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COMPARATIVE OBSERVATION ON THE TOXICITY OF SOME COMMONLY USED PESTICIDES AGAINST LABORATORY-REARED AND WILD STRAINS OF *AEDES AEGYPTI* (L.)

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Five randomly selected pesticides (cypermethrin, monocrotophos, dimethoate, malathion and DDT) were tested against laboratory-reared (PCSIR strain) and the wild strain of *Aedes aegypti* (L.) to see if there was any degree of resistance/tolerance in the wild strain against these pesticides. Resistance ratios (R/S) were calculated by dividing the LC_{50} for the wild strain by the LC_{50} for laboratory-reared strain. These ratios (R/S) were X 1.33, X 1.36, X 2.18, X 2.83 and X 5 for monocrotophos, cypermethrin, dimethoate, malathion and DDT respectively. These data have shown some degree of tolerance in the wild strain in the following order.

DDT> malathion > dimethoate > cypermethrin > monocrotophos.

These studies indicate limited degree of resistance in case of DDT and malathion while no resistance against monocrotophos, cypermethrin and dimethoate which are not used as mosquito larvicides in this country, however, a limited level of tolerance is noticeable against them.

Key words: Pesticides, Toxicity, *Aedes aegypti* (L.).

Introduction

It has been proven that insects develop first the tolerance and later on the resistance against the pesticides used to kill them. The mechanism of this ability in insects has been well understood now [1-6].

Because of the extensive use of pesticides about 300 major pest species [7-10] (insect and mites) have been reported to develop resistance to one or more groups of pesticides.

Resistance is a serious problem threatening the continued effective control of many important pests and no satisfactory answer to this problem has yet been found inspite of the extensive work done in this field world over.

Resistance against DDT, dieldrin, malathion and some pyrethroids has been reported in *Aedes aegypti* (L.) [13-16] by various authors from the various region of the world. In Pakistan, except some scanty reports [17] about the limited degree of resistance in mosquitoes and house flies to commonly used pesticide resistance in local strain of insects.

In the present paper an attempt has been made to examine the toxicity values of five randomly selected pesticides (cypermethrin, monocrotophos, dimethoate, malathion and DDT) to see if there is any degree of tolerance/resistance against these pesticides in case of local strain of *Aedes aegypti* (L.) in Karachi. This study would be useful for the strategy and planning to get the most economical and effective pest control and also to avoid the use of unappropriate pesticides.

Materials and Methods

The colony of wild strain of *Aedes aegypti* (L.) was established as a temporary strain in the laboratory during the laboratory trials. The collection of the wild strain was arranged from various localities of Karachi city. The colony of PCSIR strain (standard strain) which served as a baseline reference strain was established 30 years ago in our laboratories.

The insecticides evaluated in the study are cypermethrin, monocrotophos, dimethoate, malathion and DDT. All of them are broad spectrum pesticides commonly used in our country.

One percent stock solution of these pesticides was prepared in acetone and further dilutions were made as per the needs. Trials were run on 4th instar larvae of both the strains by standard WHO method where specified concentrations of pesticides were prepared in 250ml water.

Twenty early 4th instar larvae were treated to each concentration of the pesticide and each concentration was run in duplicate. Each material was tested six times on different days. After 24 hrs of exposure, mortality reading was taken to determine LC_{50} values. The dosage mortality results were statistically analysed by probit analysis. Resistance ratios (R/S) were calculated by dividing the LC_{50} for the wild strain by LC_{50} of standard strain according to the method followed by Jaffery and Georghiou [18]. In the present studies resistance was considered only in case the ratio (R/S) exceeded X 10.

Results and Discussion

Figures 1-5 show the dosage mortality regression lines comparing both the standard and wild strains of *Aedes aegypti* (L.). The resistance ratios obtained by dividing the LC_{50} values for wild strain by LC_{50} values of standard strain clearly showed that the standard strain was at least 1.33, 1.36, 2.18, 2.83 and 5 times less susceptible to monocrotophos, cypermethrin, dimethoate, malathion and DDT respectively. In other words

the wild strain was tolerant to the test insecticides in the above mentioned order (Table 1).

