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Sapstreak Disease of Sugar Maple

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Sapstreak disease constitutes a serious threat to sugar maple forests. Although this disease causes only minor damage to our forests at present, it is regarded as a potential danger to future production. In addition to killing trees, it reduces wood quality.

History and Geographic Distribution

Sapstreak-diseased sugar maples (*Acer saccharum* Marsh.) have been found in only four locations. It was first noticed in North Carolina about 1935. Subsequently, the disease was found in Michigan in 1959 and in Vermont in 1964. The Vermont occurrence and one of the Michigan locations involved single trees. The other Michigan location and the one in North Carolina involved more extensive areas.

Sapstreak has not been found in Canada and is not known to occur on other species of maples. In Tennessee and North Carolina the disease affects yellow-poplar (*Liriodendron tulipifera* L.) in scattered locations.

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Symptoms

The first noticeable symptom of sapstreak on sugar maple is a dwarfing of the foliage on all or a portion of the crown. The following year the dwarfing becomes more intense and may spread to previously unaffected parts of the crown. In addition, some branches may begin dying back (fig. 1). During ensuing years the foliar symptoms become even more pronounced until finally, after 3 to 4 years, the tree dies. During this period of foliar symptom development the wood of the lower stem and root system becomes stained in a characteristic fashion. The name "sapstreak" refers to this symptom pattern. Typically, the staining appears as a radiating pattern (fig. 2), possessing a water-soaked grayish coloration. Tips of the streaking pattern nearest the cambium usually are green and may have some reddish areas.

Economic Importance

Sapstreak is a fatal disease; infected trees do not recover. In addition, affected trees have low value because of the discolored wood. In a study made in northern Michigan, sapstreak reduced the value of saw logs 32 percent and lumber 57 per-

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Figure 1.—Crown symptoms of sugar maple in a late stage of the sapstreak disease. Note the abnormally small, sparse leaves.

cent. However, many people regard the stain pattern caused by sap-

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Figure 2.—Stain pattern on sugar maple with incipient infection. The circular darker stain in the center of the tree is dark heart.

streak to be quite pleasing (fig. 3). Conceivably, sapstreak - affected wood could be used for specialty products such as paneling and fine cabinetwork.

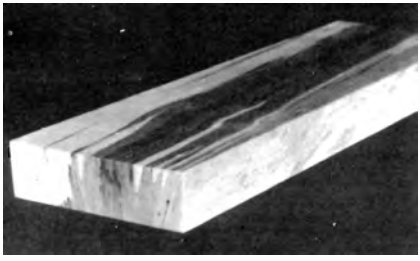

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Figure 3.—End view of a board cut from an infected log. The stain is tan to brown with reddish to gray streaks. Green streaks that are present in freshly cut wood mostly disappear upon drying.

Causal Organism

A fungus, *Ceratocystis coerulescens* (Münch) Bakshi, causes the disease. This fungus is closely related to other *Ceratocystis* species that stain wood and cause diseases such as Dutch elm and oak wilt.

When isolated from infected trees and grown in pure culture in the laboratory, the fungus appears as a fast-growing, dark-colored organism. It produces two kinds of spores during its life cycle—the ascospores, following a sexual process, and the vegetatively produced endoconidia.

Hosts

In addition to causing a disease of living sugar maples and yellow-poplar, *Ceratocystis coerulescens* often grows as a saprophyte on recently cut surfaces of stumps and logs where it produces a superficial stain. Also, a strain of the fungus morphologically identical to the disease-producing type stains freshly sawn softwood lumber in the South. The softwood strain can be distinguished by culture odor. It produces an odor of banana oil (isobutyl acetate) while the form that is pathogenic on hardwoods produces a sweet, musty smell. A form that stains hardwood pulp has been reported from the northeastern United States.

Disease Cycle

The fungus appears to enter the tree primarily through logging wounds, either on roots or near the base of the trunk (fig. 4). Spores deposited on the wound surface germinate and fungal threads (the mycelium) develop in the woody tissues of the roots and stem. In the stained areas, starch stored in the cells becomes depleted and ultimately the cells die. The cause of tree death from sapstreak is unclear but may involve depletion of food reserves and/or blocking of the tree's translocation system.

If an infected tree is felled and the stained wood becomes exposed to the air, the fungus commonly will sporulate on the exposed surface.

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Figure 4.—Root wound and associated stain on the same stump as in figure 2. The wound is the dark area indicated by arrow. Note that the stain is immediately behind the original wound face.

Both ascospores and endoconidia are produced in such locations. The spores are sticky, well adapted to being spread by insects or other animals. Millipedes, which frequent fresh wounds on maples, have been observed feeding upon the spores. Possibly they have a role in the spread of sapstreak.

Control

There is no known control for sapstreak disease. However, because the disease at present is confined in its distribution, it may be possible to prevent spread by prompt removal of newly discovered infected trees. Because the fungus readily sporulates on the stumps after a diseased tree has been felled, it might be possible to prevent sporulation by painting the stump surface with a protective material.

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