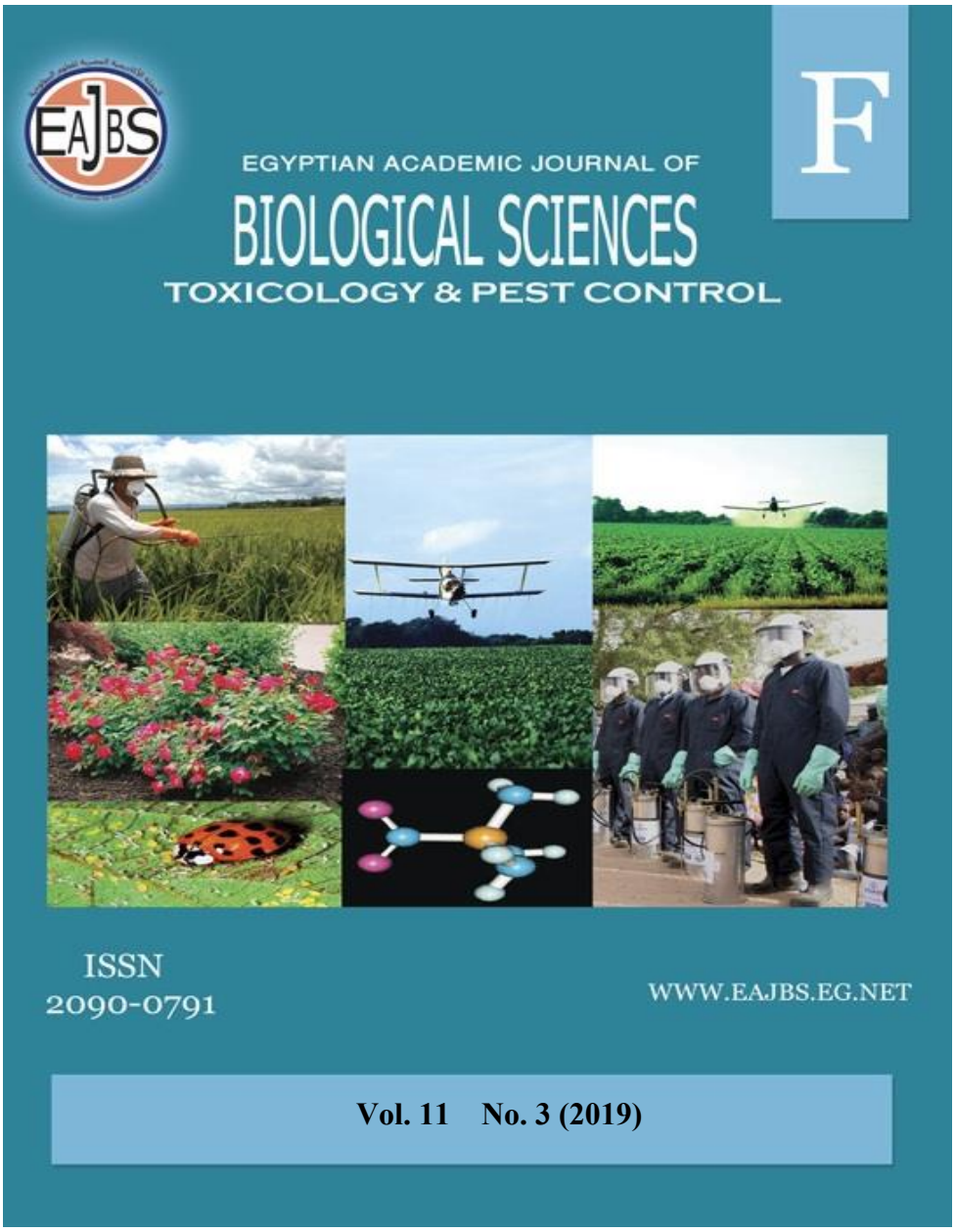

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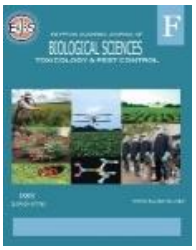
Egypt. Acad. J. Biolog. Sci., 11(3): 125-128 (2019)

Egyptian Academic Journal of Biological Sciences
F. Toxicology & Pest Control
ISSN: 2090 - 0791
http://eajbsf.journals.ekb.eg/



Comparison between the Effect of Nano Chitosan and Fabcomic Insecticide against *Tetranychus urticae* (Acari: Tetranychidae)

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ARTICLE INFO
Article History
Received:8/10/2019
Accepted:9/12/2019

Key words: *Tetranychus spp.*, nano chitosan, fabcomic acaricide

ABSTRACT

Toxicity of nano chitosan and fabcomic acaricide were studied under laboratory conditions against adults of spider mite, *Tetranychus urticae* Koch. Also, LC_{50} and LC_{90} of each treatment were determined. The obtained results revealed that fabcomic acaricide was more effective in controlling *T. urticae* than nano chitosan but it caused pollution for all living organisms as well as to the environment while nano chitosan was more save for both, humans and plants. LC_{50} for fabcomic acaricide and nano chitosan was 0.1 and 801.04 ppm, respectively. However, LC_{90} was 1.66 and 5746.09 ppm for fabcomic acaricide and nano chitosan, respectively.

