

Eradication of fusiform rust on loblolly pine rootstock—comparison of sodium arsenite and bark excision

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Bark removal, if done correctly, is the better method of gall eradication on loblolly pine rootstocks. Sodium arsenite is not registered for this use.

Fusiform rust, caused by *Cronartium fusiforme* Hedgc. & Hunt ex Cumm., is the most important disease encountered in loblolly (*Pinus taeda* L.) and slash (*P. elliotii* var. *elliotii* Engelm.) pine seed orchards in the South. In certain orchards, as many as 25 to 50 percent of these high-value trees may become infected on the rootstocks (2). Because rootstock infection will usually cause mortality of the grafted tree, it is essential to eradicate these galls whenever possible.

Mechanical excision of blister rust (*C. ribicola* Fischer) cankers on high-value eastern white pines (*P. strobus* L.) has been recommended as an effective method of rust eradication for many years (4). However, only recently did Davis and Luttrell (3) report that removing the bark from fusiform rust galls by surgical methods may be an effective method of control. Some seed orchardists have been routinely excising fusiform rust infections in their orchards for a number of years. In 1967, Brown and Rowan (1) reported that

the application of sodium arsenite to rust galls on slash and loblolly pine looked promising as a method for eradication on high-value trees. This method has also been used in a number of seed orchards throughout the South instead of the more time-consuming excision.

Because opinion has been divided among seed orchardists as to the efficacy of these two methods and restrictions have been placed on the use of toxic chemicals in forestry practices, a study was designed to evaluate and compare chemical and mechanical methods for eradicating fusiform rust galls.

Experimental Methods

In September 1970, 80 loblolly pines in the Briar Patch Seed Orchard of the Georgia Kraft Company in Putnam County, Georgia, were selected and treated. Treated trees ranged in age from 4 to 7 years and in d.b.h. from 2 to 7 inches, and all had at least one active non-girdling fusiform rust gall on the rootstock. Mechanical excision was randomly assigned to 55 trees and the chemical treatment to 25 trees. A total of 83 galls were treated on the 80 trees.

The mechanical excision involved scribing the margin of the swelling with a sharp knife. Depending on gall size, a safety zone of 1/2 to 1 inch was allowed on each side beyond the area of obvious swelling and from 1 to 2 inches on the vertical axis. Next, the bark within the

scribed area was peeled off and the wound was scraped to remove all remnants of inner bark. The wounds were V-shaped at both ends to assist in healing by normal callus formation. Figure 1 illustrates the proper bark excision of a rust gall on a 5-year-old loblolly pine rootstock. Immediately after bark removal, the entire wound was sprayed with an aerosol of asphalt-base tree wound dressing.

The chemical treatment consisted of applying a 20 percent aqueous solution of sodium arsenite containing 2 pounds of arsenic trioxide equivalent per gallon. The solution was applied with a paint brush after rubbing the rough outer bark from the gall. All visible signs of swelling within the galled area were treated until the bark appeared saturated.

Treated galls were examined for subsequent callus development, fungus sporulation, and symptoms of phytotoxicity during April of each year from 1971 through 1974. Galled areas were rated as healed, questionable, or still active. If no spores were formed, but it was questionable whether the callus growth was infected by the rust fungus, a sample of the callus tissue was examined histologically by the methods described by Matthews (5). Four years of observation were considered necessary to accurately evaluate treatments because previous studies have shown that fungus activity may be suppressed but not eliminated for up to 3 years after treatment.



Figure 1.—Freshly excised fusiform rust gall on rootstock of 5-year-old loblolly pine.



Figure 2.—Healed wound on loblolly pine rootstock 4 years after gall excision.

Results and Discussion

A high proportion of galled areas treated by both methods was judged as healed after the 4-year period (table 1). However, the percentage of treatment failures after bark excision was less than half that of the sodium arsenite application. The greater effectiveness of bark excision suggests that this is the better treatment for eradication of fusiform rust galls. Sodium arsenite is not registered for the use described here and is extremely toxic if improperly handled or applied.

Four years after treatment, most excision wounds had completely healed, leaving only vertical scars on the stems (figure 2). There was no

evidence of these trees having been weakened. If galls are eradicated by excision, it should be done during the period from mid-summer to mid-winter to escape the possibility of wound infection by air-borne basidiospores of *C. fusiforme* (6). Ample marginal tissue, particularly on the vertical axis, must be excised for complete eradication.

Pesticides Precaution Statement

This article reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal

agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

Literature Cited

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- 3 Davis, Turner S., and E. S. Luttrell. 1967. Frequency of sporulation of fusiform rust galls on loblolly pine and effectiveness of surgical and antibiotic treatments. Plant Dis. Rep. 51:505-507.
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- 5 Matthews, F. R. 1973. A rapid method for diagnosis of rust infections in woody tissues of southern conifers. (Abstr.) Phytopathology 63:445.
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Table 1.—Effect of bark excision and sodium arsenite on galled areas after 4 years

| Treatment | Galls ¹ No. | Healed | | Still active | |
|-----------------|---------------------------|--------|---------|--------------|---------|
| | | No. | Percent | No. | Percent |
| Bark excision | 45 | 39 | 87 | 6 | 13 |
| Sodium arsenite | 22 | 16 | 73 | 6 | 27 |

¹ During the study, 16 of the treated trees were rogued from the orchard during normal management and are not included in the data.