J. Product. & Dev., 18(2):129 – 136 (2013)

EFFECT OF SOME PESTICIDES AGAINST *Tetranychus cucurbitacearum* (SAYED) UNDER LABORATORY CONDITIONS

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ABSTRACT

Laboratory studies were carried out to evaluate the toxicity effects of four compounds i.e. fenpyroximate and chlorfenapyr as acaricides, chlorpyrifos as organophosphorus and lambda-cyhalothrin as pyrethroid were investigated against adult females of the two-spotted spider mite, Tetranychus cucurbitacearum (Sayed) (Acari: Tetranychidae) under laboratory conditions. Concerning the LC_{50} values, the tested compounds could be arranged descending as follow: chlorfenapyr, fenpyroximate, chlorpyrifos, and lambda-cyhalothrin recorded 0.32, 0.79, 28.69 and 432.19 ppm., respectively. Data revealed that chlorfenapyr and fenpyroximate shorten the oviposition period, female longevity, and reduced number of laid eggs compared to control.

***Conclusively**, the present study reported that chlorphenapyr was the potent toxicity compound against adult females of T. cucurbitaceraum followed descending by fenpyroximate, chlorpyrifos, and lambda-cyhalothrin according to LC_{50} of the tested compounds. In addition to chlorfenapyr shorted the oviposition period, female longevity, and reduced number of laid eggs compared to fenpyroximate.*

Key words: *Tetranychus cucurbitacearum*, fenpyroximate, chlorfenapyr, chlorpyrifos, lambda-cyhalothrin.

INTRODUCTION

Field crops, vegetables and fruit trees are infested by sucking pests as aphids, white flies and mites (Dahroug *et al*., 2000). Phytophagous mites especially members of the family Tetranychidae are responsible for significant yield losses for many host plants. The tetranychid mites including the two-spotted spider mites, *T. urticae* and *T. cucurbitacearum* has been recognized as an important sucking pests of more than 900 host plants and is described as a serious pest of at least 150 economically

important agricultural and ornamental plants (Zaher, 1984 ; El-Enany *et al*., 2001and Zhang, 2003). These pests causing highly damage to its host plants in the world. Leaves injury resulting from tetranychid mites infestation was mainly due to the sucking of cell sap, resulting in yellow, brown botch and accompanied by dry and leaf fall resulting in the loss of fruit quality and quantity of the production (Huffaker *et al*., 1969; Hell & Sabelis, 1985; El-Halawany *et al*., 1986; Pande *et al*., 1996 and El-Kawas, 2000).

Many studies were interested in evaluate the different compounds to control or reducing damage of phytophagous mites for their host plants (Davis, 1952; Henneberry *et al*., 1960 and Ghaderi *et al*., 2012).

So, the present study aimed to evaluate the efficiency of four pesticides namely; chlorfenapyr, fenpyroximate, chlorpyrifos and lambda-cyhalothrin against *T. cucurbitacearum* females. Also, the effect of LC_{50} of chlorfenapyr and fenpyroximate on some biological aspects of *T. cucurbitacearum* were studied.

MATERIALS AND METHODS

1- Rearing technique:

Samples of eggplant leaves, *Solanum melongena* L. heavily infested with *T. cucurbitacearum* were collected from Zagazig district, Sharkia Governorate. Pure culture of *T. urticae* was initiated and transferring male and females using a fine hair brush to fresh discs of mulberry leaves, *Morus alba* L. in Petri-dishes (10 cm. in diameter). Each leaf was put on a pad of cotton wool saturated with water as a source of moisture, and to prevent mite escaping, under laboratory conditions 27±2 °C and 65±5 % R.H (El-Kawas *et al*., 2008).

2- Tested pesticides:

1- Fenpyroximate (Ortus super® 5% EC), 1,1-dimethylethyl (E)-4-[[[[(1,3-dimethyl- 5-phenoxy-1H-pyrazol-4-yl)methylene] amino] oxy]methyl]benzoate, used at the rate of 50 cm^3 /100 liter of water, a trademark of Nihon Nohyaku.

2- Chlorfenapyr (Challenger® 24 % EC), 4-bromo-2-(4-chlorophenyl)-1-(ethoxymethyl)-5- (trifluoromethyl)-1H-pyrrole-3-carbonitrile, used at rate of 60 cm^3 / 100 liters of water, a trademark of BASF.

3- Chlorpyrifos (Dursban® 48%), O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate, used at rate of 1liter of feddan a trademark of Dow Agro science.

