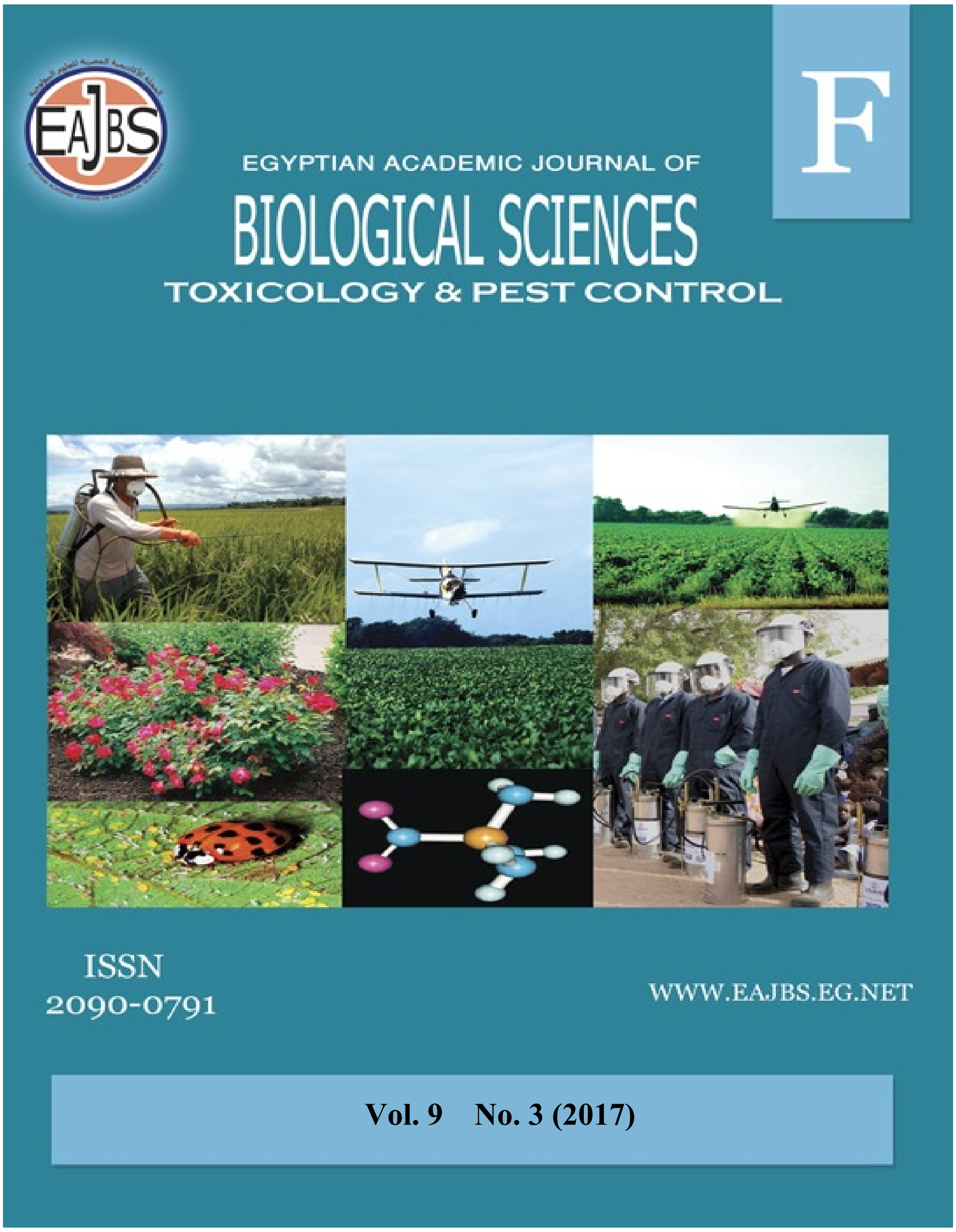

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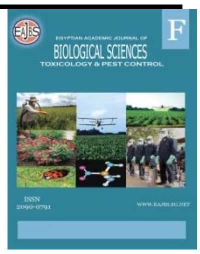

Efficiency Comparison of some Compounds and Their Nano particles against Certain Mite and its Predator in Laboratory and Field.

Abd El-Rahman, H. A
Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt.

