregon, Michigan, and Ontario, Canada.

Strumella attacks all species of oaks, but especially those of the red oak group, which are commercially important in the Northeastern United States. It was common on chestnut before chestnut blight virtually eliminated the species, and it occurs occasionally to rarely on American beech, eastern hophornbeam, basswood, black tupelo (blackgum), red maple, and pignut and shagbark hickories.

Symptoms

Infection is first signified by a yellowish or yellowish-brown discoloration around the infection point, usually a small branch. This discoloration, which may be difficult to detect on rough-barked trees, is usually accompanied by a depression of the central infected area and an elevation of the outer marginal zone. A noticeable canker is formed in about 3 years.

A targetlike canker with definite ridges of callus growth is considered typical of Strumella canker (fig. 1). Each year, probably during the dormant or inactive period of the host, the fungus kills a small area of bark around the periphery of the canker. In spring the tree forms a callus ridge, which in turn is invaded and killed. The alternating formation and killing of callus

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tissue result in a series of concentric ridges around the original canker face. Whitish fans of fungus growth (mycelium) often may be seen when the bark is removed near the canker margin (fig. 2). The cankers are elliptical in outline, up to 8 feet in length and more than 2 feet in breadth. Cankers of this type are generally slow-growing and may require 5 years or more to girdle stems 2 inches in diameter.

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Figure 1.—A target-type Strumella canker on a young red oak.

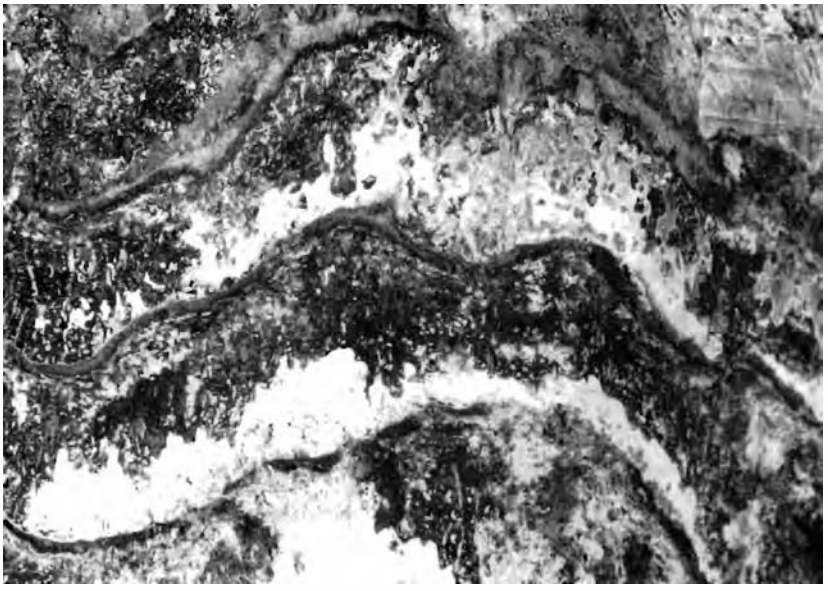

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Figure 2.—Closeup of a canker margin. The outer bark has been shaved away to expose the white fans of fungus mycelium.

On the depressed areas of recently killed bark, small brown-to-black sterile nodules are produced (fig. 3). The signifiance of these nodules, which are the first visible evidence of the causal fungus on the cankered tree, is not known. In most old cankers, and in some young ones, the dead bark sloughs off and exposes the decayed sapwood. By the time this stage is reached the cankered stem usually is sharply crooked in profile and widened or flattened from the front or rear view (fig. 1).

In addition to the slowly developing target-type cankers, *Strumella* produces a diffuse type of canker. This happens when the fungus grows rapidly and girdles the trunk before callusing can occur (fig. 4). Such a canker generally is confined to small, smooth-barked saplings. Between these two extreme types, all gradations may be found.

Water sprouts commonly grow in varying numbers below the larger lesions after a tree has been completely or partially girdled (fig. 1). These conspicuous sprouts, which are always short lived, are helpful in detecting cankers, especially the diffuse type.

