

FIELD TESTS WITH TWO PHOSPHOROTHIOATES AGAINST RESISTANT SALT-MARSH MOSQUITOES¹

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As early as 1949, salt-marsh mosquitoes, *Aedes taeniorhynchus* (Wied.) and *A. sollicitans* (Wlkr.), showed resistance to DDT in Brevard County, Fla. (Deonier *et al.*, 1950). By the summer of 1955 resistance to insecticides had developed to such a degree, in some of the intensively treated portions of Florida, that satisfactory control was not obtained with DDT, BHC, or

dieldrin. The problem was so acute in Broward and Brevard Counties that other control measures were urgently needed, and field tests were made to evaluate malathion against adults and Bayer 21/199 against larvae. These compounds were selected, instead of other phosphorus compounds known to be more toxic to mosquitoes, because currently available information indicated that they are safe for the uses intended. In tests in California (Gjullin & Peters, 1956) aerial sprays of malathion at about 0.5 pound per acre had given satisfactory control of adults of

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Aedes nigromaculis (Ludl.) but not of *Culex tarsalis* Coq.

TESTS AGAINST ADULTS.—In October four plots in the vicinity of Dania, Fla., were treated with malathion sprays as adulticides. Plots A and B each consisted of 400 acres of marshland partially covered with low vegetation, plot C of a sparsely vegetated, 400-acre tract with a palm grove in the center, and plot D of approximately 800 acres of residential area in a town. *Aedes sollicitans* comprised at least 90 percent of the infestation in every location except the palm grove. In the shade of the palm trees most of the mosquitoes were *taeniorhynchus*.

Malathion was applied at 0.5, 0.25, or 0.1 pound per acre as a solution in No. 2 fuel oil containing 5, 5, or 1.3 percent of cyclohexanone as an auxiliary solvent. All applications were made with an N₃N-3 airplane, flying at a speed of 90 miles an hour and an altitude of 75 feet. The swath width was 110 feet, and 3 quarts of spray per acre were applied to all plots. Spraying was begun as early in the morning as the pilot had adequate visibility and was discontinued before 9:45 a.m. A breeze sometimes reached 8 miles an hour while the 0.25-pound treatment was being applied, but the air was calm throughout the other spray periods.

Control was determined by comparing the number of mosquitoes per minute that landed on two men the day before and 3, 6, and 24 hours after treatment. Counts were made at 25 stations in each of plots A, B, and D. In plot C 25 counts were made in the open and 25 in the palm grove. Any reductions in the number of

mosquitoes after the treatment were attributed to the insecticide. The results are shown in table 1.

Excellent control was obtained at all three dosages of malathion. After 3 hours, control was almost complete in the open marsh areas and only slightly lower in the residential area, but was substantially lower in the palm grove. After 24 hours, however, all areas showed equally good control at the lower dosages; the 0.5-pound dosage gave almost perfect control in the open. No difference was apparent between the susceptibilities of the two species of mosquitoes.

These tests, run in the fall of the year, may not be indicative of the results with the same dosages in midsummer. After the larvae reached the third instar, the weather became cool, and 8 days passed before the adults started to emerge. This retarded development may have affected their vitality and susceptibility. Further testing at temperatures more favorable for mosquito development will be required before final conclusions as to the dosages required for practical control are drawn.

LARVICIDE TESTS.—Bayer 21/199 was evaluated as a larvicide in comparison with BHC on typical salt marshes in the vicinity of Cocoa Beach, Fla. Plots A and A-1 consisted of 5 acres, B-1 and C-1 of 10 acres, and B and C of 15 acres each. *Aedes sollicitans* was the predominant species. The insecticides were applied as 16/30-mesh attapulgit granules containing 1 percent of the toxicant. All applications were made with a Stearman airplane, which was equipped with a cockpit tank duster modified to dispense granular ma-

TABLE 1.—Control of adult salt-marsh mosquitoes with aerial sprays of malathion

Plot	Terrain	Dosage (lb./acre)	Pretreatment counts ^a	Percent control after—		
				3 hours	6 hours	24 hours
A	Open marsh	0.5	581	99+	99+	99+
B	Open marsh	.25	280	99+	99+	97
C	Open marsh	.1	255	99+	99+	97
	Palm grove	.1	236	86	95	96
D	Residential area	.1	42	97	99+	97

^a Average per man per minute.

terial. The plane was calibrated to deliver 10 pounds of granules (0.1 pound of active ingredient) per acre when a 30-foot swath was flown at 90 miles an hour. A dosage of 0.2 pound per acre was obtained by spacing the swaths 15 feet apart, and of 0.05 pound by mixing the treated granules with an equal quantity of untreated granules and flying the 30-foot swath.

Plots A and A-1 were treated during the middle of the day while a strong wind was blowing, and some of the smaller granules drifted outside the plots. Treatment of the other plots was begun very early in the morning and completed before 7:30 a.m.; throughout the period the air was calm. Control was based on 50 to 100 dipping counts before and 24 hours after application. Results of these tests appear in table 2.

TABLE 2.—Control of salt-marsh mosquito larvae with aerial applications of granules of Bayer 21/199 and BHC.

Insecticide	Plot	Dosage (lb./acre)	Pre-treatment count ^a	Percent reduction in 24 hours
Bayer 21/199	A	0.1	142	90
	B	.1	178	99+
	C	.05	620	95
BHC ^b	A-1	.1	153	0
	B-1	.1	237	41
	C-1	.2	90	0

^a Average number of larvae per dip.

^b Dosage of gamma isomer.

Bayer 21/199 gave high to almost complete control, whereas BHC had little or

no effect. A heavy thundershower occurred between the pretreatment and post-treatment counts in plots B and B-1, increasing the quantity of water, scattering the larvae over a wider area, and reducing the number per dip in the later counts. This factor increased the control indicated in these plots and probably explains the partial control with BHC in plot B-1, as no dead larvae were found.

SUMMARY.—Solutions of malathion in fuel oil plus cyclohexanone were applied by airplane to marsh and residential areas heavily infested with adults of *Aedes taeniorhynchus* (Wied.) and *A. sollicitans* (Wlkr.) that were highly resistant to chlorinated hydrocarbon insecticides. Treatments at 0.5, 0.25, and 0.1 pound of malathion per acre gave controls of 95 to more than 99 percent. The tests were run during the fall of the year, against mosquitoes that had developed slowly because of cool weather, and may not be indicative of the control obtainable with these dosages in the summer. Aerial applications of granules containing Bayer 21/199 at 0.05 to 0.1 pound per acre gave 90 to 99 percent control of larvae of the same species, whereas BHC at 0.1–0.2 pound of gamma was ineffective.

Reference Cited

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