

SUSCEPTIBILITY OF A FLORIDA STRAIN OF *Aedes taeniorhynchus* (WIEDEMANN) TO INSECTICIDES¹

G. A. MOUNT, D. A. DAME AND C. S. LOFGREN

Entomology Research Division, Agr. Res. Serv., USDA, Gainesville, Fla. 32601

ABSTRACT. The larvae and adults of the F₁ generation of a field-collected strain of *Aedes taeniorhynchus* (Wiedemann) from Brevard County, Florida, were 46 and 23 times, respectively, as resistant to malathion (LC₅₀ level) as compared with a susceptible laboratory strain

of the same species. However, no resistance to naled, fenthion, propoxur, tetramethrin, or Abate® (O,O' (thiodi-*p*-phenylene) O,O,O',O'-tetramethyl phosphorothioate) was shown by the field-collected strain.

Because of the widespread use of malathion and naled for control of adult mosquitoes in Florida, there is continued interest in the susceptibility of various species of mosquitoes to insecticides. We are especially interested in populations of *Aedes taeniorhynchus* (Wiedemann) in Brevard County because of our extensive field testing with promising insecticides and equipment in this area of Florida.

Resistance of *A. taeniorhynchus* to malathion in Brevard County was first reported by Gahan *et al.* (1966) and was confirmed by Rathburn and Boike (1967) and by Lofgren *et al.* (1967). However, more recent tests by Boike and Rathburn (1969) suggested that *A. taeniorhynchus* in this area might be showing an increase in susceptibility to malathion. Then in August 1970, we attempted to use malathion against *A. taeniorhynchus* in field tests with a new rotary atomizer (Mount *et al.* 1971). In these tests, malathion gave no control so we changed to fenthion and obtained good control with the equipment. Because of these poor results with malathion, we decided to reappraise the susceptibility of *A. taeniorhynchus* from Brevard County to various insecticides.

PROCEDURES. Adult female mosquitoes were collected in a citrus grove near Allenhurst and returned to the Gainesville laboratory. Here they were offered a blood

meal, and eggs were collected on moist oviposition medium (sphagnum moss). After two months, the eggs were hatched and reared by using the same procedures used for our laboratory strain of *A. taeniorhynchus*. These F₁ progeny were then used in all the susceptibility tests reported in this paper. Our susceptible laboratory strain of *A. taeniorhynchus* was included in the tests for comparison.

Tests of susceptibility to larvicides were made by placing groups of 25 fourth instar larvae in glass jars containing 250 ml of 0.3 percent saline water (our standard rearing medium for *A. taeniorhynchus*) that had been treated with various concentrations of insecticides in acetone solution. Mortality of the larvae was observed and recorded after 24 hours. Larvae not exposed to chemicals showed less than 1 percent mortality. Duplicate jars of each concentration were tested; however, only one test was made because of the limited numbers of larvae of the Allenhurst strain.

Tests of adult susceptibility were made by exposing groups of 25 adult female mosquitoes in a wind tunnel to contact sprays containing a range of concentrations of each insecticide. A description of the wind tunnel and procedures used is given by Mount *et al.* (1970). Knockdown and mortality counts were taken 1 and 24 hours after exposure, respectively. Adult female mosquitoes not exposed to chemicals showed only 2 percent mortality. Three tests were made with malathion, and either one or two tests were made with the other adulticides.

¹ This paper reports results of research only. Mention of a pesticide or a proprietary product in this paper does not constitute a recommendation or an endorsement of this product by the U. S. Dept. of Agriculture.

TABLE 1.—Susceptibility of a native strain of *A. taeniorhynchus* (Allenhurst, Brevard Co., Fla.) to larvicides compared with the Gainesville laboratory strain of the same species.

Larvicide	Strain	Twenty-four hour lethal concentration (ppm)		
		LC ₅₀	LC ₉₀	LC ₉₉
Malathion	Allenhurst	0.88	2.6	6.4
	Laboratory	.03	.06	.09
Naled	Allenhurst	.1	.2	.3
	Laboratory	.06	.07	.09
Fenthion	Allenhurst	.003	.005	.008
	Laboratory	.003	.005	.007
Abate	Allenhurst	.0017	.0026	.0036
	Laboratory	.0011	.0015	.002

RESULTS AND DISCUSSION. The tests of the larvicides (Table 1) indicated that the Allenhurst strain of *A. taeniorhynchus* was still highly resistant to malathion (28, 46, and 71 times as resistant as the Gainesville laboratory strain at the LC₅₀, LC₉₀, and LC₉₉ levels, respectively). However, the LC₉₀ of 2.6 ppm for the Allenhurst strain is not nearly as high as the LC₉₀ of 17.4 ppm reported by Gahan *et al.* (1966); however, this difference may result from extrapolation of the data in the earlier report rather than from any real change in the native population of *A. taeniorhynchus*. (In our tests, the larvae from both strains were exposed to concentrations of malathion that produced a complete range of

mortality; therefore, extrapolation was unnecessary.) The susceptibilities of the Allenhurst and Gainesville laboratory strains of *A. taeniorhynchus* to naled, fenthion, and Abate® (*O,O'*-(thiodi-*p*-phenylene) *O,O,O',O'*-tetramethyl phosphorothioate) differed only slightly.

