

## Biological and Toxicological studies to some compounds on two-spotted spider mite *Tetranychus urticae* and predatory mite *Amblyseius gossipi* (El-Badry) on two different plant families.

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### Abstract

According to the integrated mite management programs, laboratory experiments were carried out to evaluate the toxic effect of Three chemical compounds (Abamectin ; Fenpyroximate ; Cypermethrin )and one plant extract ( Wormseed) against the egg and adult females of the two spotted spider mite *Tetranychus urticae* (Koch) and adult females of predatory mite *Amblyseius gossipi* (El-Badry) on two different host plants (Cotton and Soybean). The side effect of mentioned compounds on some biological aspects of two species of mites were also evaluated. Cypermethrin was the most effective compound tested on egg deposition of *T. urticae* on Cotton plant, while on the other host occupies the next position after Fenpyroximate. Also, Cypermethrin was highly toxic compound that caused the highest decrease in egg hatchability especially on Cotton and Soybean. According to the nature of the chemical the prey egg consumption by the predator changed depending on time elapsed between egg contamination by chemical and egg introduction to the predator, also consequently the predator egg production. While the data in the field indicated that the same effects Abamectin was the most effective compound while Fenpyroximate and Cypermethrin caused a moderate effective, but Wormseed caused the least effective compound to motile stages of *T. urticae* than *A. gossipi* on two different host plants (Cotton and Soybean).

**Key words:** - Biological -Toxicological on mite

### Introduction

The wide use of the chemical compounds resulted many problems such as population out breaks and chemical resistance. The continuous use of the compounds to control pests has caused environmental pollution. Therefore it has become necessary to search on safe compounds against pests. The magnetic field to be measured by Gauss and every 10000 G equal to tesla. The magnetic field to the earth is about 0.5 gauss (Marshall and Skitek 1987).

*Tetranychus urticae* (Koch) is one of the most phytophagous spider mite species and it's a major pest in many cropping system world wide (Nauwen *et al.* 2001), attacking different agricultural crops such as field crops, vegetables, fruits and ornamental plants (Dermauw *et al.* 2012). Members of the family Phytoseiidae are the most effective and wide spread predators of injurious plant-feeding mites. Nevertheless, acaricides are used on a large scale to control phytophagous mites, thus affecting the population of phytoseiid mites ( Tawfiq and Isra, 2013).

The phytoseiid mites are the important group among the predatory mites on various crops (El Badry 1967) and (Croft and Mc Grotary 1977) . *Amblyseius gossipi* is a key predator for managing spider mites (Specht, 1968) which specialized on the two spotted spider mites; reproduce more quickly than the two spotted spider mites. Fed on all stages of the two spotted spider mite. Also, *Phytoseiulus persimilis* (Athias-Henriot) is an important phytoseiid mites on various crops (Croft and Mc Grotary 1977). 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 (Hosny *et al.* 2003b) and (Magouz and Saadon 2005).

Soybean, *Glycine max* (L.) Merr., considered one of the relatively new crop into the Egyptian agricultural , which combines in one crop both the dominant supply of edible vegetable oil and dominant supply of high-protein feed supplements for livestock. Cotton crop not only provides fibre for the textile industry, but also plays a role in the feed and oil industries with its seed, rich in oil (18 – 24%) and protein (20 – 40%). An estimated 350 million people are engaged in cotton production either on-farm or in transportation. So, the present study was carried out according to the recommendations of the Plant Protection Research Institute (PPRI) workshop in 28 to 29 Oct. 2018. Therefore, this study aimed to evaluate four chemical compound and one plant extract against *T. urticae* and predator mite, *A. gossipi* on Soybean and cotton plants.

### Materials and Methods

#### I- Laboratory studies

##### A- Collecting of examined mites

A pure culture of *T. urticae* was reared on leaves of *Phaseolus vulgaris* plant which cultivated in plastic trays according to Dittrich (1962), while the predatory mite, *A. gossipi* was collected directly from different plants and identified according to El-Badry (1967) and Overmeer *et al.* (1982).

##### B. Experimental techniques:

### 1- Effect of tested compounds to adult females of *T. urticae* in the laboratory:

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). Mortality counts were made 24 hours after treatment. The mortality percentages were corrected 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. In the lab after placing the disk in the plant is placed magnetic strength in the middle of these disks and then placed four pieces of metal on the edges of the dish to activate the magnetic forces and become in the image of moving magnetic field as these forces move from north to south and the area of the dish homogeneous magnetic effect. The magnetic field is placed in the middle of this piece and then four metal pieces are placed on the edges of the area to activate the magnetic forces and become in the moving image of the magnetic field as these forces move from north to south and the area of the dish is homogeneous magnetic effect.

