LOW VOLUME AERIAL APPLICATION OF TECHNICAL MALATHION FOR ADULT MOSQUITO CONTROL [1]

FRED W. KNAPP AND W. W. ROBERTS [2]
University of Kentucky, Lexington, Kentucky

Low-volume application of technical malathion has recently been used for the control of various forage crop insects, such as grasshoppers and the cereal leaf beetle. Messenger (1963) reported the advantages of this type of application in controlling rangeland grasshoppers. *American Aviation* (September 1964) reported that the U.S.D.A. Plant Pest Control Division further developed this method of applying malathion. With this information, it seemed logical that adult mosquitoes could be controlled by this method. Therefore, a test site was selected in Hopkins County, Kentucky, where the salt marsh mosquito, *Aedes sollicitans* (Walker), is a serious pest.

Four areas of 200 acres each, separated by several miles, were selected for test plots. Pretreatment counts of adult mosquitoes, made in order to insure that well populated areas were being used, and to afford a basis for comparison, were taken by counting the total number of mosquitoes attracted to a person in 60 seconds. At least two persons were involved in each count. Four to five counts were made in the middle area of each test plot. Counts were made up to midnight two nights prior to treatment and several times the day before treatment. Counts were continued 24 hours after treatment. All mosquitoes collected were identified as *Aedes sollicitans*.

A Stearman plane equipped with four 73° flat fan tee jet nozzles (730154) on each wing was used to apply the 95 percent technical malathion (10.2 pounds active per gallon). The nozzles were located at the end of the boom and at 36-inch intervals. The boom extended to each wing tip. The plane was equipped with a Pickell pump which was operated at 40 p.s.i. To purge air from the boom, the boom had a ¼-inch copper bleed line from each end of the boom, emptying into the spray tank. A 1-inch plastic bypass line was placed between the pump inlet and the pump outlet line to recycle the malathion through the pump. This recycling was to prevent excess foaming, increase temperature and stabilize the flow rate of technical malathion.

Calibration of the nozzles was made at 40 p.s.i. at a speed of 85 m.p.h. and a height of approximately 60 feet. The eight nozzles (4 per wing) delivered 4.5 fluid ounces of technical malathion per acre, or 5.3 ounces of actual malathion per acre. When the inboard nozzle was removed from each wing the delivery rate was 2.6 fluid ounces, or 3.0 ounces actual malathion per acre.

At 6:15 a.m. on the morning of June 25, 1964, two test plots were sprayed with the higher dosage of 5.9 ounces per acre. The speed and pressure were the same as at calibration. Since the terrain was very rough and no flagmen were used, the acreage sprayed was determined only by timing. Owing to the height of the trees in the test plots, the plane was flown at approximately 125 feet from the ground for safety purposes. Conditions were good for aerial application; however, because of the additional height of the plane, a wider swath was obtained than was desired. This was compensated for by overlapping each swath in order to apply the correct amount of material per acre.

By the time the first two test plots were sprayed and the two inboard nozzles were

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[2] Technical agriculturist in research and development, American Cyanamid Company.

removed in preparation for the lower dosage, the wind speed was 8 to 10 miles per hour. Even though spraying conditions were not ideal, spraying was continued since the plane would not be available again for several days.

The authors were at the first test plot sprayed and were unable to observe the other plots while spraying was in progress. In the area observed, a very fine spray pattern was noted on the windshield of a car and also on petri dishes placed in various locations; even under a canopy of a large tree. No spray particles, however, could be felt upon the observers themselves.

Adult mosquito kill was not noticeable immediately, but more mosquito activity was noticed a few minutes after spraying. Several observations were made throughout the day. The mosquito population did not diminish until 9 to 10 hours after treatment in both areas receiving the higher dosage rates. However, it is possible that mosquitoes were killed and could not be found in the debris as other large insects such as Diptera (Sarcophagidae, Calliphoridae, Muscidae, Tabanidae and other), Hymenoptera, Coleoptera, Lepidoptera (adults and larvae) were killed within 2 to 3 hours after treatment. A decrease of grasshoppers was noticed the day after treatment.

To illustrate further the effectiveness of the treatment, swarms of mosquitoes would engulf a person in any of the areas prior to treatment. Observers had tried to sit on the steps of a church in the test area before treatment but could not endure the swarms of mosquitoes for more than 1 to 2 minutes. By evening the same observers were able to sit on the steps for 7 minutes without seeing one mosquito. Mosquitoes were found, however, in deep grassy areas and in thick, wooded foliage areas. By the following morning the mosquito population was beginning to increase to the number found before treatment. This was probably due to migration from the adjacent untreated areas and the denser foliage areas which the spray did not penetrate.

In the areas of the lower dosage, mosquito reduction was not so drastic, and any noticeable reduction was seen several hours longer after treatment than in the higher dosage.

In both treatment levels, however, it was thought that the amount per acre was far less than anticipated, owing to (1) the height of the aircraft thus covering more area per swath and (2) the wind activity when applying the lower dosage.

Laboratory-reared guinea pigs were placed in the area to be treated and received a direct application of the technical malathion. No injury was observed to the animals. Both beef animals and mules received direct applications of malathion in the aerial applications. After treatment the animals did not appear to have either flies or mosquitoes on them.

No visible damage to foliage of trees, red clover, lespedeza and grass was observed.

This test indicates that a low-volume application of technical malathion by aircraft will kill adult salt marsh mosquitoes. Whether adequate reduction will result depends upon (1) compete coverage of a larger area than was used in this test and (2) finding a way to penetrate deep inaccessible wooded areas by aerial application.

This type of application should, however, prove valuable in any large-scale mosquito control program owing to the reduced cost of such application. It would also be looked upon favorably by the public because less insecticide would be used and, also, the insecticide used would be of low mammalian toxicity with short residual properties.

As shown in this work, low-volume application of technical malathion may very well be used in the future for controlling other insects in an area control program. Also, it appears possible to make low-volume aerial applications for control of livestock insect pests.

Literature Cited

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