Sweetfern Rust on Hard Pines

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Sweetfern rust, caused by the fungus *Cronartium comptoniae* Arth., is a common disease of two- and three-needled pines. It occurs in the East, throughout the United States and Canada, and in the West from Alaska to California and is probably transcontinental. This fungus causes cankers on pines and often kills trees. If an infected tree survives, the part attacked frequently becomes so malformed that it must be culled (fig. 1). Decay fungi often enter the stem through these cankered surfaces and cause heart rot.

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Figure 1.—Mature jack pine with malformation of lower stems caused by sweetfern rust.

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Figure 2.—The two alternate hosts of sweetfern rust: *A*, Sweetfern growing on a typical sandy area; *B*, sweetgale growing on a streambank.

Hosts

The disease has a wide host range. Susceptible native pines are lodgepole, ponderosa, bishop, Monterey, and Jeffrey in the West; red and jack in the North; shortleaf and loblolly in the South; and pitch, Virginia, and Table Mountain in the East. Four known exotics—Austrian, Scotch, Cluster, and Swiss Mountain pines—can also become infected. Although all the above have been reported as hosts, some species, such as red pine, are rarely attacked.

The alternate hosts for this rust are sweetfern (*Comptonia peregrina* (L.) Coult.) and sweetgale (*Myrica gale* L.) (figs. 2 and 3). Because sweetfern grows on open sandy sites and sweetgale on swampy moist areas, these alternate hosts afford the fungus a wide range of conditions.

Life History

The fungus produces pycniospores in the fall 1 year after infecting the pine host. These spores are contained in a sweet nectar that is attractive to insects. After feeding on the nectar, the insects may carry spores from one canker to another, thus cross-fertilizing the fungus. In the spring, light-orange aeciospores are produced. These spores are wind disseminated, and, if deposited on sweetfern or sweetgale under proper temperature and moisture conditions, they will infect the plants. About 2 weeks after such infection, orange-colored urediospores are produced on the underside of the leaves. The urediospores are capable of reinfecting additional sweetfern or sweetgale, a cycle that serves to intensify the disease in an area.

As autumn approaches, another spore stage—the teliospore—is produced, also on the underside of the leaves. The teliospores germinate in place and produce wind-disseminated basidiospores that are capable of completing the life cycle by causing infection on susceptible pines.

Symptoms

Sweetfern rust usually becomes evident as an elongate swelling on the stem of the infected seedling (fig. 4). The swelling may appear as early as 12 to 15 months

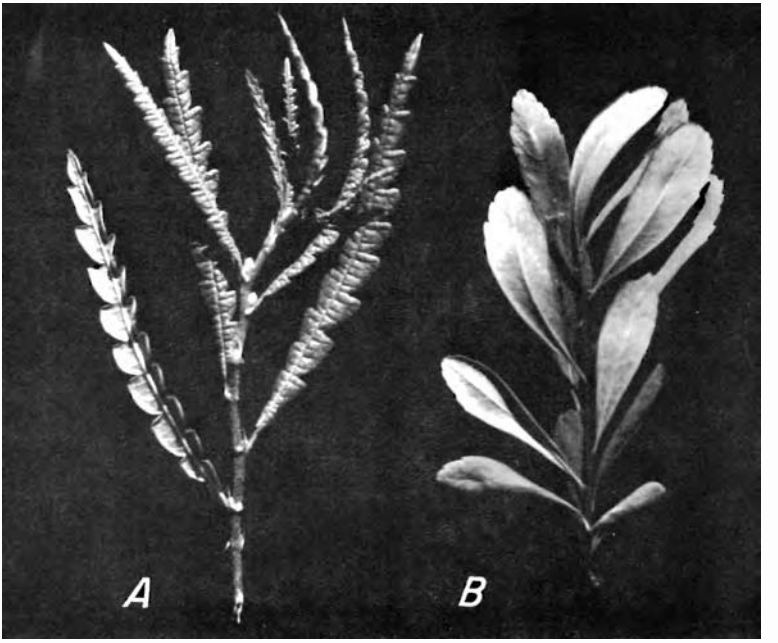

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Figure 3.—Closeup of foliage of the alternate hosts: *A*, Sweetfern; *B*, sweetgale.