### 2- Effect of tested compounds on *T. urticae* eggs:

*T. urticae* eggs as prey were obtained by placing approximately 10 adult females of *T. urticae* on a clean castor bean leaf disc placed upper side upon a water soaked cotton wool pad in petri dish. Sufficient discs were set up to provide enough eggs for the following day's of experiments. The adult mites were allowed to oviposit overnight and then were removed. Prey eggs were never longer than 24 hours old at the start of an experiment. The number of eggs on each disc was counted. The discs attached with eggs were immersed in each chemical dilution on the test liquid for (5) seconds with gentle agitation. Untreated discs were immersed in distilled water. The tested eggs were kept together with untreated control, in a holiday chamber of about  $25 \pm 2$  °C and  $70 \pm 5\%$  R.H. Assessment of the results was made when the emergent eggs in the control have reached the protonymphal stage. A count was then made -of by this formula: Egg mortality =  $(a/b) \times 100$ .

a= untreated eggs

b= number of total eggs which counted before treatment with toxicant.

Mortality percentages were corrected according to Abbot's formula (1925).

### 3- Effect of tested compounds to adult females of predatory mite; *A. gossipi*

The predator was reared by the same technique in *T. urticae* as described by Overmeer *et al.* (1982) at the same conditions.

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

To assay the residual effect of each tested chemical at LC<sub>25</sub> level on adult prey mites, the technique advised by Keratum and Hosny (1994).

### 5- Effect of compounds residues on egg consumption, egg laying and hatchability of predatory mite:

The method which was adopted by Keratum and Hosny (1994).

**Statistic analysis:** SPSS programs were used in all field and laboratory experiments

## II- Field studies

Two experiments were carried out in the farm of University of kafr El-Sheikh, Faculty of Agriculture, Egypt to evaluate the efficiency of the tested compounds on spider mite, *Tetranychus urticae* and *A. gossipi* and, *S.gilvifrons* infesting cotton plants variety. Plots each of 1/100 Feddan in completely randomized blocks design were used and four replicates were assigned for each treatment. All tested compounds were applied at their half-recommended rates using a knapsack sprayer with one nozzle. The rate of water used for diluting compounds was 200 liter/Fadden. Samples of 10 cotton leaves were randomly collected from each plot before and after treatment at intervals of 2 days and one week later. The percentage reduction of infestation was calculated for each treatment according to Handerson and Tilton equation (1955). Duncan's multiple range tests at the 5% level was used for statistical analysis of significant differences among treatment.

### Methods of determination NPK:

Samples of leaves of cotton tissues were dried till constant weight. The dried leaves were grounded to fine powder.0.2gm of the fine was digested using sulphuric acid and perchloric acid (5:1) then the solution was completed to 50 ml using distilled water. The final solution was used to determine nitrogen, phosphorus and potassium as follows:

The nitrogen content in cotton plants leaves were determined in all of the before mentioned treatment by kjeldahl method according to Chalmers (1984). Phosphorus and potassium were determined according to Chapman and Pratt (1961).

## Results and Discussion

### I- Laboratory studies

#### 1- Toxicity of tested compounds against adult females of two-spotted spider mite *T.urticae* on cotton leaf and soybean leaf discs

Three chemical compounds and one plant extract (Wormseed extract) were tested for their toxicity to adult stage of laboratory strain of two-spotted spider mite *T. urticae* by the leaf disc technique using Cotton and Soybean plants as mentioned above in methods and materials part. The natural mortality was corrected according to Abbott's formula (1925).

**Table 1.** Toxicity of different compounds to adult females of two-spotted spider mite, *Tetranychus urticae* (koch) on cotton leaf and soybean leaf discs

Compounds	Cotton			Toxicity Index*	Soybean			Toxicity index*
	LC <sub>50</sub> (ppm)	L.C.for LC <sub>50</sub>			LC <sub>50</sub> (ppm)	L.C.for LC <sub>50</sub>		
		Lower	upper			Lower	upper	
Abamectin	0.003	0.0011	0.0063	100	0.0011	0.0004	0.0035	100
Fenpyroximate	103.59	89.09	122.83	0.0024	89.87	76.56	104.76	0.0012
Cypermethrin	166.95	140.89	205.43	0.0015	139.74	116.63	167.93	0.0008
Wormseed extract	1480.60	1230.76	1811.63	0.0002	1336.48	1092.85	1627.89	0.00008

\* Toxicity index was calculated with respect to abamectin as the most effective compound.

