STUDY FOR COMPARING THE EFFICIENCY OF CERTAIN ACARICIDES AGAINST *TETRANYCHUS URTICA* KOCH UNDER LABORATORY AND FIELD CONDITIONS

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Abstract

Three synthetic pyrethroids (biphenthrin, fluvalinate and cyhalothrin) and two recommended acaricides, a sulfur compound (propargite) and a chlorinated hydrocarbon (dicofol), were evaluated against the two spotted spider mite, *Tetranychus urticae*. Bioassay data of tested pesticides against susceptible and field collected adult females were compared, both did not correlate (r^2= 0.074). Biphenthrin exhibited the greatest performance with both tested colony. The greatest tolerance of field population was recorded with fluvalinate and propargite. In contrast the lowest resistance ratio was calculated from cyhalothrin bioassay data. Weak correlation (r^2=0.307) was estimated when field data of initial and residual efficiency were linked. Fluvalinate and propargite exhibited the worst acaricidal efficiency under laboratory conditions. Although of the uncorrelation (r2=0.036 or 0.011) between the initial or residual field activity with the bioassay data of susceptible strain, but they were moderately or strongly correlated (r^2=0.69 or 0.839, respectively) with the bioassay data of field collected individuals. This study confirmed that laboratory study may not be sufficient to predict the performance of tested pesticides under field conditions.

Introduction

The two spotted spider mite *Tetranychus urticae* koch has recently considered as one of the most cotton pests in Egypt. It infests cotton at early and late season causing considerable damage to cotton crop. There is no problem of controlling the mite at early season because systemic pesticides are sprayed at early season to control sucking pests including the mite. Chemical control program at late season is directed to control cotton bollworms regardless any other infestation with sucking pests.

The purpose of this study is to evaluate the pyrethroid insecticides (Biphenthrin, Fluvalinate and Cyhalothrin), that are effective against cotton bollworms on the spider mite *T. urticae*. Two recommended acaricides (dicofol and propargite) were used as standard chemicals. Other important philosophy is that, in screening new compounds as pesticides it is important to know the relationship between the relative toxicity of compounds obtained in the laboratory and their effectiveness in the field. This knowledge not only helps entomologists to select candidates for further field tests but also to suggest approximate dosages for preliminary field tests.

Material and Methods

Chemicals used: 1-Kelthane : EC. with 18.5 % dicofol {1,1 bis (4-chlorophenyl) 2,2,2-(trichloroethanol). Recommended rate =1L. 2- Talestar: EC 10 %(biphenthrin) [1a,3a(z)] (±) (2-methyl [1,1-biphenyl] -3-yl)methyl-3-(2-chloro-3,3,3-triflouro-1-propenyl)-2,2-dimethyl cyclopropane carboxylate. Recommended rate =300 cc. 3-Mavrik: FL. 24 %(fluvalinate) {(R.S.)-@-cyano-3-phenoxybenzyl (R)-2- [2-chloro-4(triflouromethyl) anilino]-3-methylbutanoate}. Recommended rate=160 cc. 4-Karate: EC 10 % (cyhalothrin) {1-chloro (3,3,3-triflouroproprop-1-enyl) 2,2-dimethyl cyclopropane carboxylate. Recommended rate= 300 cc. 5-Comite: EC 73% (propargite) {2-[4-(1,1-dimethylethyl) phenoxyl] cyclohexyl 2-propynyl sulfite. Recommended rate=600cc.

Methods of Laboratory Studies: Six concentrations were selected to establish LC-P line of each tested pesticides. Plastic cups with 7.0 cm diameter was filled with a piece of cotton saturated in water. Fresh cotton leaves were rinsed with tap water to remove dusts and living organisms, then were left for air drying. Discs of 5 cm diameter around the mid rib were cut and each was put in a cup which the edge were closely adjacent to the moistened cotton pad. A thin film of water surrounded the edge of the disc and acted as a barrier to prevent escaping of the mite. Ten adult females apparently similar in shape, color and size were selected from a field collected colony and placed on the disc surrounded by a ring of Tangle foot at the edges of the disc which placed on wet cotton wool. The leaf discs with mite were sprayed with different concentrations of every toxicant. Control checks were handled the same way of toxicant treatment by spraying tap water only. Each treatment was replicated 4 times. All treatments were incubated at 25±0.5ºC and 65±5% RH. Mortality counts were recorded after 48 hr and corrected with control mortality using Abbott's formula (1925). The data were computed to establish the LC50 values (Finney, 1952). Bioassay data of the same chemicals with susceptible colony which established by Rateb, (1995) was compared with our data with field collected colony.

