LABORATORY NON-THERMAL AEROSOL TESTS OF INSECTICIDES FOR THE CONTROL OF ADULT MOSQUITOES

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ABSTRACT. Non-thermal aerosol sprays of 13 insecticides were compared with malathion as the standard against laboratory reared females of *Aedes taeniorhynchus* (Wied.) and *Culex nigripalpus* Theob. in a laboratory wind tunnel. Baygon and the natural and synthetic pyrethrins were more toxic to *Culex* and the organophosphates were more effective against *Aedes*.

The West Florida Arthropod Research Laboratory conducts preliminary laboratory wind tunnel tests of promising new insecticides for possible use as mosquito adulticides. This report contains the results of non-thermal aerosol tests of 13 insecticides against 2 species of mosquitoes.

MATERIALS AND METHODS. Laboratory reared adults of *Aedes taeniorhynchus* (Wied.) and *Culex nigripalpus* Theob. were placed in circular screened cages and exposed to predetermined concentrations of various insecticides as previously described by Boike and Rathburn (1975). The insecticides evaluated were Baygon 1-MOS, S-bioallethrin, SBP-1513 (3-phenoxybenzyl (±)-cis, trans-2, 2-dimethyl 1-3-(2,2-dichlorovinyl) cyclopropane carboxylate), pyrethrins, naled, chlorpyrifos, Dowco 214 (0,0-dimethyl 0-3,5,6-trichloro-2-pyridyl phosphorothioate), phenthoate, pirimiphos methyl, d-trans allethrin, resmethrin, BAS-2350-I (3,5 diethyl-phenyl-N-methyl-carbamate) and dimethrin. Malathion was used as the standard.

RESULTS AND DISCUSSION. Results are shown in Table 1. The LC_{50} and LC_{90} in milligrams of active ingredient per mil-

Table 1. Toxicity of insecticides applied as non-thermal aerosols in the laboratory to caged adult *Aedes taeniorhynchus* (Wied.) and *Culex nigripalpus* Theob.

Insecticide	Milligrams a.i. per milliliter						Reciprocal LC_{90} ratio to malathion		LC_{90} ratio of *Culex* to *Aedes*
	Aedes			*Culex*					
	Reps	LC_{50}	LC_{90}	Reps	LC_{50}	LC_{90}	*Aedes*	*Culex*	
Baygon 1-MOS	12	0.071	0.212	12	0.062	0.178	1.76	10.62	0.84
S-bioallethrin [1]	10	0.075	0.215	8	0.058	0.155	1.74	12.19	0.72
SBP-1513	8	0.063	0.230	10	0.021	0.068	1.63	27.79	0.30
pyrethrins [1]	11	0.088	0.250	12	0.029	0.092	1.50	20.54	0.37
naled	34	0.095	0.251	36	0.069	0.159	1.49	11.89	0.63
chlorpyrifos	12	0.140	0.288	12	0.219	0.465	1.30	4.06	1.61
Dowco 214	8	0.152	0.320	12	0.330	1.020	1.17	1.85	3.19
phenthoate	10	0.103	0.325	11	0.190	0.725	1.15	2.61	2.23
pirimiphos methyl	10	0.155	0.335	11	0.207	0.455	1.12	4.15	1.36
malathion	52	0.148	0.374	59	0.620	1.890	1.00	1.00	5.05
d-trans allethrin [2]	11	0.280	0.870	11	0.110	0.310	0.43	6.10	0.36
resmethrin	10	0.370	1.300	8	0.043	0.142	0.29	13.31	0.11
BAS-2350-I	10	1.200	3.700	10	0.830	2.300	0.10	0.82	0.62
dimethrin	10	1.100	3.700	12	2.100	6.300	0.10	0.30	1.70
dimethrin [3]	10	1.100	4.500	13	1.700	6.200	0.08	0.30	1.38

[1] Synergized with piperonyl butoxide (1:5).
[2] Synergized with tropital (1:5).
[3] Synergized with piperonyl butoxide (1:1).

