PITCH CANKER WOUND DRESSINGS

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Pitch canker of pines caused by *Fusarium subglutinans* is a serious disease of Monterey pines *(Pinus radiata)* in landscape plantings in the Santa Cruz area of California. Monterey pine is the most extensively planted conifer ornamental plantings. An estimated 40 million of them occur statewide, the majority in coastal locations. Monterey pine is extremely susceptible to pitch canker, which was first identified from California in 1986. The disease probably has been present for a number of years and went unnoticed until it became severe in 1985-1986 (4). Prior to that time the disease was confined to the southeastern US where it is destructive in plantations, seed orchards, and nurseries of various pine species (2).

The California Department of Transportation has already spent $250,000 in removing trees from along the State highway rights-of-way in the City of Santa Cruz and additional removals are anticipated because trees are continuing to become infected. Many of the trees removed had bole cankers, in addition to the many branch and twig infections. Insects play an important role in California in attacking trees weakened by the disease, in spread of the fungus, and by providing wounds which are necessary for infection. The fungus has been recovered from many of the insects that feed on Monterey pine, including species of *Pityophthorus, Conophthorus, Dendroctonus,* and *Ips* (4). Bark beetles *(Ips mexicanus)* contaminated with the fungus have transmitted the disease in experiments (3) and are surely important vectors of the disease in California. The disease to date has not been detected in native stands that are within 10 miles of infected landscape trees.

We have observed that a single infection (sometimes 2 or 3 infections) may occur in an isolated tree or stand, and the following year the disease intensifies in the tree and then spreads to adjacent trees. A new disease center is thereby created and at this point control or eradication is difficult if not impossible. Eventually bole cankers form and insects, particularly bark beetles, are attracted to the declining and dead trees, and many of the trees must be removed for aesthetic and safety reasons.

If the initial branch infections in isolated trees were removed when first detected, the disease could be controlled. Pruning wounds can become infected and one is quickly faced with a "Catch-22" situation. An effective wound dressing would overcome this dilemma. Thiabendazole and biological agents were not effective as wound treatments on slash and Virginia pines (1). However, the carrier in these experiments was water. Thiabendazole is effective in controlling pitch canker in nurseries (5) and has excellent in vitro activity against the fungus. We believed that water was not the appropriate carrier in that wounds on pines generally produce copious amounts of resin, which is hydrophobic. Therefore, we undertook research to develop an effective wound dressing.

Materials and Methods

The experiments were conducted at New Brighton State Beach, where the disease is severe in *P. radiata.* The terminal inch of lower branches in three different MOnterey pines was clipped and wound dressings or nothing were applied to the fresh wounds. The treatments were allowed to dry for 2-4 hours before inoculation. A conidial suspension of 10^6 conidia/ml water was applied to runoff and beyond, to the clipped, and treated or untreated terminals. In one experiment, inoculations were made before the wound treatments were applied. The treatments were applied with a paint brush.

Results

All of the products applied to fresh wounds prior to inoculation reduced infection. Red paint and pine oil without added fungicides reduced infection to 27% of the control (Table 1). Pine oil was toxic to needles and stem tissues. Both red paint and brown paint (L & H Modern Lux Plastic Enamel) were equally effective carriers of thiabendazole while yellow paint (Ace Quick Drying Enamel) was less effective (Table 2). Thiaben-

dazole in red paint applied after inoculation reduced infection by only 45% compared to no infections when red or brown paint containing thiabendazole was applied prior to inoculation.

Benomyl at 1% in brown paint was as effective as thiabendazole, at 1% in brown paint, when both were applied prior to inoculation (Table 3).

Table 1. Effectiveness of wound protectants in preventing infection by *Fusarium subglutinans*

Treatment	% Infection* Alone	With 1% thiabendazole**
Control (no treatment)	100	–
Yellow paint	55	18
Shellac	46	18
Pine oil	27	9
Red Paint	27	0

* Eleven shoots per treatment. Percentages rounded off to nearest 1%.
** Thiabendazole from 98.5% technical powder.

Table 2. Comparison of inoculation before or after treatment and paint formulation on infection by *Fusarium subglutinans*

Treatment	% Infection* Before	After
Control (no treatment	80	80
Red paint 1% thiabendazole**	55	0
Brown paint 1% thiabendazole**	--	0

Table 3. Comparison of benomyl and thiabendazole in paint on infection by *Fusarium subglutinans*

	% Infection*
Control (no treatment)	100
Thiabendazole 1% in brown paint**	5
Benomyl 1% in brown paint	5

*Twenty shoots inoculated per treatment.
**Thiabendazole from Mertect 340-F, 42.28% flowable.

Discussion

Non-water carriers of the fungicides thiabendazole and benomyl were effective as wound treatments to prevent infection by *F. subglutinans* if applied prior to inoculation. One brand of paint (L & H Modern Lux Plastic Enamel) was superior to all other carriers including another brand of enamel paint. The superior performance of this paint is likely due to the solvents which allow some of the fungicides to dissolve and enter the pruned shoots via resin that rapidly exudes when the shoot is cut.

The use of an effective wound dressing will allow sanitation pruning of pines to reduce inoculum originating from infected branches and solve the dilemma of providing another wound for entry of *F. subglutinans.*

Literature Cited

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