# SUSCEPTIBILITY OF *PSOROPHORA CONFINNIS* AND *ANOPHELES QUADRIMACULATUS* OF THE MISSISSIPPI DELTA TO FOUR INSECTICIDES

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ABSTRACT. Comparative tests using the WHO test kit were conducted on random samples of adult female populations of *P. confinnis* and *A. quadrimaculatus* from the North, Central and South Mississippi Delta.

From the accrued data it was found that dieldrin-resistance and DDT-susceptibilty were present in both species, and exposure to Baytex and Bay 41839 yielded higher mortalities than did either dieldrin or DDT.

INTRODUCTION. Dieldrin resistance in *Anopheles quadrimaculatus* Say and *Psorophora confinnis* (Lynch-Arribálzaga) of Mississippi was reported by Mathis *et al.* (1955, 1956) in Bolivar County. Tests conducted by Ouzts and Hutchins (1962) indicated that this resistance was uniform in *A. quadrimaculatus* throughout the entire Delta region of Mississippi.

The purpose of this study was to determine the present level of dieldrin resistance in those species, and ascertain mortality levels for DDT, Baytex and Bay 41831.

MATERIALS AND METHODS. Adult females of *A. quadrimaculatus* and *P. confinnis* were collected in Tunica, Desoto, Bolivar, Washington, Sunflower, Warren, and Issaquena Counties, representing north, central and south parts of the Mississippi Delta.

The apparatus used was the WHO test kit furnished by the World Health Organization of Geneva, Switzerland (PAHO, 1959). This kit is designed to permit field workers to evaluate the mortality of insecticidal residues upon field-collected adult mosquitoes and to detect any change in this effect.

Five concentrations of each insecticide were used in testing. Sheets of mimeograph paper 120 mm. x 150 mm. were impregnated with each concentration and acetone-treated sheets were used as checks. Each treatment was replicated 18 times and 20 mosquitoes were tested in each replication. Test specimens were held at least 12 hours to allow for natural mortality. A sugar solution of 7 grams of table sugar in 200 ml. of tap water absorbed in a sterile cotton pad was furnished for food. At the end of the holding period, 20 specimens were placed in a single exposure tube. At the end of the desired exposure period (3 minutes–8 hours), the mosquitoes were transferred to holding cages as suggested by Mathis *et al.* (1959).

After 24 hours, the mortalities of the tested specimens were recorded and adjusted according to Abbott's (1925) formula. In accordance with the WHO kit instructions, specimens were considered dead if they were unable to rest on the sides of the holding cages.

RESULTS AND DISCUSSION. No appreciable differences in response were found among *P. confinnis* in the areas from which it was collected. Tests on this species indicated the presence of dieldrin resistance in the North and South Delta. This is the first report of dieldrin resistance in this species in areas other than Bolivar County (Central Delta). Exposure of *P. confinnis* to DDT (Table 1) yielded approximately 100 percent mortality at the high concentrations (4.0 percent), and diminished uniformly with reduced concentrations.

Exposure of *P. confinnis* to Baytex concentrations indicated a high degree of susceptibility. It may be seen in Table 2 that only a 5-minute exposure was needed to obtain 100 percent mortality at the 0.5

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TABLE 1. Adjusted 24-hour mortality of female *P. confinnis* after 1 hour exposure to DDT-acetone concentrations.

| Percent of toxicant | Percent mortality | | |
|---|---|---|---|
| | North Delta | Central Delta | South Delta |
| 0.25 | 21.0 | 20.0 | 16.0 |
| 0.5 | 32.0 | 31.4 | 29.5 |
| 1.0 | 52.0 | 55.5 | 64.0 |
| 2.0 | 87.5 | 80.0 | 90.5 |
| 4.0 | 100 | 98.0 | 100 |

TABLE 2. Adjusted 24-hour mortality of female *P. confinnis* after 5 minute exposure to Baytex-acetone concentrations.

| Percent of toxicant | Percent mortality | | |
|---|---|---|---|
| | North Delta | Central Delta | South Delta |
| 0.125 | 37.0 | 40.0 | 38.0 |
| 0.25 | 88.0 | 76.0 | 80.0 |
| 0.5 | 100 | 100 | 100 |
| 1.0 | 100 | 100 | 100 |
| 2.0 | 100 | 100 | 100 |

TABLE 3. Adjusted 24-hour mortality of female *P. confinnis* after 8 hour exposure to dieldrin-acetone concentrations.

