

FIELD EFFECTIVENESS OF FIVE ORGANOPHOSPHORUS COMPOUNDS AS THERMAL FOGS¹

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INTRODUCTION. As space sprays are an integral part of mosquito control programs, continuing studies are conducted on the potential of new compounds in this type of application. In 1967, tests were conducted with Gardona,^{2,3} BAY 78182 [(o-Chlorophenyl)glyoxylonitrile oxime O,O-diethyl phosphorothioate],⁴ BAY 77488 (Phenylglyoxylonitrile oxime O,O-diethyl phosphorothioate),⁴ Abate⁵ and bromophos.^{6,7}

METHODS AND MATERIALS. The test area was previously described by Schoof *et al.* (1962), Jakob (1966) and Taylor and Schoof (1968). For all applications a Leco 120 thermal fog generator was used.

Treatments were given in the evening just after sundown. A malathion formulation of 6 oz./gal. of finished insecticide-No. 2 fuel oil was run as a standard before the test with the candidate insecticide. The latter formulated at 2, 4 or 6 oz./gal. of No. 2 fuel oil was then run twice. The line of travel was 1,300 feet, the time 3 minutes at 5 m.p.h. Discharge rate was 40 gal./hr. with approximately 2

gallons of formulation dispersed on each run. The prevailing southwest winds were from 0-5 m.p.h. during the test period and allowed the fog to drift through the test area. The average temperature during the tests was 78° F.; the average humidity 90 percent. Caged *Aedes aegypti*, *Aedes taeniorhynchus*, *Anopheles albimanus* and *Culex quinquefasciatus* were suspended 6 feet above the ground along three blocks 270 feet apart. The test cages were 150 and 300 feet from the line of discharge of the fog.

Approximately 15 minutes after each test run the cages were removed to the laboratory and the insects transferred to uncontaminated holding cages. Check insects were transported to the test site prior to each test and then returned to the laboratory grounds where they were suspended outdoors in the same manner as that for the treated mosquitoes. The mosquitoes were held for 24-hour mortality counts.

RESULTS. Data for 48 tests with the candidate compounds are given in Table 1.

Gardona gave outstanding kills of *Ae. aegypti* at 4 oz./gal. but was much less effective against the other species, particularly *C. quinquefasciatus*. Abate was ineffective at 6 oz./gal. against all species. Bromophos at the same dosage was most effective against *Ae. aegypti* but gave relatively poor kills of the other three species. On the other hand, Bay 78182 at the low concentration of 2 oz./gal. gave exceptionally high kills of *Ae. aegypti* and *A. albimanus* and was only slightly less effective against *C. quinquefasciatus*. However, it was much less effective against *Ae. taeniorhynchus*. BAY 77488 at 2 oz./gal. was effective only against *A. albimanus*.

Thermal fogs of malathion gave comparable test results to those previously reported against *A. quadrimaculatus* and

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² Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or by the U. S. Department of Health, Education, and Welfare.

³ Furnished through the courtesy of Shell Chemical Company, New York, New York.

⁴ Furnished through the courtesy of Vero Beach Laboratories, Inc., Vero Beach, Florida.

⁵ Furnished through the courtesy of American Cyanamid Company, Princeton, New Jersey.

⁶ Furnished through the courtesy of Eli Lilly and Company, Greenfield, Indiana.

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TABLE I.—Percent mortality of caged adult female mosquitoes in thermal fog tests, 1967.

Insecticide	Oz./gal.	Test runs	<i>Ae. aeg.</i>		<i>Ae. taen.</i>		<i>A. alb.</i>		<i>Cu. quin.</i>		LD-50 Rats
			150'	300'	150'	300'	150'	300'	150'	300'	
Malathion	6	26	94	84	90	52	96	93	61	38	1,000
Gardona	4	10	98	87	80	25	71	51	30	7	5,000
Bromophos	6	16	85	70	44	40	66	61	62	45	3,000
Abate	6	8	46	9	7	1	15	9	31	1	>8,000
BAY 77488	2	6	66	45	58	41	93	76	24	14	8,000-10,000
BAY 78182	2	8	98	88	78	67	98	94	95	82	375-535

Ae. aegypti. However, neither *C. quinquefasciatus* nor *Ae. taeniorhynchus* was killed effectively at the 300-foot stations.

DISCUSSION. Of the five experimental candidate compounds tested, BAY 78182 at 2 oz./gal. was the most effective. Against *Ae. aegypti* and *A. albimanus* it was essentially equal to malathion at 6 oz./gal. It was markedly superior to that compound against *C. quinquefasciatus*. In contrast, BAY 78182 was definitely inferior to the standard against *Ae. taeniorhynchus*. Both Gardona and bromophos were more effective against *Ae. aegypti* than against the other three species, Gardona at 4 oz./gal. being slightly superior to the malathion standard. BAY 77488 at 2 oz./gal. was ineffective against all species except *A. albimanus* against which it was only slightly less effective than malathion and BAY 78182. Abate, despite the use of a concentration of 6 oz./gal. of toxicant, proved ineffective against all 4 species.

BAY 77488, BAY 78182 and Gardona were used at lower concentrations than standard so it appears probable that an increase to the 6 oz./gal. level might well improve the performance of these materials against those species that reflected inadequate kills. The four effective candidate compounds possess acute oral LD-50 levels to rats above 375 mg./kg. and except for BAY 78182, the acute oral LD-50 dosages are in the range of 3,000 to 10,000 mg./kg. Of particular interest is BAY 77488, the acute oral LD-50 for which is 8,000 to 10,000.

SUMMARY. In tests as thermal fogs

against caged *A. albimanus*, *C. quinquefasciatus*, *Ae. aegypti*, and *Ae. taeniorhynchus*, BAY 78182 at 2 oz./gal. was superior to the malathion standard of 6 oz./gal. against all species except *Ae. taeniorhynchus*. Gardona at 4 oz./gal. was superior to the standard against *Ae. aegypti* but inferior against the other three species.

BAY 78182 at 2 oz./gal. and Gardona at 4 oz./gal. were equivalent in effectiveness against *Ae. aegypti* and *Ae. taeniorhynchus* but the former was markedly superior against *A. albimanus* and *C. quinquefasciatus*. Bromophos at 6 oz./gal. was not effective against any species except *Ae. aegypti*, whereas BAY 77488 proved effective against *A. albimanus* only. Abate at 6 oz./gal. was ineffective against the four test species.

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