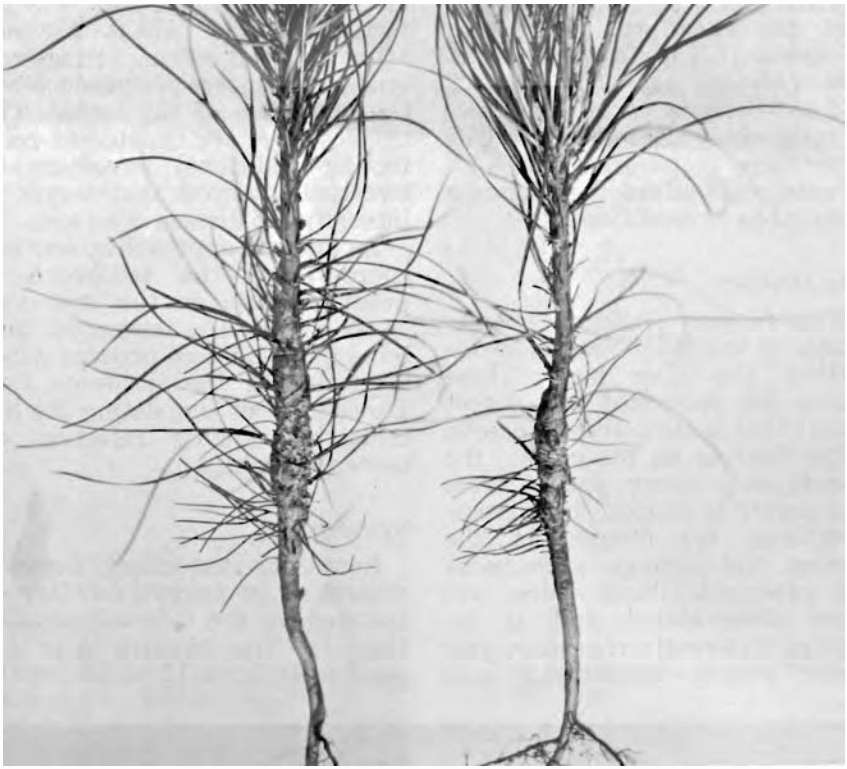

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Figure 4.—Sweetfern rust infection on 3-year-old seedlings. The elongate swellings are a typical symptom of this disease.

after inoculation. In other trees, swelling may not become evident until the second year. The disease is most conspicuous during the 3- or 4-week period in the spring when orange-yellow aeciospores are being produced. Cankers are seldom found more than 5 feet above the ground line.

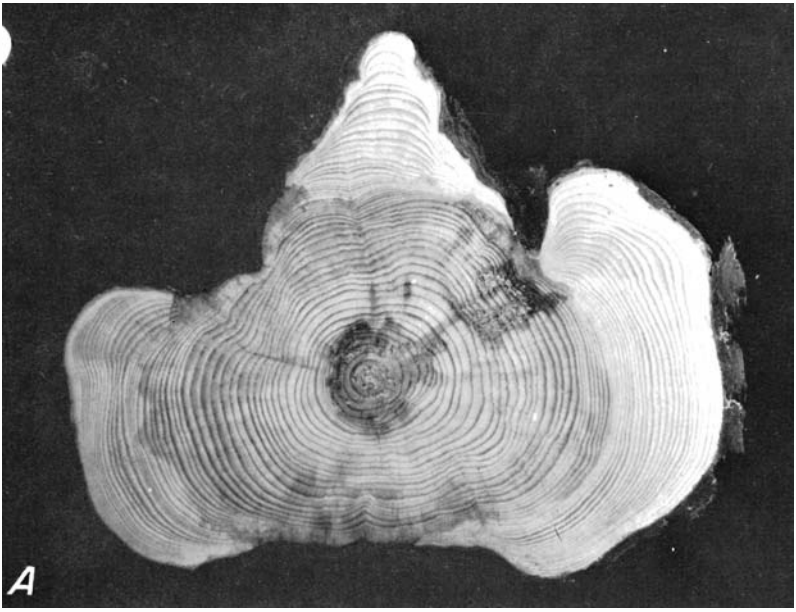
The canker itself may range in appearance from an area of deep, vertical fissures to a very slight depression in the bark. The fungus has been observed sporulating on trees where no other external infection was evident.

