A COMPARISON OF DDT AND OTHER NEW INSECTICIDES FOR MOSQUITO CONTROL [1]

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Screening tests on synthetic organic compounds as acetone-water suspensions and laboratory studies on promising mosquito larvicides are being continued. The methods used follow those reported previously (U. S. Bur. Ent. and Plant Quar. 1947).

In these tests it has been found that heptachlor is slightly less toxic than DDT to larvae of *Anopheles quadrimaculatus* Say, *Culex quinquefasciatus* Say, and *Aedes aegypti* (L.). Parathion has been found more toxic than DDT to these three species of mosquito larvae. The results of these tests are shown in Table 1.

Comparative Toxicity of Methoxy Analog of DDT, TDE, and DDT.—Because of the interest in TDE and the methoxy analog of DDT, which are less toxic than DDT to fish and wildlife, further tests were made on the comparative toxicity of these compounds as acetone-water suspensions to *Anopheles quadrimaculatus, Aedes aegypti,* and *Culex quinquefasciatus.* As in previously reported tests (Deonier *et al.* 1946), TDE and DDT were about equal in toxicity to *Anopheles* larvae and about 10 times as toxic as the methoxy analog of DDT. *Culex* larvae were less susceptible to DDT and TDE but more susceptible to the methoxy analog than were *Anopheles* and *Aedes* larvae (Table 2).

TABLE 1.—Comparative toxicity of parathion, heptachlor, and DDT to larvae of *Aedes aegypti, Culex quinquefasciatus,* and *Anopheles quadrimaculatus.* (3 replications with 20 larvae each at each dilution.)

Material	Percent mortality in 48 hours at indicated dosages					
	0.025 p.p.m.	0.01 p.p.m.	0.005 p.p.m.	0.0025 p.p.m.	0.001 p.p.m.	0.0005 p.p.m.
			Anopheles quadrimaculatus			
Parathion	...	...	...	100	...	100
Heptachlor	100	78	62	57	...	...
DDT	...	100	100	68	...	...
			Aedes aegypti			
Parathion	...	...	...	100	68	58
Heptachlor	100	78	...	43	...	...
DDT	...	100	...	72	...	...
			Culex quinquefasciatus			
Parathion	...	...	...	100	38	12
Heptachlor	40	17	...	...	...	...
DDT	...	83	...	37	...	...

[1] This work was conducted under a transfer of funds, from the Office of the Surgeon General, Department of the Army, and, in part, from the Bureau of Medicine and Surgery, Department of the Navy, to the Bureau of Entomology and Plant Quarantine.

[2] Acknowledgment is made of the advice of W. V. King, in charge of the Orlando, Fla., laboratory of this Bureau, in carrying out these tests.

TABLE 2.—Comparative toxicity of the methoxy analog of DDT, TDE, and DDT to larvae of *Aedes aegypti, Culex quinquefasciatus,* and *Anopheles quadrimaculatus.* (4 replications of 25 larvae each.)

Material	Dosage (p.p.m.)	Percent mortality in 48 hours		
		Culex	*Aedes*	*Anopheles*
Methoxy analog of DDT	0.05	100	78	83
	.025	65	36	45
	.01	–	19	23
	.005	–	9	0
TDE	.01	85	–	–
	.005	35	85	100
	.0025	7	34	37
DDT	.01	82	97	100
	.005	17	96	100
	.0025	7	28	61

Field Tests with Parathion as an Anopheline Larvicide.—Since laboratory tests have shown parathion to be about 10 times as toxic as DDT to fourth instars of *Anopheles quadrimaculatus,* comparative toxicity tests were made in the field with DDT and reduced dosages of parathion to anopheline larvae. Comparisons were also carried out with dusts, emulsions, and oil solutions of parathion to determine the most effective type of formulation.