Methods of Field Studies: The field experiments was conducted in 1995 cotton season. The same pesticides that were used in laboratory studies were re-used in this study. An area of about 1/2 fed. was cultivated with cotton variety (Giza 80) (*Gossypium hirsutum* L.). This area was divided in completely randomized blocks design to 30 plots of 84 m2 each. On July 9 pre-spray counts were made by randomly taking 10 leaves. The samples were brought in paper bags inside plastic bags to the laboratory and kept in

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the refrigerator. The microscopic examination was done within 24 hr. by counting the number of mobile stages in square inch of lower surface around the mid rib. One tenth, the recommended rate of each pesticide/Fed. was diluted in 20 L. water and sprayed in the five plots of each treatment using the soloback motor. Untreated 5 plots were received water only as control treatment. Post-spray samples were collected 3 days and 2 weeks post spray. These samples were handled the same way as pre-spray samples. Percent reduction in mite population density per each replicate was calculated using Tilton and Henderson formula (1955).

Results and Discussion

Laboratory studies: Three synthetic pyrethroids (biphenthrin, Fluvalinate, and cyhalothrin) were evaluated against susceptible (Rateb,1995) and field collected adult females of *Tetranychus urticae* Koch. The recommended acaricides (dicofol and propargite) were used as standard materials. Bioassay data of tested pesticides were graphed in Fig. (1). The pyrethroid biphenthrin was superior against both susceptible and field collected strains having LC50 values of 16.3 and 130.4 ppm, respectively. The order of other tested materials was varied according to the tested strain. With susceptible one, the tested pesticides were descendingly arranged as follow: biphenthrin, dicofol, Fluvalinate, propargite and cyhalothrin which exhibited the greatest LC50 value of 94.3 ppm, respectively. With field collected adult females, the descending order was biphenthrin, cyhalothrin,dicofol, propargite and Fluvalinate, respectively, The greatest performance of biphenthrin was also established by Shoeib (1990) as compared with fluvalinate and cyhalothrin which were approximately similar. El-Beheiry,(1981) recorded that the LC50 of dicofol was 74 ppm but Ibrahim, (1989) established this value to be 270.5 ppm in the bioassay data with the soybean field strain from Minia Governorate.

The resistance ratio of the field collected adult females toward dicofol, biphenthrin, Fluvalinate, cyhalothrin and propargite was 6.3, 8.0, 12.0, 2.3 and 8.2 fold, respectively. The LC50 values of tested materials toward susceptible adult females were linked (Fig.2) with those of resistant ones. Both did not correlate (r2=0.074) confirming different pattern of activity according to the tested populations of the same species.

Field study: The recommended rates of tested materials were sprayed on cotton plants on July 1995 cotton season. The initial performance of tested pesticides was calculated as % reduction in mobile stages infestation after 3 days post spray. Dicofol occupied the first position (Fig.3) resulting in the greatest reduction (ca.91%) followed by biphenthrin and cyhalothrin exhibiting ca. 81 % reduction in mite population. Fluvalinate and propargite were less effective with ca. 44 and 66 % mite control, respectively. Martinas *et.al.*, (1990) and Burris and Leonard,(1993) confirmed the better performance of biphenthrin under field conditions.

The residual effect of tested acaricides as % reduction in mite population density after 2 weeks of spray was also calculated. Biphenthrin resulting in the greatest residual efficiency (ca. 89 % control) followed by cyhalothrin (84%). Dicofol which exhibited the greatest initial performance (91%) pushed down to the 3rd position (61.6) when the residual efficiency was considered. Fluvalinate and propargite showed similar insufficient residual potency of ca 55 % control. Data of initial effect was poorly correlated (r2=0.0307) with those of residual effect (Fig.4).

In an attempt to know if the laboratory bioassay is an accurate indicator of field performance of tested acaricides, the bioassay data of susceptible and field collected adult females were linked with the initial field activity (Fig.5) and the residual one (Fig.6).Bioassay data of susceptible strain did not correlate with initial or with residual field performance (r2= 0.036 and 0.01, respectively), but the correlation was strong (r2= 0.839) and moderate (r2=0.69) when bioassay data of field collected colony was linked with the initial and residual field effect, respectively, of the same tested acaricides. This confirm that the pesticide tolerance of field population is essential reason for the incompatibility of laboratory bioassay data susceptible strain with field performance. In addition, the uncontrolled conditions in the field may be involved in less pesticide performance under field condition. Mable and Pree, (1993) reported that, laboratory bioassay data may not be sufficient as an accurate indicator to predict pesticides performance under field conditions.

