LABORATORY EVALUATION OF MATERIALS AGAINST THE LARVAE OF *AEDES AEGYPTI*[1]

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INTRODUCTION. The search for new and better materials for the control of mosquitoes is an important and continuous research project. This task has been intensified in Kentucky in recent years because of the increasing importance and interest in controlling the salt marsh mosquito, *Aedes sollicitans* (Walker), in certain areas of the state. The State Department of Agriculture conducts a spraying operation that is directed primarily against adults and provides only temporary relief from great numbers of mosquitoes in the infested areas. While this program is certainly helpful, it is not altogether satisfactory as is evidenced by the public remonstration during periods of heavy infestation. For this reason field studies were planned in an attempt to control larvae of this species and thus prevent the large adult populations. However, prior to initiating field studies the authors felt that some preliminary laboratory studies were in order. Thus the efficiency of several insecticides against the larvae of a laboratory strain of *Aedes aegypti* (L.) was determined. The results of this study, conducted during 1964 and 1965, are reported herein.

MATERIALS AND METHODS. The methods employed were similar to those used by Mulla *et al.*, (1961, 1962) in studies with *Culex* spp. Third instar larvae from a susceptible laboratory colony of *Aedes aegypti* (L.) were used for all tests. To standardize the tests, all larvae used were approximately the same age. This was accomplished by placing an egg paper in water until hatch began, removing it and placing it in another container of water for a period of 30 minutes, then moving it again to still another container of water. At the time the egg papers were removed a measured amount of ground Gaines dog food (General Foods Corp., White Plains, N. Y.) was added to the water as a source of food for the larvae. When the larvae reached third instar, their food was re-

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TABLE 1.—Chemical identification of proprietary compounds evaluated against *Aedes aegypti* larvae.

Designation	Chemical identification
American Cyanamid 52160 (Abate)	o,o,o′,o′ tetramethyl o,o′-thiodi-p-phenylene phosphorothioate
Bayer 25141	o,o-Diethyl o-p-(methylsulfinyl) phenyl phosphorothioate
Bayer 37289	o-Ethyl o-2,4,5-trichlorophenyl ethyl-phosphanothioate
Bayer 39007	o-Isopropoxyphenyl methyl-carbamate
Bayer 41831	o,o-Dimethyl o-4-nitro-m-tolyl phosphorathioate
General Chemical 9160	Delta-(5-hydroxy-1,2,3,4,6,7,8,9,10,10 decachloropentacyclo $[5.3.0.0.^{2,6}.0^{3,9}.0^{4,8}]$ decyl) ethyl leuvlinate
Niagara 10242	2,2-dimethyl-2,3,dihydrobenzofuranyl-7 N-methyl carbamate
SD 7438	Toluene-2,2-dithiol bis (o,o1dimethyl phosphorodithioate)
SD 8447	Phosphoric acid, 2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl ester
SD 8803	Phosphorothioic acid, o-(2-chloro-1-(2,4-dichlorophenyl) vinyl o,o-diethyl ester
SD 9098	Phosphorothioic acid, o-(2-chloro-1-(2,5-dichlorophenyl) vinyl) o,o-diethyl ester
Stauffer S-1942	o,o-Dimethyl-o-2,5-dichloro-4-bromophenyl thionophosphate
Stauffer R-5762	o-Ethyl-o-n-propyl-S-(4,6-dimethyl pyrimidyl-2) phosphorodithioate
Stauffer R-5763	o-Ethyl-o-isopropyl-S (4,6-dimethylpyrimidyl-2) phosphorodithioate
Stauffer B-10046	o-Isopropyl-S-p-chlorophenyl chloromethyl-phosphonodithioate
Stauffer B-10117	o-n-Propyl-S-p-chlorophenyl chloromethyl-phosphonodithioate
Stauffer B-10119	o-Isopropyl-S-p-tolyl chloromethylphosphonodithioate

moved by transferring them through three containers of distilled water. Larvae were then used in the tests without encountering difficulty from molting.