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ABSTRACT

The two-spotted spider mite, *Tetranychus urticae* (Koch) is one of the major pest attacking different field crops, vegetables and fruits, while the predatory mite *Phytoseiulus persimilis* (Athias-Henriot) is well known as predator specialized on tetranychida mites. Nanotechnology is science of manipulating materials at nano-scale. Among the latest technological advancements. Nanotechnology and common solution of some compounds occupies a major position in pest control. So, the present investigation was carried out to evaluate some compounds (Cyhalothrin 5% SC, Abamectin Benzoate 1.8 % SC, Chlorpyrifos 48% SC and Methomyl 95 % WP) and their images Nan particles against *T. urticae* and *P. persimilis* in laboratory and under field conductions on cotton plants. Also, the LC50 of these chemicals on the mite and predatory mite were evaluated .The results revealed that Abamectin Benzoate nano particles had high toxic effect and high toxicity index , on the other hand Methomyl 95 nano partials was least toxic compounds to adult female *T. urticae* than the tested compounds in common solution. Moreover Cyhalothrin nano partial was the most effective compound against *T. urticae* eggs deposition and eggs hatchability of *T. urticae.* But Cyhalothrin nano partials had moderate effect on mite eggs and adults of *T. urticae*.Under field condition, all compounds of nano particles achieved good effect against *T. urticae* on cotton plants. But all compounds were safety to predatory mite *P.persimilis* in comparison with *T. urticae.* The current investigation could be recommended as an aspect of integrated pest management against *T. urticae* and *P. persimilis* both in the field.

INTRODUCTION

Tetranychid mites are common pests in agricultural systems, causing in many cases, greater economic losses than any other arthropod pests. The two – spotted spider mite, *Tetranychus urticae* is considered as one of the major pests attacking different agricultural crops such as field crops, vegetables, cotton and ornamental plants. The two – spotted spider mite *T. urticae* (Koch) has been extensively studied and the early work was reviewed by Huffaker *et al.* (1970). *T. urticae* infests a wide range of economic plants in the field such as cotton (Leigh *et al*., 1968).

A wide range of chemicals have been marketing for controlling the two- spotted spider mite. The wide use of the chemical compounds resulted many problems such as population outbreaks and resistance to chemical, enolangering human health and wealth. For that, entire world are going to reduce chemicals use and trying to introduce predators and the entomopathogens such as virus.

The use of predators had proved the most effective control method for tetranychid mites and the most effective predators have been found in the family, phytoseiidae (Abou-Awad and El-Banhawy, 1985). *Phytoseiulus persimilis (Athias-Henriot)* is an important phytoseiidae mites on various crops (Croft and Mcgrotary, 1 977), and it is a key predator for managing spider mites (Specht, 1968). The possibility of controlling phytophagous mites by a combination of biological and chemical methods had proved a less costly and more permanent method of control than had pesticides alone (Hislop and Prokopy, 1981).

Nanotechnology is science of manipulating materials at nano-scale. Among the latest technological advancements. Nanotechnology and common solution of some compounds occupies a central position to control pests. Nanotechnology is emerging as a rapidly growing field with its application in science and technology for the purpose of manufacturing new materials at the nano scale level (Albrecht, *et al*., 2006). Nanotechnology is a field that is burgeoning day by day making an impact in all dimensions of human life. Until now, limited research provided some evidence of the applicability of silver for controlling plant diseases (Park, H.- J., *et al*. 2006). Silver ions are very reactive, which are known to cause the inhibition of microbial respiration and metabolism as well as physical damage (Gavanji *et al*. 2013).The ever increasing human population and subsequent worldwide demand for food has urged for a better protection of agricultural crops from the infestation by different groups of insects. This initiated the intervention of modern techniques for the development of novel strategies of plant protection. Over the past decade, there has been a considerable amount of active research on the possible application of nanotechnology in the current agricultural practices including development of novel plant-protection products. In particular, designing of nanoformulation of different insecticides has emerged at high speed and which can be basically attributed to the fact that the composition of many conventional insecticides are feebly water soluble and require a delivery system for their application in the field. Compared to bulk substances, nano-insecticides have many added advantages such as: (a) less environmental contamination through reduction in pesticide application rates and reduced losses; (b) enhanced efficiency of chemical and natural insecticides by controlled release; (c) renders insecticides more susceptible to photodegradation; (d) easy/safe handling with reduced toxicity risks to animals and; (e) less toxicity towards non-target organisms compared with bulk, Bragg, (2015).

Melanie, (2015) researched into nanotechnology applications for use in agriculture has become increasingly popular over the past decade, with a particular interest in developing novel nanoagrochemicals in the form of so-called "nanopesticides" and "nanofertilizers." *In view* of the extensive body of scientific literature available on the topic, many authors have foreseen a revolution in current agricultural practices. This analysis identifies directions for future research and regulatory needs in order to encourage intelligent design and promote the development of more sustainable agrochemicals.Until now this pest showed resistance to 80 types of pesticides and its economical restriction because of increase in its resistance to pesticides and its growth rate is growing daily (Cranham and Andhelle, 1985).

MATERIALS AND METHODS

Preparation of nanoparticles:

In this study, the solutions containing compounds nanoparticles were produced by department of nanotechnology, Faculty of Science, University of Kafr El-Sheik. The concentrations of these compounds were the same concentrations of common solutions and it was in form of colloidal suspension. This compound keeps its stability in cultural medium. The sizes of this compound were between 20 to 100 nm showed the average stability of this compounds (Figures 1,2,3,4 and 5). All the applied concentrations have obtained by diluting different amount of the solutions with appropriate amount of distilled water.

