SUSCEPTIBILITY OF THE RED SPIDER MITE, *TETRANYCHUS TELARIUS* L. COMPLEX, TO FIVE ACARICIDES

BY

I. A. GAABOUB, S. M. HAMMAD
Entomology Division, Faculty of Agriculture, Alexandria University

AND

I. I. MOHAMED AND M. N. EL-BEHEIRY
Acarology Department, Division of Cotton and Crops, Ministry of Agriculture, Cairo

ABSTRACT

Five acaricides (Acrex, Kelthane, Neoron, Galicron and Tedion) were tested against a culture of *Tetranychus telarius* complex L. (red form) for their acaricidal action to find out an effective remedy for the control of this pest.

The 24-hour LC_{50} values of Acrex, Kelthane, Neoron, Galicron and Tedion were 2.3 (1.97-2.67), 3.7 (2.40-5.57), 27 (15.70-46.44), 94 (47-188) and 550 (435.47-694.65) p.p.m., respectively. Statistical analysis showed that heterogeneity in response to both of Kelthane, Neoron and Galicron occurred among the individuals. In case of Acrex and Tedion, homogeneity was shown among the individuals in their susceptibility to these acaricides. These records indicate that Acrex was more toxic to the tested spider mite, followed by Kelthane, Neoron, Galicron and finally Tedion.

RÉSUMÉ

Cinq acaricides (Acrex, Kelthane, Neoron, Galicron et Tedion) ont été testés sur un élevage du complexe *Tetranichus telarius* L. (forme rouge).

Les valeurs du LC_{50} par 24 heures de l'Acrex, du Kelthane, du Neoron du Galicron et du Tedion sont respectivement de 2,3 (1,97-2,67), 3,7 (2,40-5,57), 27 (15,70-46,44), 94 (47-188) et 550 (435, 47-694,65) p.p.m.

L'analyse statistique montre une hétérogénéité dans les réponses pour le Kelthane, le Neoron et le Galicron. Les réponses sont homogènes dans le cas de l'Acrex et du Tedion. Ces données montrent que l'Acrex est le plus toxique pour cette espèce suivi du Kelthane du Néoron, du Galicron et enfin du Tedion.

INTRODUCTION

Many authors have reported the results of their investigations on the susceptibility of spider mite species to different acaricides (HUISMAN, 1955 ; ABOU-EL-GHAR, 1958 ; HENNEBERRY *et al.*,

1960 ; LIPPOLD, 1961 ; CWILICH and ASHER, 1961 ; DITTRICH, 1962 ; MAILLOUX and MORRISON, 1962 ; SHRIVER and HENNEBERRY, 1962 ; ELDEFRAWI *et al.*, 1965 and EL-DAHAN, 1972). But in Egypt, the need for having an effective acaricide against this pest encouraged testing some of the modern compounds for their acaricidal action. Therefore, tests on five acaricides (Galicron, Kelthane, Neoron, Tedion and Acrex) were carried out in the present investigation.

MATERIALS AND METHODS

Acaricides Used : All acaricides were tested in water solutions which were diluted to the appropriate concentrations needed. The formulated acaricides were available as emulsifiable concentration. The needed concentrations were calculated on the basis of p.p.m. of the active ingredient present in the formulation. These formulations were as follows :

Galicron : N-(2-methyl-4-chlorophenyl)-N', N'-dimethyl for mamidine, 50 % E. C. was supplied by CIBA Agrochemical Company.

Neoron : Isopropyl 4, 4-dibromobenzilate, 50 % E. C. was supplied by Geigy Chemical Corporation.

Kelthane : 1, 1-bis (p-chlorophenyl) 2, 2, 2-trichloroethanol, 18.5 % E. C. was supplied by Rohm and Hass Company.

Tedion : 2, 4, 4, 5-tetrachlorodiphenyl sulfone, 8 % E. C. was supplied by N. V. Philips-Duphar.