Based on LC<sub>50</sub> values in Table (1) in our study, the abamectin was the most toxic compound, followed by fenpyroximate to adult females of *T. urticae* with LC<sub>50</sub> values of 0.003 and 103.59 ppm. While Wormseed extract was the least toxic to adult females of *T. urticae* with LC<sub>50</sub> values of 1480.60 ppm. Moreover, the mentioned results are agreement with Gamieh *et al.* (2000) who reported that, Vertimec (abamectin) (40ml/100L water) was satisfactory in controlling the mite *T.cucurbitacearum* on soybean while, saied *et al.* (2002) who recorded Vertimec (abamectin) as a high initial kill (81.75%) against two spotted spider mite population on cotton, while the supermasrona cause high residual effect (87 .61%) against two spotted spider mite population in cotton crops. In addition, abamectin was the most toxic compound followed by fenpyroximate to adult females of *T. urticae* with LC<sub>50</sub> value of 0.003 and 103.59 ppm (Ismail *et al.* 2006)). Many studies were carried out to evaluate the toxicity of selected acaricides in a glass-vial bioassay to two spotted spider mite (Acari: Tetranychidae). Toxicity of the mentioned acaricides against the adults of *T. urticae* were arranged based on their toxicity to abamectin > bifenazate > dicofol > propargite = spiromesifen (Latheef and Hoffmann, 2014). Moreover, Reddy *et al.* (2014) evaluated five commercially available new acaricides viz., abamectin, fenazaquin, spiromesfen, fenpyroximate and hexythiazox compared to a standard acaricides.

All the acaricides tested in both laboratory and greenhouse conditions were proved superior over control and Abamectin and Fenazaquin were superior

over other acaricides tested. Chemical composition of five lamiacase plant essential oils, and their acaricidal activity against *Tetranychus sp* were improved the ability to control *T. turkestanii* and could be useful in the development of new agents for mite control (Zandi-Sohani and Ramezani, 2015). On the other hand, Adel (2014) revealed that the five tested compounds mentioned above induced an average of 81.55%, 80.62%, 75.94%, 65.35% and 54.57% reduction in the population of spider mite during the 2007 season, and then changed to 79.72%, 77.92%, 72.54%, 60.05% and 47.97% reduction during the 2008 season. From the studies mentioned above and our results it can be concluded that, the abamectin was the most effects on *T. urticae* which can be use in case of high population while the Wormseed extract, can be using in case of low population of *T. urticae*.

## 2- Toxicity of tested compounds to eggs of two – spotted spider mite *T. urticae* on Cotton leaf and Soybean leaf discs:

The mentioned compounds were tested for their toxicity to one day old –eggs of two – spotted spider mite *T. urticae* (Koch) under laboratory conditions. Tests were done as leaf disc residue technique using tow different host plants (Cotton and Soybean). The mortality was corrected using Abbott's formula (1925) and it was plotted on log concentration-probit papers. Probit regression lines were statistically analyzed according to Litchfield and Wilcoxon (1949), which supplies information on confidence limits of LC<sub>50</sub> and slope values.

**Table 2.** Toxicity of different compounds to eggs of two -spotted spider mite, *Tetranychus urticae* (koch) on Cotton leaf and Soybean leaf discs.

Compounds	Cotton			Toxicity Index *	Soybean			Toxicity index *
	LC <sub>50</sub> (ppm)	L.C.for LC <sub>50</sub>			LC <sub>50</sub> (ppm)	L.C.for LC <sub>50</sub>		
		Lower	upper			Lower	upper	
Abamectin	0.016	0.0078	0.0316	100	0.008	0.004	0.016	100
Fenpyroximate	23.44	20.84	26.48	0.066	21.03	18.55	23.75	0.39
Cypermethrin	28.67	25.60	32.15	0.054	26.51	23.63	29.65	0.031
Wormseed extract	312.40	290.49	338.73	0.05	263.83	234.81	295.27	0.003

\* Toxicity index was calculated with respect to abamectin as the most effective compound.