Damage

Although the disease rarely affects more than 2 to 3 percent of the trees in a stand, economic losses may be high because the damage usually is to valuable butt logs. In well-stocked stands, few trees more than 25 years old are attacked because no branches suitable for infection remain on the main stem.

Infected trees rarely heal their cankers and may continue to occupy valuable space in the stand for many years. Dominant trees are as susceptible as suppressed ones and are much more likely to persist. In addition, cankered trees are highly subject to windbreakage at the point of cankering (fig. 4) and are thus hazards to adjacent crop trees and reproduction.

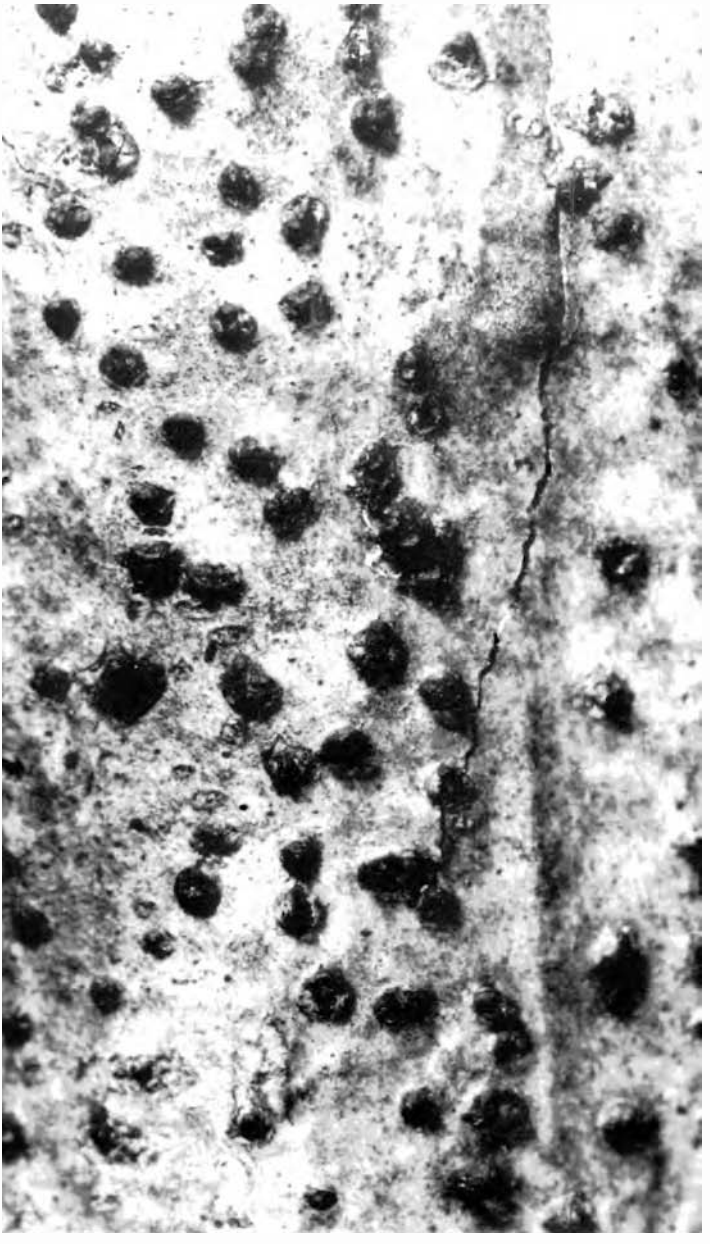

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Figure 3.—These sterile nodules, which appear on recently killed bark, are the first visible evidence of the causal fungus (X5).

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Figure 4.—A diffuse-type canker on a young red oak. The tree was broken at the canker by wind or snow.

Cause

The causal fungus, *Strumella coryneoidea*, presumably enters the host through a small branch, since a dead branch stub is usually found at the center of a canker (fig. 5). The first signs of the fungus, aside from the sterile nodules mentioned earlier, are fruiting structures called sporodochia, which are produced in abundance on the dead bark of the canker and on the surrounding tissue (fig. 6). The sporodochia, which ordinarily do not develop until the tree is girdled and killed, are dark brown, rounded, powdery pustules about 1 to 3 mm. in diameter.

