NOTE

EFFECT OF PINE OIL ON LANDING AND ATTACK BY THE SOUTHERN PINE BEETLE (COLEOPTERA: SCOLYTIDAE)

Key Words: Pine oil, southern pine beetle, *Dendroctonus frontalis,* behavioral chemical, *Thanasimus dubius,* repellent.

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Nijholt (Nijholt, W. W. 1980. Pine oil and oleic acid delay and reduce attacks on logs by ambrosia beetles (Coleoptera: Scolytidae). Canad. Entomol. 113: 337-40; Nijholt, W. W., L. H. McMullen, and L. Safranyik. 1981. Pine oil protects living trees from attack by three bark beetle species, *Dendroctonus* spp. (Coleoptera: Scolytidae). Canad. Entomol. 113: 337-40) reported that pine oil, a distillate by-product of sulphate woodpulping, acting as a repellent, interfered with attack by bark beetles. Subsequently, Berisford et al. (Berisford, C. W., U. E. Brady, C. W. Fatzinger, and B. H. Ebel. 1986. Evaluation of a repellent for prevention of attacks by three species of southern pine bark beetles. J. Entomol. Sci. 21: 316-18) investigated the efficacy of a pine oil, BBR-2, (Safer Chemical Company, Victoria, B. C., Canada) in preventing attack on pines by the southern pine bark beetle (SPB). They found BBR-2 effective in protecting treated 1.5m long loblolly pine (*Pinus taeda* L.) bolts baited with a synthetic SPB attractant which were hung on host trees in an active SPB infestation. We conducted the following test to determine if another pine oil, Norpine-65, (Northwest Petrochemical Corporation, Anacortes, Washington) would protect southern pines from attack and colonization by the SPB.

The study was conducted from May through July, 1984, in a mixed loblolly/shortleaf pine stand in Montgomery County, Texas. Three replicates of 10 trees each were selected for study approximately 50m in advance of a vigorously expanding SPB infestation which colonized approximately 300 trees. Each replicate consisted of 5 treatment trees and 5 control trees. The replicates were separated by approximately 50m. Trees within replicates were 2 - 5m apart. Using a gasoline-powered sprayer, 3.8 liters of undiluted Norpine-65 were sprayed on the bole of each treatment tree to a height of 10m. In effect, that amount of pine oil covered the treated trees until runoff. All treatment and control trees were baited at 3.5m height with two elution vials (Billings, P. D., E. A. Roberts, and T. L. Payne. 1980. Controlled released device for southern pine beetle behavioral chemicals. J. Ga. Entomol. Soc. 16: 181-85), each containing 2 ml of the synthetic SPB attractant Frontalure. One 15 $\times$ 30 cm screen sticky trap was suspended on each tree at 3m height to monitor landing of the SPB and a bark beetle predator, *Thanasimus dubius* F. The replicates were treated at the same time in May and monitored weekly for 35 days for catches on landing traps and attack status.

Within the first week after treatment all control trees were mass attacked by the SPB. Because the number of beetles arriving on trees declines rapidly after mass attack (Coster, J. E., T. L. Payne, E. R. Hart, and L. S. Edson. 1977. Aggregation of the southern pine beetle in response to attractive host trees. Environ. Entomol. 6: 725-31), landing traps were removed from the control trees after the first check. Thirteen of the treatment trees showed only light signs of attack (visible pitch tubes or boring dust), which were present only around the elution devices and in crevices on the bark not covered by Norpine-65. The pine oil caused a distinct staining of the bark; therefore, it was easy to determine apparently untreated areas. Two of the treatment trees showed no signs of attack. SPB catches on traps were significantly lower (t-test, $P \geq 0.01$) on treatment trees than on control trees, 22 vs. 200 respectively. Beetle attacks in crevices missed by the pine oil, yet lying directly adjacent to pine oil-coated bark, suggested that the beetles must closely approach or contact the treated surface before the attack is prevented.