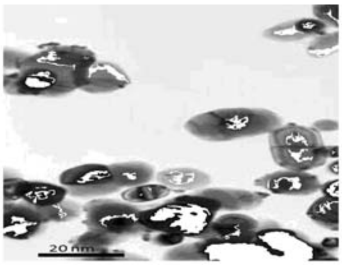

Fig. 1: Abamectin Benzoate

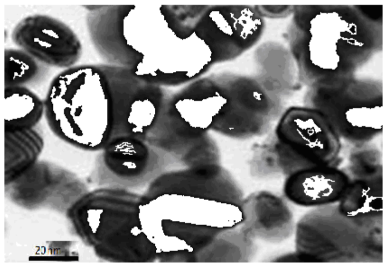

Fig. 2: Cyhalothrin

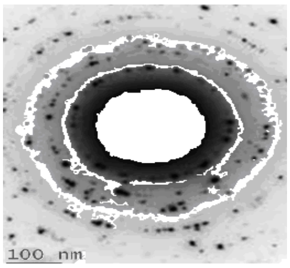

Fig. 3: Chlorfenapyr

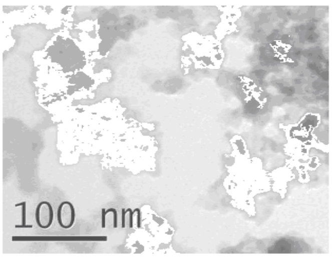

Fig. 4: Methomyl 95

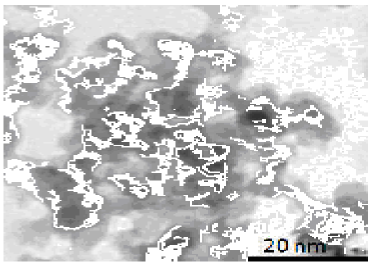

Fig. 5: Chlorpyrifos Culture techniques

Figs. 1,2,3,4 and 5: The size of compounds nanoparticles

The two-spotted spider mite, *Tetranychaus urticae* (Koch) (Acarina: Tetranychidae) was reared according to Dittrich (1962).

Experimental techniques:

Toxicity of tested compounds to adult females of two-spotted spider mite *T. urticae*:

To evaluate the toxic effect of tested chemicals to the two-spotted spider mite *T. urticae*, all compounds were evaluated by the leaf disc dip technique according to Siegler (1947). The formulated chemicals were diluted to certain concentrations (ppm) of the active ingredient. Distilled water was used in all dilutions. Four discs of castor bean leaves were dipped in each concentration for 5 seconds and left to dry. Then 10 adult female mites were transferred to each disc. The discs were placed on moist filter paper, which rested on moist cotton wool pad contained in Petri dishes and kept in the same condition of breeding room. Mortality counts were made 24 hours after treatment. Correction for the control mortality was made using Abbott's formula (1925). Data were plotted on log dosage probit papers and statistically analyzed according to Litchfield and Wilcoxon (1949). Each treatment was replicated four times.

Toxicity of tested compounds to eggs of two-Spotted spider mite *T. urticae*:

A count was then made of (a) untreated eggs, (b) number of total eggs which counted before treatment with toxicant. Egg mortality was calculated as follows: Egg mortality= (a/b) ×100. Correction for control mortality was made using Abbot's formula (1925).

Effect of compounds residues on *T. urticae* egg deposition and egg-hatching:

To assay the residual effect of each tested chemical at LC_{25} level on adult prey mites, the technique advised by Keratum *et al*. (1994).

Leaf dipping method

In this method the rose leaves disinfected from any pests were cut freshly with their long tail before experiment. Each tail was placed in wet cotton and covered with aluminum cover. Then the leaves were individually immersed in concentrations 10, 50, 100, 200 and 500 ppm of compounds nan particle for 5 seconds and their common compounds. Discs were glued individually to plastic Petri dish and then adult mites were transferred on leaves.

Bioassay test

Direct toxicity to adults (LC_{50} values) was determined using the leaf-spray method. Each leaf was placed on wet cotton in Petri dish and 5 adult female mites were transferred to leaf disc to which treatments were sprayed by a hand sprayer. Mortality was recorded after 24 h .Each concentration of nano particles was tested with 5 replicates and water as control. The Petri dishes were stored in a cabinet at 25±4°C, 60±4% RH, 16 L: 8 D photoperiod.

RESULTS AND DISCUSSION

Toxicity of tested compounds against adult females of two-spotted spider mite *T. urticae* on cotton discs:

Nanotechnology is science of manipulating materials at nano-scale. Among the latest technological advancements. Nanotechnology and common solution of some compounds occupies a central position to control pests. So, the present investigation was carried out to evaluate some compounds (Abamectin Benzoate, Cyhalothrin ,Chlorpyrifos, Chlorfenapyr and Methomyl 95) and their images nano particles against *T. urticae* in laboratory.