The toxicity of different tested compounds on eggs of two- spotted spider mite *T. urticae* is presented in Table (2). The data indicated that abamectin was the

most toxic compound against the egg stage of spider mite with LC<sub>50</sub> value of 0.016 ppm. Fenpyroximate and Cypermethrin were of moderate ovicidal effect

with LC<sub>50</sub> values of 23.44 and 28.67 ppm. Then come Wormseed extract in a category of least effective compounds on the egg stage with LC<sub>50</sub> value of 312.40 ppm. Concerning the toxicity index at LC<sub>50</sub> level, the data in Table (2) confirmed that, abamectin was the most toxic to eggs of two –spotted spider mite with toxicity index of 100 followed by fenpyroximate of toxicity index 0.066. While cypermethrin and Wormseed extract are of moderate ovicidal effect on eggs of two – spotted spider mite with toxicity indexes of 0.054 and 0.05 respectively.

The toxicity of different tested compounds on eggs of the two-spotted spider mite *T. urticae* is presented in Table (2). The data indicated that abamectin was the most toxic compound against the egg stage of spider mite with LC<sub>50</sub> value of 0.008 ppm. Fenpyroximate and Cypermethrin were of moderate ovicidal effect with LC<sub>50</sub> values of 21.03 and 26.21 ppm respectively. Then come Wormseed extract in a category of least effective compound on the egg stage with LC<sub>50</sub> value of 263.83 ppm. Concerning the toxicity index at LC<sub>50</sub> level, the data in Table (2) confirmed that abamectin was the most toxic to eggs of two- spotted spider mite of toxicity index of 100 followed by fenpyroximate with toxicity index of 0.39. While cypermethrin is of moderate ovicidal effect on eggs of two- spotted spider mite with toxicity index of 0.031 respectively. This results agreement with Ibrahim *et. al.* (2000) they reported that 1-day old eggs of two-spotted spider mite *T.urticae* was more susceptible for Andalin than 2 and 3-days old eggs and Mousa and El- Sisi ( 2001) they indicated that cotton seed oil was effective in its

initial and residual effects against eggs of spider mite *T.urticae* on sauash crop . in the same time Keratum (2001) indicated that fenpyroximate was the most potent compound against eggs of *T.urticae*, followed by Vertimec, while, Hosny *et al.* (2003) indicated that, abamectin was more toxic to eggs of *T.urticae* and fenpyroximate had the next position in integrated mite management. Also they indicated that cypermethrin was one of the most effective compounds on eggs of *T.urticae* . , Finally, Ismail (2009) found that cyhalothrin and abamectin have a special effect on eggs of *T.urticae* and considered the best compounds that have a special importance in integrated mite management, while the mineral oil Nat-1 was more toxic to egg stage of *T.urticae* than black cumin extract.

### 3- Toxicity of tested compounds to predatory mite *A. gossipi* on Cotton leaf and Soybean leaf discs

The same four compounds that were tested for their toxicity to adults stage of *T.urticae* were tested again against the adults stage of the predatory mite *A. gossipi* under laboratory conditions. Tests were done according to the technique explained in chapter of materials and methods using three different host plants. The mortality was recorded and corrected according to Abbott's Formula (1925), and the results were plotted on log concentration – probit papers and regression lines were statistically analyzed according to Litchfield and Wilcoxon (1949). This supplied informations on confidence limits of LC<sub>50</sub>.

**Table 3.** Toxicity of different compounds to adult females of predatory mite *Amblyseius gossipi* (EL-Badry) on Cotton leaf and Soybean leaf discs.

Compounds	Cotton				Soybean			
	LC <sub>50</sub> (ppm)	LC for LC <sub>50</sub>		Toxicity Index *	LC <sub>50</sub> (ppm)	LC for LC <sub>50</sub>		Toxicity index *
		Lower	upper			Lower	upper	
Abamectin	0.0002	0.0001	0.0003	100	0.0001	0.0001	0.0002	100
Fenpyroximate	57.56	44.26	76.23	0.0003	50.05	37.04	65.08	0.0002
Cypermethrin	101.81	83.15	129.79	0.0002	93.80	76.61	114.01	0.0001
Wormseed extract	699.81	518.45	959.44	.0000003	678.87	509.16	901.84	0.00001

\* Toxicity index was calculated with respect to abamectin as the most effective compound.