In the first series of tests, fuel-oil solutions of parathion and DDT were applied as atomized sprays at a dosage of 0.006 pound of the toxicant per acre. The test plots were in drainage ditches overgrown with water hyacinth and had a uniformly distributed larval population, chiefly *Anopheles crucians* Wied. At this dosage DDT gave a very low larval reduction, the average of two tests being 24 percent as compared with 92 percent for parathion. Parathion at 0.001 pound per acre gave an average reduction of 65 percent (Table 3). Fuel oil applied in amounts equivalent to that used with the toxicant caused no mortality.

In the second series of tests three formulations of parathion were applied at a dosage of 0.01 pound per acre. Replications using a 0.25-percent dust in talc were applied with a rotary hand duster. A hand atomizer was used to apply a 0.1-percent solution in fuel oil and a 0.1-percent emulsion. The test plots were small permanent ponds overgrown with vegetation and containing larvae of *Anopheles crucians* and *A. quadrimaculatus.*

The emulsions gave the lowest larval mortality, 90 percent, as compared with

TABLE 3.—Field tests with fuel-oil solutions of parathion and DDT against anopheline larvae.

Dosage per acre		Average number of larvae per dip before treatment		Percent reduction after 24 hours	
Gallons of solution	Pounds of toxicant	DDT	Parathion	DDT	Parathion
0.3	0.025	13	9.0	94	100
		6.7	4.9	90	96
	.0125	10.3	6.2	73	92
		6.0	6.6	67	92
	.006	3.9	7.6	10	91
		4.8	10.6	37	92
.6	.0025	...	4.9	...	55
		...	6.4	...	71
		...	4.3	...	66
	.001	...	5.1	...	63
		...	4.8	...	58
		...	6.7	...	75

TABLE 4.—Comparison of dusts, emulsions, and oil solutions of parathion in toxicity to anopheline larvae.

Concentration (Percent)	Treatment	Number of tests	Percent 24-hour mortality	
			Range	Mean
0.25	Dust in talc	2	96–99	97
.1	Oil solution	3	93–100	97
.1	Emulsion	3	82–98	90

97 percent mortality with dusts and oil solutions (Table 4).

In a third series of tests parathion, as a 0.1-percent dust, was carefully applied with a small hand duster at dosages of 0.00125 and 0.006 pound of toxicant per acre. The test plots, ⅛-acre in size, were located in ditches and ponds choked with water hyacinths. The higher dosage was very toxic to the larvae of *Anopheles crucians* and *A. quadrimaculatus* present in the plots, giving in six replicated tests an average reduction of 97 percent in 24 hours. The lower dosage in three replicated tests gave 59 percent larval reduction. A strong wind during the application in some of the tests probably reduced the amount of dust that settled on the plots.

Field Tests on *Culex quinquefasciatus* Larvae.—A small plot (0.1 acre) in a sewage-polluted lake heavily infested with larvae of *Culex quinquefasciatus* was treated with a 1-percent solution of parathion in fuel oil applied with a hand atomizer at the rate of 0.05 pound of toxicant per acre. Counts 24 hours after treatment showed an average of 2.8 larvae per dip, compared with an estimated 500 per dip before treatment, or better than 99 percent larval reduction. In previous tests the *Culex* larvae in the polluted water of this lake had proved difficult to kill with much heavier dosages of DDT.

Summary.—In comparative laboratory tests DDT was slightly more toxic than heptachlor but less toxic than parathion to *Anopheles quadrimaculatus* Say, *Aedes aegypti* (L.), and *Culex quinquefasciatus* Say; TDE and DDT were about equal in toxicity to *Anopheles* larvae and about 10 times as toxic as the methoxy analog of DDT. *Culex* larvae were less susceptible to DDT and TDE but more susceptible to the methoxy analog than were *Anopheles* and *Aedes* larvae. In field tests oil solutions of DDT at 0.006 pound of toxicant per acre gave only 24 percent reduction of anopheline larvae, as compared with 92 percent for parathion. At 0.01 pound per acre, emulsions of parathion gave 90 percent reduction and dusts and oil solutions 97 percent. Parathion in a 1-percent solution in fuel oil applied at 0.05 pound of toxicant per acre was effective against *Culex quinquefasciatus* breeding in sewage-polluted water.

Literature Cited

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