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COMPARATIVE TESTS OF FIVE ORGANO-PHOSPHOROUS INSECTICIDES AGAINST LAB-BRED AND WILD CAUGHT LARVE OF *ANOPHELES STEPHENSI MYSORENSIS* IN SOUTHERN IRAN

A. V. Manouchehri,
M. Khademi
N. Eshghi

ABSTRACT

Five organo-phosphorous compounds were tested against lab-bred and wild caught larvae of *Anopheles stephensi mysorensis* at the Kazeroun Medical Research Station, southern Iran, during May-June, 1974. This study showed that as the larvae grew their tolerance to the insecticides tested increased up to 5 times more than that of day-old larvae. When late 3rd and early 4th instar larvae of wild caught *An. stephensi mysorensis* were tested against organo-phosphorous compounds, the LC50's increased up to 2 times more than those of the same instar larvae of lab-bred mosquitoes of this species.

INTRODUCTION

During the past 20 years, southern Iran has been subjected to insecticide application inside houses for malaria control and, to some extent, for agricultural pest control. The area has been under Malathion and DDT spraying since 1967. In this area, *An. stephensi mysorensis* is resistant to DDT and Dieldrin and susceptible to Malathion (Manouchehri *et al.*, 1974a). Although there is a great deal of information about the susceptibility level of adults of this species, little information has ben published on the status of the susceptibility level of larvae of *An. stephensi mysorensis* to organopphosphorous compounds. This paper presents the results of tests of the susceptibility levels of different instars of lab-bred *An. stephensi mysorensis* and late 3rd and early 4th instars of wild caught larvae of this species.

MATERIAL AND METHOD

The larvae used were as follows :

1. Lab-bred larvae of *An. stephensi mysorensis.* This strain was originally collected from Chity village, Khesht, Kazeroun, southern Iran. It has been reared in the laboratory since 1962. The strain is resistant to DDT and Dieldrin, but has never experienced organo-phosphorous insecticides. Eggs are laid in spring water from Brakatake village near Kazeroun, and usually hatch within 24 hours. Susceptibility tests were conducted according to procedures recommended by the World Health Organization (1970).

Newly-hatched larvae were exposed to different concentrations of insecticides and the mortality rates were calculated. For each concentration, 4 replicants were used. Twenty-five larvae were placed in each of twnty-four 50 ml beakers containing 25 ml of water. One ml of the appropriate insecticide was pipetted into each of twenty-four 400 ml beakers containing 225 ml of spring water. The 25 ml of water containing the mosquito larvae were added to each test concentration 30 minutes after preparation. The tests were repeated at intervals of 24 hours for about 10 days until the larvae reached the pupal stage. The pupae were also exposed to the highest concentrations that have been prepared by WHO. The insecticides used were Malathion, Abate, Fenitrothion, Dursban and Bromophose.

2. Wild caught larvae of *An. stephensi mysorensis.* These were collected at Tolkharaki village, Khesht, Kazeroun, and were tested against five organo-phosphorous insecticides. The larvae were collected from standing water in a palm-growing area. This area has been sprayed with Malathion and DDT 2 times per year at the rate of 2 g/m^2 since 1967.

Mortality counts were recorded after 24 hours exposure. The larvae were considered dead if they could not be induced to move when probed in the siphon with a needle. Abott's formula was applied to correct for mortality when necessary (Abott, 1925). The larvae had been fed with Jerber (Merk Company, U.S.A.).

RESULTS AND DISCUSSION

The LC50's of Malathion, Abate, Fenitrothion, Dursban and Bromophose for different instars of lab-bred larvae of *An. stephensi mysorensis* are shown in Table 1. It is seen that, for all insecticides tested against larvae of *An stephensi mysorensis,* as the larvae grew their tolerance to insecticides increased. The LC50's for day-old larvae were about 0.074, 0.0014, 0.0041, 0.00063 and 0.0055 ppm for Malathion, Abate, Fenitrothion, Dursban and Bromophose respectively. When 4th instar larvae were tested against the above-named insecticides, the LS50's increased to 4, 3.5, 5.4, 2.5 and 5 times more than day-old larvae respectively.

When 3rd and 4th instar larvae of wild caught. *An. stephensi mysorensis,* collected at Tolkharaki, were tested against malathion, Abate, Dursban and Bromophose, the LC50's increased to 1.3, 1.9, 2 and 2 times respectively

more than lab-bred 3rd and 4th stage larvae of this species (Table 1). This shows that wild caught larvae tolerate the above-named larvicides better than lab-bred larvae. In the case of Fenitrothion, wild caught larvae were more susceptible, and the LC50 of lab-bred lavae was about 1.5 times more than that of wild caught larvae.

It has been reported that newly-molted 4th instars of *Anopheles quadrimaculatus* were more susceptible to DDT than 3rd instar larvae (Jones, 1957). In tests with *An. stephensi* and *An. atroparvous* larvae using DDT, Grams (1959) observed that after the 3rd molting there was a decrease in tolerance. In tests with *An. stephensi* larvae using sulphonamides it was observed that newly-molted 3rd and 4th instar larvae were more susceptible than were late 2nd and late 3rd instar larvae (Manouchehri *et al.*, 1974b). Using Malathion, Abate, Fenitrothion, Dursban and Bromophose, there were no significant differences betwen newly-molted late 1st and early 2nd, late 2nd and early 3rd, and late 3rd and early 4th stage instar larvae.

A delayed effect for all insecticides tested was observed in *An. stephensi mysorensis* larvae. When larvae were exposed to sub-lethal doses of Malathion (0.0625 ppm), Abate (0.0025 ppm), Fenitrothion (0.0125 ppm), Dursban (0.001 ppm) and Bromophose (0.0125 ppm) for 24 hours, after 24 hours recovery, the mortality for all insecticides increased and eventually the mortality rates were 48, 65, 36, 60 and 43% for Malathion, Abate, Fenitrothion, Dursban and Bromophose respectively. There was no significant difference in the sex ratio of emerged pupae from tested larvae and that of controls.

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TABLE 1

LC50's of five organo-phosphorous insecticides for lab-bred A. stephensi mysorensis larvae in Kazeroun, southern Iran

	LC50 (ppm X 10^4) for the following instars of lab-bred larvae										LC50 for wild caught larvae
Stage:	I			II		III		IV			III & IV
Days / Insecticide	0	1	2	3	4	5	6	7	8	9	
Malathion	740	700	700	720	750	1700	1730	1970	2100	2800	2600
Abate	14	12	16	22	24	24.5	27	42	46	49	62
Fenitrothion	41	38	43	62	75	160	170	185	195	215	120
Dursban	6.3	6	6.5	7.5	7.7	7.8	7.9	9	14	16	18
Bromophose	55	60	62	140	170	190	210	270	290	300	520