FIELD EVALUATION OF FENITROTHION FOR POST-ATTACK CONTROL OF THE SOUTHERN PINE BEETLE[1]

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(Accepted for publication May 5, 1986)

ABSTRACT

One and 2% fenitrothion caused high mortality of southern pine beetles, *Dendroctonus frontalis* Zimmermann within billets removed from infested trees which had been sprayed. Mortality of beetles through 72 hours post-emergence was significantly higher than mortality of those which emerged from billets from lindane-treated trees.

Although lindane is superior to fenitrothion for prevention of SPB attack, fenitrothion was more effective for remedial control.

Key Words: Southern pine beetle, *Dendroctonus frontalis*, control, fenitrothion.

J. Entomol. Sci. 21(2): 139-141 (April 1986)

INTRODUCTION

The Southern pine beetle, *Dendroctonus frontalis* Zimmermann (SPB) is a serious threat to high-value pines throughout the South (Thatcher et al. 1978). SPB-caused mortality to trees in yards of private homes, in parks and on city streets often causes substantial losses. Although no dollar estimates of damage are available, the losses are probably sufficient to offset the costs of insecticide applications for prevention of SPB attack.

In 1975, when the Expanded Southern Pine Beetle Research and Applications program (ESPBRAP) was initiated, only lindane was registered for control of pine bark beetles. The efficacy of lindane for SPB control has been documented (Dixon and Osgood 1961; Bennett and Pickard 1966; Jump and Tsao 1973) and its persistence on pine bark had been demonstrated (Berisford and Brady 1976). However, the Environmental Protection Agency issued a rebuttable presumption against registration of lindane in 1975 and it subsequently became a restricted use compound. Possible alternative compounds were tested in the laboratory to select candidates for field testing (Hastings and Jones 1976). Based on those data, field research was initiated on some promising insecticides. Early studies tested chlorpyrifos, chlorpyrifos-methyl and carbaryl. Chlorpyrifos proved to be effective for both preventive and remedial control of the SPB (Fitzpatrick et al. 1979; Brady et al. 1980) and it was subsequently registered (Dursban® Formulation) for SPB control.

Studies were also initiated to evaluate fenitrothion for preventive and remedial control of SPB since it had been shown to be highly toxic to the SPB in the laboratory (Hastings and Jones 1976). Berisford et al. (1980) and Mizell et al. (1981) reported on the efficacy of fenitrothion for prevention of SPB attacks and

[1] Coleoptera: Scolytidae.

fenitrothion (Sumithion® formulation) was registered for SPB control. Preliminary data on remedial control suggested that fenitrothion might be superior to other compounds (Hastings and Coster 1981). We report here a study to evaluate fenitrothion for remedial control relative to lindane.

MATERIALS AND METHODS

Applications of 0.5% lindane and 1 and 2% fenitrothion were made to standing trees infested with SPB. Four trees in each of 2 SPB spots were randomly assigned each treatment. Treated trees were 14 - 20 cm dbh (diameter at breast height) and 12 - 14 m high. Trees were sprayed until the bark was thoroughly wetted and 4 untreated trees were designated as checks in each spot.

Five days after spraying, treated and check trees were felled and 1 m long billets were removed from the lower, mid and upper portions of the infested boles. These billets were returned to the laboratory and 3 bark discs (8 cm diameter) were removed from each billet and radiographed to confirm the presence of SPB and to determine the developmental stage of the SPB brood. The billets were then placed in rearing containers with forced air ventilation of ca. 1 liter/min to eliminate possible fumigation (Berisford et al. 1971). Emerging brood adults were collected and counted at 12 hr intervals and each cohort held for 72 hrs. Survival of each cohort was determined at 24 hr intervals. The glass jars into which beetles emerged had paper towels in the bottom moistened with distilled water. The towels were covered with wood chips from freshly cut pines. Mean daily emergence and percent survival were analyzed by Duncan's (1955) multiple range test. Percentages were converted to arcsine values for analysis.

RESULTS AND DISCUSSION

Radiographs of bark disk samples showed that all trees had SPB broods in every billet. Table 1 shows numbers of SPBs which emerged in the lab from treated and check billets. Different trees contained SPB broods which were in various stages of development when treated. Both fenitrothion and lindane significantly reduced SPB emergence ($P = 0.01$) relative to untreated checks (Table 1). Fenitrothion was superior to lindane in causing post-emergence mortality at both concentrations. Survival of SPBs at 24, 48, and 72 hrs after emergence was considerably higher for lindane than for fenitrothion (Table 1).

