

SUSCEPTIBILITY PATTERN OF A FIELD STRAIN OF *CULEX P. QUINQUEFASCIATUS* FROM SOUTHERN CALIFORNIA¹

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Since the advent of chlorinated hydrocarbon insecticides in the late forties, DDT and toxaphene exclusively have been used for mosquito control in the Coachella Valley of southern California. Since parts of this valley are intensively farmed, large numbers of mosquitoes frequently breed in irrigated farms. Mosquitoes breeding in agricultural areas or seeking food and shelter are not only exposed to mosquito larvicidal treatments but also to chemicals used for the control of phytophagous insects.

During the late 1961 season, DDT treatments failed to control *Culex p. quinquefasciatus* larvae in a polluted pool adjacent to a date garden. Larvae collected from this breeding source were tested in the laboratory; standard techniques designed for screening of mosquito larvicides were used (Mulla *et al.*, 1960, 1961, 1962). These larvae were found to be tolerant to DDT. Subsequently, the strain was colonized in the laboratory and its susceptibility level to various compounds was determined.

METHODS AND MATERIALS. Laboratory tests were performed in the same manner as in earlier studies dealing with susceptible strain (Mulla *et al.*, 1960, 1961, 1962). Acetone solutions were prepared using technical grade compounds. Proper dilutions were made and the aliquots of these were added to 6-oz. wax-paper cups containing 100 ml. of tap water and 25 4th instar larvae. The larvae were exposed to the toxicants at a temperature of 78–80° F.

Each cup was replicated 3 or 4 times and each material was evaluated on 3 or 4 occasions.

The resistant strain was reared in the laboratory for 4 months before the tests were conducted.

RESULTS AND DISCUSSION. The dosage response lines of various insecticides tested against a laboratory susceptible strain and the DDT tolerant strain are presented in Figure 1. The dosage response lines of methyl parathion, Baytex® (*O,O*-dimethyl *O*-3-methyl-4-methylthiophenyl phosphorothioate), Sumithion® (*O,O*-dimethyl *O*-3-methyl-4-nitrophenyl phosphorothionate), AC-5727 (*m*-isopropylphenyl *N*-methylcarbamate) and Ortho 5305 (3-*sec*-butylphenyl *N*-methylcarbamate) within the range of experimental variation are essentially the same. The dosage response lines of parathion, Ortho 5353 (3-*sec*-amylphenyl *N*-methylcarbamate) and malathion for the tolerant strain have moved slightly to the right indicating a slight degree of vigor tolerance. However, the lines for dieldrin and DDT have shifted considerably to the right, indicating slight to intermediate levels of tolerance to these two materials.

The degree of tolerance in the tolerant strain at both the LD₅₀ and LD₉₀ levels as compared with the susceptible laboratory strain are presented in Table 1. Tolerance to DDT was greater than to any of the other materials.

It is obvious that *Culex p. quinquefasciatus* in the Coachella Valley has not acquired marked tolerance to the organophosphates, despite the fact that large quantities of these materials are used for agricultural pest control in areas where this species might frequently be exposed. The resistant strain is at most localized at the present time, as was reported for this

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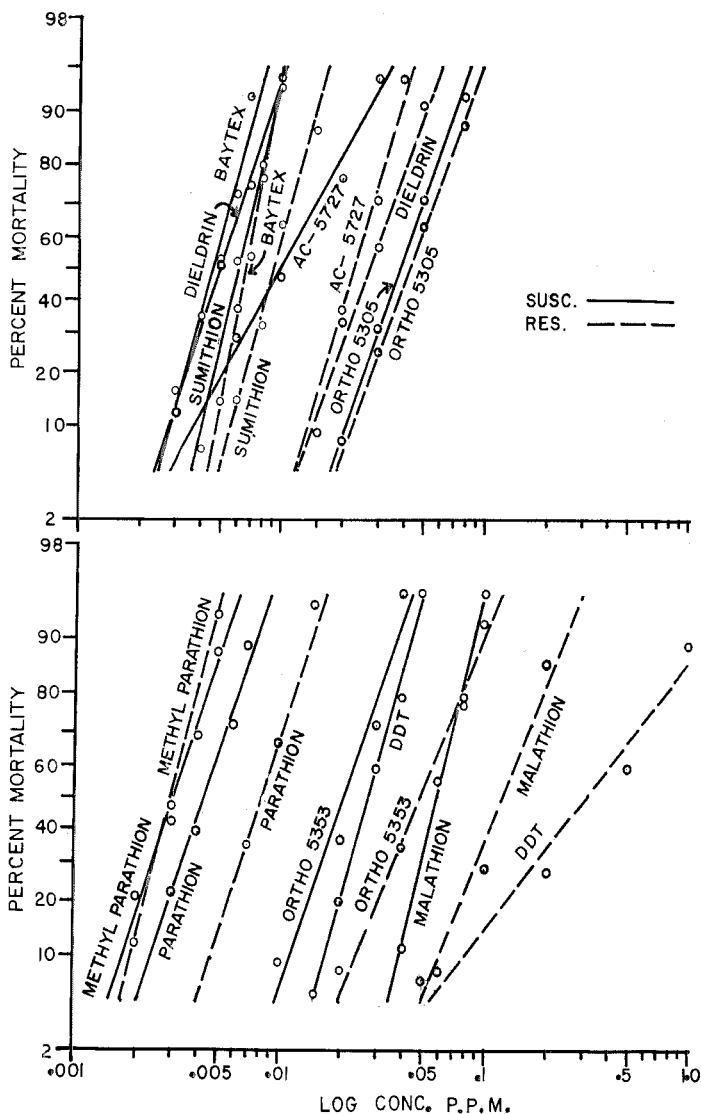


