ELEVEN PROMISING INSECTICIDES EVALUATED AS ULTRALOW VOLUME COLD AEROSOLS AGAINST *AEDES TAENIORHYNCHUS* (WIEDEMANN)[1]

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Ultralow volume (ULV) cold aerosols of several insecticides have shown great potential for adult mosquito control (Mount *et al.*, 1968; Mount *et al.*, 1970a). The main advantages of ULV aerosols over high volume cold or thermal aerosols are: (1) solvents, carriers, and additives are not required, and therefore the need for formulating facilities is eliminated; (2) the dense fogs typical of thermal aerosols are not produced, which eliminates a traffic hazard; and (3) the minimum dose of actual insecticide needed for satisfactory adult mosquito kill is reduced. The third advantage is important not only in reducing cost of operations but also in decreasing environmental contamination. Our tests have demonstrated that standard doses of malathion, naled, and fenthion could be reduced by at least one-half if ULV cold aerosols are used in lieu of high volume aerosols. Because of the increasing use of and wide interest in ULV cold aerosols for adult mosquito control, we have tested 11 additional promising insecticides applied by this method.

Methods and Materials. The tests were conducted in an open field near Gainesville, Florida in April and May, 1970. The tests were performed between 6 and 9 p.m. when climatic conditions were favorable. Temperatures 5 feet above the ground ranged from 78° to 87° F and averaged about 83° F. Wind speeds ranged from <2 to 10 miles per hour (m.p.h.) and averaged about 4 m.p.h.

The insecticides tested are listed below.

A Leco ULV cold aerosol generator was used to disperse the concentrated insecticides (undiluted as received from manufacturers). In general, no modifications of the ULV aerosol generator were necessary for the testing; however, the flowmeter and needle valve assembly were moved to the cab of the truck on which the machine was carried so that flow rates could be constantly monitored while test applications were being made. All flowmeter calibrations were made for a temperature range of 80 to 85° F so that the viscosity of the insecticides would be about the same as during actual application.

Geigy GS–13005 (Supracide®)	*O,O*-dimethyl phosphorodithoate *S*-ester with 4-(mercaptomethyl)-2-methoxy-Δ^2-1,3,4-thiadiazolin-5-one
Fenitrothion	
Dowco® 214	*O,O*-dimethyl *O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate
Montecatini L 561 (Cidial®)	Ethyl mercaptophenylacetate *S*-ester with *O,O*-dimethyl phosphorodithioate
Dursban®	*O,O*-diethyl *O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate
Phoxim	
Penick SBP–1382	(5-benzyl-3-furyl)methyl *cis-trans*-(±)-2,2-dimethyl-3-(2-methylpropenyl) cyclopropanecarboxylate
Tetramethrin	
Propoxur	
Promecarb	
Dichlorvos	
Malathion (standard)	
Fenthion (standard)	

[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.

TABLE 1.—Effectiveness of ultralow volume cold aerosols of insecticides against caged female *Aedes taeniorhynchus* (Wiedemann).

ENT-No.	Insecticide	Active ingredient (pounds per gallon)	Percent mortality[a] after 18 hours at indicated dose (pound per acre)[b]					LD_{90}[c]	
			0.1	0.05	0.025	0.0125	0.00625	Pound per acre	Fluid ounces per minute at 10 m.p.h.
					Promising Insecticides				
27193	Geigy GS–13005	3			100	76	89	0.012	3.1
25715	Fenitrothion	8.34			93	91	65	.014	1.3
27520	Dowco 214	6			97	90	57	.015	1.9
27386	Montecatini L 561	8.6			96	81	64	.017	1.5
27311	Dursban	6		100	97	92	37	.017	2.2
27448	Phoxim	6			96	72		.019	2.4
27311	Dursban	4		100	87	75		.022	4.2
27474	Penick SBP–1382	2			89	79		.027	10.3
27339	Tetramethrin	1.73			81	79		.028	12.3
25671	Propoxur	2		96	82	57		.032	12.2
27300	Promecarb	2		95	75			.037	14.1
20738	Dichlorvos	11.9	27		18			>.1	>6.5
					Standard Insecticides				
17034	Malathion	9.7		96	92	76		.025	2
25540	Fenthion	9.67			91	99	77	.009	.7

[a] The average mortality at distances of 150 and 300 feet; the average mortality of unexposed mosquitoes was 5 percent.
[b] Based on active ingredient used over a 300-foot swath.
[c] Estimated from eye-fitted line on probit graph paper.

The dose of each insecticide was changed by varying either flow rate and/or vehicle speed. Flow rates ranged from 1 to 9.5 fluid ounces per minute and vehicle speeds ranged from 5 to 20 m.p.h. Previous tests indicated that vehicle speeds of as much as 20 m.p.h. were not a factor affecting mosquito kill providing flow rates were increased proportionately to vehicle speeds (Mount *et al.*, 1970b).

