MOSQUITO LARVICIDE FIELD TESTS IN IRRIGATED PASTURES OF THE SAN JOAQUIN VALLEY, CALIFORNIA

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Chemical control of mosquito larvae in California depends primarily on the application of chlorinated hydrocarbons and organophosphorus compounds. Materials currently in use have limitations which justify a continuing search for more effective chemicals.

The chlorinated hydrocarbons may present residue problems when used to control mosquito larvae in areas where feed and forage crops are produced. The organophosphorus compound, parathion, is a highly efficient and economical chemical control agent, but unfortunately has an extremely high mammalian toxicity which presents an element of danger in handling. Malathion, another organophosphorus compound, is considerably safer to handle but is less effective and more expensive.

Some of the objectives that are sought in a mosquito larvicide screening program are: (1) high toxicity to mosquito larvae; (2) low vertebrate toxicity; (3) economical application. Materials that meet all of these criteria are difficult to find.

Recent work with new materials has indicated that several offer promise as mosquito larvicides. Although some of these compounds will undoubtedly be found not to have performed outstandingly at all, it seems appropriate to report on the activity of all materials which were field tested during 1959.

The procedures observed in conducting these tests were the same as outlined by Lewallen (1958) except that 1/32 acre plots were used, and the emulsion concentrates were mixed with 1/2 gallon of water for the spray application.

Results of field tests conducted in 1959 are given in Table 1.

Bayer 29493 (*O,O*-dimethyl 4-methylthio-*m*-tolyl ester of phosphorothioic acid) was the most outstanding material tested. The mammalian toxicity is fairly low which makes this compound of interest as a mosquito larvicide. The acute oral LD-50 to rats is approximately 310 mg./kg. Other compounds of interest include: methyl parathion, methyl trithion, barthrin, Geigy 30494, and Shell SD4402. The bacterial insecticide, Thuricide, did not perform well as a mosquito larvicide.

The development of parathion-resistance in *Aedes nigromaculis* (Ludlow) (Lewallen and Nicholson, 1959) has prompted a search for an effective material that can be substituted at a reasonable price. The results of some of the materials investigated are reported in Table 2.

It appears that either Metacide or methyl parathion at 0.1 lb./acre would be an effective substitute for ethyl parathion where resistance poses a problem in control. Cost of treatment with these compounds runs only a couple of cents more per acre than with ethyl parathion. Based on previous tests, the data in Table 2 would seem to

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TABLE 1.—Tests with mosquito larvicides in irrigated pastures against 4th instar larvae[a]

Compound and formulations	Rate of application lb./acre	24-hour percent mortality	
		Aedes nigromaculis	*Culex tarsalis*
Methyl parathion	0.1	100.0	100.0
2 lb./gal. E.C.	0.05	99.9	97.0
	0.025	99.0	—
Methyl Trithion	0.2	99.6	—
4 lb./gal. E.C.	0.1	98.0	99.6
	0.05	84.6	87.5
Bayer 29493	0.05	100.0	100.0
50% E.C.	0.025	99.2	100.0
	0.0125	—	84.0
Barthrin	0.25	100.0	100.0
25% Tech; 70% xylene;	0.2	98.5	97.0
5% Triton X-100	0.1	95.8	94.5
Geigy 30494	0.2	100.0	100.0
2 lb./gal. E.C.	0.1	99.6	98.0
	0.05	90.0	—
Shell SD4402	0.25	100.0	100.0
1.25 lb./gal. E.C.	0.2	95.7	—
	0.1	95.0	93.0
Thuricide	2.0	54	—
3×10^9 Viable Spores	1.0	41	—
Per Gram W.P.	0.5	77[b]	—
(*Bacillus thuringiensis*)			

[a] Each test replicated 3 to 5 times.
[b] One test only.

indicate that malathion application rates could be reduced considerably by combination with Shell SD4402. Also less SD4402 is required to produce an effective kill than when used alone. This would appear to indicate a synergistic effect when these materials are combined. If the new material is not too costly, a combination of these two materials might be used effectively. Residue restrictions that pertain to chlorinated hydrocarbons must be observed with the mixture.

Emulsion concentrate formulations of EPN, although effective, are somewhat doubtful as to availability. The cost of Guthion emulsion concentrate remains high.

SUMMARY

During 1959, seven materials were extensively tested against fourth instar larvae of *Aedes nigromaculis* (Ludlow) and *Culex tarsalis* Coquillett in irrigated pastures. The most outstanding material tested was Bayer 29493 (*O,O*-dimethyl 4-methylthio-*m*-tolyl ester of phosphorothioic acid). Concentrations as low as 0.05 lb./acre gave complete mortality of both species. The mammalian toxicity of this compound is fairly low.

Other compounds that are of interest as mosquito larvicides include: methyl parathion, methyl trithion, barthrin, Geigy 30494, and Shell SD4402.

The bacterial insecticide, Thuricide, did not perform well as a mosquito larvicide.

Tests against parathion-resistant *Aedes nigromaculis* larvae have indicated that either methyl parathion or Metacide (80 percent methyl parathion, 15 percent ethyl parathion) at 0.1 lb./acre can be used economically in controlling resistant larvae.

TABLE 2.—Field tests against parathion-resistant 4th instar *Aedes nigromaculis*

Compound and formulations [a]	Rate of application lb./acre	24-hour percent mortality [b]
Metacide		
60% methyl parathion	0.1	100.0
15% ethyl parathion	0.05	98.0
7.5 lb./gal.	0.025	94.0
Methyl parathion	0.1	100.0
2 lb./gal.	0.05	99.9
	0.025	99.6
Malathion 5 lb./gal.	0.25 Mala. + 0.05 SD4402	100.0
Shell SD4402		
1.25 lb./gal.	0.1 " + 0.05 "	99.0
EPN	0.1	100.0
4 lb./gal.	0.05	95.3
Guthion	0.5	100.0
1.5 lb./gal.	0.3	89.0
Parathion	0.1	97.0
2 lb./gal. (control)		

[a] Emulsion concentrates.
[b] Average of 3 to 5 replications.

The cost of treatment with these compounds runs only a couple of cents more per acre than with ethyl parathion.

Tests with combinations of malathion and Shell SD4402 indicate that dosages of each compound can be reduced considerably by combination rather than when used alone. This would indicate that a synergistic effect may be exerted when these compounds are combined. Residue restrictions that pertain to chlorinated hydrocarbons must be observed with the mixture.

Literature Cited

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