On the surface of these pustules are borne uncountable numbers of conidia (asexual spores) on tiny, stout, branched stalks or conidiophores. These spores undoubtedly are windborne, but how or when they germinate and whether they can cause new infections are unknown. The exact requirements for infection are not known, but probably wounds on young tissue are necessary.

Urnula craterium, the perfect stage, develops only on oak logs that are in contact with damp soil and leaf mold. The fruiting bodies are brown to black large open cups, deeply urn-shaped with a wavy margin, leathery or cheesy in consistency, and up to 3 inches in

height and 2 inches in diameter when mature (fig. 7). The sexual spores (ascospores) produced in these cups are windborne and germinate readily. These spores probably are the means by which the fungus travels from diseased to healthy trees and incites new infections.

Control

Early attempts to control the disease by continued eradication of cankered trees have not been successful, presumably because inconspicuous incipient or diffuse cankers were overlooked. Also, in these early attempts the *Urnula* inoculum

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Figure 5.—*Strumella* probably entered the main stem through the branch in the center of this canker.

source was not recognized, and the trees were not removed from the stand but merely cut and left on the ground. In light of the information now available regarding the significance of the *Urnula* stage, infected trees should be removed from the stand. Management should be based on crop trees selected for freedom from canker.

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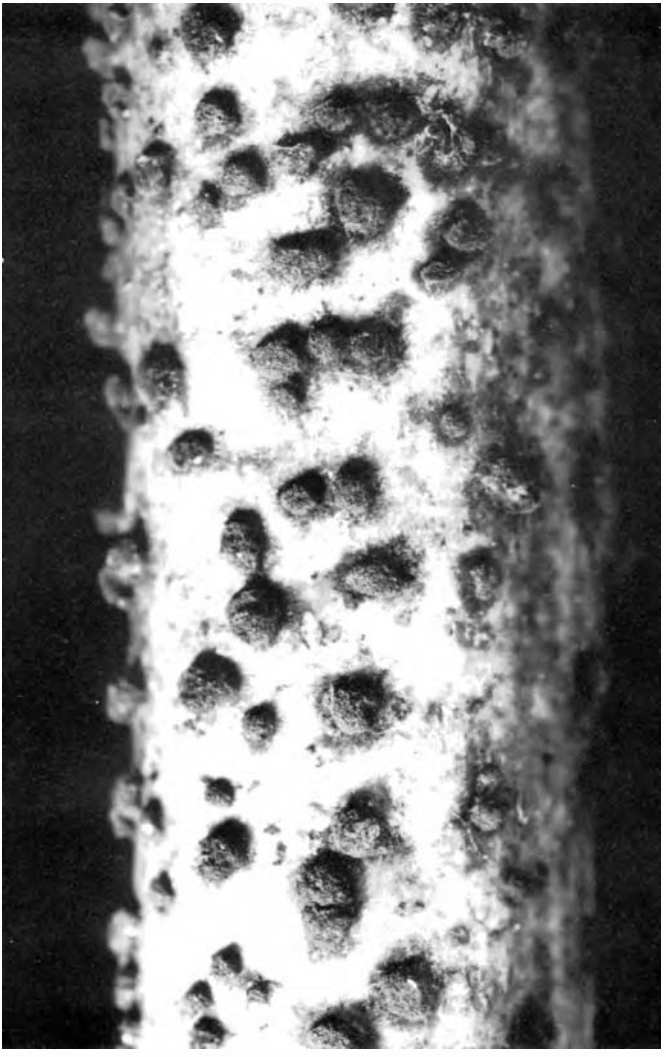

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Figure 6.—Sporodochia bearing the asexual conidial stage develop on the bark of twigs and stems killed by the fungus (X5).

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Figure 7.—Mature fruiting bodies of the perfect stage, *Urnula craterium*.

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