

Annosus Root Rot in Slash Pine Plantations in the Sandhill Section of South Carolina

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ABSTRACT

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Cutting slash pine and inoculating the stumps with *Heterobasidion annosum* (*Fomes annosus*) caused mortality of adjacent trees, regardless of the month of inoculation. Mortality was greatest after inoculations during October and least after July inoculations. *H. annosum* was isolated from 52 trees adjacent to inoculated stumps and from 10 trees adjacent to uninoculated controls. Stumps in half of the plots were treated with borax and those in the other plots received no borax. Only five trees adjacent to the treated stumps died, but 58 adjacent to untreated stumps died; mortality was greatest when trees were felled in January and June.

Heterobasidion annosum (Fr.) Bref., formerly *Fomes annosus* (Fr.) Karst., was recognized in 1954 as a potential threat to conifers in the southeastern United States (2). In a survey of thinned pine plantations, 59% of the loblolly (*Pinus taeda* L.) and 44% of the slash pines (*P. elliotii* var. *elliotii* Engelm.) were infected by the fungus (9). Although annosus root rot has not become as devastating as once feared, it is still a serious potential threat on deep, well-drained, sandy soils (8). Annual losses averaging 48.8 m³/ha over 10 yr have been reported (7,11).

The primary mode of entry of the fungus into a stand is by spores germinating on freshly cut stump surfaces and growth of mycelium into the roots of adjacent healthy trees through root contact (10). Granular borax sprinkled over stumps immediately after cutting has prevented entry of the fungus (1,3,13) and has been recommended for control (5). Ross and Driver (12), however, found that during April through August, uninoculated stumps fail to yield the causal fungus, and Ross (11) later believed that plantations south of approximately 34°N latitude in the southeastern United States could be thinned in late spring and summer without danger of stump colonization by *F. annosus*. Summer cutting without treatment has been recommended for several years (6).

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At the U.S. Department of Energy Savannah River Plant near Aiken, South Carolina, summer cutting was done without use of borax as a preventive measure, and because pulpwood harvesters were reluctant to apply borax, there was interest in extending the summer cutting period. The objectives of this study were to determine if the time for cutting without applying borax could be extended safely and to determine if artificial inoculation after cutting would negate the seasonal effect.

MATERIALS AND METHODS

Inoculation study. Beginning in 1973, five 20-yr-old slash pine trees in each of four stands were cut each month and their stumps were covered with an approximately 1-cm layer of *H. annosum*-infested sawdust prepared in the laboratory. The sawdust was then

covered with a wood disk cut from the same tree. Five additional trees were cut as controls, and their stumps were covered with a wood disk over sterilized sawdust. In 1974, 1975, and 1977, a lateral root was collected from each tree that had died since the last sampling, and isolations were made. Living trees were not examined for infection.

Borax study. Each month during 1974 and 1975, 50 trees in each of two stands were cut. Twenty-five stumps in each plot were immediately treated with granular borax, and 25 were left untreated as controls. In July 1977, isolations were made from roots of dying trees adjacent to these stumps.

RESULTS

Inoculation study. *H. annosum* was isolated from 52 of the 134 dead trees adjacent to inoculated stumps and from 10 of 76 dead trees adjacent to control stumps. All 210 dead trees had typical annosus root rot symptoms. Trees died in some plots cut each month, but the largest number (17) was in plots in which trees were cut and stumps inoculated in October (Fig. 1). The fewest (two) trees died in control plots cut in July. There were some stumps around which no trees died in inoculated and control plots. More trees were dead in inoculated than in control plots ($P = 0.01$), but trees died in some plots cut each month both in

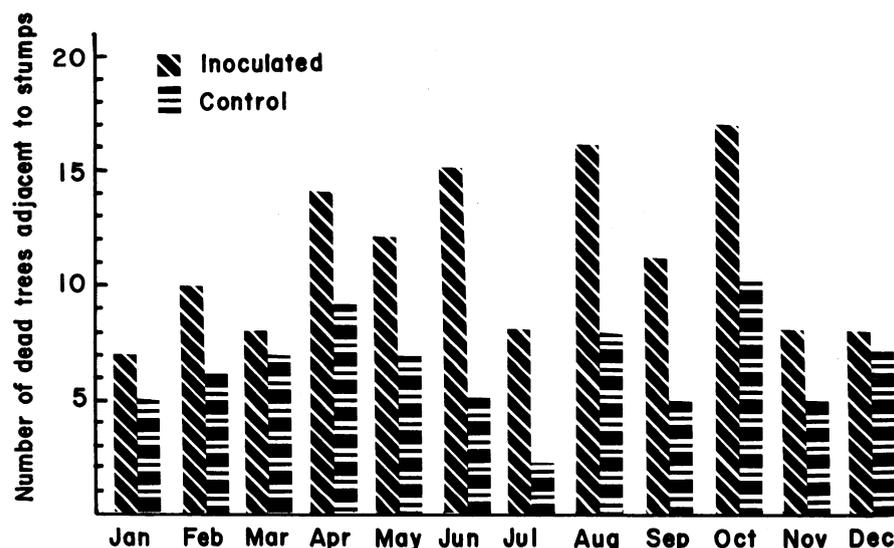


Fig. 1. Numbers of dead trees near stumps inoculated with *Heterobasidion annosum* and control stumps by month in which they were cut.

inoculated and in control plots. The differences between months of cutting were not significant.

Borax study. Some trees died adjacent to stumps in plots established every month except February; the greatest number died near stumps of trees cut in January and in June. Five trees in borax-treated plots and 58 trees in untreated plots died.

DISCUSSION

Because of these results, we cannot recommend extending the safe cutting period in summer. Others (4,14) have pointed out some limitations of summer thinning as a preventive measure. Because the August cuttings in the inoculation study resulted in the second largest mortality, we suggest a closer look at this recommendation. Control by summer cutting is based on high air temperature and low humidity in the stand, so large variations in effectiveness from year to year can be expected.

Therefore, the "safe" period may not be very dependable, and careful monitoring of the weather may be necessary before deciding whether or not to treat stumps.

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