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Toxicological Studies of Some Compounds on Two-Spotted Spider Mite *Tetranychus urticae* on Different Host Plants.

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

ABSTRACT

The present study is directed to evaluate the effect of five compounds of different mode of action, four pesticides (Abamectin benzoate; Cypermethrin, Profenofos and Chlorpyrifos) and one natural oil(Neem oil) against the eggs and adult females of the two spotted spider mite *Tetranychus urticae* (Koch) on three different host plants (maize, cotton and soybean) using leaf-disc dip technique.Also,to evaluate these compounds on toxic effect of spider mite *T. urticae* on different host plants under filed conditions. Abamectin benzoate has a special position in mite chemical control or in integrated mite management because of its high toxic effect and its high toxicity index while neem oil was the least toxic compound to adult females of *T. urticae* on different host plants. Abamectin benzoate has a special effect on eggs of *T. urticae* and still considered the best compound that has a special importance in integrated mite management.Cypermethrin was the most effective compound against the motile stages, while neem oil was the least effective compound against the motile stages of *T.urticae* in the field.

INTRODUCTION

The two-spotted spider mite, *Tetranychus urticae*, is a ubiquitous polyphagous arthropod herbivore that feeds on a remarkably broad array of species, with more than 150 of economic value. It is a major pest of greenhouse crops and field crops such as(maize, cotton, soybean, and sugar beet).

The two-spotted spider mite (TSSM) has four life stages; egg, larva, nymph, and adult. Under optimum conditions of high temperatures and low humidity, Our recordings of mite feeding established that duration of the feeding event ranges from several minutes to more than half an hour and we determined that the stylet penetrates the leaf either in between epidermal pavement cells or through a stomatal opening without damaging the epidermal cellular layer.(Nicolas Bensoussan *et al* 2016).This mite can complete its development in 5 to 7 days. Under more normal temperatures and humidity, the generation interval is approximately 19 days. The following provides an overview of TSM life stages. Chemical control is the primary method used for control of ornamental plant pests (Parrella, 1990; Hudson *et at.* 1996 and Hodges and Haydu, 1997).However, frequent applications made to confined populations can lead to pesticide resistant pests. So, many problems resulted from using chemical control against *T.urticae* and other pests (Devine *et al*. 2001; EL-Zen and Hardee, 2003; Van *et al*. 2005).

The host plant of spider mite is important value in deciding the very useful for the relation between the two type spider mites and is influenced by plant characteristics.The two-spotted spider mite (TSSM), is one of the most polyphagous herbivores that feeds on over 1100 plant species, including more than 150 crops species(Migeon and Dorkeld,2016).Thus when this relation is translated to pronounce and valuable results, it will be of important value in process of integrated pest management these all of above factors are closely related since. The results show that the host plant species can affect critical parameters of population dynamics, and most importantly that maternal and environmental conditions can facilitate colonization and exploitation of a novel host in the polyphagous *T. urticae*, by affecting dispersal behavior (host acceptance) and female fecundity(Cassandra Marinosci *et al*., 2015). Free-choice experiments revealed that *A. andersoni* had no preference for cotton or maize-reared *T. urticae* compared with those reared on non-Bt cotton or maize. Collectively these results provide strong evidence that these crops can complement other integrated pest management(Guo *et al*., 2015).The two-spotted spider mite, *Tetranychus urticae*, is a ubiquitous polyphagous arthropod herbivore that feeds on a remarkably broad array of species, with more than 150 of economic value. It is a major pest of greenhouse crops, especially in Salonaceae and Cucurbitaceae (e.g., tomatoes, eggplants, peppers, cucumbers, zucchini) and greenhouse ornamentals (e.g., roses, chrysanthemum, carnations), annual field crops (such as maize, cotton, soybean, and sugar beet).(Cazaux M *et al*., 2014).