The data in Table (3) showed that abamectin was the most effective compound on adult females of predatory mite *A. gossipi* with LC<sub>50</sub> of 0.0002 ppm, followed by fenpyroximate with LC<sub>50</sub> of 57.56 ppm . While cypermethrin and Wormseed extract were of moderate toxic effect with LC<sub>50</sub> of 101.81 and 699.81 ppm. respectively.

Concerning the toxicity index at LC<sub>50</sub> level, the data in Table (3) confirmed that abamectin was the most toxic compound to adult females of predatory mite *A.gossipi* of toxicity index 100, followed by fenpyroximate and cypermethrin with toxicity indexes

of (0.0003 and 0.0002) respectively . Wormseed extract was the least toxic compound to adult females of predatory mite *A.gossipi* with a toxicity index of 0.0000003 .The data in Table (3) showed that abamectin is the most effective compound on adult females of predatory mite *A.gossipi* with LC<sub>50</sub> of 0.0001 ppm. , f followed by fenpyroximate and cypermethrin with LC<sub>50</sub> of 50.05 and 93.80 ppm respectively.While Wormseed extract was of moderate toxic effect with LC<sub>50</sub> of 678.87 ppm.

**Table 4.** Toxicity parameters of different compounds to adult females of predatory mite *Amblyseius gossipi* (EL-Badry) Coton leaf and Soybean leaf discs

Compounds	Cotton			Soybean		
	Safety index	Selectivity ratio (S.R)	Selectivity index	Safety index	Selectivity ratio (S.R)	Selectivity index
Abamectin	0.0000099	0.0667	10.934	0.0000065	0.091	13.562
Fenpyroximate	2.867	0.556	91.148	3.283	0.557	83.010
Cypermethrin	5.071	0.610	100	6.153	0.671	100
Wormseed extract	100	0.473	77.541	44.530	0.508	75.708

The safety index, selectivity index and selectivity ratio values in Table (4) showed that Wormseed extract is the safest compound to adults of predatory mite with safety index of 100, followed by Cypermethrin with a safety index of 5.071, while fenpyroximate was of moderate safe effect on adults of predator mite with safety index of 2.867, respectively. On the other hand, abamectin showed of the Lower safety effect on adult predatory mites with safety index of 0.0000065. These results confirmed that cypermethrin appeared to be of high selective effect on predatory mite with selectivity ratio of 0.671 and selectivity index of 100. while fenpyroximate and supermasrona have a moderate selective effect with selectivity ratios of 0.557 and 0.508 respectively and selectivity index values of 83.010 and 75.708 respectively.

The present data are accessionally in agreement with that of others in some times, several investigators

showed the toxicity of the tested compounds against adult of predatory mites. Keratum (2000) found that fenpyroximate was less toxic to adult predatory mite *A. gossipi* than cypermethrin .

#### 4-Effect of compound's residues on egg deposition by the adult females of *T. urticae* on Coton leaf and Soybean leaf discs :

The effect of sublethal concentrations of tested compounds (  $LC_{25}$ ) on eggs deposited by the adult females mites of *T. urticae* was studied . Five adult female mites of *T. urticae* were allowed to oviposit on different compounds – treated leaf discs for a period of 5 days . The deposited eggs were counted daily for five days . Each treatment was replicated four times on different host plant discs .

**Table 5.** Effect of different compound's residues on egg of *T. urticae* on Coton leaf discs .

Compounds	No. of eggs deposited / 5 adults						LSD 0.01
	1 <sup>st</sup> day	2 <sup>nd</sup> day	3 <sup>rd</sup> day	4 <sup>th</sup> day	5 <sup>th</sup> day	General mean	
Control	22.00 ±0.82a	23.00±0.82a	24.75±0.50a	28.75±1.26a	36.25±0.96a	26.95±0.25a	1.10
Abamectin	11.00±0.82d	12.25±0.96d	17.75±0.50d	21.25±0.96d	27.00±0.82d	17.85±0.44c	1.26
Fenpyroximate	17.75±0.96b	19.75±0.96c	21.25±0.96c	24.25±0.50b	27.50±1029b	22.10±0.48d	1.20
Cypermethrin	3.50±0.58e	4.50±0.58e	5.50±0.58e	8.00±0.82e	11.50±0.58e	6.60±0.16e	0.77
Wormseed extract	16.50±0.58c	19.25±0.96b	22.50±0.50b	25.00±0.82b	28.75±0.50c	22.35±1.00E <sup>10b</sup>	0.84

The accumulated eggs deposited by the adult females of mite *T. urticae* through the first to fifth day exhibited about the same trend.

