TRUNK-IMPLANTED SYSTEMIC INSECTICIDES FOR SLASH PINE CONE INSECT CONTROL

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ABSTRACT

Four systemic insecticides, dimethoate, oxydemetonmethyl, dicrotophos, and Monitor® (O,S-dimethyl phosphoramidithioate), were implanted into trunks of 40-foot slash pines, *Pinus elliottii* Engelm. var. *elliottii*, to control coneworms (Lepidoptera: Phycitidae: *Dioryctria* spp.) and the slash pine seedworm (Lepidoptera: Olethreutidae: *Laspeyresia anaranjada* Miller) in maturing cones. All insecticides, when implanted in drilled holes on 8 May 1968 at a dosage of 5 g active toxicant per diameter inch, reduced *Dioryctria* cone infestation by 80-89% during the last 4-1/2 months of cone development. Dicrotophos and oxydemetonmethyl at the 5 g/inch dosage also reduced cone infestation by the slash pine seedworm by 97% and 95%, respectively. Monitor and oxydemetonmethyl at a 2 g/inch dosage rate failed to control either the coneworms or the seedworm. No phytotoxicity was observed in any of the treatments.

Dicrotophos, dimethoate, and oxydemetonmethyl, applied by hydraulic sprayer or mist blower, controlled seed-destroying insects on Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, in the Pacific Northwest (Johnson 1963; Johnson and Rediske 1964; Hedlin 1964, 1966; Buffam and Johnson 1966; Johnson and Meso 1966; Johnson and Hedlin 1967). These authors stressed the importance of full-cover, or wetting sprays, to obtain maximum insect control; but very little research has been done on the direct implantation of systemics into conifers for cone and seed insect control. Schenk et al. (1967) found that insect-caused seed losses on open-growing, pole-sized Douglas-fir in Idaho were reduced significantly when oxydemetonmethyl was implanted into tree trunks at a dosage of about 2 g actual toxicant per diameter inch by means of Mauget®[1] injectors. In Florida, Merkel (1969) implanted dicrotophos into slash pine trunks at rates of 3.4- or 5-g per diameter inch, either by means of Mauget injectors or by the drill-hole method, and prevented cone infestation by the slash pine seedworm, *Laspeyresia anaranjada* Miller, and *Dioryctria* spp. coneworms.

METHODS

This study was conducted on the Olustee Experimental Forest, Baker County, Florida, in 1968. The slash pine study trees had large spreading crowns, were open-growing, and averaged 40 ft in height and 9 inches in diameter at breast height.

The following commercial systemic insecticide formulations were applied in a completely randomized design with whole-tree treatments: (1) Bidrin® technical liquid containing 9 lb/gal actual dicrotophos; (2) Monitor® 6 concentrate containing 6 lb/gal actual Monitor (O,S-dimethyl phosphoramidithioate); (3) Cygon® 4E containing 4 lb/gal actual dimethoate;

[1]J. J. Mauget Company, P. O. Box 509, Burbank, California 91503. Mention of trade names does not constitute endorsement by the U.S. Department of Agriculture to the exclusion of other equally acceptable products.

and (4) Meta-Systox-R® spray concentrate containing 2 lb/gal actual oxydemeton-methyl. All insecticides were tested at the dosage rate of 5 g actual toxicant per inch of tree diameter at breast height for direct comparisons among chemicals. Monitor and oxydemetonmethyl were also tested at a 2 g per diameter inch dosage rate. Dicrotophos and dimethoate were not tested at the lower dosage because of an insufficient supply. Dicrotophos was used as a standard of comparison because in previous studies it controlled *Dioryctria* spp. and *L. anaranjada* on slash pine (Merkel 1969).