The test procedures consisted of dissolving technical formulations of the various insecticides in glass-distilled acetone and making serial dilutions to obtain the desired dosage. The final dilution was made by adding 1 ml. of the acetone solution to 100 ml. of distilled water which was contained in 6-ounce waxed paper cups. Twenty-five third instar larvae were added to each cup. Each treatment and the untreated check were replicated four times. The untreated check consisted of 1 ml of acetone plus 100 ml of distilled water. Mortality counts were taken 24 hours after treatment, with the criterion for mortality being the inability of the larvae to surface. Temperatures were approximately 76°F. during the tests.

The proprietary compounds evaluated in these tests are listed in Table 1. Other materials tested were DDT, malathion, parathion, fenthion, phenothiozine, and ronnel.

RESULTS AND DISCUSSION. The dosages of several insecticides are shown in Table 2 and are expressed as parts per million required to obtain 50 and 90 percent mortality of third instar *Aedes aegypti*

TABLE 2.—Efficacy of several insecticides against third instar *Aedes aegypti* larvae from a susceptible laboratory colony, expressed as parts per million required to achieve 50 and 90 percent mortality.

	Parts per million	
Material	LC 50	LC 90
American Cyanamid 52160	0.0013	0.023
Stauffer B-10046	0.0032	0.0127
Parathion	0.0043	0.0145
Fenthion	0.0048	0.0083
Bayer 41831	0.0054	0.0134
SD 7438	0.0057	0.017
DDT	0.0073	0.0185
SD 9098	0.0085	0.0176
Stauffer R-5762	0.0108	0.0284
Stauffer B-10119	0.0124	0.052
Bayer 37289	0.0155	0.052
SD 8803	0.0185	0.0470
Bayer 25141	0.0263	0.067
SD 8447	0.0374	0.1
Malathion	0.0475	0.124
Stauffer B-10117	0.051	0.136
Stauffer S-1942	0.057	0.31
General Chemical 9160	0.150	0.305
Ronnel	0.186	0.305
Stauffer R-5763	0.254	0.69
Niagara 10242	0.255	0.780
Bayer 39007	0.5	3.2
Phenothiozine	5.9	10.225

larvae from a susceptible laboratory strain. An LC-50 of 0.01 ppm was arbitrarily selected by the authors as the maximum standard dosage for an insecticide to be considered as an effective larvicide. Therefore, if one examines the LC-50 values in Table 2 he finds American Cyanamid 52160, Stauffer B-10046, parathion, fenthion, Bayer 41831 and Shell Development 7438 to be the most toxic of the materials tested, with DDT and Shell Development 9098 somewhat less toxic but well within the limits of the arbitrary standard selected.

The inherent danger of arbitrarily selecting a standard requirement for performance is the possibility of eliminating a useful compound. Such is the case in these tests. Malathion would be eliminated, but because of its low mammalian toxicity it has often been used as a larvicide. Perhaps further consideration should be given to such "borderline" materials as Stauffer R-5762, Stauffer B-10119, Bayer 25141, Bayer 37289, and Shell Development 8803. However, it is felt that they should have something additional to offer as has malathion with its low mammalian toxicity. Certainly, materials such as phenothiozine, ronnel, Bayer 39007, and Stauffer R-5763 do not warrant further consideration as larvicides; however, the possibility of synergism among any of the compounds has not been explored.

Insofar as the same materials were evaluated, the LC-50 values obtained in these tests compare favorably with those reported by Mulla *et al.*, (1964) against a laboratory strain of *Culex pipiens quinquefasciatus* Say. It should be pointed out, however, that the LC-90 values we obtained were, in most instances, lower than those reported by Mulla, Metcalf and Kats. No explanation is offered for this discrepancy.

References Cited

MULLA, M. S., AXELROD, H., and ISAAK, L. W. 1961. Effectiveness of new insecticides against mosquito larvae. Mosquito News 21(3):216–24.

MULLA, M. S., METCALF, R. L., and ISAAK, L. W. 1962. Some new and highly effective mosquito larvicides. Mosquito News 22(3):231–38.

MULLA, M. S., METCALF, R. L., and KATS, G. 1964. Evaluation of new mosquito larvicides, with notes on resistant strains. Mosquito News 24(3):312–19.