From the mean number of eggs deposited by adult female mites *T. urticae* on leaf discs treated by different compounds (Table 5 ), results suggested that

cypermethrin was the most effective compound on egg deposition followed by abamectin . While supermasrona, fenpyroximate and etoxazole had a moderate effect on that character and were about similarly effective in reducing mite fecundity.

**Table 6.** Effect of different compound's residues on egg deposition of *T. urticae* on Soybean leaf discs.

Compounds	No. of eggs deposited / 5 adults						LSD 0.01
	1 <sup>st</sup> day	2 <sup>nd</sup> day	3 <sup>rd</sup> day	4 <sup>th</sup> day	5 <sup>th</sup> day	General mean	
Control	19.7± 0.5a	23.0±0.82a	28.0±1.4a	28.75±0.50a	34.75±1.26a	26.85±0.34a	1.20
Abamectin	12.75±0.5b	13.5±0.58b	16.0±0.82b	18.75±0.50b	21.00±0.82bc	16.40±0.28b	2.56
Fenpyroximate	5.00±0.8d	5.75±0.5d	7.50±0.58e	10.25±0.96e	14.00±0.82d	8.50±0.34e	0.93
Cypermethin	4.25±0.5e	5.7±0.5dc	8.50±0.58d	11.25±0.96d	13.75±0.96e	8.70±0.35d	0.90
Wormseed extract	8.25±0.5c	10.7±0.9c	13.50±0.58c	18.00±0.82bc	22.00±0.82b	14.50±0.48c	0.95

From the mean number of eggs deposited by adult female mites *T. urticae* on leaf discs treated by different compounds (Table 6), results suggested that fenpyroximate and cypermethrin were the most effective compound on egg deposition followed by Wormseed extract. While etoxazole and abamectin had a moderate effect on that character.

### III- Field studies

Field experiments on (soybean) plants were carried out in the farm of (Kafr E1-Sheikh- El-Hamol). While (Cotton) plants were carried out in the farm of (El-Gharbia-El-Shen). Agricultural research station, Sakha. Kafr E1-Sheikh Egypt in order to evaluate the relative susceptibility of motile stages of mites *Tetranychus urticae* to different tested compounds and predatory mite *Amblyseius gossipi*. All tested compounds were applied at half of their recommended rates. Samples of 10 leaves from (cotton and soybean) were randomly collected from each plot before and after treatment at intervals of two days and one week later. 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 test (Duncan, 1955).

#### 1-Effect of tested compounds on motile stages of spider mite, *T. urticae* .

The data presented in tables (7 and 8) showed that, Abamectin was the most effective compound in reducing the population density of motile stages of mite, *T. urticae* followed by abamectin and Fenpyroximate while Cypermethin was of moderate effect, whereas Wormseed extract was the least effective compound in reducing the population density of motile stages of *T. urticae* and predatory mite *A.gossipi*. One 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. Based on these reductions, all compounds, in general, were effective in reducing the population density of motile stages of mite *T. urticae* and predatory mite *A.gossipi*.

**Table 7.** Number of motile stages of mite *T. urticae* plants in the field on different chemicals-treated cotton.

Compounds	Mean No. of motile stage/10leaves before treatment	No. of motile stages/10leaves at indicated period after treatment				Mean reduction %
		Mean of 48 hours		Mean of One week		
		No. of motile stage	Reduction %	No. of motile stage	Reduction %	
Control	53.0	103.0	-	117.0	-	-
Abamectin	71.0	23.0	82.58	5.00	96.33	90.62
Fenpyroximate	78.0	24.0	80.44	7.00	96.32	90.60
Cypermethin	97.0	13.0	90.56	5.00	98.21	95.33
Wormseed extract	72.0	31.0	75.46	8.00	95.15	85.78

**Table 8.** Number of motile stages of mite *T. urticae* plants in the field on different chemicals-treated Soybean.

Compounds	Mean No. of motile stage/10leaves before treatment	No. of motile stages/10leaves at indicated period after treatment				Mean reduction %
		Mean of 48 hours		Mean of One week		
		No. of motile stage	Reduction%	No. of motile stage	Reduction %	
Control	51.0	103.0	-	116.0	-	-
Abamectin	71.0	21.0	83.58	5.00	96.65	90.66
Fenpyroximate	80.0	25.0	83.44	7.00	96.64	90.61
Cypermethin	98.0	14.0	90.56	5.00	98.13	95.35
Wormseed extract	72.0	35.0	76.56	9.00	95.15	85.81

