SLOW-RELEASE AND EMULSIFIABLE FORMULATIONS OF DURSBAN® AND ABATE® FOR CONTROLLING LARVAE OF *CULEX PIPIENS QUINQUEFASCIATUS* SAY[1]

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ABSTRACT. Slow-release and emulsifiable formulations of Dursban® (*O,O*-diethyl *O*-3,5,6-trichloro-2-pyridyl phosphorothioate) and Abate® (*O,O*-dimethyl phosphorothioate *O,O*-diester with 4,4′-thiodiphenol) were tested in man-made potholes against larvae of *Culex pipiens quinquefasciatus* Say. The emulsions of both compounds lasted much longer than the slow-release formulations.

The use of slow-release formulations of insecticides to control mosquito larvae is not new. Some of the first extensive work was done by Raley and Davis (1949) who obtained effective control in California for more than 3 months with DDT and lindane incorporated in briquettes made of casting plaster and sawdust. Subsequently, Evans and Fink (1960) controlled *Aedes aegypti,* but not *Culex pipiens quinquefasciatus* Say, in fire barrels for more than 2 months by using dieldrin incorporated in cement briquettes, and Barnes *et al.* (1967) obtained good control of larvae of *C. pipiens* in the laboratory through several water changes with malathion or Abate® (*O,O*-dimethyl phosphorothioate *O,O*-diester with 4,4′-thiodiphenol) in charcoal, plaster, and/or concrete briquettes. Also, Whitlaw and Evans (1968) got long term control of *C. p. quinquefasciatus* in laboratory tests with Abate, Dursban® (*O,O*-diethyl *O*-3,5,6-trichloro-2-pyridyl phosphorothioate), malathion, and naled formulated plastic carriers, and Barnes and Webb (1968) got extended control of several species of mosquito larvae in woodland pools during a 176-day test period with Abate in plaster briquettes. A recent innovation in this area of research is the use of pesticide-impregnated rubber: Schultz and Webb (1969) found that a formulation of Abate in EPDM (floating rubber) was especially effective against larval *C. p. quinquefasciatus* in laboratory tests.

METHODS AND MATERIALS. The effect of some slow-release and emulsifiable formulations of Dursban and Abate on larvae of *C. p. quinquefasciatus* was tested with simulated field conditions in man-made potholes constructed by digging holes 10 feet long, 5 feet wide, and 2.5 feet deep with sloping sides. The holes were lined with a double layer of 8-mil polyethylene plastic film which lapped over the sides; then about 6 inches of soil was placed over the film, and the sides were sloped to hold the soil on the plastic before 300 gallons of water were added. Manure and other organic materials were included to make the water more favorable for the larvae, and water hyacinths were placed in each pothole to shade the water and keep it cool. The holes were allowed to stabilize for a few days, i.e., until the water cleared, before the tests were begun. Figure 1 shows a pothole after it had stabilized and the vegetation had become well established.

Slow-release formulations [8.7 percent Dursban in polyvinyl chloride (PVC) pellets and 5 percent Abate in plaster briquettes] were compared with emulsifiable concentrates (EC) of the two compounds. Duplicate potholes were treated with each formulation and concentration. Dursban was applied at the rate of 5, 10, or 20 total parts per million (ppm) active ingredient in pellets and at rates of 0.0025, 5, 10 or 20 ppm as an EC; Abate was

[1] Mention of a pesticide or a proprietary product in this paper does not constitute a recommendation or an endorsement of this product by the U. S. Department of Agriculture.

FIG. 1.—A stabilized pothole with well established vegetation where tests were made with slow-release and emulsifiable formulations of Dursban and Abate.

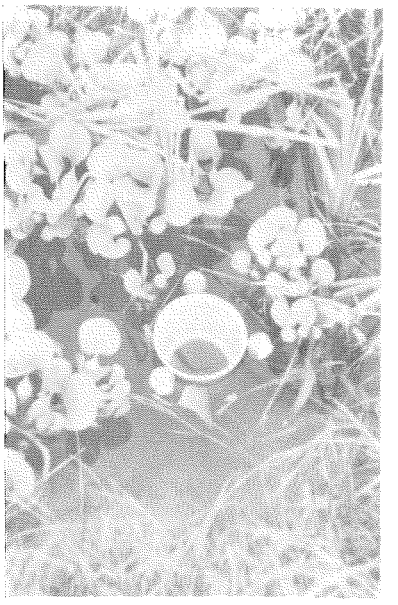

FIG. 2.—A container used to confine larval *Culex pipiens quinquefasciatus* during tests, showing container floating in pothole.

used at 0.1, 1 or 10 ppm in briquettes and 0.001, 0.1, 1 or 10 ppm as an EC. The concentrations were calculated to represent the amount of insecticide incorporated in the granules and not that released in the water.

The effectiveness of the treatments was determined by placing 25 early fourth instar laboratory-reared larvae in a floating container (Fig. 2) in each pothole for 24 hours and then recording the mortality. Each container was made from a 32-ounce waxed paper cup that had the bottom replaced with 32-mesh lumite plastic screen. Thus, these cups held the larvae but allowed the water to circulate. Fishing floats were attached to the outside to keep the containers from sinking. The assays were made 1, 3, and 7 days posttreatment, and then weekly until less than 75 percent mortality was recorded for 2 consecutive weeks. The potholes were refilled with water to the original level 24 hours before each assay.

RESULTS AND DISCUSSION. The results are presented in Table 1. The EC of both compounds was effective much longer than the slow-release formulations at the same concentrations. Control with the Dursban pellets ranged from 0 days at 5 ppm to 70 days at 20 ppm. The Dursban EC gave over 75 percent control for 1 day at 0.0025 ppm but more than 200 days each at 5, 10 and 20 ppm.

The Abate briquettes were effective for 3 days at 0.1 and 1 ppm and for 35 days at 10 ppm. The Abate EC produced 68 percent mortality for only 1 day at 0.001 ppm but more than 75 percent for 7 days

TABLE 1.—Control of larval *Culex pipiens quinquefasciatus* Say in artificial potholes with Dursban and Abate in slow release and emulsifiable formulations.

Concentration (total ppm)	Number of days with control above 75 percent	
	Slow-release formulation	Emulsifiable formulation
	Dursban	
0.0025 [1]	..	1 [2]
5.0	0	210
10.0	28	238
20.0	70	294
	Abate	
0.001 [1]	..	0 [3]
.1	3	7
1.0	3	56
10.0	35	238

[1] The lowest concentrations (EC) to produce 100 percent mortality to early fourth-instar larvae in 24 hours in laboratory tests.

[2] 100 percent mortality 24 hours posttreatment; 72 percent after 3 days.

[3] 68 percent mortality 24 hours posttreatment; 56 percent after 3 days.

at a concentration of 0.1 ppm, 56 days at 1 ppm, and 238 days at 10 ppm. Control with the Abate EC with 10 ppm lasted as long as control with Dursban EC at 10 ppm.

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