EFFECTIVENESS OF CAVITY FILLER IN INHIBITING WOOD DECAY IN POST OAK

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Abstract. The paper presents the results of a study to determine the effectiveness of tree cavity filler and fungicide in inhibiting fungi in post oak trees (*Quercus stellata*) in Central Texas. After the first year of observations the filler alone was not significantly effective in inhibiting discoloration. Filler combined with a fungicide displayed differences enough to encourage continued observations of the test plot.

Through the years, the effectiveness of tree wound dressings to inhibit decay and discoloration has been examined. A.L. Shigo and C.L. Wilson, in 1970, began an experiment testing asphalt, polyurethane, and shellac as wound dressing on American elm and red maple. They compared the results of these dressings to untreated control trees that were wounded in the same manner at the same time. Their results disclaimed any benefits of the dressing over the control method for preventing decay and discoloration in trees (Shigo and Wilson 1977). The results stimulated new interest. Did their research results apply to all tree species despite climatic differences? Would a replicated experiment on other tree species show different results? Would a fungicide added to the filler aid in preventing wood decay? The work of Houston (1971) reported on the use of several chemicals in reducing discoloration and decay without definitive results.

The present paper reports the results from a one-year study to determine the effectiveness of polyurethane foam cavity filler in preventing wood decay and discoloration of post oak in central Texas.

Materials and Methods

Fifty-four post oaks (*Quercus stellata*) were selected on a 0.3 ha section of Texas A&M University. A minimum dbh size of 30 cm (12 in.) and a canopy that displayed vigorous growth without visible evidence of dieback were the selection criteria.

The study was begun February 24, 1977. Wounds were made using a chain saw in each of the 54 post oaks. They measured approximately 12 cm (5 in.) long, 7 cm (3 in.) wide and 5 cm (2.1 in.) deep and were one meter (three feet) above the ground in the northeast quadrant of the tree (Figure 1).

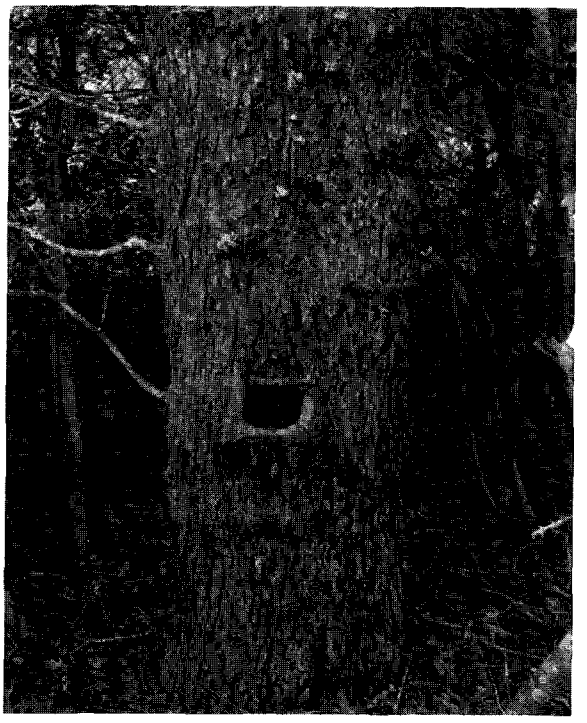

Figure 1. The cavities were made in the northeast quadrant of the tree.

The wounded trees were divided into three treatment groups of 18 each. One group was treated with fungicide (Banrot — thiadiazole and

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thioallophanate) and filler, one with filler only (FO) and one received no treatment (CT).

For application of fungicide and filler the wound was first cleaned of all loose wood. Then the fungicide was applied inside the cavity with a small brush. Next, a piece of tar paper was held against the left side, right side and bottom of the wound. The two components of polyurethane foam, isocynate (A) and resin (B), were mixed in a styrafoam cup. When the mixture began to react into a foam, it was poured through the top of the tar paper and into the cavity. The tar paper was immediately forced against all sides of the wound so that the foam would completely fill the cavity. After the foam solidified, the paper was removed and the exterior foam was trimmed flush with the tree's xylem.

A plastic filler was applied over the solidified foam as a sealant. It was spread over the filler with a putty knife. Tape was placed around the wound's edges so the plastic filler would not touch the cambium at the wound's edges (Figure 2).

The same filler application procedure was used for the treatment receiving just the filler.

For the control group, the wounds were created and left exposed. No attempt was made to clean or maintain them after the initial cutting debris was removed (Figure 3).

On March 21, 1979, one year after the trees were wounded, a 8cm (3 in.) increment boring was taken 3 cm (1 in.) directly above each wound to determine if any discoloration had begun (Figure 4). These borings were sterilized in 70% alcohol to kill surface contaminants. They were then cut into one centimeter segments and placed four to a plate in acid strep malt agar. The plates were checked every two weeks for fungal growth. On June 23, 1979, one and one-third years after the wound treatments, two additional increment borings were made directly above the wounds.

Figure 2. The sealant was placed over the polyurethane filler.

Figure 3. A cavity in a control tree is shown above.

Figure 4. Increment borings were taken above the wounds using a gas-generated increment borer.

After the borings had been plated, the xylem was exposed above the wounds and the length of wound-caused discoloration was measured.

Results

Discoloration lengths are reported in Table 1. There was no significant difference in discoloration lengths at the 5% level. However, a noticeable difference was found between the control treatment and the filler-fungicide treatment. Since P was determined to be 0.056, a difference as large as the observed would occur about 1 in 18 times by chance. Thus the difference cannot be regarded as significant using the usual statistical standard (Snedecor and Cochran 1967 p. 105).

Table 1. Discoloration length results for the two treatment and control groups (No differences were significant at the 5% level).

Item	*Filler and fungicide*	*Filler only*	*Control group*
Number in sample	18	18	18
Mean	3.8 in. (9.7 cm)	4.7 in. (11.9 cm)	5.5 in. (14.1 cm)
P value vs. control[a]	.056	>.500	—

[a]P value is defined as the proportion of the time that the difference between the control group and the observed would occur just by chance. A P value of .05 or less indicates significance at the 5% level. See Snedecor and Cohran (1967).

None of the 13 examined fillers showed signs of deteriorations by weathering. Nine of them adhered to all sides of the wound Four fillers did not adhere to the back of the wound.

The wound closure pattern in which the callus on either side of the cavity grew at a significantly greater rate than the callus on top or bottom confirmed previous research (Neely 1970).

The following genera of microscopic organisms occurred regardless of treatment: *Penicillium, Paecilomyces, Zylaria, Aspergillus* and *Cladosporium.* Trees receiving the filler and fungicide treatment contained the following organisms: *Gliocladium, Hypoxylon, Tricoderma, Spicaria, Pestolotia, Scopulariopsis* and *Cephalosporium.*

Conclusions

The results of the present study support the findings of Shigo and Wilson in that no significant difference in discoloration was found among the treatments at the 5% level. The polyurethane foam exhibited many positive qualities. It showed no evidence of surface deterioration and permitted cambial initiation along the cavity's edges. It was lightweight and pourable. Also, it was easily cut and shaped in the wound. The indication of reduced discoloration after one year when fungicide and filler are applied to the tree wound encourage the investigators to continue the study.

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