Gamieh *et al.* (2000) found that under field conditions abamectin (40 ml/100 liter water) was satisfactory in controlling the mite *T. cucurbitacearum* on soybean plants, since they gave 89.76 and 87.19% reduction in population density, respectively, While, Ahmed (2001) studied the efficiency of seven acaricides against the two spotted spider mite *T. urticae* with refer to their side effect on predaceous mites on soybean plants during 1999 and

2000 seasons in Assiut Governorate. The obtained results clearly showed that all tested materials gave over 90% mortality of spider mite population after three days of spray, but in different trend. Residual activities on spider mites could be arranged in descending order as follows: Vertimec, Endo, Ortus, Sanmite, Propergate, Neron and dicofol. In the same trend (Mamun *et al.* (2015) showed the results indicated that all the pesticides showed the toxic effect

on red spider mite in Tea and significantly reduced mite population both in laboratory and field conditions. Therefore, Pozzebón *et al.* (2015) showed that, indoxacarb and tebufenozide had a low impact on the predatory mites considered here, while a significant impact was observed for chlorpyrifos, flufenoxuron, and thiamethoxam. The information obtained here should be considered in the design of IPM strategies on grapevine. Finally, GuoYY *et al.* (2016) found that *T. urticae* contained biologically active Cry proteins. Cry protein concentrations declined greatly as they moved from plants to herbivores to predators and protein concentration did not appear to be related to mite density.

2. Toxicity of different compounds on movable stages of predator mite *A.gossipi* on Cotton and Soybean plants in the field.

To evaluate the relative susceptibility of motile stages of *A.gossipi* to toxicity tested compounds. All tested compounds were applied at half of their recommended rates. Samples of 10 leaves from (cotton and soybean) were randomly collected from

each plot before and after treatment at intervals of two days and one week later. 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 test (Duncan, 1955).

### 3-Effect of tested compounds on motile stages of predator mite *A.gossipi* on Cotton and Soybean plants in the field.

The data presented in table (8) show that, Abamectin was the most effective compound in reducing the population density of motile stages of *A.gossipi*, two days after treatment, followed by Fenpyroximate and Cypermethin were of moderate effect, whereas Wormseed extract was the least effective compound in reducing the population density of motile stages of *A.gossipi*. One week after application it was observed that the population density of motile stages of *A.gossipi* decreased, in general, all compounds, in general, were effective in reducing the population density of motile stages of *A.gossipi*.

**Table 9.** Toxicity of different compounds to adult female of predator mite). *A. gossipi* on Cotton and Soybean plants in the field.

Compound	Cotton				Soybean			
	LC <sub>50</sub> (PPM)	C.L.for LC <sub>50</sub>		Toxicity index	LC <sub>50</sub> (PPM)	C.L. for LC <sub>50</sub>		Toxicity index
		lower	upper			Lower	upper	
Abamectin	0.002	0.001	0.004	100	0.0008	0.0004	0.001	100
Fenpyroximate	57.68	48.94	63.58	0.003	61.33	55.43	66.13	0.001
Cypermethin	64.72	59.22	69.73	0.003	66.84	62.01	71.59	0.0009
Wormseed extract	16.68	13.06	23.59	0.01	14.20	11.61	17.55	0.004

The present data are accessional, in agreement with that of other investigators who showed the toxicity of the tested compounds against adult females of predators.

The rate of NPK for Cotton and, Soybean leaves.

Thus the determination of such minerals as nitrogen, potassium and phosphorus in different host plant leaves used to rear or to test the acaricidal effect of chemicals used was one of the aims of the present study just to detect if there are differences in mite response (toxicity, oviposition and hatchability of prey and predatory eggs) due to the type of host plant or not. The data in Table (10) illustrate the rate of NPK for two host plants Cotton and Soybean. It is clear that Soybean has the highest rates of the three elements under study (potassium, nitrogen and phosphorus). While Cotton plants have the lowest rates in the three elements. The rate of potassium as meq/ 100 gm.d.w. in the two host plants was tomato > green beans > castor bean (2.949, 2.179 and 1.731 respectively). The rate of nitrogen as NO<sub>3</sub> meq / 100 gm.d.w. in the three host plants was Soybean > Cotton