The tests of adulticides (Table 2) also showed a high degree of resistance to malathion in the Allenhurst strain of *A. taeniorhynchus* (13, 23, and 36 times as resistant as the Gainesville laboratory strain at the LC₅₀, LC₉₀, and LC₉₉ levels, respectively). There were no substantial differences in the susceptibilities of adults of the two strains to naled, fenthion, propoxur, and tetramethrin.

TABLE 2.—Susceptibility of a native strain of *A. taeniorhynchus* (Allenhurst, Brevard Co., Fla.) to adulticides compared with the Gainesville laboratory strain of the same species.

Adulticide	Strain	One hour knockdown concentration (%)	Twenty-four hour lethal concentration (%)		
		KC ₅₀	LC ₅₀	LC ₉₀	LC ₉₉
Malathion	Allenhurst	1.9	0.24	0.79	2.1
	Laboratory	.058	.019	.034	.055
Naled	Allenhurst	.032	.013	.027	.048
	Laboratory	.035	.016	.031	.054
Fenthion	Allenhurst	>.025	.007	.014	.024
	Laboratory	>.025	.006	.011	.019
Propoxur	Allenhurst	.012	.008	.013	.019
	Laboratory	.013	.008	.014	.021
Tetramethrin	Allenhurst	.013	.014	.031	.06
	Laboratory	.01	.014	.028	.05

We concluded that the population of *A. taeniorhynchus* in the Allenhurst area of Brevard County has changed little in its susceptibility to malathion in the past five years. Our data show levels of resistance to malathion similar to those reported by Gahan *et al.* (1966) and Lofgren *et al.* (1967). Therefore, from our results and those reported during the past five years, the population of *A. taeniorhynchus* in Florida (excluding northwest Florida) is from 1.4 to 74 times as resistant to malathion as laboratory strains that have never been intentionally exposed to this insecticide. The average resistance in larvae is about 20 times greater; in adults, it is 14 times greater. Research with a colonized strain of *A. taeniorhynchus* that is resistant to malathion could yield valuable information about the degree of resistance that could be developed to malathion and adult cross-resistance patterns to other insecticides.

References Cited

- Boike, Arthur H., Jr., and Rathburn, Carlisle B., Jr. 1969. Laboratory tests of the susceptibility of mosquito larvae to insecticides in Florida. Rpt. 40th Ann. Mtg. Fla. Anti-Mosq. Assn. pp. 61-65.
- Gahan, James B., Smith, Carroll N. and Glancey, B. Michael. 1966. Resistance in Florida and countermeasures involving chemicals. Mosq. News 26(3):330-337.
- Lofgren, C. S., Ford, H. R., Glancey, B. M. and Mount, G. A. 1967. Resistance of *Aedes taeniorhynchus* (Wiedemann) to malathion. Rpt. 38th Ann. Mtg. Fla. Anti-Mosq. Assn. pp. 53-58.
- Mount, G. A., Baldwin, K. F. and Lofgren, C. S. 1970. Effectiveness of seven promising mosquito adulticides. Mosq. News 30(2):213-214.
- Mount, G. A., Pierce, N. W., Lofgren, C. S. and Salmela, Jack. 1971. Droplet size and kill of adult mosquitoes with ultralow volume aerial sprays dispersed from a rotary-cylinder atomizer. Mosq. News 31(3):326-330.
- Rathburn, Carlisle B., Jr. and Boike, Arthur H., Jr., 1967. Studies in insecticide resistance in Florida mosquitoes. Mosq. News 27(3):377-382.

NOTICE TO CONTRIBUTORS

Members of the AMCA, please make sure that your agency uses the current charge of \$20.00 a page in calculating page charges for purchase orders.

This change went into effect March 1, 1971, after several announcements of the change during the preceding year. It is also given on the inside back cover of each issue. However, several agencies have continued to use the old figure of \$15.00 in their estimates, thus causing confusion and extra work both in their bookkeeping and in ours.

The charge for non-members of the AMCA is \$35.00 for all pages.