MATERIALS AND METHODS

1-Culture techniques:

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

2- tested Compounds:

Five compounds were used. All tested compounds were in the formulated form and the dosages were calculated on the basis of ppm of active ingredient. The chemical names for the tested compounds are as follows:

Abamectin Benzoate: Abamectin benzoate(1.8% : 0.5%): B,a (5-0-deinethyl avermectin Aia) and a maximum of 20% avermectin B, b [5-0-demethyl-25-de-(l-methyl-propyl)-25-(l-methylethyl) avermectin A,a] and Phenylcarboxylate $C_7H_5O_2^-$.

Profenofos72%: Teliton (72 % EC):1-naphthyl methyl- α-Naphthyl *N*-methyl-diethyl (Dimethoxythiophosphorylthio) Succinate.

Cypermethrin: Lambda-cypermethrin5% :a-cyano -3-phenoxybenzyl(*Z*)-(1*R,3R*)-3-(2-chloro-3,3,3-trifluoroprop -1-enyl)-2,2-dimethylcyclopropane carboxyl late and[[(*R*)-a-cyano-3-phenoxybenzyl(*Z*)-(1*S,3S*)-3-(2-chloro-3,3,3-trifluoroprop-enyl)-2,2-dimethyl cyclopropane carboxylate.

Chlorpyrifos 48%: Pestban (48 % EC):chloro-3,3,3-trifluoropropenyl- (2~chloro-3,3-trifluropropenyl)*N*-methyl-diethyl **(**Dimethoxythiophosphorylthio) Succinate**.**

Neem oil : Neem oil 96 % (*Azadirachta indica*)

3.Toxicity of tested chemicals to adult females of two-spotted spider mite, *Tetranychus urticae* (Koch):

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 different host plant leaves were dipped in each concentration for 5 seconds and left to dry. Then 10 adult female of mites were transferred to each disc. The discs were placed on moist filter paper, which rested on moist cotton wool pad 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 by 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. The same technique was repeated by using broad bean and soybean leaf discs.

4.Toxicity of tested compounds on eggs of two-spotted spider mite *T.urticae*:

Red spider mite eggs for use as prey were obtained by placing approximately 10 adult females of *T .urticae* on a clean different host plant leaves 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 experiments. The adult mites were allowed to oviposite 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 controls, in a holiday chamber of about 25±2^{0}C and 70±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 (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).

Field experiments:

This experiments was carried out in the farm of Agricultural Research Station,Sakha. Kafr E1-Sheikh Egypt to evaluate the efficiency of the tested compounds on spider mite, *Tetranychus urticae* infesting (maize, cotton and soybean) plants. Plots each of 1/200 feddan in completely randomized block 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/feddan. Samples of 10 leaves from each plants were randomly collected from each plot before and after treatment at intervals of 2 days and one week later. The reduction percentage of infestation was calculated for each treatment according to Henderson and Tilton equation (1955). Duncan's multiple range test at the 5% level was used for statistical analysis of significant differences among treatments.

RESULTS AND DISCUSSION

1- Toxicity of tested compounds against adult females of two-spotted spider mite *T.urticae* on different host plant discs:

Five compounds, one acaricide (abamectin benzoate),one pyrethroid (cypermethrin), one natural oil (neem oil) and Two pesticides (Profenofos and Chlorpyrifos) were tested for their toxicity on adult stage of laboratory strain of two-spotted spider mite *T.urticae* by the leaf disc technique.

a- Maize leaf discs:-

The regression lines of the tested compounds are presented in (Table 1), results indicated that abamectin benzoate was the most toxic compound, followed by profenofos to adult females of *T.urticae* with LC_{50} values of 0.004 and 38.92 ppm. While Chlorpyrifos and cypermethrin have a moderate toxicity to adult females of *T.urticae* with LC_{50} values 72.62 and 156.6 ppm.Neem oil was the least toxic compound to adult females of *T.urticae* of LC_{50} value 6158.04 ppm. Based on LC_{50} values in Table (1) the data showed that abamectin benzoate as an acaricides was more toxic to adult females of *T.urticae* than profenofos.Slope values of the log concentration–probit lines in Table (1) indicated that chlorpyrifos and abamectin benzoate have the highest slope values of 1.023 and 0.80, while neem oil and cypermethrin have the lowest slope values (0.393 and 0.394). Profenofos has slope value of 0.556.The result showed that a susceptible pest assay demonstrated that *T. urticae* contained biologically active Cry proteins. Cry proteins concentrations declined greatly as they moved from plants to herbivores to predators and protein concentration did not appear to be related to mite density(Guo *et al* 2015).