liliter were obtained from dosage-mortality curves. The insecticides are arranged in descending order of their toxicity to *A. taeniorhynchus* when compared with malathion. Baygon 1-MOS, S-bioallethrin, SBP-1513, synergized pyrethrin, naled, and chloryprifos were 1.76 to 1.30 times more toxic to *A. taeniorhynchus* in that order than was malathion. The relative toxicity of naled to malathion is the same as that obtained by Mount and Pierce (1973); however, the relative toxicity of pyrethrins is considerably less than the 6-fold difference they obtained. Data in Table 1 also show that Dowco 214, phenthoate and pirimphos methyl were only slightly more toxic than the standard. Mount et al. (1970) also reported similar results for Dowco 214. Synergized d-trans allethrin, unsynergized resmethrin, BAS-2350-I and dimethrin (alone and synergized) were all found to be less toxic to *A. taeniorhynchus* than malathion. The relatively poor performance of unsynergized resmethrin against *A. taeniorhynchus* both in the laboratory and in the field, has been substantiated by Rathburn and Boike (1972, 1975) and Mount and Pierce (1973). Dimethrin also was reported by Hadaway et al. (1970) to give poor results against *Anopheles stephensi* Liston and *Aedes aegypti* (L.).

Against *C. nigripalpus,* SBP-1513 and synergized pyrethrin were 28 and 21 times more toxic respectively than malathion. The data obtained with pyrethrin compare favorably with that of Mount and Pierce (1973) who found pyrethrin synergized by piperonyl butoxide to be about 25 times as toxic as malathion. Resmethrin, S-bioallethrin, naled, and Baygon 1-MOS were approximately 11–13 times more toxic, while d-trans allethrin, pirimiphos methyl, chlorpyrifos, and phenthoate were 2–6 times more toxic than malathion to *C. nigripalpus.* The carbamate BAS-2350-I and dimethrin (alone and synergized) were less effective than the standard.

The pyrethroids (SBP-1513, d-trans allethirn, and resmethrin) and the pyrethrin were found to be considerably more toxic to *C. nigripalpus* than to *A. taeniorhynchus,* while Dowco 214, phenthoate,

and malathion were more toxic to *A. taeniorhynchus* than *C. nigripalpus*.

The relative toxicity of naled to *A. taeniorhynchus* and *C. nigripalpus* compares favorably to the difference obtained by Mount and Pierce (1973); however, they showed pyrethrins to be equally effective against both species. The results of these tests indicate that pyrethrins are 2–3 times more effective against *C. nigripalpus* than *A. taeniorhynchus*. This difference was also substantiated in field tests (Rathburn and Boike, 1975).

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ULTRALOW VOLUME GROUND AEROSOLS OF PROPOXUR (BAYGON® MOS) FOR CONTROL OF ADULT MOSQUITOES [1]

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ABSTRACT. Comparative tests demonstrated that ultralow volume (ULV) aerosols of propoxur (Baygon® MOS) were 2.4 and 3.2× more effective than aerosols of technical malathion against *Aedes taeniorhynchus* (Wiedemann) and *Anopheles quadrimaculatus* Say, respectively. The Baygon MOS formulation provided more efficient use of propoxur than a previous Baygon ULV formulation used as an ULV aerosol.

The first wind-tunnel aerosol tests with propoxur at our laboratory showed it to be ca. 3× more toxic than malathion to adult female *Aedes taeniorhynchus* (Wiedemann) (Gahan and Davis 1964). Since that time a number of investigators have demonstrated the efficacy of high volume aerosols of propoxur against *Aedes, Culex,* and *Anopheles* mosquitoes (Gahan *et al.* 1965; Lofgren *et al.* 1966, 1967; Mount *et al.* 1966; Mount and Lofgren 1967; Shipp and Hazeltine 1967; Taylor and Schoof 1968). The first ultralow volume (ULV) aerosol tests with propoxur (2 lb AI/gal ULV formulation) indicated that it was about equal to malathion against caged adult *Ae. taeniorhynchus* (Mount and Pierce 1971). This comparison suggested that some changes in formulation and/or aerosolization were needed to utilize more efficiently propoxur as a ULV aerosol. Subsequently, a new formulation of propoxur (Baygon® Mosquito Oil Spray (MOS) —1 lb AI/gal) was developed

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