Acrex : 2-sec-butyl-4, 6-dinitrophenyl isopropyl carbamate, 30 % E. C. was supplied from the Ministry of Agriculture, Egypt.

Maintaining of Mite Stock Culture : The strain of the spider mite (red form) used in this investigation had been started from infested leaves of cotton plants. Rearing was made on Caster-oil leaves under laboratry conditions of 25-5°C and 60-70 % R. H.

Pots of 30 cm in diameter were used for plantation of Caster-oil seeds, and 7-10 days old seedlings were generally infested by the spider mite. In order to have a continuous supply of new culture of the host plant, pots were planted continuously at 7 day-intervals. Mites were always transferred from aging plants to the younger ones by placing the old leaves infested with mites onto the new seedlings. Individuals of mites were collected and transferred for bioassay tests by means of a fine brush.

Bioassay Experiments and Preparation of Log-dasage Probability Lines : The Slide-dip Method (DITTRICH, 1962) was used in these bioassay tests. A piece of double-faced stock tape was pressed tightly to the surface of a glass slide, by using a moistened brush, 25 adults were stuck on the tape on their backs, so that their legs were free.

The prepared slides were dipped in the toxicant concentration and gently agetated for five seconds. Then, these slides were kept at breeding room conditions. Mortality counts were made 24 hours after dipping. Mites responding to touch of the brush were considered alive.

By using the mentioned method, preliminary tests were performed with a complete range of concentrations for each of the tested acaricides. Four to five concentrations were used for the preparation of each of the dosage-mortality line. Four replicates for each concentration and two control replicates were tested. It was noted that not less than 3 mortality counts, in screening each acaricide, were between 10 and 90 %. Bottles containing the prepared solutions

were always kept tightly stoppered. Test slides were carefully cleaned with potassium dicromate and sulfuric acid and washed after each run.

Results were plotted on Logarithmic-propability papers after being corrected with Abbott's formula for compensting to the natural mortality, if there is any in the control. Then, the regression line was fitted by eye. Litchfield and Wilcoxon's method (1949) was used for testing the goodness of fit of the regression lines, for testing the homogeneity of the data and for finding the regression coefficients and the fiducial limits of the median lethal concentrations (LC_{50}'s).

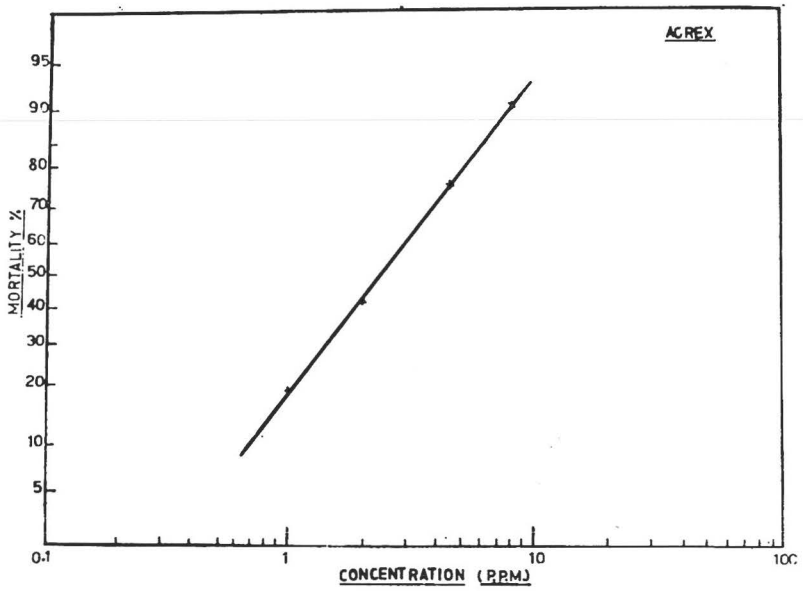

FIG. 1 : Concentration/mortality regression line of Acrex against adults of *T. telarius* L. complex.