Table 1. Toxicity of different compounds on adult females of two- spotted spider mite *T. urticae* (Koch) on Maize, Cotton and Soybean leaf discs:

Compounds	Maize					Cotton					Soybean				
	LC_{50} (PPM)	C.L.forLC_{50} Lower	upper	Toxicity* index	Slope value	LC_{50} (PPM)	C.L.forLC_{50} Lower	upper	Toxicity* index	Slope value	LC_{50} (PPM)	C.L.forLC_{50} Lower	upper	Toxicity* index	Slope value
Abamectin Benzoate	0.004	0.002	0.009	100	0.80	0.006	0.010	0.014	100	0.75	0.006	0.003	0.013	100	0.082
Profenofos	38.92	32.17	47.839	0.0103	0.556	167.29	138.70	194.263	0.0036	0.564	220.965	179.890	306.814	0.0027	0.554
Cypermethrin	156.6	124.19	209.63	0.0025	0.394	708.07	660.08	763.819	0.0085	1.092	654.539	614.856	692.100	0.0009	1.150
Chlorpyrifos	72.62	64.72	84.97	0.0055	1.023	106.1	93.176	118.940	0.0056	1.603	118.810	113.680	124.034	0.0051	1.875
Neem oil	6158.040	4872.538	8211.696	0.0001	0.393	6181.04	5189.9	7532.126	0.0001	0.426	3899.66	3170.519	4579.436	0.0002	0.417

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

Referring to data in Table (1) Chlorpyrifos has the highest slope value in all compounds .It is known as reported by Hoskins and Gordon (1956) that slope value of log concentration–probit line is considered as reaction indicator between the chemical and the affected organism. In other words the highest slope value 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 slope value indicates heterogeneous mite population, in its response to the chemical.

Also, they postulated the fact that one of the first signs in the development of a resistant strain is the decrease in the slope of the dosage mortality line, therefore one expect that compound with low slope value may lead to development of resistance if used successively. Concerning the toxicity index at LC_{50} level the data in Table (1) confirmed that, abamectin benzoate was the most toxic compound to adult females of *T.urticae* with toxicity index of 100 followed by profenofos with toxicity index of 0.0103**,** while chlorpyrifos and cypermethrin have a moderate toxic effect to adult females *T.urticae* with toxicity indexes of 0.0055 and 0.0025, respectively. Neem oil was the lest toxic compound to adult females *T.urticae* with toxicity index of 0.0001.

b- Cotton leaf discs:

The regression lines of the tested compounds are based on LC_{50} values (Table 1),results indicated that abamectin benzoate was the most toxic compound, followed by chlorpyrifos to adult females of *T.urticae* with LC_{50} values of 0.006 and 106.1 ppm. While profenofos and cypermethrin have a moderate toxicity to adult females of *T.urticae* with LC_{50} values of 167.29 and 708.07 ppm. Neem oil was the least toxic compound to adult females of *T.urticae* of LC_{50} value 6181.04 ppm. Based on LC_{50} values in Table (1) the data showed that abamectin benzoate as an acaricide was more toxic to adult females of *T.urticae* than chlorpyrifos, but Neem oil was less toxic than other tested compounds.

Slope values of the log concentration –probit lines in Table (1) indicated that chlorpyrifos was the highest slope values of 1.603, while Neem oil has the lowest one (0.426).Cypermethrin, abamectin benzoate and profenofos have slope values of 1.092, 0.75 and 0.564, respectively.