Two weeks post-treatment, SPB catches on the traps increased significantly on the treated trees (Fig. 1), 9 of which were successfully mass attacked. The six remaining trees showed varying degrees of beetle attack; however, when bark was shaved from attacked regions on the trees, most of the attacks were found to be unsuccessful as evidenced by short, pitch-filled galleries or the absence of gallery construction. Over the remaining period of monitoring, the six trees were overcome by SPB and *Ips* beetles. The number of SPB caught on landing traps declined to nearly zero by 5 weeks post-treatment when trapping was discontinued (Fig. 1).

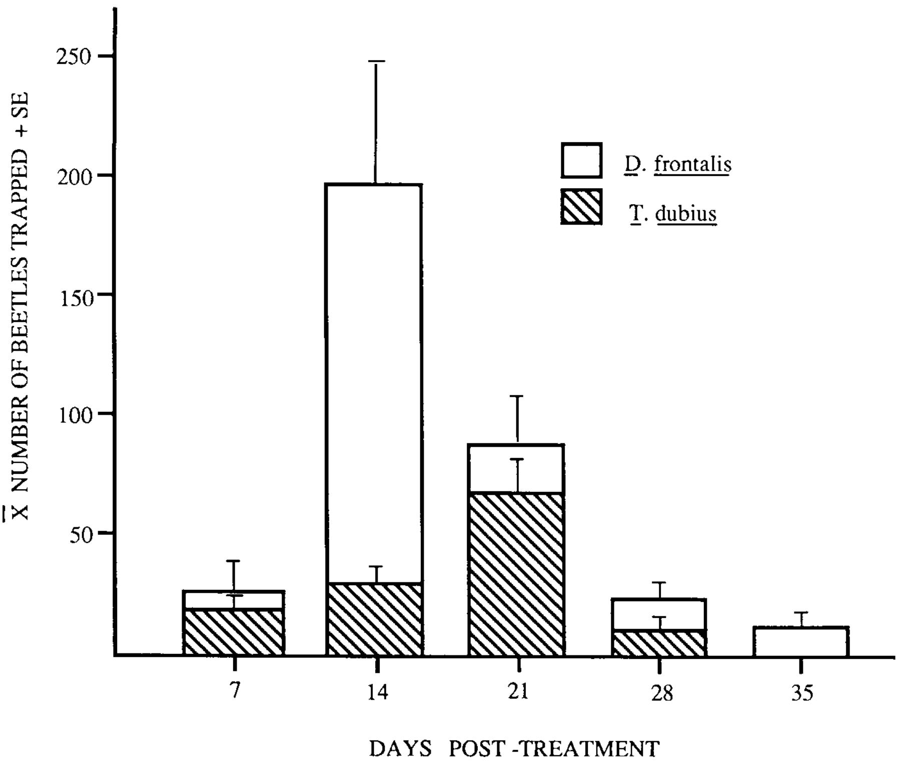

Fig. 1. Mean SPBs and clerids trapped on treatment trees over time. Means at 14 days for SPBs and 21 days for clerids are significantly different from the other means for the given species as determined by Kruskal-Wallis test, $P \geq 0.01$.

The number of clerids trapped one week after treatment was significantly lower (t-test, $P \geq 0.01$) on the treated vs. the control trees, 20 vs. 29 respectively. The lower catch may have been due to the pine oil treatment alone. however, it may also have been influenced by the lower number of attacking SPB and, as a result, reduced pheromone release from the trees. The numbers of clerids landing on treated trees reached its peak 21 days after treatment and declined to zero by the fifth week (Fig. 1).

Norpine-65 reduced the attack of the SPB on healthy pines for a period of time; however, all treated trees ultimately died from beetle attack within the 35-day monitoring period. Baiting the treatment trees with aggregation pheromone provided a strong test of the treatment and may have reduced any possible sustained effects of the chemical. — B. P. O'Donnell, T. L. Payne, and K. D. Walsh, Department of Entomology, Texas Agricultural Experiment Station, Texas A & M University, College Station, TX 77843. This research was funded by McIntire-Stennis project 1525 and published as Texas Agricultural Experiment Station paper no. 20608. (Accepted for publication August 11, 1986).