4- Lambda-cyhalothrin (Lamda ZD® 5% EC), O-(4-bromo-2-chlorophenyl) O-ethyl S-propyl phosphorothioate, [1□(S*), 3□(Z)]-(±)-cyano(3-phenoxyphenyl)methyl

3-(2-chloro-3,3,3-trifluoro-1-propenyl) -2,2-dimethylcyclopropanecar-boxylate, used at 375 cm^3 / feddan of water, a trademark of Syngenta Agro Egypt.

3. Toxicity action against *T. cucurbitacearum* adult females:

The toxicity of chlorfenapyr, fenpyroximate, chlorpyrifos and lambda-cyhalothrin were evaluated against adult females of *T. cucurbitacearum*. Ten adult females of the same age were transferred to a leaf disc of mulberry (1 inch in diameter) and sprayed with different concentrations for each compound, fenpyroximate (0.1, 1, 5, and 10 ppm.), chlorfenapyr (0.05, 0.1, 0.5 and 1 ppm.), chlorpyrifos (200, 500, 750, and 1000 ppm.) and lambda-cyhalothrin (10, 20, 50, and 80 ppm.) using a glass atomizer. These discs were placed on their lower surface on pads of moist cotton wool in Petri-dishes. Six replicates for each treatment were used. Untreated discs were sprayed with water only as a control. The mortality percentages were calculated after 72 hr. after spray according to Abbott's equation (1925). Toxicity Index calculated according to Sun equation (1950).

4. Latent effects of Fenpyroximate and Fenpyroximate on *T. cucurbitacearum* females:

Six gravid females of *T. cucurbitacearum* were transferred to mulberry leaf discs (3 cm. in diameter) and sprayed with the LC_{50} of Fenpyroximate and Chlorfenapyr using a glass atomizer, while control was sprayed with water only. These discs were placed on their lower surface on pad of moist cotton wool in Petri-dishes. Ten replicates for both treatments were used. The adult female longevity (pre-oviposition, oviposition and post-oviposition), fecundity and deterrent index were recorded.

Deterrent index based on the number of laying eggs treatment compared to control was calculated according to the equation of Lundegren (1975):

$A-B/A+B \times 100$

A= number of eggs in control.

B= number of eggs in treated part.

The data were subjected to statistical analysis by Duncan's (1955) multiple range tests were used to determine the significant of the difference between mean values of the treatments.

RESULTS AND DISCUSSION

1- Toxicity action against *T. cucurbitacearum* adult females:

Data in Table (1) indicated that fenpyroximate was the highest effective against *T. cucurbitacearum* females, while chlorpyrifos was the lowest one. Based on LC_{50} and LC_{90} for the tested compounds can be arranged in the following descending order: chlorfenapyr, fenpyroximate,

lambda-cyhalothrin and chlorpyrifos were (0.32 and 3.90), (0.79 and 228.91), (28.69 and 155.96) and (432.19 and 1713.88 ppm.), respectively.

At LC_{50} and LC_{90} the toxicity index of fenpyroximate, lambda-cyhalothrin and chlorpyrifos were 40.70 &1.70%, 1.13 & 2.5% and 0.075 & 0.22% against *T. cucurbitacearum* as compared with chlorfenapyr after 72 hr, of treatments.

Despite, chlorpyrifos insecticide and acaricide, data show that chlorpyrifos lower toxicity against *T. cucurbitacearum* may be due to acts as a contact poison, with some action as astomic poison.

The finding results are in agreement with Abdel-Samad (2002) revealed that lambda-cyhalothrin (Kendo 5 % EC) recorded 85 % mortality for *T. urticae* female observed at 24 hr. post application under laboratory conditions.

Table (1): Toxicity of some pesticides against *T. cucurbitacearum* females.

Treatments	Con. (ppm.)	Mortality %	LC_{50} ppm. (Upper-Lower)	LC_{90} ppm. (Upper-Lower)	Slope	Toxicity index at:	
						LC_{50}	LC_{90}
Chlorfenapyr	0.05	18.33	0.323 (0.43-0.250)	3.908 (8.945-2.257)	1.184	100	100
	0.1	38.33					
	0.5	58.33					
	1.0	93.33					
Fenpyroximate	0.1	33.33	0.796 (1.395-0.395)	228.926 (2722.6- 61.12)	0.521	40.704	1.70
	1	50.00					
	5	63.33					
	10	75.00					
lambda-cyhalothrin	10	20.00	28.695 (34.21-23.95)	155.974 (259.87-111.13)	1.743	1.129	2.50
	20	41.67					
	50	65.00					
	80	78.33					
Chlorpyrifos	200	25.00	432.152 (497.6-366.6)	1713.328 (2569.71-1318.7)	2.142	0.075	0.22
	500	53.33					
	750	66.67					
	1000	81.67					