( 7.50 and 6.75 respectively ). The rate of phosphorus as meq /100 gm.d.w. in the two host plants was Soybean > Cotton ( 0.832 and, 0.433 respectively ) . The decrease of phosphorus and potassium and the increase of nitrogen contents may be an important reason for unsuitability and decrease of the population density of the mite and predators. Several studies (Gamieh and El-Basuony,2001 and El Sanady *et al.*,2007) found significant positive correlation between leaf contents of potassium and nitrogen positive correlation between population densities of *T.urticae* on different tested cotton genotypes. The data in Table (10) cleared that Giza 86 has the highest rates of the three elements under study nitrogen, potassium and phosphorus. While Giza 92 has the lowest rates in the three elements. The rate of nitrogen as NO<sub>3</sub> meq/ 100gm.d.w. in cotton plant leaves. The rate of phosphorus as meq/ 100gm.d.w. The following points can be concluded from the results on the effect of different rates of the three elements in cotton plant leaves to spider mites *T. urticae*, *S. gilvifrons* and *A. gossipi* on different tested cotton genotypes.

**Table 10.** The rate of NPK for Cotton and Soybean leaves:

The host plant	The rate of K as meq/100 g.d.w	The rate of No <sub>3</sub> as meq/100 g.d.w	The rate of P as meq / 100 g.d. w
Cotton	1.731	4.75	0.277
Soybean	2.179	6.75	0.433

LSD = 0.6098

The following points can be concluded from the results on the effect of different rates of the three elements in the two host plants on the toxicity of the tested compounds to spider mites *T.urticae* and its predator *A.gossipi* and on the biological aspects studied :

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## دراسات بيولوجية وسمية لبعض المركبات علي العنكبوت الأحمر ذو البقعتين و المفترس الأكاروسي (امبليسيوس

### جوسيباي ) علي نباتات القطن و فول الصويا .

صدقي عبد الحميد عبد الراضى عثمان

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – مصر

تم التحضير لبرامج المعالجة المتكاملة للأكاروسات، وقد أجريت التجارب العملية لتقييم التأثير السام أربع مركبات (اثنان مركبات اكاروسية وهى الابامكتين ، الفينبيروكسميت) ومركب بيرثرين (السيبرمثرين) ومستخلص(حبه البركه ) ضد الإناث البالغة للأكاروس الاحمر ( نترانكس اورتیکا ) ولاختبار التأثير الابادى لهذه المركبات على طور البيض ايضا، كما اختبرت ضد الإناث البالغة للأكاروس المفترس ( امبليسيوس جوسيباي ) على نواعان من العوائل النباتية ( القطن والفاصوليا ) باستخدام تكنيك غمر القطاعات النباتية. كما تم تقييم التأثيرات الجانبية للجرعات لهذه المركبات على بعض الصفات البيولوجية للأكاروس النباتي و المفترس.

وقد اظهر المبيد الاكاروسى ابامكتن وضعاً خاصاً فى المعالجة المتكاملة للاكاروسات بينما اظهر المستخلص النباتي ناثراً واعداً فى هذا النوع من المكافحة. السيبرمثرين كان اكثر المركبات تأثيراً على خصوبة الاناث البالغة للأكاروس حيث وجد انخفاض كبير فى عدد البيض الموضوع مقارنة بالكنترول وذلك فى حالة القطن أما فى حالة فول الصويا فكان يلى الفينبيروكسميت من حيث التأثير. ايضا السيبرمثرين كان اكثر المركبات تأثيراً فى انخفاض فقص البيض وخاصة على الأقراص الورقية لكل من القطن وفول الفاصوليا كعوائل نباتية، وانه تبعاً لطبيعة المركب فان استهلاك البيض بواسطة المفترس يتغير معتمداً على الزمن المار بين ثلوث البيض بالمبيد وتقديمه للمفترس وبالتالي ايضا انتاج بيض المفترس. بينما فى الحقل أوضحت النتائج بأن المركبين الأبامكتن سجل أعلى درجات الانخفاض للأفراد فى حين سجل كلا من الفينبيروكسميت و السيبرمثرين تأثيرات متوسطة للتعداد بينما سجل المستخلص النباتي أقل التأثيرات للأفراد محل الدراسة للعنكبوت الأحمر ذو البقعتين و المفترس الأكاروسي .