Concerning the toxicity index at LC_{50} level the data in Table (1) confirmed that, abamectin benzoate was the most toxic compound to adult females of *T.urticae* with toxicity index of 100 followed by Cypermethrin with toxicity index of 0.0085, while chlorpyrifos and profenofos have a moderate toxic effect to adult females of *T.urticae* with toxicity indexes of 0.0056 and 0.0036 respectively. Neem oil was the least toxic compound to adult females of *T.urticae* of toxicity index (0.0001).

c-Soybean leaf discs:

The regression lines of the tested compounds are based on LC_{50} values (Table 1), results indicated that abamectin benzoate was the most toxic compound, followed by chlorpyrifos to adult females of *T.urticae* with LC_{50} values of 0.006 and 118.810 ppm.While profenofos and Cypermethrin have a moderate toxicity to adult females of *T.urticae* with LC_{50} values 220.965 and 654.539 ppm. Neem oil was the least toxic compound to adult females of *T.urticae* of LC_{50} value 3899.66 ppm.Based on LC_{50} values in Table (1) the data showed that abamectin benzoate as an acaricides was more toxic to adult females of *T.urticae* than chlorpyrifos**,**.Slope values of the log concentration – probit lines in Table(1) indicated that chlorpyrifos was the highest slope value of 1.875,while abamectin benzoate has the lowest one (0.082).While cypermethrin, profenofos and neem oil have slope value of (1.150,0.554 and 0.417) respectively.

Concerning the toxicity index at LC_{50} level the data in Table (1) confirmed that, abamectin benzoate was the most toxic compound to adult females of *T.urticae* with toxicity index of 100 followed by chlorpyrifos with toxicity index of 0.0051, while profenofos and cypermethrin have a moderate toxic effect to adult females of *T.urticae* with toxicity indexes of (0.0027and 0.0009) respectively. Neem oil was the least toxic compound to adult females of *T.urticae* of toxicity index (0.0002). Radwan *et al*. (2000) indicated that the two tested *Eucalyptus* species plant extracts (red and spotted gum) showed very promising acaricidal activity on *Tetranychus spp*. Abd EL-Wahab (2003) indicated that castor oil treatment appeared to be the most effective against the population of *T. urticae* than soy bean oil on cucumber. When *A. sativum* extract was applied in this study, it's the least effective against the adult mites, the result that in agreement with that of Ismail *et al*. (2007) who found that wormwood extract was the least toxic to adult females of *T. urticae* with LC_{50} value of 4060.30 ppm. Ismail (2009) indicated that black cumin extract was the poorest toxic compound to adult females of *T. urticae*.Keratum *et al.* (2010) indicated that abamectin has a special position in mite chemical control because of its high toxic effect and its high toxicity index among different mite control agents. While *Allium sativum* extract was the least toxic compound to adult female of *T. uriticae.* Derbalah *et al.* (2013) showed that cypermethrin and fenopyroximate were the highest toxicity while wormseed extract was the least toxic compound to adult stage of *T. urticae.*

2- Toxicity of tested compounds to eggs of two – spotted spider mite *T.urticae* on different host plant discs:

Different compounds were tested for their toxicity to eggs of two-spotted spider mite *T.urticae* (Koch) under laboratory conditions.

a- Maize leaf discs:-

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 benzoate and profenofos were the most toxic compounds against the egg stage of spider mite with LC_{50} values of 1.049 and 3.866 ppm, respectively . chlorpyrifos and

Cypermethrin were of moderate ovicidal effect with LC_{50} values of 13.890 and 101.87 ppm, respectively.Then neem oil come in a category of least effective compound on the egg stage with LC_{50} value of 169.05 ppm. Slope values of the log concentration – probit lines Table (2) indicated that Neem oil and chlorpyrifos have the highest slope values (0.462 and 0.438) followed by profenofos with slope value of 0.254.While Cypermethrin and abamectin benzoate have the lowest slope values of 0.163 and 0.152.

