

ULTRALOW VOLUME GROUND AEROSOLS OF INSECTICIDES FOR CONTROL OF RICE FIELD MOSQUITOES IN ARKANSAS¹

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ABSTRACT. In large-scale tests with ultralow volume (ULV) ground aerosols of insecticides in Lonoke, Arkansas, malathion, naled and chlorpyrifos gave fair to good control of adult rice field mosquitoes, predominantly *Psorophora confinnis* (Lynch Arribáizaga). The minimum effective doses determined from previous tests with caged

adult mosquitoes appeared more than adequate against the natural population. All three compounds gave good control after 1 to 2 hours (86 to 100 percent), but at 24 hours posttreatment, applications every other night and every night averaged only 66 and 87 percent control, respectively.

The ultralow volume (ULV) ground aerosol method has received wide acceptance among mosquito control workers during the past several years. Meisch *et al.* (1971) therefore suggested that this economical method could be used in conjunction with a larvicide-oriented mosquito control program against rice field mosquitoes, predominantly *Psorophora confinnis* (Lynch Arribáizaga), in small communities or in Arkansas towns. However, most of the research with the ULV method has had to do with caged mosquitoes; little information is available concerning the effectiveness of the method against natural populations. The main objectives of the present research were therefore: (1) to evaluate the effectiveness of ULV aerosols in large-scale field tests; (2) to determine whether the minimum effective doses of insecticides determined by tests

of caged adult mosquitoes would be effective against natural infestations of adult mosquitoes; and (3) to determine how often during the mosquito season such ULV aerosol applications would need to be made for satisfactory control in a typical town in a rice-producing area.

METHODS AND MATERIALS. The town of Lonoke, Arkansas, used as the test area contains about 2,900 people and is located 20 miles east of Little Rock. It consists of about 1,000 acres of flat terrain divided into standard size residential and business lots covered with a moderate amount of vegetation. Most streets in the town are spaced a standard block (about 300 feet) apart, which made fairly complete coverage possible. An untreated area about three-fourths of a mile north of Lonoke was considered the control and was used to obtain estimates of the fluctuations in the untreated population of adult mosquitoes.

The insecticides malathion, naled (10 percent Dibrom® 14 in heavy aromatic naphtha) and chlorpyrifos, were applied from 9 p.m. to 11 p.m. CDST during the first 3 weeks of July 1971, with two Leco ULV aerosol generators, one standard model and one heavy duty model. The instrument panels were mounted in the cabs of the trucks on which the aerosol generators were carried so that insecticide flow, air pressure, and insecticide temperature could be monitored while the applications were being made. With mala-

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TABLE 1.—Results of ultralow volume insecticide aerosol tests against infestations of adult mosquitoes (predominantly *P. confinnis*) at Lonoke, Arkansas, July 1971.

A.I. (lb/gal)	Flow (fl oz/ min)	Air pressure (psi)	Speed (mph)	Amount used (gal)	Dose (lb/acre) ^a		Percentage kill ^b of caged mosquitoes at 18 hr	Percentage control of natural population ^c	
					Intended	Actual		By landing rate at 1-2 hr	By light trap at 24 hr
9.7	3	2 & 4 ^d	10	3.1	Malathion		92	63	
9.7	3	2 & 4 ^d	10	3.2	0.0375	0.030	99	58	
9.7	3	2 & 4 ^d	10	3.9	0.0375	0.031		94	94
9.7	3	2 & 4 ^d	10	4.2	0.0375	0.0378		69	88
					Naled ^e				
1.4	12	1.5	10	15	0.02	0.021		100	62
1.4	12	1.5	10	12.5	0.02	0.0175		93	74
					Chlorpyrifos				
6	3.2	2	15	2.5	0.0187	0.015		86	96
6	3.2	2	20	1.9	0.125	0.0114		80	82

^a Actual doses varied according to road network which depended on wind direction.

^b Corrected for check mortality (15 percent) by Abbott's formula.

^c Calculated from comparison with baseline pretreatment data and adjusted according to fluctuations in the check area by Abbott's formula.

^d Air pressure was 2 psi for standard Leco machine and 4 psi for heavy duty Leco machine.

^e Ten percent Dibrom 14 in heavy aromatic naphtha.

thion, flowmeter settings were changed according to temperature changes to maintain a constant flow; however, this adjustment was not necessary with naled and chlorpyrifos because the viscosity of these insecticides varied only slightly.

The effectiveness of the aerosols was evaluated by three methods. 1. Caged adult female *P. confinnis* were exposed to two malathion aerosol applications to correlate caged mosquito kill with control of the natural infestation of rice field mosquitoes (predominantly *P. confinnis*). Caged mosquitoes were collected from natural infestations in the check area and exposed in 16-mesh screen wire cages (approximately 25/cage) suspended about one foot above the ground. These cages were placed around several abandoned houses and a church located in the town. Also, additional cages were placed in the check area to determine the amount of mortality, if any, that might occur because of the handling procedures. 2. The natural infestations of adult mosquitoes were sampled by making landing counts at each intersection on two streets perpendicular to each other, a total of 26 count stations. Also, five landing count stations were established in the check area. 3. Overnight light trap collections were made with New Jersey light traps at three locations within the town and compared with similar collections made outside the treated area.

RESULTS AND DISCUSSION. The results (Table 1) indicated fair to good control of adult rice field mosquitoes. In the first two tests with malathion 92 and 99 percent of the caged mosquitoes were killed, which correlated well with the control of the native population at 1 to 2 hours after treatment with all three compounds (86-100 percent). Also, the control of the native population at 24 hours posttreatment, as determined by landing counts and light trap collections, correlated well but averaged about 15 percent less than at 1 to 2 hours, apparently because of reinfestation from nearby untreated areas.

From research with caged mosquitoes

(Mount *et al.*, 1970; Mount and Pierce, 1971; Mount and Pierce, in press) the doses of insecticide used at Lonoke were about the lowest which would give good control. However, such a high degree of control was obtained at 1 to 2 hours post-treatment with malathion and chlorpyrifos (these insecticides usually require 3 to 6 hours for complete knockdown with minimum effective doses) there is a possibility that even lower doses of all three insecticides might have been adequate. We also observed a fast knockdown ($\frac{1}{2}$ to 1 hour) of the caged mosquitoes exposed to malathion, which likewise suggested overkill.

Reinfestations of rice field mosquitoes occurred almost nightly in Lonoke during the entire test period; thus adequate mosquito control would require repetitive applications. Our tests were not designed specifically to evaluate the effect of applications made every night or every other night, but we did note that the average control with applications made every other night (two with malathion and two with naled) was only 66 percent (range 58-82 percent); nightly treatments (two with malathion and two with chlorpyrifos) gave an average 87 percent (range of 79-94 percent). These data therefore suggest that for good control of a rapidly migrating species such as *P. confinnis*, nightly applications of insecticide are necessary.

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