Common solution (CS)

Results indicated that common solution of abamectin benzoate was the most toxic compound to adult females of *T. urticae* with LC_{50} values of 0.005 ppm but common solution of methomyl 95 was the least toxic compounds to adult females of *T. urticae* of LC_{50} value 89.54 ppm. In other words the highest toxicity index means more homogeneity in response of the organism towards the pesticide and in the same time the pesticide is acting as a selection factor producing an organism strain as pure genetically as possible, while the low toxicity index indicates heterogeneous mite population, in its response to the chemical, therefore one expect that compound with low toxicity index may lead to development of resistance if used successively.

Concerning the toxicity index at LC_{50} level the data in Table (1) confirmed that, common solution of Abamectin Benzoate was the most toxic compound to adult females of *T. urticae* with toxicity index of 100 .While common solution of Methomyl 95 was the least toxic compounds to adult females *T. urticae* with toxicity index of 0.09. Ismail *et al*. (2006) found that abamectin was the most toxic compound followed by Fenpyroximate to adult females of *T. urticae* with LC_{50} value of 0.003 and 103.59 ppm. Auger *et al*. (2003) reported the effect of Abamectin on eggs and adult of *Tetranychus urticae.* By using 12 and 25g/lit at 20, 27.5 and 35°C condition, they could control 90% of *T. urticae* and eggs of it.

Nano solution (NS):

Results indicated that images nano particles Abamectin Benzoate was the most toxic compound to adult females of *T.urticae* with LC_{50} values of 0.006 ppm but images nano particles Methomyl 95 was the least toxic compounds to adult females of *T.urticae* of LC_{50} value 73.54 ppm. While the low toxicity index indicates heterogeneous mite population, in its response to the chemical, therefore one expect that compound with low toxicity index may lead to development of resistance if used successively. Concerning the toxicity index at LC_{50} level the data in Table (1) confirmed that, images nano particles Abamectin Benzoate was the most toxic compound to adult females of *T. urticae* with toxicity index of 100. While images nano particles Methomyl 95 was the least toxic compounds to adult females *T.urticae* with toxicity index of 0.07.Gavanji *et al.* (2013) this study it was revealed that some concentrations of sulfur in nano scale can affect the spider mites and in this study showed that the sulfur in nano scale can be more effective and stable on *T. urticae* at different life stages. Gavanji *et al.* (2013) The results of the laboratory bioassay on adults showed that nano sulfur is more toxic than sulfur at different time intervals against both adults and nymphs, results showed that as time pasts both products have residual efficacy.

Table 1: Toxicity of different compounds to adult females of two- spotted spider mite *T. urticae* (Koch) on Castor bean, Broad bean and Cucumber leaf discs:

Compound	Common solution(CS)				Nano solution (NS)			
	LC_{50} (PPM)	C. L. for LC_{50} lower	C. L. for LC_{50} upper	Toxicity index	LC_{50} (PPM)	C. L. for LC_{50} lower	C. L. for LC_{50} upper	Toxicity index
Abamectin Benzoate	0.006	0.003	0.013	100	0.005	0.002	0.008	100
Chlorpyrifos	21.25	17.93	26.55	0.03	21.25	15.44	22.60	0.024
Cyhalothrin	67.30	61.47	73.06	0.06	67.30	63.32	82.62	0.006
Chlorfenapyr	41.44	33.32	49.19	0.02	41.44	29.58	46.13	0.011
Methomyl 95	89.54	76.52	98.46	0.09	73.54	69.41	77.39	0.07

Reduction percentage in eggs laying capacity of *T. urticae* /5females due to compounds on cotton leaf discs.

Common solution. (CS):

The data shown in Tables (2) indicated that the mean number of eggs deposited by adult female mites *T. urticae* on leaf discs treated by different compounds which common solution .The result in Tables (2) suggested that common solution of Abamectin Benzoate was the most effective compounds on egg deposition and the effective in reducing mite fecundity by (75.9%). While Cyhalothrin had a moderate effect on that character and similarly effective in reducing mite fecundity with (54%). But Methomyl 95 was the least effect of reduction by 12.88% on adult female mites *T. urticae.* Ismail (2007) indicated that Cypermethrin was highly toxic compound that caused the highest decrease in egg hatchability on leaf discs against egg stage of *T. urticae*. Hosny *et* *al*. (2009 and 2010) indicated that Cyhalothrin was highly toxic compound that caused the drastic drop in egg hatchability, while ethion and Abamectin were about of the same ovicidal effect against the egg stage of spider mite *T. urticae*.

Table 2: Reduction percentage in eggs laying capacity of *T. urticae* /5females due to compounds on castor bean leaf discs.