RESULTS

Acrex Test : Figure 1 shows the dosage-mortality results of the adults of the present spide mite exposed to Acrex. It was evident that concentrations varied from 1 to 8 p.p.m. to induce mortality percentage ranging from 18.9-90.5 %. The LC_{50} value ranged from 2.0 to 2.7 p.p.m., 2.3 p.p.m. from graph, Table 1. Statistical analysis revealed the homogeneity of results as the Chi-square value for data equaled 0.14 which was far less than its value derived from the tables at the 5 % probability limit (5.99 at d.f. 2). Also, points of mortality percentages showed a straight line which explained the homogeneity between the individuals in their sensitivity to Acrex.

Kelthane Test : On inspecting Kelthane toxicity data (Fig. 2), it was evident that concentrations from 2 to 8 p.p.m. to induce percentage mortalities which ranged from 16.6 to 82.3 %. The LC_{50} read from the graph equaled 3.7 p.p.m. Its range was between 2.4-5.7 p.p.m. with 95 % probability limit (Table 1). Points of mortality percentages explain the differentiation in the sensitivity of this mite to Kelthane, as these points did not make a straight line and data were significantly heterogeneous.

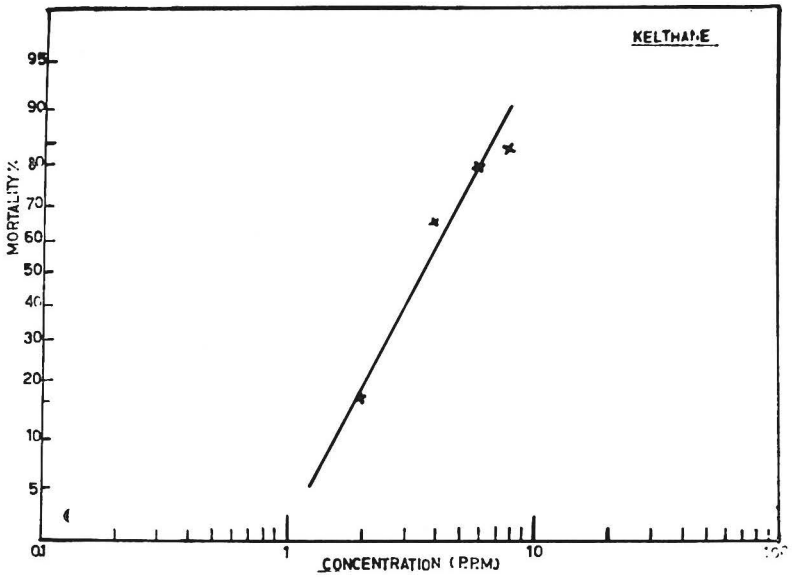

FIG. 2 : Concentration/mortality regression line of Kelthane against adults of *T. telarius* L. complex.

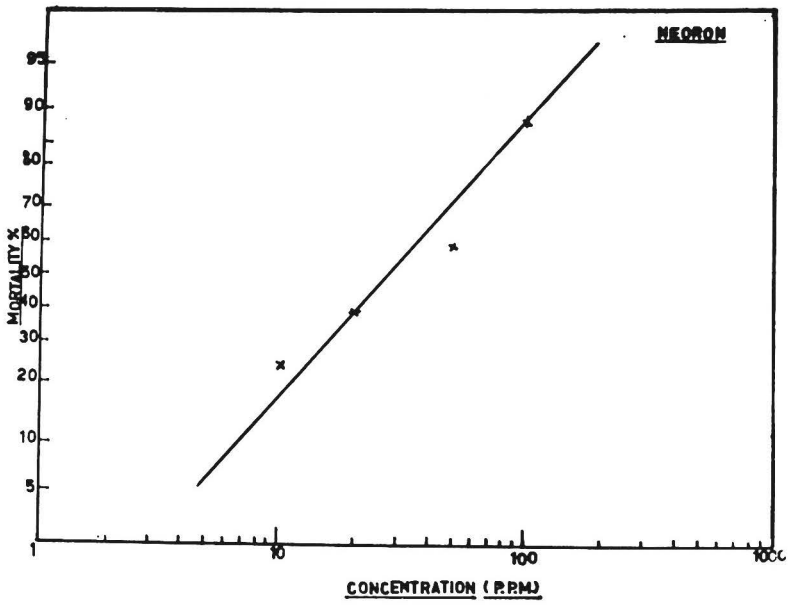

FIG. 3 : Concentration/mortality regression line of Neoron against adults of *T. telarius* L. complex.