Table 1. Emergence and survival of SPBs from 24 one m long billets at 24, 48, and 72 hrs after emergence from billets of trees treated with remedial sprays of fenitrothion or lindane.*

Treatment	Total SPB emergence	Mean daily emergence	Mean percent survival hrs after emergence 24	48	72	
Check	501	17.1 a	94.6	88.54	83.0	a
0.5% Lindane	36	1.2 b	54.94	36.28	22.06	b
1% Fenitrothion	84	2.8 b	8.19	6.51	2.38	c
2% Fenitrothion	36	1.2 b	8.31	2.91	0.875	c

* Means followed by the same letter are not significantly different ($P = 0.05$; Duncan's (1955) multiple range test).

Fenitrothion provided better control than lindane and it was apparently equally effective against all developmental stages. Fenitrothion was equal to, or better than lindane for causing mortality within trees and superior to lindane in post-emergence mortality.

ACKNOWLEDGMENTS

We thank Terry Price, Georgia Forestry Commission and John Godbee, Union Camp Woodlands Corporation for their help in the field and Felton Hastings and Gary DeBarr for reviews of the manuscript.

This research was supported in part by the USDA-sponsored program entitled "The Expanded Southern Pine Beetle Research and Applications Program." USDA-SEA agreement No. 904-15-9, and The Georgia Agricultural Experiment Stations. The findings, opinions and recommendations are those of the authors and not necessarily those of the USDA.

LITERATURE CITED

Bennett, W. H., and L. S. Pickard. 1966. Benzene hexachloride emulsion as a summer control of the Southern pine beetle. J. Econ. Entomol. 59: 484.

Berisford, C. W., and U. E. Brady. 1976. Duration of protection of loblolly pines from *Ips* bark beetles by lindane. J. Econ. Entomol. 69: 357-8.

Berisford, C. W., U. E. Brady, R. F. Mizell, J. H. Lashomb, G. Fitzpatrick, I. R. Ragenovich, and F. L. Hastings. 1980. A technique for testing insecticides for long-term prevention of bark beetle attack. J. Econ. Entomol. 73: 694-7.

Berisford, C. W., H. M. Kulman, R. L. Peinkowski, and H. J. Heikkenen. 1971. Factors affecting distribution and abundance of hymenopterous parasites of *Ips* spp. bark beetles in Virginia. Can. Entomol. 103: 235-9.

Brady, U. E., C. W. Berisford, T. L. Hall, and J. S. Hamilton. 1980. Efficacy and persistence of chlorpyrifos, chlorpyrifos-methyl and lindane for preventive and remedial control of the southern pine beetle. J. Econ. Entomol. 73: 639-41.

Dixon, J. C., and E. A. Osgood. 1961. Southern pine beetle: A review of present knowledge. U. S. Forest Serv. Southeast Forest Exp. Sta. Pap. 128, 34 p.

Duncan, D. B. 1955. Multiple range and multiple F tests. Biometrics 11: 1-41.

Fitzpatrick, G., W. W. Neel, and J. H. Lashomb. 1979. Emergence and surviorship of *Dendroctonus frontalis* from three species of insecticide treated trees. J. Ga. Entomol. Soc. 14: 19-23.

Gammill, W. J., G. Fitzpatrick, and W. W. Neel. 1978. A dispenser for release of the aggregation pheromone of the southern pine beetle. J. Ga. Entomol. Soc. 13: 95-7.

Hastings, F. L., and A. S. Jones. 1976. Contact toxicity of 29 insecticides to southern pine beetle adults. U. S. Dept. Agr., For. Serv. Res. Note SF-245. 4 p.

Hastings, F. L., and J. E. Coster. 1981. Field and laboratory evaluations of insecticides for southern pine beetle control. U. S. Dept. Agr. Southeast. For. Exp. Sta. Gen. Tech. Rept. SE-21. 40 p.

Jump, B. J., and C. H. Tsao. 1973. Control of southern pine beetles by spraying standing and felled trees with BHC. J. Ga. Entomol. Soc. 8: 203-9.

Mizell, R. F., W. W. Neel, and J. H. Lashomb. 1980. Field evaluation of fenitrothion for prevention of tree mortality from southern pine beetle attack. J. Econ. Entomol. 74: 30-2.

Thatcher, R. C., J. E. Coster, and T. L. Payne. 1978. Southern pine beetles can kill your ornamental pine. U. S. Dept. Agr. Home and Garden Bull. 226. 15 p.