Compounds	Reduction% of common solution(CS)					Mean
	1st day	2nd day	3rd day	4th day	5th day	
Abamectin Benzoate	88.4	83.6	77.93	70.7	65.7	75.9
Chlorpyrifos	50	45.1	32.56	22.1	19.1	32
Cyhalothrin	75.6	68.2	54.37	39.5	42	54
Chlorfenapyr	19.8	14.3	11.74	9.2	13	13.2
Methomyl 95	24.5	15.4	9.48	6.5	10	12.88

Nano solution (NS):

Data in Tables (3) indicated that the mean number of eggs deposited by adult female mites *T. urticae* on leaf discs treated by different compounds which images nano particles .The result in Tables (3) suggested that images nano particles of Abamectin Benzoate was the most effective compounds on egg deposition and the effective in reducing mite fecundity by (82.46%). While images nano particles Cyhalothrin had a moderate effect on of reduction by 70.7% of that character and similarly effective in reducing mite fecundity. But images nano particles Methomyl 95 was the least effect of reduction by 37 % on adult female mites *T. urticae.*

Table 3: Reduction percentage in eggs laying capacity of *T. urticae*/5females due to compounds on cucumber leaf discs.

Compounds	Reduction% of nano solution (NS)					Mean
	1st day	2nd day	3rd day	4th day	5th day	
Abamectin Benzoate	34.6	41.5	42.8	38.4	37.9	82.46
Chlorpyrifos	76.6	62.8	57.3	49.2	45.8	56.4
Cyhalothrin	76.6	77.7	75.5	68.4	60.8	70.7
Chlorfenapyr	54.4	49.7	41.4	30..9	27..9	47.1
Methomyl 95	59.3	58.6	51	38.4	26.5	37

Saadoon (2006) indicated that the two tested compounds (Challenger and Abamectin) decreased the average number of deposited eggs per female from 51.8 to 12.6 and 3.6 eggs laid/female for Challenger and Abamectin respectively. Ismail (2007) indicated that Chlorfluazuron, Cypermethrin and Supermasrona were the most effective compounds on egg deposition of the adult female mites *T. urticae* and caused the highest reduction in egg deposition comparable to the control treatment. Also, Hosny *et al*., (2010) indicated that cyhalothrin is the most effective compound tested on egg deposition. Chlorfenapyr and Nat-1 are the best compounds that have a moderate effect on egg deposition of spider mite which give these compounds special importance in integrated mite management.

Effect of compounds residues on number of eggs hatched of the two-spotted spider mite *T. urticae* on cotton plants:

Common solution. (CS):

From the percent hatchability Table (4), results suggested that common solution of Abamectin Benzoate was the most effective compound on egg hatchability (35 %). While common solution of Cyhalothrin had a moderate effect on that character (43.6). common solution of Methomyl 95 was the least effective one (58.2 %) on this biological character.

Table 4: Effect of different compounds residues on egg hatching of *T. urticae* on cotton of common solution.

Compounds	Unhatchehd eggs at indicated day of nano solution					Mean	Hatchability %
	1st day	2nd day	3rd day	4th day	5th day		
Control	18.00±0.81e	15.00±0.81de	9.50±1.29cd	3.75±0.95d	0.00±0.00e	9.25±0.772e	63
Abamectin Benzoate	24.50±1.00a	22.25±1.89a	17.25±0.50a	9.25±0.95ab	8.00±1.82ab	16.25±1.232a	35
Chlorpyrifos	19.00±1.15cd	16.00±1.41c	13.50±1.29b	11.50±2.00a	9.50±1.73a	13.90±1.516b	44.4
Cyhalothrin	23.75±1.50b	19.75±1.50ab	12.50±1.29bc	8.50±1. 29c	6.00±2.44c	14.10±1.604ab	43.6
Chlorfenapyr	20.25±0.50c	18.00±2.30bc	10.75±2.87c	9.00±1.15abc	7.25±0.50bc	13.05±1.464bc	47.8
Methomyl 95	16.75±1.70f	15.00±1.15d	9.00±1.41f	7.00±0.81cd	4.50±0.57d	10.45±1.128d	58..2

Nano solution (NS):

The percent hatchability in Table (5), results suggested that nano solution of Abamectin Benzoate was the most effective compound on egg hatchability (22.8%). While nano solution of Cyhalothrin had a moderate effect on that character (38.2). Methomyl 95 was the least effective one (54.8 %) on this biological character.

Table 5: Effect of different compounds residues on egg hatching of *T. urticae* on **cotton** of nano solution**.**

Compounds	Unhatchehd eggs at indicated day of nano solution					Mean	Hatchability %
	1st day	2nd day	3rd day	4th day	5th day		
Control	14.50±1.29e	11.00±2.75d	5.00±0.81e	0.75±0.95d	0.25±0.50e	6.30±1.26e	74.8
Abamectin Benzoate	25.00±0.00a	23.25±2.21a	19.00±0.81a	15.50±1.00a	13.75±0.95a	19.30±0.994a	22.8
Chlorpyrifos	21.00±1.00b	19.25±1.50b	12.75±1.50b	9.50±0.57c	7.00±0.81c	12.90±1.076d	48.4
Cyhalothrin	23.75±1.50ab	20.00±3.55ab	13.50±3.69b	10.75±1.70b	9.25±0.95bc	15.45±2.278b	38.2
Chlorfenapyr	19.75±0.95bc	15.75±1.70c	12.50±1.73c	10.25±1.25bc	9.75±0.95b	13.60±1.316c	45.6
Methomyl 95	17.75±0.50d	13.75±2.25cd	11.50±1.29d	7.25±1.50cd	6.25±1.25d	11.30±1.35de	54.8