Concerning the toxicity index at LC_{50} level, the data in Table (2) confirmed that, abamectin benzoate was the most toxic compound to eggs of two-spotted spider mite with toxicity index of 100 followed by profenofos with toxicity index of 27.134. While chlorpyrifos and Cypermethrin have a moderate ovicidal effect on eggs of two-spotted spider mite with toxicity indexes (7.552 and 1.030). Neem oil was the least toxic to eggs of two-spotted spider mite with toxicity index 0.617.

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

Compound	Maize					Cotton					Soybean				
	LC_{50} (PPM)	C.L.for LC_{50} Lower	Upper	Toxicity index	Slope value	LC_{50} (PPM)	C.L.for LC_{50} lower	upper	Toxicity index	Slope value	LC_{50} (PPM)	C.L.for LC_{50} lower	upper	Toxicity index	Slope value
Abamectin Benzoate	1.049	0.881	1.252	100	0.152	1.254	1.074	1.477	100	0.160	0.995	0.839	1.181	100	0.153
Profenofos	3.866	3.362	4.344	27.134	0.254	3.485	2.856	4.051	35..983	0.244	4.068	3.382	4.722	24..459	0.241
Cypermethrin	101.87	82.614	121.544	1.030	0.163	113.47	93.545	134.20	1.105	0.162	109.43	88.875	130.67	0.909	0.159
Chlorpyrifos	13.890	9.266	21.247	7.552	0.438	10.126	8.623	11.565	12.384	0.246	12.035	7.455	17.363	8.268	0.424
Neem oil	169.05	96.445	227.186	0.617	0.462	192.03	165.01	217.50	0.653	0.250	168.1	106.43	218.86	0.592	0.464

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

b- Cotton leaf discs:

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 benzoate and profenofos were the most toxic compounds against the egg stage of spider mite with LC_{50} values of 1.254 and 3.485 ppm, respectively. chlorpyrifos and cypermethrin were of moderate ovicidal effect with LC_{50} values of 10.126 and 113.47 ppm, respectively.Then neem oil come in a category of least effective compound on the egg stage with LC_{50} value of 192.3 ppm. Slope values of the log concentration – probit lines (Table 2), indicate that Neem oil has the highest slope value (0.250) followed by chlorpyrifos , profenofos and cypermethrin have a moderate slope value with slope values of 0.246, 0.244 and 0.162,respectively While abamectin benzoate has the lowest slope value (0.160).

Concerning the toxicity index at LC_{50} level, the data in Table(2) confirmed that, abamectin benzoate was the most toxic to eggs of two-spotted spider mite of toxicity index of 100 followed by profenofos with toxicity index of 35.983 While chlorpyrifos and cypermethrin have a moderate ovicidal effect on eggs of two-spotted spider mite with toxicity indices of (12.384, 1.105). Neem oil was the least toxic on eggs of two-spotted spider mite with toxicity index of 0.653.

c- Soybean leaf discs:

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 benzoate and profenofos were the most toxic compounds against the egg stage of spider mite with LC_{50} values of 0.995 and 4.068 ppm, respectively. chlorpyrifos and cypermethrin were of moderate ovicidal effect with LC_{50} values of 12.035 and 109.43 ppm, respectively. Then neem oil come in a category of least effective compound on the egg stage with LC_{50} value of 168.1 ppm. Slope values of the log concentration –probit lines (Table 2) indicate that neem oil has the highest slope value(0.464) followed by cypermethrin, chlorpyrifos and profenofos with slope values of 0.159, 0.424 and 0.241, respectively. While abamectin benzoate has the lowest slope value (0.153).