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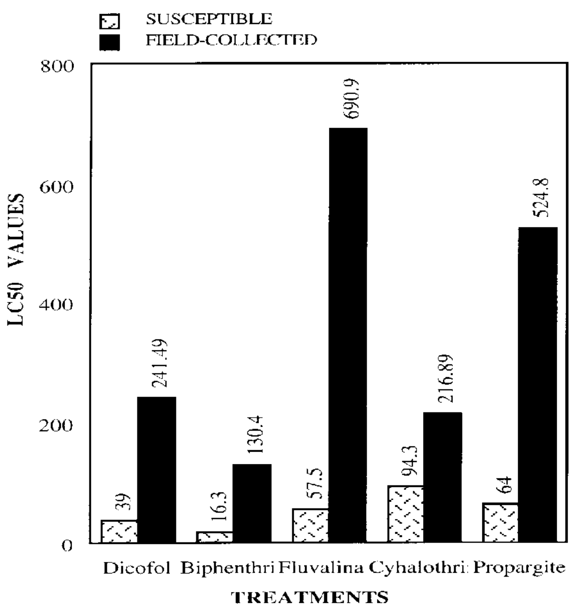

Fig. 1: Efficiency of certain acaricides against susceptible and field collected adult females of *T. urticae*

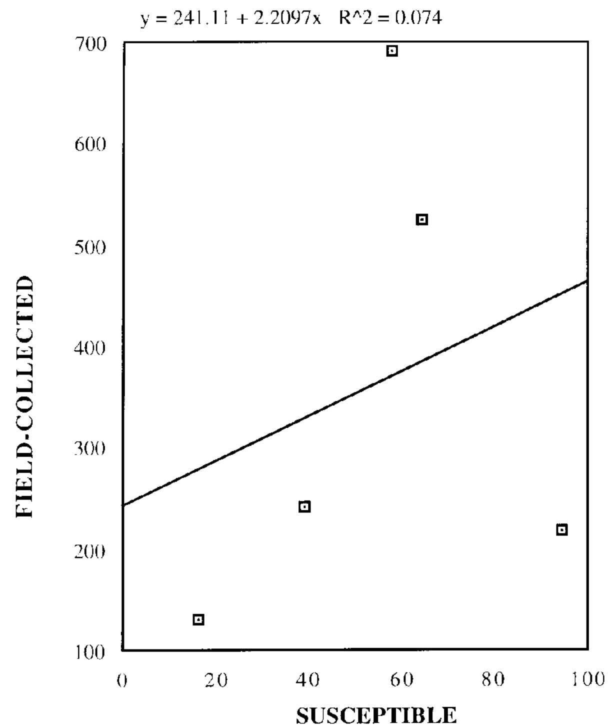

Fig. 2: The correlation between the LC_{50} values of tested acaricides with susceptible and field collected adult females of *T. urticae*

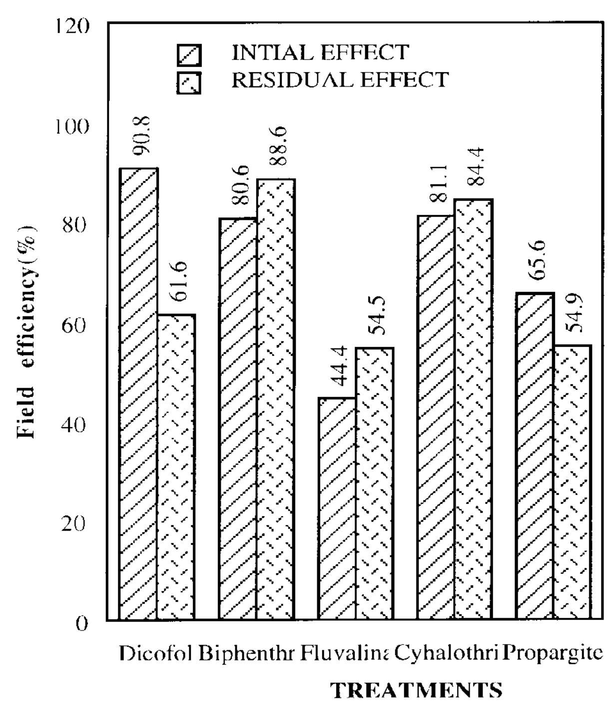

Fig.3: Comparing the intial and residual effects of tested acaricides against the mobile stages of T. urticae.