Toxicity Parameters of different compound to adult females of predatory mite *P. persimili*s on cotton leaf discs:

Common solution (CS):

The safety index, selectivity index and selectivity ratio values in Table (6) showed that common solution Methomyl 95 is the most safe compound to adults of predatory mite *P. persimilis* with safety index of 100. But Abamectin Benzoate was of the lowest safety effect on adult predatory mite with safety index of 0.0001. These results confirmed that Chlorpyrifos appeared to be of high selective effect on predatory mite *P. persimilis* with selectivity ratio of 4.44 and selectivity index of 100. While common solution Abamectin Benzoate has lowest selective effect with selectivity ratios of 0.20, and selectivity index values of 4.50.It is interesting to find out that Chlorpyrifos has the highest selectivity index and highest selectivity ratio in spite of its low safety index value.

Nano solution (NS):

In Table (6) data showed that nano solution Methomyl 95 is the most safe compound to adults of predatory mite *P. persimilis* with safety index of 100. But nano solution Abamectin Benzoate was of the lowest safety effect on adult predatory mite with safety index of 0.001. These results confirmed that Chlorpyrifos appeared to be high selective effect on predatory mite *P. persimilis* with selectivity ratio of 5.35 and selectivity index of 100. While Abamectin Benzoate has lowest selective effect with selectivity ratios of 0.28, and selectivity index values of 2.76. It is interesting to find out that nano solution Chlorpyrifos has the highest selectivity index and highest selectivity ratio in spite of its low safety index value. But all concentrations of nano solution were lowest values and the most toxic compounds.

Table 6: Toxicity Parameters of different compound to adult females of predatory mite *P. persimilis* on cotton leaf discs:

Compound	Common solution (CS)			Nano solution (NS)		
	Safety index	Selectivity ratio (S. R)	Selectivity index	Safety index	Selectivity ratio (S. R)	Selectivity index
Abamectin Benzoate	0.0001	0.20	4.50	0.001	0.28	2.76
Chlorpyrifos	11.73	4.44	100	15.07	5.35	100
Cyhalothrin	9.75	0.96	21.62	13.66	1.99	25.32
Chlorfenapyr	1.55	0.29	6.53	3.51	0.38	6.39
Methomyl 95	100	0.27	6.08	100	0.31	7.42

Effect of different compounds residues on feeding capacity of predatory mite *P. persimilis* on cotton leaf discs:

Common solution (CS) :

The data of this study shown in Table (7) indicated that most of tested compound's residues caused a decrease in prey egg consumption comparable to the control treatment. It is apparent from the calculated average number of eggs consumed by one adult predator through the first and second day that common solution of Abamectin Benzoate was the most effective compounds that reduced the prey egg consumption (2.87egg/adult/day) comparable to control of (10.75eggs/ adult/da), common solution of Cyhalothrin caused a moderate effect with (2.75 eggs/adult/da). While common solution of Methomyl 95 was the least effective compound in this respect. Ismail *et al.* (2009) found that Methomyl the safest compounds to adult females of both predatory mites *P.persimilis*.

Keratum *et al.* (2010) indicated that the mineral oil and Methomyl were the safest compounds to the adults of predatory mites *P.macrophilis*. Nadimi *et al.* (2011) found that all Fenpyroximate treatments and three days old residues of Abamectin Benzoate treatments would be the least compatible with *P. persimilis* but ten days old residues of Abamectin Benzoate treatments were favorable towards *P. persimilis.*

Nano solution (NS) :

Results shown in Table (7) indicated that most of tested compound's residues caused a decrease in prey egg consumption comparable to the control treatment. Nano solution of Abamectin Benzoate was the most effective compounds that reduced the prey egg consumption (2.50 egg/adult/day) comparable to control of (9.25 eggs/adult/day), nano solution of Cyhalothrin caused a moderate effect with (2.87 eggs/adult/day) .While nano solution of Methomyl 95 was the least effective compound in this respect with (5.50 eggs/adult/day) .All compounds were safety to predatory mite *P. persimilis* in comparison with *T. urticae.*

Table 7: Effect of different compounds residues on feeding capacity of predatory mite *P. persimilis* On cotton leaf discs:

Compound	Common solution(CS)				Nano solution(NS)			
	No. of consumed egg/adult/day		Average	LSD	No. of consumed egg/adult/day		Average	LSD
	1st day	2nd day			1st day	2nd day		
Control	12.25±0.95a	9.25±1.50a	10.75±1.225a	3.27	9.50±0.57a	9.00±0.81a	9.25±0.69a	1.83
Abamectin Benzoate	2.50±0.57de	3.25±0.95e	2.87±0.76d	2.05	2.50±0.57ef	2.50±0.95d	2.50±0.76e	2.05
Chlorpyrifos	4.00±0.81c	4.00±1.15cd	4.00±0.98cd	2.59	4.25±0.50de	4.25±0.95cd	4.25±0.725c	1.98
Cyhalothrin	2.75±0.50d	2.75±1.70df	2.75±1.10de	3.27	3.00±0.81e	2.75±0.50de	2.87±0.655d	1.76
Chlorfenapyr	5.50±0.57bc	4.75±0.95c	5.12±0.76bc	2.05	5.25±0.50b	4.50±1.29c	4.87±0.895bc	2.54
Methomyl 95	6.50±1.00b	5.00±1.15b	5.7 5±1.075b	2.80	5.00±1.63bc	5.50±1.00b	5.50±1.315b	3.51