Concerning the toxicity index at LC_{50} level, the data in (Table 2)confirmed that, abamectin benzoate was the most toxic to eggs of two-spotted spider mite with toxicity index of 100 followed by profenofos with toxicity index of 24.459. While chlorpyrifos and cypermethrin have a moderate ovicidal effect on eggs of two-spotted spider mite with toxicity indices of (8.268 and 0.909).Neem oil was the least toxic on eggs of two-spotted spider mite with toxicity indexes of 0.592. The quality of the host plant affects the life-history traits of plant-feeding arthropods. The effect of several soybean cultivars on the fitness of *Tetranychus urticae* was assayed by determining developmental time for mites**.** Ismail (2009) indicated that cypermethrin 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. Keratum *et al.* (2010) indicated that abamectin and cypermethrin have a especial effect on *T. urtica* and considered the best compounds that have a special importance in integrated mite management. Also, Derbalah *et al*. (2013) showed that cypermethrin and fenpyroximate were the highest toxicity to egg stages of *T. uritica*, while wormseed extracts was the least toxic compound to egg stage of *T. uriticae.*

Field studies

Field experiment on (soybean, cotton) plants were carried out in the farm of El-Hamol district-Kafr E1-Sheikh Governorate).While (maize) 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 *T.urticae* to different tested compounds.All tested compounds were

applied at half of their recommended rates. Samples of 10 leaves from (maize, 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).

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

The data presented in tables (3,4 and 5)showed that, cypermethrin was the most effective compound in reducing the population density of motile stages of mite, *T. urticae*, followed by abamectin benzoate and profenofos while chlorpyrifos was of moderate effect, whereas neem oil was the least effective compound in reducing 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, in general, in all treatments the most effective compounds in reducing the population density were cypermethrin,abamectin benzoate, profenofos and chlorpyrifos, while neem oil was the least effective compound. Based on these reductions, all compounds, in general, were effective in reducing the population density of motile stages of mite *T. urticae* .

Table 3. Number of motile stages of mite *T.urticae* on different chemicals-treated maize plants in the field.

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 Benzoate	71.0	23.0	82.58	5.00	96.33	90.62
Profenofos	78.0	24.0	80.44	7.00	96.32	90.60
Cypermethrin	97.0	13.0	90.56	5.00	98.21	95.33
Chlorpyrifos	72.0	31.0	75.46	8.00	95.15	83.78
Neem oil	90.0	50.0	74.85	10.0	95.19	76.61

Table 4. Number of motile stages of mite *T.urticae* on different chemicals-treated cottoplants in the field.

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 Benzoate	71.0	21.0	83.58	5.00	96.65	91.66
Profenofos	80.0	25.0	83.44	7.00	96.64	88.61
Cypermethrin	98.0	14.0	90.56	5.00	98.13	95.35
Chlorpyrifos	72.0	35.0	76.56	9.00	95.15	85.81
Neem oil	91.0	48.0	72.75	11.0	95.22	72.52

Table 5. Number of motile stages of mite *T.urticae* on different chemicals-treated soybean plants in the field.

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	50.0	104.0	-	115.0	-	-
Abamectin Benzoate	71.0	20.0	85.58	4.80	96.66	92.65
Profenofos	81.0	24.0	86.44	5.60	96.05	90.44
Cypermethrin	98.0	15.0	91.56	4.00	98.11	95.36
Chlorpyrifos	72.0	35.0	75.46	7.90	95.15	85.80
Neem oil	90.0	48.0	74.85	9.0	95.41	74.48

From the field results indicated in table (3,4and 5) the following points could be concluded:

1- Most of the tested materials used on(maize- soybean –cotton) plants exhibited high mean reduction (> 85%) in motile stages of spider mite *T. urticae*, while neem oil was the least effective in this respect (<76 %).

2- cypermethrin was the most effective compound against the motile stages, while neem oil was the least effective compound against the motile stages of *T.urticae* in the field.The present results are supported by several investigators.

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.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.

Guo *et al* (2015) found that *T. urticae* contained biologically active Cry proteins. Cry proteins concentrations declined greatly as they moved from plants to herbivores to predators and protein concentration did not appear to be related to mite density.

REFERENCES

Abbott, W. W. (1925). A method of computing the effectiveness of an insecticide. J. Econ. Entomol. 18: 265-266.

Abd El-Wahab, H. A. (2003). Efficiency of leaves extracts of castor bean plant against *Aphis gossipi* (Glover) and *Tetranychus urticae* (Koch) on cucumber plant. J. Agric. Sci. Mansoura Univ., 28(5): 4029- 4038.

