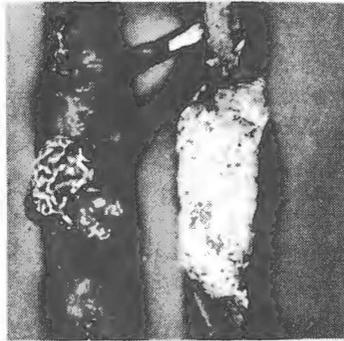


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Forest Tree Diseases of Virginia

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Fusiform Rust
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Many researchers and forest managers consider fusiform rust as the most serious threat to the pine industry of the Southeast. The rust fungus, *Cronartium fusiforme* causes the destruction of large numbers of seedlings and saplings and it is the first major disease of concern to plantation managers. The replacement of slower growing pine species that were somewhat resistant to infection by this fungus with the faster growing but susceptible loblolly and slash pines has favored rapid spread of this fungus pathogen. In some areas of the Southeast, 80 to 90 percent mortality of sapling-sized trees has been reported. Fusiform rust is present in



Figure 1. Fusiform rust gall on Loblolly pine stem. Galls are elongate, fissured and may occur on branches or the main stem.

Virginia, but stands suffering severe damage are scattered. However, the potential of this disease is extremely high as millions of loblolly pine are planted each year and the various species of the alternate host oak are abundant throughout the state.

Range: Fusiform rust has been found from Maryland's eastern shore to Florida and Texas. It is most commonly found in southeastern Virginia.

Suscepts and Disease Cycle: Loblolly and slash pine are highly susceptible to infection by this fungus. Longleaf pine is somewhat resistant and shortleaf and Virginia pine are considered to be "immune". Virginia pine is susceptible to another rust fungus (*C. quercum*) which causes Eastern Gall Rust. This fungus also requires the oaks for alternate hosts and spores produced on the oak cannot be distinguished from those produced by the fusiform rust fungus. Water, willow and laurel oaks are most susceptible while other red and black oak species are less favorable hosts; white oaks are rarely infected.

The fungus lives from one year to the next in living wood of pine stems, but spores (seeds) produced on the pine cannot infect other pines. The spores are windblown to oak leaves where another spore stage is produced which can re-infect oak leaves. Within a few weeks after the initial infection of the oak leaves, a different spore stage is produced which may infect only pine. Infection of the pine takes place through the needles or succulent new growth; the fungus grows through the needles into the twig, branch, and main stem. The infection cycle (pine-oak-pine) may occur in as little as 2-3 weeks in mid-Spring.

Symptoms: Fusiform rust is characterized by spindle-shaped galls which may occur on branches or the main stem of pine. Galls are elongate, often with deep fissures, and seldom have a pronounced ridge between healthy and infected tissues (Figure 1). During the early Spring, pustules containing bright orange spores are produced on the galls making them very conspicuous. Many galls may be present on one tree and galls which occur on the main stem of young trees may cause breakage or girdle the stem.

The fungus produces fine brown hair like projections on the lower surface of infected oak leaves. Severely infected leaves may exhibit chlorotic spots and some distortion, but usually oak leaves remain symptomless.

Control:

Nurseries: Nurseries should be located away from known centers of rust infection. Seedlings may be protected by fungicide sprays applied once a week or after every rain from the time of germination until mid-June. Ferbam, Ziram or Zineb have been effective when properly applied at the rate of 2 lbs./100 gallon water with 1 pint of Santomerse S sticker.

Chemical control in nurseries may soon be considered undesirable because highly susceptible trees are protected from infection until they are outplanted.

Plantation: The susceptible oak and pine hosts must be abundant within 2 miles of each other in order for a severe outbreak to occur. The reduction of the oak population about a pine plantation is virtually impossible. Planting sites which have frequent periods of high humidity (100%) and temperatures of 64-72° F are considered to be high hazard areas and should be avoided when possible.

In areas where the chance of infection is high, stands should be dense to insure early self-pruning of infected branches. Trees in high value stands should be pruned before fungus invasion of the main stem occurs. Young trees with galls on the main stem should be removed during thinning operations. Galls on the main stem of larger trees do not indicate a poor risk tree and such trees may remain until harvested as sawtimber.

Forest fire control will reduce the rust hazard as fire stimulates early leaf flush of pine during times when conditions for infection are most favorable. However, recent studies have indicated that trees infected with the rust fungus exude abundant pitch about the galls and are therefore much more susceptible to fire kill than healthy trees. At the present time it is difficult to predict if fire will play a role in the control of fusiform rust in established plantations.

Extensive studies have been conducted at North Carolina State University concerning genetic variation of loblolly pine with respect to susceptibility to infection by C. fusiforme. The results indicate that resistance is apparently broad base and progenies from rust free parents have less rust than those from infected parents. Further evaluation is planned to determine if adequate control may be available through resistant planting stock.

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1. Read the label on each pesticide container before each use. Follow instructions to the letter; heed all cautions and warnings, and note precautions about residues.
2. Keep pesticides in the containers in which you bought them. Put them where children or animals cannot get to them, preferably under lock and away from food, feed, seed, or other material that may become harmful if contaminated.
3. Dispose of empty containers in the manner specified on the label. If disposal instructions are not printed on the label, burn the containers where smoke will not be a hazard, or bury them at least 18" deep in a place where water supplies will not be contaminated.

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