2- **Effect of LC_{50} for chlorfenapyr and fenpyroximate against *T. cucurbitacearum* females:**

Obtained data in Table (2) showed that, fenpyroximate and chlorfenapyr shortened the longevity and reduced the fecundity of *T. cucurbitacearum* females. The pre-oviposition period recorded 1.72 and 1.96 days for fenpyroximate and chlorfenapyr, compared to 1.58 days for the control, respectively. On the other hand, the oviposition

period lasted 8.68 and 12.22 days for the same order while was 16.05 days for control.

Table (2): Effect of LC_{50} for Challanger and Fenpyroximate against *T. cucurbitacearum* adult females:

Treatments	Duration in days:				Fecundity	Deterrent index %
	Pre-ovipostion	Ovipostion	Post-ovipostion	Female longevity		
Fenpyroximate	1.72	8.68	1.63	11.71c	18.72c	54.85
Chlorfenapyr	1.96	12.22	2.51	16.69b	24.51b	44.74
Control	1.58	16.05	2.41	20.04a	64.20a	00.00

Means under each variety having different letters in the same column indicate a significant different ($P \leq 0.05$).

The adult female longevity lasted 11.71 and 16.69 days compared to 20.04 days for control. The total laid eggs number was 18.72 and 24.51 for fenpyroximate and chlorfenapyr compared to 64.20 eggs for control.

Fenpyroximate was more efficacy pesticides that reduced total laid eggs with deterrent index 54.85 % followed by fenpyroximate 44.74%. The results showed that effect of LC_{50} concentrations of fenpyroximate and chlorfenapyr significantly affected the fecundity and longevity of the treated females of *T. cucurbitacearum.* This results are agreement with Amjad *et al*. (2012) who revealed that chlorfenapyr caused the highest mortality percentages for *T. urt*icae female (100 %) compared to fenpyroximate (77%) under laboratory conditions.

Conclusively, the present study reported that chlorphenapyr was the potent toxicity compound against adult females of *T. cucurbitaceraum* followed descending by fenpyroximate, chlorpyrifos, and lambda-cyhalothrin according to LC_{50} of the tested compounds. In addition to chlorfenapyr shorted the oviposition period, female longevity, and reduced number of laid eggs compared to fenpyroximate.

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تأثير بعض المبيدات على الحلم العنكبوتي ذو البقعتين تحت الظروف المعملية

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أجريت هذه الدراسة المعملية لتقييم سمية أربعة مركبات هي أورتس (كلوربيروكسمات) و شالنجر (كلورفينابير) (مبيد أكاروسي) ودورسبان (كلوربيروفوس) (مبيد فوسفوري) و لمدا زد (لمبادا سيهالوثرين) (مبيد بيروثرويد) ضد إناث الحلم العنكبوتى ذو البقعتين. و قد أظهرت النتائج أن: المبيد الاكاروسى شالنجر كان أعلي المبيدات المختبرة سمية أعقبة أورتس، لمبادا وأخيراً دروسبان و ذلك طبقا لقيمة التركيز النصفي القاتل حيث بلغت قيمته ٠.٣٢، ٠.٧٩ ، ٢٨.٦٩ و ٤٣٢.١٩ جزء فى المليون على التوالى وكان دليل السمية ١٠٠ ، ٤٠.٧ ، ١.١٢ و٠.٠٧ % على التوالى.

تم دراسة التأثير المتأخر للتركيز النصفي القاتل لكلا من أورتس و شالنجر على بعض المظاهر البيولوجية لإناث الحلم العنكبوتي ذو البقعتين و تمثلت هذه النتائج فيما يلي:

١. قصر دورة حياة الإناث المعاملة و بلغت ١١.٧١و ١٦.٦٩ يوم على التوالى مقارنة بالكنترول حيث بلغ ٢٠.٠٤ يوم.
٢. نقص عدد البيض الكلى الذي تضعة الإناث المعاملة حيث بلغ عدد البيض١٨.٧٢و ٢٤.٥١ بيضة على التوالى مقارنة بالكنترول حيث بلغ عدد البيض ٦٤.٢ بيضة.
٣. وجد أن نسبة إعاقة وضع البيض بواسطة أروتس وشالنجر بلغت ٥٤.٨٥ و٤٤.٧٤ %، على التوالي.

التوصية: