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THE RELATIVE EFFECTIVENESS OF SEVERAL INSECTICIDES AGAINST MOSQUITO LARVAE IN ALASKA [1]

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Tests to determine the effectiveness of a number of insecticides against *Aedes* mosquito larvae were made on 146 one-eighth- to one-half-acre plots in the Anchorage, Eklutna, and Gulkana, Alaska, areas in May and June of 1947 and 1948. Several of the insecticides were also tested against *Culiseta* larvae.

The test areas in 1947 ranged from clear, open pools to pools almost completely filled with sedges. In some pools the water was covered with a heavy scum. The most common species of larvae were *Aedes punctor* (Kby.), *A. pionips* Dyar, and *A. communis* (Deg.). Nearly all the larvae were in the fourth instar, and many were pupating when the tests were made.

Fuel-oil solutions of DDT, benzene hexachloride, chlordane, and toxaphene (chlorinated camphene), and water emulsions of DDT were applied with a small hydraulic-type hand sprayer that produced a fine mist spray. The DDT and benzene hexachloride wettable powders were applied with a small hand sprayer, and the DDT dusts were dispersed with a small plunger duster.

The results of the tests against *Aedes* larvae (Table 1), indicated that oil solutions and water emulsions of DDT were about equally effective and somewhat better than benzene hexachloride in oil solution. These two chemicals appeared superior to the other chemicals and formulations tested. The tests against *Culiseta* larvae (Table 2), further showed DDT and benzene hexachloride to be superior to chlordane and toxaphene.

A suitable sprayer for dispersing wettable DDT powder was not available, and

[1] This work was conducted under funds allotted by the National Military Establishment to the Bureau of Entomology and Plant Quarantine.

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TABLE 1.—Effectiveness against *Aedes* larvae of various insecticides applied as sprays and dusts. Small-plot tests near Anchorage and Gulkana, Alaska. May and June 1947.

Material	Dosage (Pound/acre)	Number of tests	Percent mortality in 24 hours	Percent mortality in 48 hours
DDT				
5% in fuel oil	0.2	6	91	98
	.1	10	87	93
	.05	8	66	68
5% emulsion	.2	4	97	93
	.1	7	84	97
	.05	5	93	90
2.5% suspension made from 50% wettable powder	.2	6	64	77
	.1	5	93	79
	.05	4	85	83
10% dust	.2	2	81	57
	.1	3	39	57
Benzene hexachloride (12% gamma), 2.5% in fuel oil	.2	3	86	83
	.1	5	91	84
	.05	2	88	81
Benzene hexachloride 2.5% suspension made from 50% wettable powder containing 6% of gamma isomer	.2	7	64	76
	.1	6	92	82
	.05	6	47	59
Chlordane, 5% in fuel oil	.2	5	60	62
	.1	9	51	55
Toxaphene, 5% in fuel oil	.2	5	56	74
	.1	5	89	80
	.05	3	25	59

TABLE 2.—Effectiveness against *Culiseta* larvae of various insecticides applied as 5-percent sprays. Small-plot tests near Anchorage, Alaska, July 1947.

Material	Dosage (Pound/acre)	Number of tests	Percent mortality in 24 hours	Percent mortality in 48 hours
DDT				
In fuel oil	0.2	2	95	94
	.1	2	94	88
	.05	2	94	91
In water emulsion	.2	2	88	89
	.1	2	77	90
	.05	1	52	79
Chlordane in fuel oil	.2	2	46	70
	.1	1	0	61
Toxaphene in fuel oil	.2	2	45	59
	.1	1	9	12
	.05	1	51	11
Benzene hexachloride, 5% in fuel oil from 83% gamma powder	.05	1	48	82

the results of the individual tests varied considerably. The mortalities may have been unduly low because of faulty application. Both low and high kills were recorded from plots with a heavy surface scum or with heavy grass or reed cover, but mortality was invariably high in clear, open pools. Poor results (not included in Table 1) were also secured on five plots in a low marsh bordering the dock area at Anchorage. Large numbers of *Aedes punctor* and *A. communis* larvae were present in the water between shrub-covered tussocks on this flat seepage area, but no significant mortality was observed after the application of DDT in fuel oil, even at dosages of 0.3 and 0.4 pound per acre.

In 1948 tests with DDT, TDE, methoxychlor, and parathion oil solutions were made on 30 one-half-acre plots near Anchorage and Eklutna. The most common species of larvae were *Aedes punctor, A. communis,* and *A. pionips.* The larvae ranged from first to fourth instars, and third or fourth instars predominated in all tests. The sprays were applied with a small hydraulic-type sprayer and with a hand pump atomizer.