All chemicals were implanted 8 May into holes drilled by wood auger at 5-inch intervals around the bole at waist height by means of a Hauptner®[2] veterinarian's syringe of 50 cc capacity. The number and location of implant holes per tree were determined by using a diameter tape upon which red lines were painted at 5-inch intervals. The last implant hole was not used if its location was within 4 inches of the first-hole mark on the diameter tape. Trunk diameters were recorded and used to calculate dosage per tree and per hole for each insecticide. Diameters and depths of holes varied with insecticide to accommodate different amounts of active ingredient per unit volume. The largest holes were 3/4 inch by 4 inches deep, drilled at a 60° downward slope; the smallest were 1/2 inch by 3 inches deep.

The effectiveness of control for *Dioryctria* spp. was calculated by examining the entire mature cone crop on each tree in mid-September. Evaluation of seedworm control was made from a sample of 50 mature cones which showed no external symptoms of *Dioryctria* larval damage. These cones were stored in well-ventilated, indoor drying bins until November when completion of overwintering larval galleries in the cone axes was assured. Infested cones were bisected longitudinally for examination. Data for percentage cone infestation of *L. anaranjada* and *Dioryctria* were subjected to arc-sin transformation and analysis of variance.

Results

All insecticide applications at the 5 g/inch dosage rate significantly reduced average cone infestation by *Dioryctria* as compared to untreated check trees (Table 1); however, cone infestation at this dosage did not vary significantly for the different insecticides. Monitor and oxydemetonmethyl, at the 2 g/inch dosage, did not reduce *Dioryctria* attacks significantly on second-year cones compared with the check.

Dicrotophos and oxydemetonmethyl, at 5 g/inch, were the only insecticides that provided better than 90% reduction in cone infestation by the slash pine seedworm (Table 2). The 57% reduction in cone infestation, produced by 5 g/inch of Monitor, was significantly lower than the check infestation (Table 2).

No phytotoxic symptoms, based on needle color, were observed in any of the treatments.

This article reports results of research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses dis-

[2]NASCO, Ft. Atkinson, Wisconsin, and Modesto, California.

cussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

TABLE 1.—EFFECTS OF TRUNK IMPLANTATION OF SYSTEMIC INSECTICIDES ON THE CONTROL OF *Dioryctria* CONEWORMS ON SECOND-YEAR SLASH PINE CONES—OLUSTEE, FLA., 1968

Treatments*	Toxicant per inch dbh	Replicates (trees)	Average infested cones per tree**	Reduction in infested cones
	Grams	*Number*	*Percent*	*Percent*
none (check)	0	15	10.0 a	—
oxydemetonmethyl	2	7	9.3 ab	7
Monitor	2	7	6.6 abc	34
"	5	7	2.0 bcd	80
dimethoate	5	6	2.0 cd	80
oxydemetonmethyl	5	6	1.8 cd	82
dicrotophos	5	8	1.1 d	89

* All chemicals were applied 8 May 1968 in holes drilled at 5-inch intervals around tree circumference at waist height.

**Any two means followed by the same letter are not significantly different at the 1% probability level by Duncan's multiple-range test.

TABLE 2.—EFFECTS OF TRUNK IMPLANTATION OF SYSTEMIC INSECTICIDES ON THE CONTROL OF *Laspeyresia anaranjada* ON SECOND-YEAR SLASH PINE CONES—OLUSTEE, FLA., 1968

Treatments*	Toxicant per inch dbh	Replicates (trees)	Average infested cones per tree**	Reduction in infested cones
	Grams	*Number*	*Percent*	*Percent*
none (check)	0	15	23.3 a	—
Monitor	2	7	13.1 ab	44
oxydemetonmethyl	2	7	13.0 ab	44
dimethoate	5	6	12.7 ab	46
Monitor	5	7	10.0 b	57
oxydemetonmethyl	5	7	1.1 c	95
dicrotophos	5	8	0.8 c	97

* All chemicals were applied 8 May 1968 in holes drilled at 5-inch intervals around tree circumference at waist height.

** Any two means followed by the same letter are not significantly different at the 1% probability level by Duncan's multiple-range test.

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The Florida Entomologist 53(3) 1970