RESIDUAL EFFECTIVENESS OF SIX ORGANOPHOSPHORUS COMPOUNDS AGAINST *ANOPHELES QUADRIMACULATUS* SAY

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Residual applications of chlorinated hydrocarbon insecticides have been used to control anopheline mosquitoes in various parts of the world. Reports from Java, Greece, Lebanon, Nigeria, Saudi Arabia, and the United States have indicated that resistance to one or more of these compounds, particularly DDT, lindane, and dieldrin, has developed in five species of this genus (Busvine 1957). In most instances the degree of resistance is not so great as to eliminate practical control with these insecticides, but the need for other toxicants to supplement those now in use may soon be felt. Organophosphorus compounds have been utilized with success both as larvicides and adulticides against other Culicidae where resistance to chlorinated hydrocarbons was present (Gjullin *et al.* 1956, Stivers 1956, Gahan *et al.* 1957, and Davis *et al.* 1957).

In the spring of 1957 laboratory tests were initiated to compare the duration of effectiveness of residues of several organophosphorus compounds and DDT against adults of a nonresistant colony of *Anopheles quadrimaculatus* Say.

Malathion, Diazinon, Dow ET-57 (sampled as ET-14), Dipterex, Am. Cyanamid 4124, chlorthion, and DDT were tested against 3- to 4-day-old adults of undetermined sex in a series of duplicate tests. Acetone solutions of the insecticides were sprayed on plywood panels at the rate of 100 mg. of active ingredient per square foot. The panels were tested after aging for periods ranging from 1 to 180 days. Enough panels were sprayed with each insecticide to avoid the necessity of using any panel twice. In each test 20 to 40 mosquitoes were exposed on treated panels for periods ranging from 5 to 120 minutes, after which they were transferred to cylindrical screen cages, provided with a 10-percent sugar solution in pads of absorbent cotton, and held for 24 hours, when mortality counts were made. The results are given in table 1.

Malathion was equal or superior to DDT, giving 100 percent mortality in 30- or 60-minute exposures throughout the 180-day test period. Diazinon was more effective than malathion through 14 days of aging, about equal after 30 to 60 days, and slightly less effective thereafter. Dow ET-57 was also more effective than malathion through 14 days, but much less effective thereafter. Am. Cynamid 4124 was slightly less effective than malathion, but gave 100 percent mortality in 60- or 120-minute exposures throughout the 180-day period. Chlorthion and Dipterex were less effective.

Literature Cited

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TABLE 1.—Percent mortality of *Anopheles quadrimaculatus* after exposure to residues of insecticides aged for various periods (Average of 2 tests)

Insecticide and Exposure (Minutes)	Age of Residue (Days)								
	1	7	14	30	60	90	120	150	180
First Series									
Malathion									
5	93	41	29	2	—	—	—	—	—
15	100	75	82	23	—	—	—	—	—
30	100	100	100	96	91	96	98	100	91
60	—	—	100	100	100	100	100	100	100
Diazinon									
5	100	100	100	11	—	—	—	—	—
15	100	100	100	18	—	—	—	—	—
30	100	100	100	97	100	72	11	—	—
60	—	—	—	100	100	85	55	88	58
120	—	—	—	—	100	100	100	100	100
Dow ET-57									
5	100	98	100	5	—	—	—	—	—
15	100	100	100	9	—	—	—	—	—
30	100	100	100	27	—	—	—	—	—
60	—	—	—	42	98	31	35	67	26
120	—	—	—	89	67	100	100	100	56
DDT									
5	55	46	25	29	—	—	—	—	—
15	91	59	51	54	—	—	—	—	—
30	100	100	85	100	94	97	100	83	79
60	100	100	100	100	100	100	100	100	100
120	—	—	—	—	—	100	100	100	100
Check									
—	9	6	10	0	9	10	0	6	0
Second Series									
Dipterex									
5	17	5	—	—	—	—	—	—	—
15	96	97	47	0	—	—	—	—	—
30	100	85	95	19	—	—	—	—	—
60	—	—	100	97	100	36	93	18	—
120	—	—	—	100	100	96	100	63	53
American Cyanamid 4124									
15	12	21	—	—	—	—	—	—	—
30	71	69	39	26	—	—	—	—	—
60	—	98	100	100	45	82	100	100	47
120	—	—	100	100	100	100	100	100	100
Chlorthion									
15	4	11	—	—	—	—	—	—	—
30	52	77	27	15	—	—	—	—	—
60	—	72	100	98	97	94	93	63	10
120	—	—	100	100	100	100	100	100	35
DDT									
5	6	29	—	—	—	—	—	—	—
15	61	65	93	98	—	—	—	—	—
30	79	98	94	100	—	—	—	—	—
60	100	100	100	100	100	100	100	100	95
120	—	100	100	100	100	100	100	100	100
Check									
—	4	10	6	5	2	4	0	0	5