INTRODUCTION

Tetranychus urticae Koch is a notorious pest of economically important agricultural crops as well as ornamental plants (Navajas, 1998). It has been reported to attack about 1200 species of plants (Zhang, 2003), of which more than 150 are economically important (Jeppson *et al*., 1975, Xie *et al*., 2006). It causes damage to sweet corn, beans, peas, hops, grapes, deciduous fruit trees, strawberries and many other vegetables, flowers and ornamental plants (Johnson and Lyon, 1991). Commercially available synthetic acaricides are usually cost a lot and also needed to be imported for use by farmers. They also tend to have detrimental effects on the environment and can be hazardous to humans. These negative effects have resulted in raising interest in natural materials which are assumed to be safer than females synthetic pesticides (Yanar *et al*., 2011).

Chitosan (CS) is a natural polysaccharide. It is not only pollution safe but nourishes the plant and less costly too. Chitosan $(C_6H_{11}NO_4)_n$, the N-deacetylated derivative of chitin, is preferred due to its, antioxidant, biodegradability, biocompatibility, antimicrobial, and non-toxic properties (Dash *et.al.*, 2011) as well as being a kind of the waste of fish and crustaceans, which are abundant in Egypt.

The present work was aimed to evaluate the comparison between nano chitosan and the specific acaricide, Fabcomic, on *T. urticae*.

MATERIALS AND METHODS

Rearing Mites:

T. urticae adults were collected from unsprayed castor bean plants and reared at 25± 2° C and 60± 5%RH.

Treatments:

-Fabcomic insecticide and acaricide (Abamectin 1.8%EC).

-Chitosan Nanoparticles:

Chitosan (CS)-g-poly (acrylic acid) (PAA) nanoparticles. It is bought from Naqaa Company.

Preparing the Stock Solution of the Tested Materials:

Convenient stock concentrations of each material were prepared based on the tested material weight and the volume of the distilled water (w/v). Four diluted concentrations for each material were used to draw the LC-P lines. Three replicates were used for each concentration.

Toxicity Test:

The toxicity of nano chitosan and the Fabcomic acaricide were tested against *T. urticae*. Thirty newly emerged adult females were transferred to the lower surface of castor leave discs (2.5 cm diameter) placed separately on moist cotton wool in Petri dishes. Each petri dish contains three replicates, ten individuals in each replicate. Each acaricide had four concentrations which were sprayed on the individuals. Mortality was recorded for 3 days after treatment. The mortality percentage was estimated and corrected according to Abbott's formula, 1925. LC_{50} values were determined using the appropriate analysis statistical method of Finney, 1971.

Equation: Sun, 1950 (to determine LC_{50} index**)**

Toxicity Index for LC_{50}=

$$\frac{LC_{50} \text{ of the most effective compound}}{LC_{50} \text{ of the least effective compound}} \times 100$$

RESULTS AND DISCUSSION

The Effect of Nano Chitosan and Fabcomic Acaricide on Adult Female of Spider Mite, *Tetranychus urticae* Koch:

The data in Table (1) indicated that nano chitosan and fabcomic acaricide caused a high mortality proportion on *T. urticae* specially in high concentrations. These results were in agreement with El Kady *et al*. 2007 and Campos *et al.*2018.

Lethal Concentrations of Nano Chitosan and Fabcomic Acaricide on Adult Female of Spider Mite, *Tetranychus urticae* Koch:

Table (2) and Fig. (1) demonstrated that fabcomic was more effective than nano chitosan, with LC_{50}: 0.10 ppm and 801.04 ppm, respectively. LC_{90} value was 1.66 ppm and 5746.09 ppm for fabcomic and nano chitosan, respectively. The toxicity index was 100% for fabcomic while it was 0.013% for nano chitosan. The slope values were 1.06 and 1.50 for fabcomic and nano chitosan, respectively. Although fabcomic acaricide was more effective than nano chitosan in control of *T. urticae*, it's harmful for all living organisms including plants. While nano chitosan is originated from remains of fish and skeleton of sea organisms so, it's more save on humans, animals, fish and plants and also effective in controlling *T. urticae*. These results also were in agreement with Ahmadi *et al.* 2017.