Adult female *Aedes taeniorhynchus* (Wiedemann) 2 to 5 days old were exposed in 16-mesh screen wire cages (25 per cage) suspended on stakes 150 and 300 feet downwind in two rows perpendicular to the line of travel of the generator. Thus, a total of four cages per replicate were used, and from one to five replications were made with each concentration of each insecticide. From four to eight tests were conducted with each insecticide. After the passage of the aerosol generator, the mosquitoes were transferred to plastic tubes lined with clean paper. Except during exposure to the aerosols, the mosquitoes were held in insulated chests containing ice in cans. Absorbent cotton pads moistened with 10 percent sugar-water solution were placed on the holding tubes when they were returned to the laboratory. Mortality counts were made 18 hours after the mosquitoes were exposed to the aerosols.

RESULTS AND DISCUSSION. The mortalities and estimated LD_{90}'s for each insecticide are presented in Table 1. Geigy GS–13005, fenitrothion, and Dowco 214, LD_{90}'s of 0.012, 0.014, and 0.015 pounds per acre, respectively, were only slightly less effective than the fenthion standard (LD_{90} of 0.009 pound per acre). Geigy GS–13005 and fenitrothion were also shown to be highly effective as high volume cold aerosols against adult mosquitoes (Mount and Lofgren, 1967; Mount *et al.*, 1969). Mount *et al* (1970b) reported that Dowco 214 was 1.77 more effective than malathion as a contact spray against adult mosquitoes. Montecatini L 561, Dursban, and phoxim were also highly effective as ULV cold aerosols and had LD_{90}'s ranging from 0.017 to 0.022 pound per acre. McNeill and Ludwig (1970) showed that Dursban was highly effective as a ULV cold aerosol against adult mosquitoes in Texas. Montecatini L 561 and phoxim were also very effective in our earlier tests with high volume cold aerosols (Mount *et al.*, 1969). Penick SBP–1382, tetramethrin, propoxur, and promecarb, LD_{90}'s of 0.027 to 0.037 pound per acre, were all about equal or just slightlv less effective than the malathion standard (0.025 pound per acre). Dichlorvos was ineffective as a ULV cold aerosol, even at a dose of 0.1 pound per acre.

We observed that Penick SBP–1382, tetramethrin, propoxur, and promecarb gave relatively quick knockdown (within one-half hour posttreatment), which is a desirable characteristic of mosquito adulticides, especially when small areas are to be treated.

SUMMARY. Ultralow volume cold aerosols of 11 promising insecticides and two standards (fenthion and malathion) were evaluated against caged adult female *Aedes taeniorhynchus* (Wiedemann). Geigy GS–13005, fenitrothion, and Dowco 214 were only slightly less effective than fenthion. Montecatini L 561, Dursban, and phoxim were less effective than fenthion but more effective than malathion. Penick SBP–1382, tetramethrin, propoxur, and promecarb were all either about equal to or only slightly less effective than malathion. Dichlorvos was ineffective as a ULV cold aerosol.

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CROSS-MATING BETWEEN *AEDES (S.) POLYNESIENSIS* MARKS AND *AEDES (S.) ALBOPICTUS* SKUSE IN A LARGE CAGE[1]

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INTRODUCTION

In small cage competition experiments, Gubler (1970a, b) observed a rapid displacement of *A. polynesiensis* by *A. albopictus,* in which cross insemination sterility of the *A. polynesiensis* females was thought to be an important factor. In small cages, the females are unable to avoid the extremely aggressive *A. albopictus* males. If cross insemination is to be effective in practical control of *A. polynesiensis,* it must occur where the females are not confined in a small area. The object of this investigation was to determine whether cross mating occurs readily in a large cage, which would more nearly simulate a natural environment, and in which there is ample space for maneuverability. Also, we attempted to find evidence that free association of the two species in this large cage was accompanied by a lower fertility in the *A. polynesiensis* females.

MATERIALS AND METHODS

The mosquitoes were taken from stock colonies. The *A. albopictus* originated in Poona, India, and had been maintained in our insectary since 1966. The *A. polynesiensis* was obtained from Samoa in 1950. Pupae were separated according to size and were placed in groups of 5 or less in test tubes. Most adults emerging in these tubes were of one sex; groups with both sexes were discarded. The adult males and females were kept temporarily in separate holding cages before they were liberated in the large experimental cage. This cage consisted of a screened enclosure in one of the insectary rooms, and had the following dimensions: length, 9 ft. 10 in., width, 5 ft.; height, 9 ft. 3 in. Temperature was maintained at about 80° F. and the relative humidity at about 80 percent. Bottles equipped with dental-dam wicks served as a source of 10 percent sucrose solution. Blood meals for the female mosquitoes were supplied by anaesthetized guinea pigs and the experimenters. A numbr of potted plants, bobbinet hangings, the undersides of shelves, as well as the walls and ceilings, furnished resting places for the adults.

Eggs to be examined for embryonation were depigmented by submersion in a dilute solution of sodium hypochlorite.

EXPERIMENT 1. EMBRYONATION OF EGGS. The object of this experiment was to determine whether *A. albopictus* sperm will bring about embryonation of *A. polynesiensis* eggs.

One hundred newly emerged, virgin

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