Ahmed, M. A. E. (2001). Field potency of acaricides against spider mite *Tetranychus urticae* Koch with their side effect on predacious mites on soybean plants., J. Agric. Sci. Mansoura Univ.,26 (11):7331-7336.

Cassandra Marinosci , Sara Magalhães,Emilie Macke, Maria Navajas,David Carbonell, Céline Devaux and Isabelle Olivier(2015). Plant-Herbivore Interaction: Dissection of the Cellular Pattern of *Tetranychus urticae* Feeding on the Host Plant Front Plant Sci. 2015; 7: 1105.

Cazaux M, Navarro M, Bruinsma KA, Zhurov V, , Negrave T, Van Leeuwen T, Grbic V and Grbic M (2014). Application of two-spotted spider mite *Tetranychus urticae* for plant-pest interaction studies. J Vis Exp. 2014 Jul 4;(89).

Derbalah, A. S.; A. Y. Keratum; M. E. El-dewy and E. H. El-Shamy (2013). Efficacy of some insecticides and plant extracts against *Tetranychus urticae* under libaratory conditions. Egy. J. plant pro. Res. 1(3), 46-68.

Devine , G . J . ; M . Barber and j . Denholm (2001). Incidence and Inheritance of resistance to MTEI – acaricides in European strains of the two – spotted spider mite *Tetranychus urticae* (Acari: Tetranychidae) . pest manag . Sci ., 57 (5) : 443 - 448

Dittrich, V. (1962). A comparative study of toxicological test methods on a population of the two-spotted spider mite *(T.urticae)*. J. Econ. Entomol. 55 (5)644-648.

Duncan, B.D. (1955). Multiple range and multiple F test. Biometrics (11): 1-42.

El-Zen, G. W. and D. D. Hardee (2003). United States Department of Agriculture- Agricultural" Research Service, research on managing insect resistance to insecticides. Pest Manag. Sci., 59 (6-7): 770- 776.

Finney, D.J. (1952): Probit analysis a statistical treatment of the sigmoid response curve. Cambridge Univ. Press.

Gameih, G. N.; S. E. Saadon; A. M. Nassef and A. A. Younes (2000). Efficacy of mineral oils, acaricides and their mixtures against *Tetranychus cucurbitacearum* (sayed). Zagazig. J. Agric. Res. 27(2):591-601.

Guo YY, Tian JC, Shi WP, Dong XH, Romeis J and Naranjo SE.(2015).The interaction of two-spotted spider mites, *Tetranychus urticae* Koch, with Cry protein production and predation by *Amblyseius andersoni* (Chant) in Cry1Ac/Cry2Ab cotton and Cry1F maize. Transgenic Res. 2015 Feb;25(1):33-44.

Handerson, C.F. and E.W. Telton (1955). Test with acaricides against the brawn wheat mite. J. Econ. Entomol. (48): 157-161.

Hodges , A . W . and J.J . Haydu (1997). Economic impact of Florida =s Environment of Horticulture Industry , 1997 . economic Report , EIR 99-1. Florida University , March , 1999 , PP48 .

Hoskins, W.M and T. Gordon (1956).Arthropod resistance to chemicals. Annu. Rev. Entomol, 1:89-122.

Hudson, W. G. ; M. P. Garber ; R. D. Getting ; R. F. Mizell ; A. R. Chase and K. Bandari (1996). Pest management in the United States green house and nursery industry: V. Insect & mite Control. HortTech., 6(3): 216-221.

Ismail, A. A. (2009). Integrated mite management1-Evaluation of some compounds against the two spotted spider mite, *Tetranchyus urticae and* the two predators A*mblysieus fallacies* and *phytoseiulus perimillis*. J. Agri. Res. Kafr El-Shiekh Univ., 35(4): 1082-1095.

Ismail, M. S. M.; M. F. M. Soliman; M. H. EL-Naggar and M. M. Ghallab (2007). Acaricidal activity of spinosad and abamectin against two-spotted spider mites. Experimental & Applied acarology; 43(2): 129–135.