Field studies:

Number of motile stages of mite *T. urticae* treated with different compounds on cotton plants in the field:

Field experiments on cotton plants were carried out in the farm of Agricultural research station, Sakha. Kafr E1-Sheikh Egypt in order to evaluate the relative susceptibility of motile stages of mites *T. urticae* to different tested compounds. All tested compounds were applied at half of their recommended rates. Samples of 10 cotton leaves were randomly collected from each plot before and after treatment. The percentage reduction of infestation was calculated for each treatment according to Handerson and Tilton equation (1955). All data recorded were analyzed according to the method of Duncan's multiple range tests.

Number of motile stages of mite *T. urticae* treated with different compounds on cotton plants in the field:

Common solution (CS):

The data presented in Table (8) show that common solution of Abamectin Benzoate was the most effective compound in reducing the population density of motile stages of mite, *T. urticae* two days after treatment, followed by common solution of Chlorpyrifos while common solution of Cyhalothrin and Chlorfenapyr were of moderate effect, whereas common solution of Methomyl 95 was the least effective compound in reducing the population density of motile stages of *T. urticae*. two week after application it was observed that the population density of motile stages of *T. urticae* decreased, in general, in all treatments the most effective compounds in reducing the population density were common solution of Abamectin Benzoate, Chlorpyrifos, Cyhalothrin and Chlorfenapyr while common solution of Methomyl 95 was the least effective compound. Based on these reductions of all compounds, in general, were effective in reducing the population density of motile stages of mite *T. urticae*.

Table 8: Number of motile stages of mite *T.urticae* treated with different compounds on cotton plants in the field.

Compounds	Reduction %					
	Common solution					
	15 days	30 days	45 days	60 days	75 days	90 days
Abamectin Benzoate	18.64	23.74	26.63	29.56	32.59	30.75
Chlorpyrifos	22.85	26.34	34.55	47.23	40.33	38.64
Cyhalothrin	36.71	38.22	44.59	47.71	55.35	53.44
Chlorfenapyr	48.36	53.65	56.73	58.56	63.47	60.72
Methomyl 95	61.55	63.75	66.43	70.21	77.82	73.64
Concentrations (Gausses)	Reduction %					
	Nano solution					
	15 days	30 days	45 days	60 days	75 days	90 days
Abamectin Benzoate	15.69	18.43	18.58	21.45	28.62	26.99
Chlorpyrifos	16.78	21.75	27.55	31.23	30.69	28.66
Cyhalothrin	31.58	33.84	38.77	42.59	46.73	46.88
Chlorfenapyr	41.12	44.91	47.73	49.85	47.43	45.65
Methomyl 95	54.45	58.55	60.01	62.27	64.33	62.46

Nano solution (NS):

The data presented in Table (8) show that nano solution of Abamectin Benzoate was the most effective compound in reducing the population density of motile stages of mite, *T. urticae* two days after treatment, followed by nano solution of Chlorpyrifos while nano solution of Cyhalothrin was moderate effect, whereas nano solution of Methomyl 95 was the least effective compound in reducing the population density of motile stages of *T. urticae.* two week after application it was observed that the population density of motile stages of *T. urticae* decreased, in general, in all treatments the most effective compounds in reducing the population density were Abamectin Benzoate, Chlorpyrifos, Cyhalothrin and Chlorfenapyr while Methomyl 95 was the least effective compound.

Number of motile stages of mite *T. urticae* treated with different compounds on cotton plants in the field:

Common solution (CS):

During the season 2015 ,results in Table (9) for cotton crop proved that the simple correlation was positive correlated between mean population of population density of motile stages of mite, *T. urticae* and common solution of compounds .The data presented in Table (9) show that common solution of Abamectin Benzoate was the most effective compound in correlation of motile stages of mite, *T. urticae*, followed by common solution of Chlorpyrifos while common solution of Cyhalothrin and common solution of Chlorfenapyr were of moderate effect, whereas common solution of Methomyl 95 was the least effective compound in correlation of the population density of motile stages of *T. urticae.* One week after application it was observed that the population density of motile stages of *T. urticae* decreased with different images nano particles of compounds.