Neoron Test : When Neoron was tested against the adults of the present mite, the effective concentrations ranged from 10 to 200 p.p.m. and induced percentage mortalities ranging from 25.8 to 97.9 % (Fig. 3). LC_{50} value equaled 27 p.p.m. and ranged from 15.7-46.4 p.p.m. (Table 1). The same results of Kelthane concerning the mortality percentages were found, as the points did not also make a straight line. This means that heterogeneity in response to Neoron occurred among the individuals.

TABLE 1 : REGRESSION CALCULATIONS ESTIMATED FOR KELTHANE, TEDION, ACREX, NEORON AND GALICRON ACCORDING TO THE STATISTICAL METHOD OF LITCHFIELD AND WLICOXON (1949).

Regression calculations	Acaricides				
	Kelthane	Tedion	Acrex	Neoron	Gallicron
(X^2) for data	7.40	1.55	0.10	11.70	11.21
$(X^2/$ at 5 % prob.	5.99	9.49	5.99	7.82	7.82
FLC_{50}	1.54	1.26	1.16	1.72	2.00
LC_{50} (p.p.m.)	3.70	550.00	2.30	27.00	94.00
Confidence limits of LC_{50}	2.4–5.7	435.5–694.6	2.0–2.7	15.7–46.4	47–188.0
S	1.91	6.67	2.57	2.91	4.11
FS	1.83	1.04	1.23	1.82	2.73
Slope	3.56	1.21	2.43	2.15	1.62
Confidence limits of S	1.1–3.5	6.4–6.9	2.1–3.2	1.6–5.2	1.5–11.3

Galicron Test : The effective concentrations used for preparing the regression toxicity line ranged from 10 to 200 p.p.m. (Fig. 4). Obtained percentage mortalities ranged from 8.2 and 79.6 %, respectively. The LC_{50} was found to be 47 to 188 p.p.m. (94 p.p.m. from Fig. 4). Statistical analysis showed the same heterogeneity of individuals exposed to Galicron as in cases of Kelthane and Neoron.

Tedion Test : In case of Tedion, tests showed that concentrations between 50 and 1 600 p.p.m. gave adequate toxicity lines (Fig. 5). In this range, percentage mortalities varied from 9.4 to 71.5 %. The LC_{50} value of this acaricide was somewhere between 435.5-694.7 p.p.m. (550 p.p.m. from graph). Statistical analysis revealed the homogeneity of the data and the goodness of fit of the regression line.

DISCUSSION

The present tests revealed that Acrex was more toxic to the tested spider mite, followed by Kelthane, Neoron, Galicron and Tedion, respectively, as LC_{50} values were 2.3, 3.7, 27, 94 and 550 p.p.m., in respect.

A comparison of the abovementioned values showed that acaricides could thus be arranged