Keratum, A. Y.; A. H. Hosny and N. E Hassan (2010). Comparative efficiency of pesticides and some predator to control spider mites.J.plant prot and path., Mansoura univ., vol. (14): 1049-1063.

Litchfield, J. T. Jr and F. Wilcoxon (1949). A simplified method of evaluating dose-effect experiments. J. Pharmacol. And exp. Therap,(96):99-l 13.

Migeon A.,and Dorkeld F. (2016). Spider Mites Web: a comprehensive database for the Tetranychidae. Biological Control ,2016 Feb;25(1):33-44.

Nicolas Bensoussan, M. Estrella Santamaria, Vladimir Zhurov, Isabel Diaz, Miodrag Grbić and Vojislava Grbić (2016).Plant-Herbivore Interaction: Dissection of the Cellular Pattern of Tetranychus urticae Feeding on the Host Plant.Front Plant Sci, 7: 1105, 2016 Jul 27.

Parrella , M. L. (1990). Biological control in ornamentals ; status and perspectives . SROP / WPRS Bulletin XILL/5 : 161 – 168.

Radwan, S. M.; Z. Zidan; A. El-Hammady and M. M. Aly (2000). Field performance of tested eucalyptus plant extract biocides and conventional pesticides against key pests infesting cotton in Egypt. Ann. Agric. Sci., Ain Shams Univ., Cairo, 45 (2): 777-791.

Siegler, E. H. (1947). Leaf-disc technique for laboratory tests of acaricides. J. Econ. Entomol., (40): 441-442.

Van, T.L.; S.V. Pottelberge and L. Tirry (2005). Comparative acaricide susceptibility and detoxifying enzyme activities in field-collected resistant and susceptible strains of *Tetranychus urticae*, Pest Manag., Sci. 61: 499-507.

دراسات تكسكولوجيه لبعض المركبات علي أكاروس العنكبوت الأحمر علي العوائل النباتية المختلفة.

حمدي عبد الرحيم عبد الرحمن و محمود سعد القبلاوي

معهد بحوث وقاية النباتات - مركز البحوث الزراعية – وزارة الزراعه

لقد أجريت الدراسة الحالية لتقييم التأثير السام لخمسه مركبات ذات مجاميع مختلفة .أربعة مبيدات أكاروسية و حشرية (أبامكتين بنزوات وسيبرميثرين و كلوروبيروفوس و بيروفينافوس) وزيت طبيعي واحد (زيت النيم) ضد البيض والاناث البالغة للأكاروس النباتي (تترانيكس أورتيكا) على العوائل النباتية المختلفة(الذرة –القطن- فول الصويا)باستخدام تكنيك غمر القطاعات النباتية.أيضا تقييم التأثير السام للمركبات المختبرة علي العنكبوت الأحمر علي العوائل المختلفة تحت الظروف الحقلية. وقد أظهر المبيد الأكاروسى أبامكتين بنزوات وضعا خاصا فى المكافحة الكيماوية (تترانيكس أورتيكا) وذلك بسبب تأثيره السام العالي علي الإناث البالغة للأكاروس النباتي ، بينما كان الزيت الطبيعي (زيت النيم) أقل المركبات سمية على الإناث البالغة للأكاروس النباتي (تترانيكس أورتيكا) على مختلف العوائل النباتية . كان للمبيد الأكاروسى أبامكتين بنزوات وضعا خاصا فى التأثير على بيض الأكاروس النباتي، ويعتبر من أفضل المركبات التي لها أهمية خاصة فى المكافحة ،ويعتبر الزيت الطبيعي (زيت النيم)أكثر المركبات أمانا على بيض الأكاروس النباتي على مختلف العوائل النباتية ويعتبر مبيد السيبرميثرين أكثر المركبات تأثير في أعداد الأطوار المتحركة بينما زيت النيم أقل المركبات تأثير في أعداد الأطوار المتحركة للأكاروس النباتي في الحقل.