

FIELD TESTS OF INSECTICIDES APPLIED AS ULV SPRAYS BY GROUND EQUIPMENT FOR THE CONTROL OF ADULT MOSQUITOES

C. B. RATHBURN, JR., A. H. BOIKE, JR., C. F. HALLMON AND R. L. WELLES

Florida Department of Health and Rehabilitative Services, West Florida Arthropod Research Laboratory, Panama City, Florida 32401

ABSTRACT. Field tests of several insecticides applied as ULV sprays by ground equipment were conducted using caged adult *Aedes taeniorhynchus* (Wiedemann) and *Culex nigripalpus* Theobald. Satisfactory mortalities of both species were obtained with chlorpyrifos (Dow MFC), fenitrothion (Sumithion Concentrate); phenthoate (Cidial ULV); propoxur

(Baygon I MOS); and 3% naled (Dibrom 14) in various diluents including heavy aromatic naphtha (HAN); Chevron 400 solvent, and diesel oil plus 3% Ortho Additive. Resmethrin (20% SBP-1382 18.5MF in Klearol) gave excellent mortality of *Cx. nigripalpus* but poor kill of *Ae. taeniorhynchus*.

This research is part of a continuing program to establish effective dosages of insecticides and insecticide formulations presently labeled as ULV sprays and for other insecticides which have shown promise in laboratory spray tests against the adults of two important species of Florida mosquitoes. The tests were conducted over a 5-year period from 1974-1979.

MATERIALS AND METHODS

All tests were conducted in the early evening hours after sunset. Temperatures ranged from 64 to 85°F and averaged 78.8°F and wind velocities ranged from 1 to 10 mph and averaged 5.3 mph for the tests. The test plot was a fairly

open beach residential area with few houses and a few large pine trees but with little ground vegetation.

Four cages of mosquitoes, 2 of *Aedes taeniorhynchus* (Wiedemann) and 2 of *Culex nigripalpus* Theobald, each containing 25 females, were attached to a metal pole. One cage of each species was placed at 6 ft. and another at 2 ft. above ground level. The poles with cages attached were placed at 165 and 330 ft. downwind and perpendicular to the line of travel of the first swath of the aerosol generator. A second and third swath were applied at 1 and 2 blocks (300 and 600 ft.) upwind of the first swath. Each test, or replicate, consisted of the cages of mosquitoes from 3 sets of poles (165 and 330

ft.) placed one block (600 ft.) apart, or a total of 12 cages of each species. The cages were 6 in. in diameter and 1 in. deep with 14 X 18 mesh screen on both circular surfaces and were hung vertically with the screened surfaces facing into the wind. A like number of cages were used as untreated controls for each test.

All mosquitoes used in the test were from organophosphorous susceptible laboratory colonies and were between 2 and 8 days old. After exposure, the mosquitoes were anesthetized with carbon dioxide and transferred to clean holding cages which were identical to the treatment cages. All cages of mosquitoes were held with access to a 10% sucrose solution on cotton pads for 12 to 15 hrs. at which time mortality counts were made.

The tests were conducted with a Leco HD ULV® cold aerosol generator mounted on a flat-bed truck and the aerosol was discharged at an upward angle of 45°. Because of proposed label requirements, the tests of resmethrin (SBP-1382 18.5MF) were conducted at a vehicle speed of 5 mph. All other tests were conducted at a vehicle speed of 10 mph. The equipment was calibrated for each formulation prior to testing and the insecticide was measured before and after each test to determine actual discharge rates. Tests in which the actual discharge varied more than 10% were discarded. Spraying time was recorded by means of a stop watch and varied from 15–18 min. depending on the length of run necessary to completely cover the test area.

RESULTS

The average percent mortalities for the two species of mosquitoes at the stated discharge rates of the various insecticides and formulations are shown in Table 1. All percentage formulations shown are expressed as volume to volume. The average percent mortalities for each test were corrected for the check mortality of that test. Overall check mortalities averaged 1.1% for *Ae. taeniorhynchus* and 0.7% for *Cx. nigripalpus*.

Good results were obtained with Dow MFC (chlorpyrifos) against *Ae. taeniorhynchus* at a discharge rate of 0.63 gallon per hour (gph) and a formulation pressure of 4.0 psi; however, 1.0 gph was required for satisfactory mortality of *Cx. nigripalpus*. Since research by Mount and Pierce (1972) demonstrated an increase in mortality of a formulation of Dibrom 14 in HAN when the formulation (air) pressure was reduced to 1.5 psi, Dow MFC was further tested at a formulation pressure of 2.0 psi. At this pressure, the discharge rate of 0.63 gph gave satisfactory mortality of both species of mosquitoes.