The tests in the Anchorage area were made on mossy pools partially filled with grass. The results of the tests on these plots (Table 3), indicated that TDE and methoxychlor were about equal to DDT at 0.1 pound per acre. A freshly prepared oil solution of parathion at 0.025 pound per acre was indicated to be nearly four times as toxic as DDT. A parathion-fuel-oil solution, about 2 months old, showed no toxicity to mosquito larvae at 0.02 pound per acre.

In the Eklutna plots the larvae occurred in pools between shrub-covered tussocks on flat seepage areas. In these tests TDE, DDT, and methoxychlor were much less effective at 0.1 pound per acre than in the Anchorage area. These plots were similar with respect to drainage and vegetation to those in which 0.4 pound of DDT failed to give larval kills in 1947. Prehatching sprays applied to this type of breeding area have also been found less effective than on other types of areas (Travis *et al.* 1949). The reasons for the ineffectiveness of the insecticides under these conditions were not determined.

SUMMARY

Tests of DDT, TDE, methoxychlor, benzene hexachloride, chlordane, toxaphene, and parathion were made against *Aedes* mosquito larvae on 146 one-eighth- to one-half-acre plots near Anchorage, Eklutna, and Gulkana, Alaska. Nineteen tests were also made against *Culiseta*

TABLE 3.—Effectiveness against *Aedes* larvae of different insecticides in fuel oil. Small-plot tests near Anchorage and Eklutna, Alaska. May 1948.

Material and concentration	Dosage (Pound/acre)	Number of tests	Percent mortality in 24 hours	Percent mortality in 48 hours
	Anchorage			
TDE, 2.5%	0.1	3	84	84
Methoxychlor, 2.5%	.1	3	79	82
Parathion, 0.25%	.025	3	59	66
DDT, 20%	.1	2	66	88
	.2	5	93	97
Velsicol AR-50 [1] 50%	2 quarts	2	0	0
	Eklutna			
TDE, 2.5%	0.1	4	55	68
DDT, 2.5%	.1	4	44	52
Methoxychlor, 2.5%	.1	4	44	48

[1] Chiefly mono- and dimethyl-naphthalenes.

larvae. DDT oil solutions and water emulsions were about equally effective against *Aedes* larvae and superior to DDT and benzene hexachloride wettable powders and to DDT larviciding powder. These DDT formulations were also more effective than fuel-oil solutions of benzene hexachloride, chlordane, and toxaphene. DDT, TDE, and methoxychlor fuel-oil solutions were about equal in effectiveness. Against *Culiseta* larvae, DDT in fuel oil and in water emulsion was superior to fuel-oil solutions of chlordane, benzene hexachloride, and toxaphene. In the Anchorage area dosages of 0.1 to 0.2 pound of DDT per acre caused 88 to 97 percent kill of *Aedes*. A dosage of 0.1 pound per acre of DDT proved inadequate for control under conditions prevailing in the Eklutna area.

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THE EFFECTIVENESS OF DDT AND OTHER INSECTICIDES AS LARVICIDES AGAINST ARCTIC SPECIES OF *AEDES* [1]

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In 1947 and 1948 an experimental program was carried out at Ft. Churchill, Manitoba, Canada, by Canadian and United States entomologists to determine the applicability of present-day methods of mosquito control against arctic and subarctic species of *Aedes* mosquitoes. The program included studies on the effectiveness of prehatching treatments (McDuffie *et al.* 1949), adulticides (Goldsmith *et al.* 1949), and larvicides applied with ground and aerial equipment. The greatest effort was devoted to the study of larvicides, over 150 tests being made with DDT and 7 of the newer insecticides that had shown promise as larvicides in screening and field tests at Orlando, Fla. (Deonier *et al.* 1949). Although most of the tests were made on small plots to evaluate the various insecticides, sufficient tests were also made on large areas with aerial and ground equipment to determine the effectiveness of DDT on a practical scale. The results of the larvicidal investigations for the 2 years are given in this paper.

TEST CONDITIONS AND METHODS

Larvicidal treatments were applied during June on pools and grassy depressions in the tundra and along the margins of lightly forested areas. Several species were present in most of the plots, with *Aedes nigripes* (Zett.) and *A. punctor* (Kby.) predominating. Other species present and

[1] The results herein reported were obtained through the joint efforts of the Canadian Division of Entomology, on behalf of the Canadian Defense Research Board, and the U. S. Bureau of Entomology and Plant Quarantine, on behalf of the Army Committee for Insect and Rodent Control.

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[5] Acknowledgment is made of the valuable contributions of the following members of the joint U. S.-Canadian group: J. B. Goldsmith, Major, Sn.C., U. S. Army; B. Hocking, Douglas Peterson, John Rooks and R. W. Fisher, Canada.