The presence of elongate swelling is not conclusive evidence that a tree is infected with sweetfern rust. Some other rust fungi cause similar symptoms, and, for most fungi, the only way of differentiating among them is through inoculation studies to determine their host range. One notable exception is comandra blister rust, caused by *Cronartium comandrae* Pk., which can be distinguished microscopically because of its pear-shaped aeciospores.

Damage to the Host

The fungus may damage pines by reducing growth rates, causing malformed stems, and providing entrance courts for insects and decay organisms. Frequently the trees are killed.

Mortality from sweetfern rust is common in the younger age classes, particularly seedlings. Nurseries located near alternate host plants are often heavily dam-



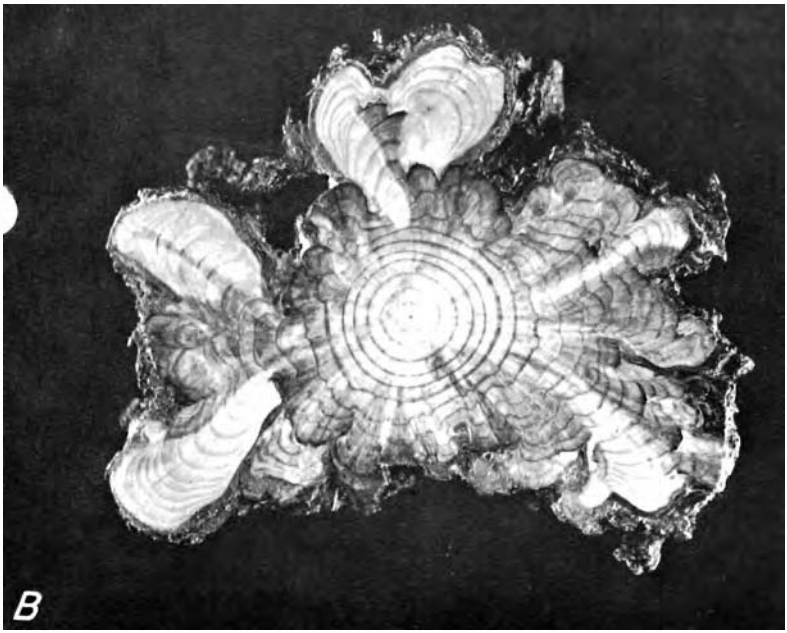


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Figure 5.—Cross sections of pine stems infected with sweetfern rust: *A*, Note decay; *B*, note resin-impregnated wood. Removal of bark from such malformed stems is very difficult.

aged. This is due to moist conditions in seedbeds that are watered frequently. In one nursery, practically all the stock was destroyed

by this rust. Such losses are not a reflection on the nurseryman but rather are a natural consequence of the necessity for maintaining conditions that favor seedling production.

Young trees may maintain a favorable growth rate even though infected by sweetfern rust. Trees over 25 years old, however, are reported to suffer reduced height and diameter growth. Old trees may die from suppression or from the coalescing of multiple infections.

For most uses to which the timber will be put, the malformed parts of diseased stems must be culled (fig. 5). This is especially true when the material is to be used for pulp, because the bark within the deeper fissures of the canker and the resin-impregnated wood behind the canker cause discoloration in the pulping process. In some trees, fungi that enter the stem through these cankers cause heart rot. This rot may extend above the canker, thus necessitating additional cull. For uses such as poles and piling, the malformed parts are not acceptable.

The distribution of sweetfern rust often seems very erratic. Within some diseased stands, 25 percent or more of the pines may be infected, and within others only scattered infected trees can be found. One stand may have a high level of infection, while a nearby stand has no infection even though the two stands appear similar in other respects. In some stands, the disease occurs only in a localized area. This varying distribution occurs in natural stands as well as in plantations.

Control

Little effort is made to control sweetfern rust. With two alternate hosts that inhabit opposite extremes in site, the fungus is able to attack hard pines in dry sandy areas, as well as those near swamps. Where the alternate hosts are found, they usually are abundant enough to make eradication impractical except possibly in the immediate vicinity of a nursery.

New nurseries should be located at least one-fourth mile from the nearest sweetfern or sweetgale plants. To avoid introducing the fungus into new areas, care should be taken not to field plant diseased stock.

While no effective control for sweetfern rust in forest stands has been found, infected trees should be removed during thinning and logging operations. This serves to reduce the supply of inoculum as well as to provide growing space for the healthy trees.

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