Dibrom 14 Concentrate (naled) at 3% and a discharge rate of 10 gph resulted in good mortality of both species of mosquitoes when diluted in either Chevron 400 solvent or diesel oil plus 3% Ortho Additive at a formulation pressure of 4.0 psi and when diluted in heavy aromatic naphtha (HAN) at a pressure of 1.5 psi. The 2% Dibrom 14 diluted in diesel oil plus 2% Ortho Additive applied at 10 gph and a formulation pressure of 4.0 psi did not give satisfactory mortality of *Ae. taeniorhynchus*. Formulation studies conducted prior to testing to determine the stability of formulations of Dibrom 14 in diesel oil showed that Ortho Additive in equal proportions to Dibrom 14 were required to eliminate sludge formation for a period of one week.

Satisfactory mortality of *Cx. nigripalpus* was obtained with 20% SBP-1382 18.5MF (resmethrin) in Klearol at 4.3 gph, but very poor kill was obtained with *Ae. taeniorhynchus*. These tests substantiated previous research (Rathburn and Boike 1972 and 1973) with essentially the same dosage of undiluted SBP-1382 40MF which resulted in 28% mortality of *Ae. taeniorhynchus* and 93% with *Cx. nigripalpus*. The 18.5MF (18.5% wt./wt.) formulation was introduced by the manufacturer because of better low temperature stability than the 40MF (40% wt./wt.) formulation.

Other data in Table 1 show that excellent results were obtained with 1.0 gph of Sumithion Concentrate (fenitrothion),

Table 1. The mortality of caged adult *Aedes taeniorhynchus* and *Culex nigripalpus* obtained with several insecticides applied as ULV sprays by ground equipment.

Insecticide	Formulation			Dschg. rate gph	Form. press. psi	No. tests	Average % mortality	
	trade name	percent	diluent				<i>Aedes</i>	<i>Culex</i>
chlorpyrifos	Dow MFC	—	none	1.0	4.0	5	100	94
				0.75	4.0	4	96	84
				0.63	4.0	5	99	72
fenitrothion naled	Sumithion Conc. Dibrom 14 Conc.	—	none	1.00	2.0	3	97	92
				0.63	2.0	3	95	90
				1.00	4.0	5	100	96
				10.0	1.5	3	97	99
				Chevron 400	4.0	3	99	100
phenothoate propoxur resmethrin	Cidial ULV Baygon I MOS SBP-1382 18.5MF	3.0	diesel oil ¹	10.0	4.0	4	94	100
		2.0	diesel oil ¹	10.0	4.0	4	81	95
		—	none	1.5	4.0	1	100	92
		—	none	4.0	4.0	6	99	98
	20	Klearol	4.3	4.0	5	30	95	

¹ Plus Ortho Additive.

1.5 gph of Cidial ULV (phenthoate), and 4.0 gph of Baygon 1 MOS (propoxur) all applied at a formulation pressure of 4.0 psi.

At present, Dow MFC is labeled for use as ULV sprays by ground equipment at 0.67 to 1.33 fl. oz./min. (0.31 to 0.63 gph). In addition, there is a Florida 24C (or local need) label for use at 2.1 fl. oz./min. (1.0 gph) for the control of *Cx. nigripalpus*. It appears from the results of the preceding tests that if the formulation pressure is reduced to 2.0 psi, satisfactory control of *Cx. nigripalpus* can be obtained at the highest labeled rate under the national label. At present, the formulation of 3.125% Dibrom 14 in HAN, Chevron 400 or diesel oil plus 3.125% Ortho Additive is only labeled for use in Florida, but there is a national label for 10% Dibrom 14 in soybean oil or HAN for application as ULV sprays by ground equipment. SBP-1382 40MF is labeled at 8.9% in Klearol as a ULV spray, but at present

the 18.5 MF formulation does not have an EPA label. Sumithion Concentrate, Cidial and Baygon 1 MOS are also not presently labeled for use as ULV sprays. Therefore, it is recommended that potential users of these, and any other insecticides, consult appropriate state agencies or manufacturer's representatives for currently approved recommendations.

References Cited

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