As the ratios (R/S) of the tested pesticides remained below X 10, it can be inferred that the real level of resistance in the local wild strain of *Aedes aegypti* (L.) has not yet reached, however, there seems to be the development of tolerance against DDT and malathion which remained in use during the recent past. It may be noted that the tolerance is known to be derived from the accumulation of multiple genes of nonspecific and comparatively slight effect [13].

With the above background in view, it can be concluded that wild strain of *Aedes aegypti* (L.) possesses the potential to develop resistance if extensive use/selection pressure of these pesticides is not avoided in future pest control programme in this city. There seem to be no danger of resistance in case of cypermethrin, monocrotophos and dimethoate as they are not used against *Aedes aegypti* (L.) larvae and adults in the urban areas. The larvae of this species breed in the fresh water where the level of the residues of these pesticides cannot be higher.

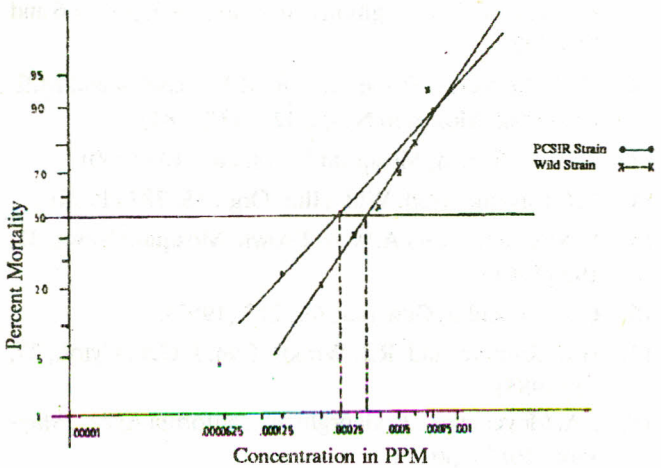

Fig. 1. Dosage mortality lines showing toxicity of cypermethrin against fourth instar larvae of *Aedes aegypti* (L.)

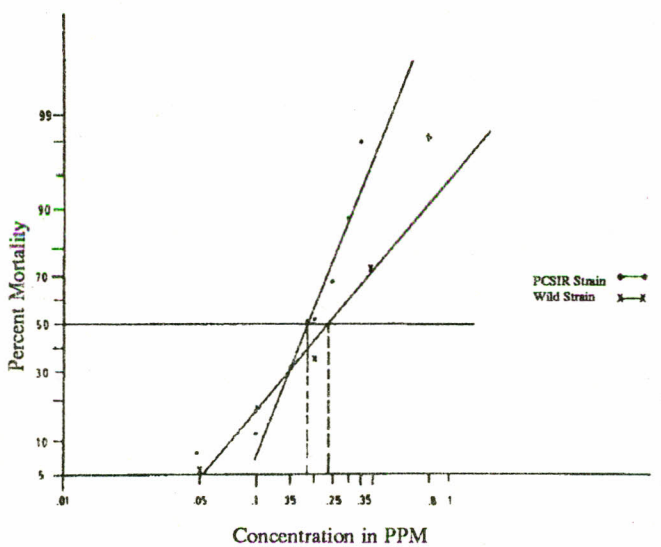

Fig. 2. Dosage mortality lines showing toxicity of monocrotophos against fourth instar larvae of *Aedes aegypti* (L.)