Table 9: Number of motile stages of mite *T.urticae* treated with different compounds on cotton plants in the field

	Common solution					
Compounds	**15 days**	**30 days**	**45 days**	**60 days**	**75 days**	**90 days**
Abamectin Benzoate	18.64	23.74	26.63	29.56	32.59	30.75
Chlorpyrifos	22.85	26.34	34.55	47.23	40.33	38.64
Cyhalothrin	36.71	38.22	44.59	47.71	55.35	53.44
Chlorfenapyr	48.36	53.65	56.73	58.56	63.47	60.72
Methomyl 95	61.55	63.75	66.43	70.21	77.82	73.64
Replication	0.145	0.133	0.126	0.166	0.168	0.189
	Nano solution					
Compounds	**15 days**	**30 days**	**45 days**	**60 days**	**75 days**	**90 days**
Abamectin Benzoate	15.69	18.43	18.58	21.45	28.62	26.99
Chlorpyrifos	16.78	21.75	27.55	31.23	30.69	28.66
Cyhalothrin	31.58	33.84	38.77	42.59	46.73	46.88
Chlorfenapyr	41.12	44.91	47.73	49.85	47.43	45.65
Methomyl 95	54.45	58.55	60.01	62.27	64.33	62.46
Replication	0.122	0.134	0.145	0.165	0.176	0.178

Nano solution (NS):

Images nano particles of compounds .The data presented in Table (9) show that images nano particles of Abamectin Benzoate was the most effective compound in correlation of motile stages of mite, *T. urticae*, followed by nano solution of Chlorpyrifos while nano solution of Cyhalothrin and Chlorfenapyr were of moderate effect, whereas nano solution of Methomyl 95 was the least effective compound in correlation of the population density of motile stages of *T. urticae.* One week after application it was observed that the population density of motile stages of *T. urticae* decreased with different images nano particles of compounds. Alireza, *et al*. (2013). Nanotechnology is emerging as a rapidly growing field with its application in science and technology for the purpose of manufacturing new materials at the nano scale level. There are considerable issues relating to the definition of nanoparticles and how the criteria proposed could apply to nanopesticides (discussed in Kah *et al*., 2013). Finally, other groups have warned that manufactured nanoparticles, nano-emulsions and nano-capsules are now found in agricultural chemicals (Harth, 2015).

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ARABIC SUMMERY

الكفاءة المقارنة لتأثير بعض المركبات وتحويلها إلي صورها النانوتكنولوجية علي الأكاروس الأحمر ذو البقعتين و أحد مفترساته (فيتوسيلس بيريسميلس).

حمدي عبد الرحيم عبد الرحمن
معهد بحوث وقاية النباتات – محطة البحوث الزراعية بسخا- الدقي - مركز البحوث الزراعية - القاهرة – مصر.

العنكبوت الأحمر ذو البقعتين آفة من الأفات الرئيسية التي تقوم بمهاجمة المحاصيل الحقلية المختلفة و الخضروات و الفاكهة أيضا .المفترس الأكاروسي (فيتوسيلس بيريسميلس) من المفترسات المتخصصة علي العنكبوت الأحمر و له تأثير ملحوظ علي الأكاروس النباتي و حيث يعتبر علم النانوتكنولوجي من العلوم التي تختص بالوصول للمواد الأساسية الي نطاق أساس المواد الأولية و من بين أحدث التطورات لهذا العلم هو استخدام هذه التقنية في مكافحة الآفات . ولذلك تمت إجراء هذه الدراسة لمقارنة كفاءة بعض المركبات و هي (سيهالوثرين أبامكتين بنزوات و كلوروبيروفوس و ميثوميل٩٥) و صورها النانوتكنولوجية ضد العنكبوت الأحمر ذو البقعتين و المفترس الأكاروسي (فيتوسيلس بيريسميلس) في المعمل و الحقل علي نباتات القطن كما تم تحديد قيمة ال (LC_{50}) لهذه المركبات سواء في الصورة المعتادة أو في صورة النانوتكنولوجي علي العنكبوت الأحمر و المفترس الأكاروسي .أظهرت النتائج أن مركب أبامكتين بنزوات كان له تأثير عالي السمية في صورته النانوتكنولوجية في حين أن مركب ميثوميل كان له تأثير أقل سمية في نفس الصورة بينما أعطي المركب البيروثرويدى سيهالوثرين سميه متوسطة في الصورة ذاتها علي كل من الأكاروس النباتي و المفترس الأكاروسي علي سلوك الأكاروس و التعداد علي حدا سواء .كان للمركب الأخير في صورته النانوتكنولوجية تأثير متوسط علي كل من وضع البيض و فقس البيض للأكاروس النباتي و الطور المتحرك للمفترس الأكاروسي علي نباتات القطن. حققت جميع المركبات في الصورة النانوتكنولوجية تأثير فعال بالمقارنة بالصورة التطبيقية المعتادة لكل من الأكاروس و المفترس محل الدراسة . و لذلك يمكن التوصية بوضع هذه المركبات في الصورة النانوتكنولوجية كنوع من أنواع المكافحة الهادفة في برامج المكافحة المتكاملة للأكاروسات ضد الأكاروسات النباتية و المفترس الأكاروسي علي نباتات القطن في التطبيق الحقلي.