| Percent of toxicant | Percent mortality | | |
|---|---|---|---|
| | North Delta | Central Delta | South Delta |
| 0.1 | 0.0 | 4.0 | 0.0 |
| 0.2 | 10.0 | 12.0 | 8.0 |
| 0.4 | 12.5 | 11.0 | 14.5 |
| 0.8 | 23.0 | 25.0 | 25.0 |
| 1.6 | 37.0 | 41.5 | 33.0 |

TABLE 4. Adjusted 24-hour mortality of female *A. quadrimaculatus* after 3 hours exposure to dieldrin-acetone concentrations.

| Percent of toxicant | Percent mortality | | |
|---|---|---|---|
| | North Delta | Central Delta | South Delta |
| 0.1 | 7.2 | 8.5 | 10.7 |
| 0.2 | 12.0 | 15.0 | 19.0 |
| 0.4 | 14.49 | 16.0 | 22.0 |
| 0.8 | 22.0 | 19.0 | 28.0 |
| 1.6 | 26.0 | 28.0 | 31.0 |

TABLE 5. Adjusted 24-hour mortality of female *A. quadrimaculatus* after 1 hour exposure to DDT-acetone concentration.

| Percent of toxicant | Percent mortality | | |
|---|---|---|---|
| | North Delta | Central Delta | South Delta |
| 0.25 | 9.0 | 10.0 | 10.0 |
| 0.5 | 23.0 | 25.5 | 31.0 |
| 1.0 | 63.0 | 55.0 | 70.0 |
| 2.0 | 88.0 | 93.0 | 91.0 |
| 4.0 | 96.0 | 100.0 | 100.0 |

percent concentration. Bay 41831 gave 100 percent mortality at the 0.5 percent concentration after a 1-hour exposure. DDT gave 100 percent mortality only at the 4.0 percent concentration, and only after an exposure of 1 hour. An 8-hour exposure to 1.6 percent dieldrin concentrations gave an average mortality of 37.2 percent in this species (Table 3).

Tests with *A. quadrimaculatus* indicated that dieldrin resistance was still present in the Delta region (Table 4). DDT susceptibility (Table 5) did not differ appreciably from that shown by Ouzts and Hutchins (1962). A 2-hour exposure of *A. quadrimaculatus* females to Bay 41831 concentrations gave 100 percent mortality at the 0.5 percent concentrations, as well as 1.0, 2.0, and 4.0 percent. Baytex concentrations yielded high mortalities at the low levels after a short exposure. Mortalities of 100 percent were obtained at the 0.3 percent concentrations after a 35-minute exposure (Table 6).

From the data accrued in tests on *A. quadrimaculatus* and *P. confinnis,* it was seen that dieldrin-resistance and DDT-susceptibility was present in both species. Exposure to 2 organophosphate insecticides, Baytex and Bay 41839, yielded higher mortalities at lower concentrations than did either dieldrin or DDT. Baytex performed more satisfactorily than the other 3 insecticides tested, in that only a

TABLE 6. Adjusted 24-hour mortality of female *A. quadrimaculatus* after 35 minutes exposure to Baytex-acetone concentrations.

| Percent of toxicant | Percent mortality | | |
|---|---|---|---|
| | North Delta | Central Delta | South Delta |
| 0.125 | 35.0 | 30.0 | 30.0 |
| 0.25 | 93.0 | 88.0 | 90.0 |
| 0.3 | 100 | 100 | 100 |
| 1.0 | 100 | 100 | 100 |
| 2.0 | 100 | 100 | 100 |

5-minute exposure was needed to obtain 100 percent mortality in *P. confinnis*, and a 35-minute exposure gave the same mortality in *A. quadrimaculatus*. The difference in length of exposure is attributed to the differences in resting habits which characterize the two species.

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## EDITORIAL COMMENT

Authors of papers submitted to *Mosquito News* are encouraged to use the metric system. In reporting results of laboratory investigations conversion to metric equivalents is particularly desirable. The following conversion factors may be useful:

| | | |
|---|---|---|
| 1 inch | = | 2.54 cm |
| 1 yard | = | 0.914 m |
| 1 mile | = | 1.61 km |
| 1 lb. | = | 453.6 g |
| 1 gal. (U.S.) | = | 3.785 liters |
| 1 acre | = | 0.405 hectare |
| 1 lb/acre | = | 1.12 kg/hectare |
| 1 cm | = | 0.394 in. |
| 1 m | = | 3.28 ft=1.094 yards |
| 1 km | = | 0.621 mile |
| 1 kg | = | 2.2 lb |
| 1 liter | = | 0.264 gal (U.S.) |
| 1 hectare | = | 2.47 acres |