FIG. 1.—Dosage response lines of several organochlorine, organophosphate and carbamate insecticides against a laboratory susceptible and a DDT resistant field strain of *Culex p. quinquefasciatus*.

TABLE 1.—Activity of some insecticides against a susceptible laboratory strain and a DDT resistant field strain of *Culex pipiens quinquefasciatus* (from Coachella Valley).

| Compound | Susceptible | | Resistant | | Fold tolerance ¹ | |
|------------------|------------------|------------------|------------------|------------------|-----------------------------|------------------|
| | LC ₅₀ | LC ₆₀ | LC ₅₀ | LC ₆₀ | LC ₅₀ | LC ₆₀ |
| Methyl parathion | 0.003 | 0.0054 | 0.003 | 0.0047 | 1.0 | 1.0 |
| Baytex | 0.0046 | 0.0074 | 0.0068 | 0.0094 | 1.4 | 1.3 |
| Parathion | 0.0043 | 0.008 | 0.0082 | 0.015 | 2.0 | 2.0 |
| Dieldrin | 0.005 | 0.009 | 0.037 | 0.05 | 7.4 | 5.5 |
| Sumithion | 0.0062 | 0.0094 | 0.0092 | 0.015 | 1.5 | 1.7 |
| AC-5727 | 0.01 | 0.026 | 0.023 | 0.038 | 2.3 | 1.5 |
| Ortho 5353 | 0.021 | 0.038 | 0.05 | 0.1 | 2.4 | 3.0 |
| DDT | 0.028 | 0.045 | 0.32 | 1.2 | 11.0 | 27.0 |
| Ortho 5305 | 0.038 | 0.07 | 0.046 | 0.082 | 1.2 | 1.2 |
| Malathion | 0.06 | 0.09 | 0.12 | 0.25 | 2.0 | 3.0 |

¹ Tolerance level of 1.0 indicates similar susceptibility.

species from other parts of the country (Hedeem 1963).

It should be pointed out that some reversal in tolerance may have occurred during the rearing of this Coachella Valley strain before actual evaluation studies in the laboratory. But the degree of such a reversal (if any) is considered to be rather small. Studies on the susceptibility pattern of laboratory colonies selected with organochlorine insecticides will bear this out. The period required for appreciable reversal is generally long.

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PARASITIC HYDRACARINA OBSERVED ON MOSQUITOES AT THE WICHITA MOUNTAINS WILDLIFE REFUGE

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While studying the activities of mosquitoes at the Refuge during the summer of 1958 and 1959, a number of adult mosquitoes and a few larvae were observed to be parasitized by Hydracarina. The regular occurrence of this phenomenon at the headquarters area collecting station led to further study and the recording of Hydracarina on other species of mosquitoes. The results of these observations are presented below.

The Refuge is a tract of 59,020 acres, embracing the major portion of the Wichita Mountains in southwestern Oklahoma, and lies entirely within Comanche County.

MATERIALS AND METHODS. Larval and adult mosquitoes were examined routinely for parasites with a stereoscopic microscope under 60X magnification. A few larvae, with parasitic water mites attached, were observed for several days in isolation vials