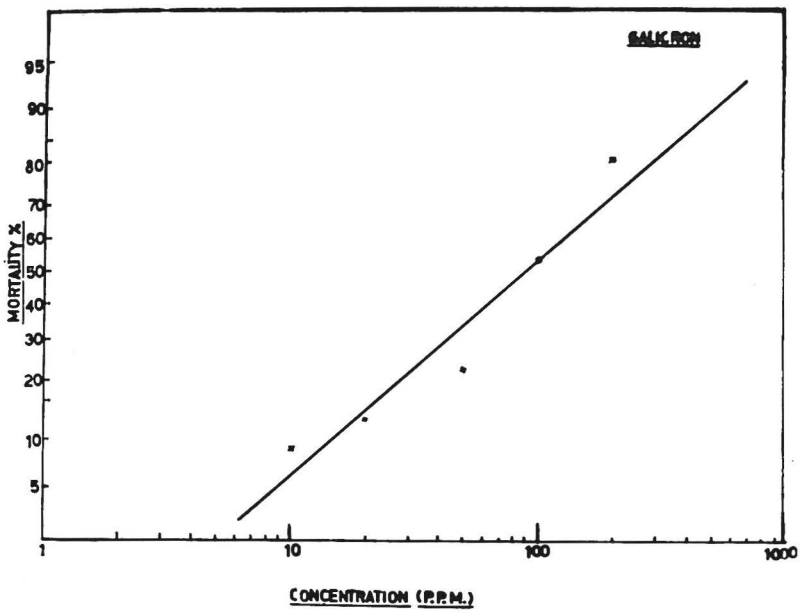

FIG. 4 : Concentration/mortality regression line of Galicron against adults of *T. telarius* L. complex.

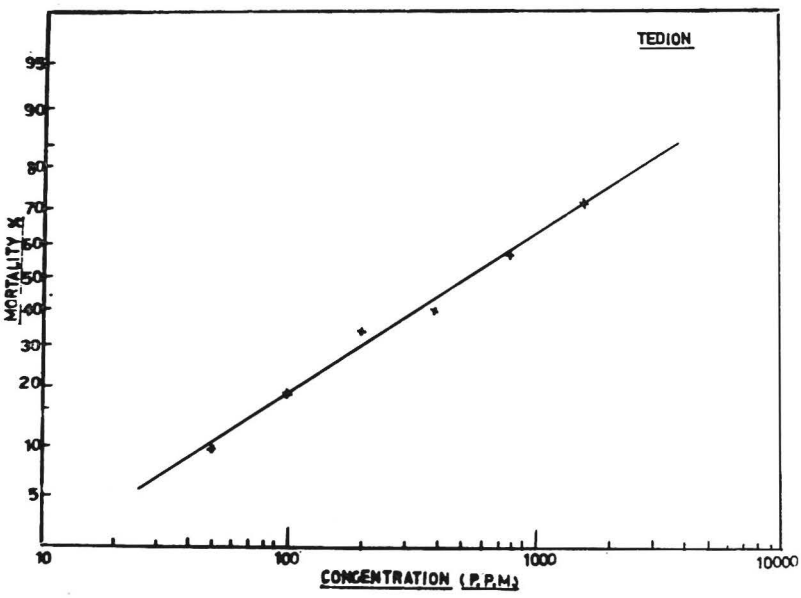

FIG. 5 : Concentration/mortality regression line of Tedion against adults of *T. telarius* L. complex.

in the following descending order to their toxic effect : Acrex, Kelthane, Neoron, Galicron and finally Tedion.

In case of Tedion, most of authors cocluded that this compound showed a specific ovicidal effect. This explains the high LC_{50} value recorded in the present work for this compound when tested on adult stage. The effectiveness of Tedion as found here is in agreement with the results obtained by HUISMAN (1955), HENNEBERRY *et al.* (1960), MAILLOUX and MORRISON (1962) and EL-DAHAN (1972).

Kelthane was also found to be very effective against adult stage of the present mite by CWILICH and ASHER (1961), MAILLOUX and MORRISON (1962), SHRIVER and HENNEBERRY (1962) and EL-DAHAN (1972). This agrees with the present results. This conclusion was also found in case of Neoron and Galicron, as the results agree very well with that found by EL-DAHAN (1972), as the LC_{50} values were 27 and 94 p.p.m., respectively, by using the same present Slide-dip Method.

All results indicate that there is a positive correlation between the increase in acaricide concentration tested and the mortality rate of this mite. There is also a considerable difference between the five acaricides as far as their efficiency on the adult mites is concerned.

However, in conclusion, for using the studied acaricides in the field, certain environmental measures have to be considered before any definite recommendations can be advised.

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