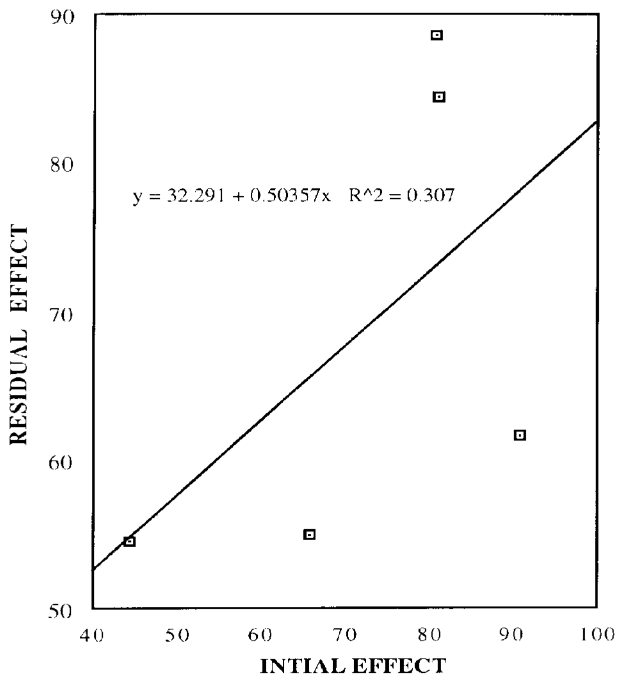

Fig. 4: The correlation of intial and residual effects of tested acaricides against T. urticae mobile stages

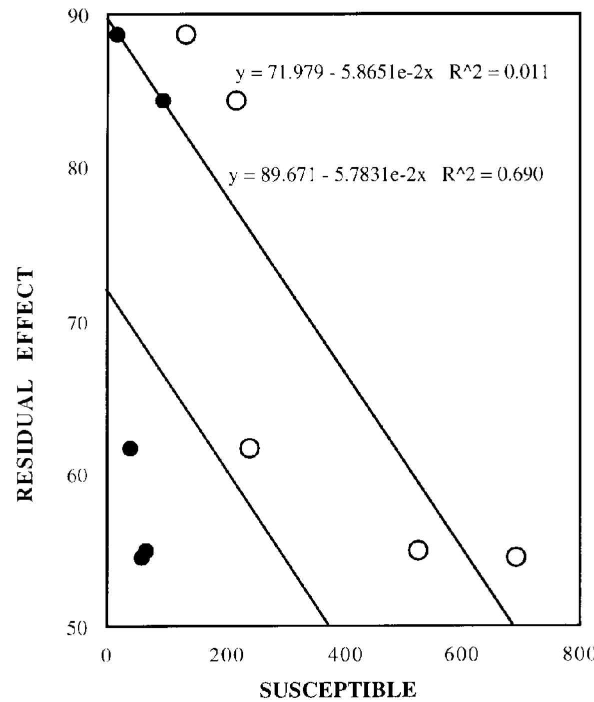

Fig. 6: The corellation between the field residual activity of tested acaricides with the LC50 values with susceptible and field collected adult females.

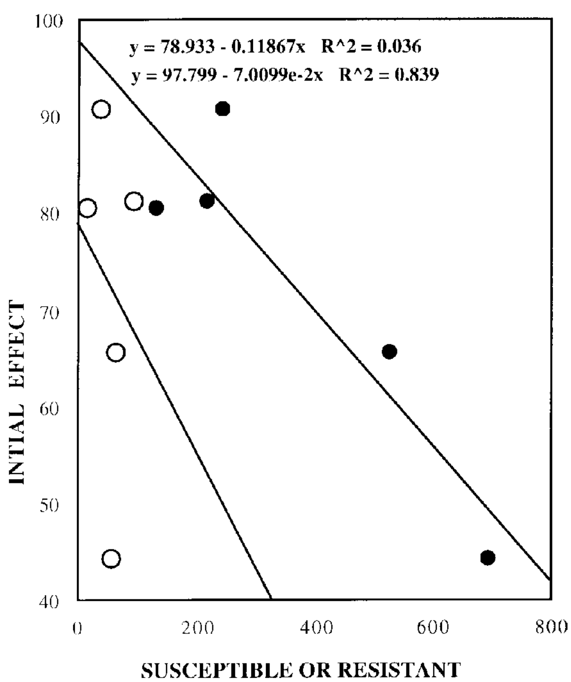

Fig. 5: The correlation between the intial field activity of tested acaricides and the LC50 values of susceptible and field collected adult females of T. urticae.