Table 1: Corrected mortality % of *T. urticae* treated with nano chitosan and fabcomic acaricide under laboratory conditions 25±2 ˚C and 60±5% RH.

No.	Treatments	Conc. (ppm)	Mortality after treatments %		Total Mortality %
			One day	Three days	
1	Nano chitosan	100	3.33	10	10
		400	10	20	30
		700	20	23.33	43.33
		1000	33.33	26.67	60
2	Fabcomic (insecticide)	0.9	10	40	50
		1.8	20	40	60
		3.6	30	40	70
		7.2	43.33	30	73.33

Table (2): Efficiency of nano chitosan and fabcomic acaricide *against T. urticae:*

Treatments	Conc.	Corrected mortality %	LC_{50}	LC_{90}	Slope± S.D.	Toxicity index LC_{50}	LC_{90}/LC_{50}	R	P
Nano chitosan	100	10	801.04	5746.09	1.50± 0.208	0.013	5.87	0.989	0.443
	400	30							
	700	43.33							
	1000	60							
Fabcomic (insecticide)	0.9	50	0.10	1.66	1.06± 0.285	100	16.6	0.992	0.887
	1.8	60							
	3.6	70							
	7.2	73.33							

R: Regression **P: Propability**

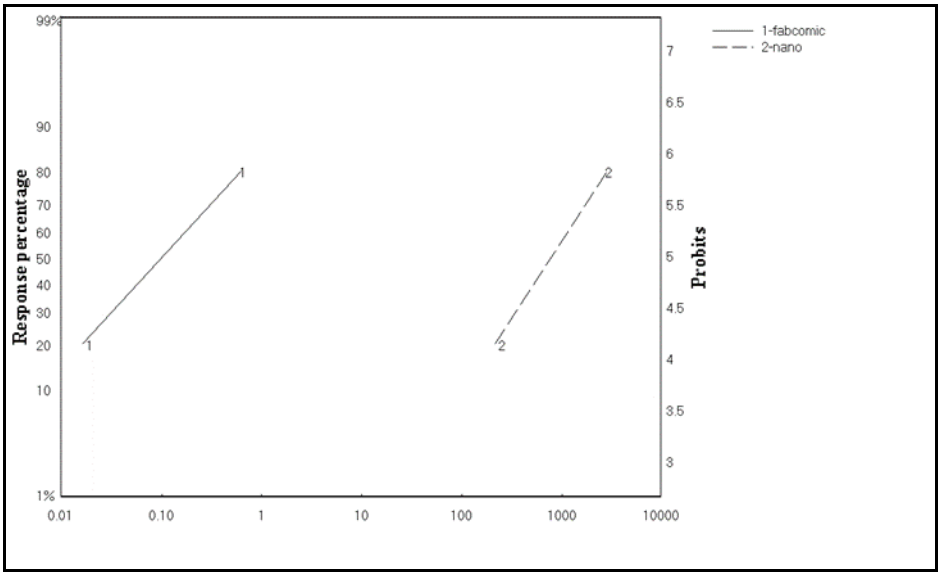

Fig. (1): LC-P lines nano chitosan and fabcomic acaricide against *T. urticae.*

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ARABIC SUMMARY

مقارنة بين النانو كيتوزان والمبيد الأكاروسى فابكومك على أكاروس*Tetranychus urticae*

مروة محمد شلبى، هبه محمد نصر، ايناس مصطفى يحيى، نها عوض ابراهيم

معهد بحوث وقاية النباتات-الدقى-الجيزة-جمهورية مصر العربية.

تم دراسة سمية كلا من النانو كيتوزان والمبيد الأكاروسى فابكومك تحت الظروف المعملية على الأكاروس ذات النقطتين وهو *Tetranychus* urticae وكذلك تم حساب كلا من التركيز نصف المميت والتركيز المميت 90 وقد أثبتت النتائج أن المبيد الأكاوسى أكثر فعالية من النانو كيتوزان ولكن المبيد يسبب تلوثا للبيئة والانسان والنبات بينما النانو كيتوزان أكثر أمانا للبيئة والانسان والنبات حيث أن التركيز نصف المميت 0.1 ، 801.04 جزء فى المليون لكل من الفابكومك ، النانوكيتوزان على التوالى وكذلك التركيز الذى يميت 90 % من الأفراد كان 1.66 و 5746.09 جزء فى المليون لكل من الفابكومك ، النانوكيتوزان على التوالى.