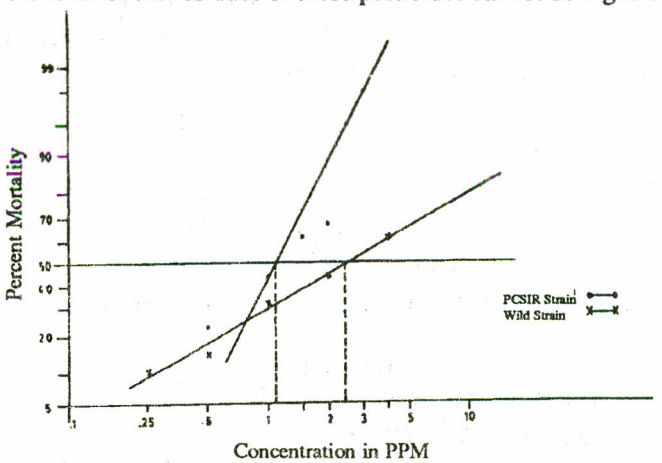

Fig. 3. Dosage mortality lines showing toxicity of dimethoate against fourth instar larvae of *Aedes aegypti* (L.).

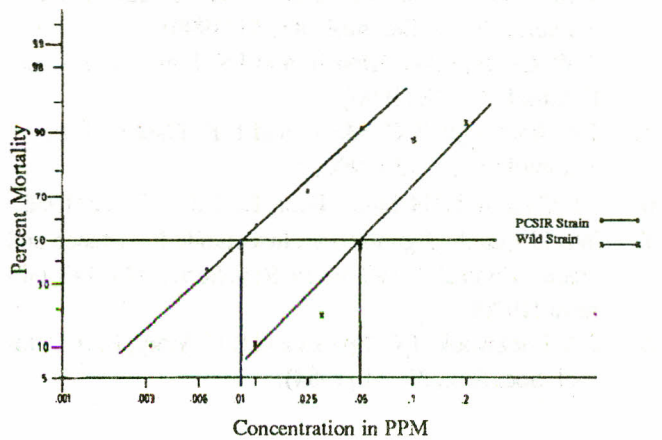

Fig. 4. Dosage mortality lines of DDT against fourth instar larvae of *Aedes aegypti* (L.).

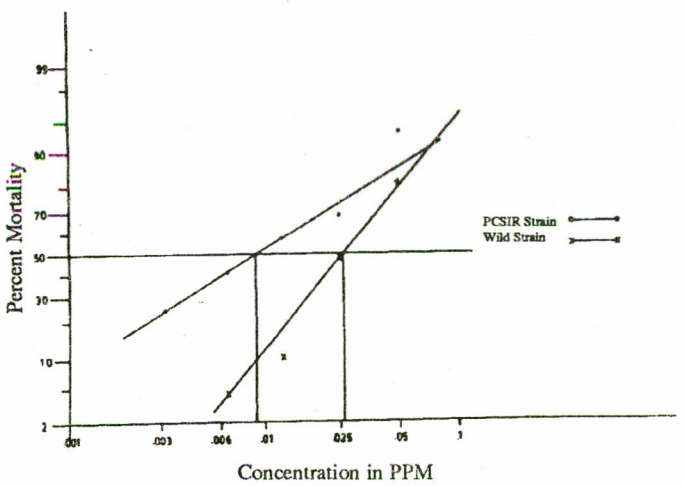

Fig. 5. Dosage mortality lines of malathion against fourth instar larvae of *Aedes aegypti* (L.).

TABLE 1. RELATIVE TOXICITIES OF FIVE SELECTED INSECTICIDES TO FOURTH INSTAR LARVAE OF PCSIR (STANDARD) STRAIN AND WILD STRAIN OF *AEDES AEGYPTI* (L.).

S.No.	Insecticides	Standard strain			Wild strain			Resistance Ratio* (R/S)
		LC_{50} (PPM)	Slope	Coefficient of correlation	LC_{50} (PPM)	Slope	Coefficient of correlation	
1.	DDT	0.01	1.0	0.99	0.05	1.1	0.93	X 5.0
2.	Malathion	0.0092	0.8	0.99	0.026	1.4	0.96	X 2.83
3.	Dimethoate	1.1	2.2	0.97	2.4	0.7	0.98	X 2.18
4.	Cypermethrin	0.00025	1.3	0.99	0.00034	1.7	0.99	X 1.36
5.	Monocrotophos	0.18	2.6	0.86	0.24	1.3	0.98	X 1.33

* Resistance ratio (R/S) = LC_{50} of wild strain% LC_{50} of standard strain.

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