Zagazig J. Agric. Res., Vol. 46 No. (5) 2019 1377-1386

Plant Protection and Pathology Research

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

EFFICIENCY OF SOME ACARICIDES ON THE TWO SPOTTED SPIDER MITE *Tetranychus urticae* Koch., INFESTING EGGPLANT AND PEPPER UNDER LABORATORY AND FIELD CONDITIONS

Khairia M.M. Saleh*, A.A.A. Aioub, A.A.A. Shalaby and M.A. Hendawy

Plant Prot. Dept., Fac. Agric., Zagazig Univ., Egypt

Received: 11/06/2019 ; Accepted: 09/07/2019

ABSTRACT: The aim of this study was to investigate the efficiency of six acaricides against the two spotted spider mite, *T. urticae*, infesting eggplant and pepper plants during the two growing season, 2016 and 2017, under laboratory and field conditions. The tested acaricides namely: abamectin 1.8% EC, buprofezin 25% WP, Abamectin 5% EC, chlorfenapyr 24% SC, hexythiazox 5% WP and fenpyroximate 5% EC. Abamactin 1.8% was the most effective acaricides followed by buprofezin, abamactin 5%, chlorfenapyr, hexythiazox and fenpyroximate, respectively. The LC_{50} values were 1, 5, 10, 45, 88 and 100 mg/l, respectively. The tested acaricides indicated significant reduction for population of *T. urticae* under field conditions during the first and second seasons. The reduction percentages were 77.1, 58.8 and 44.4%, in the first season (2016) and 71.47, 64.5 and 53.6% in the second season (2017) for abamectin 1.8% EC, fenpyroximate and hexythiazox, respectively on eggplant. On the other hand, Buprofezin, chlorfenapyr and abamectin 5% showed significant reduction in population of *T. urticae* on pepper plant, in the first and second seasons (2016,2017) which recorded 71.5, 64.16 and 59.88%, 77.8, 66.85 and 66.4%, respectively.

Key words: The two spotted spider, acaricides, eggplant, pepper plant, control.

INTRODUCTION

Vegetables are grown extensively in Egypt which are essential for a healthy and balanced diet for human.

They are attacked by a variety of pests, including aphids, cucumber beetles, seed corn maggot, squash bug, squash vine borer and two spotted spider mite .Scouting a field to estimate the number of pests present is an important component of effective management **(Dinham, 2003)**.

The two spotted spider mite, *T. urticae*, is a polyphagous arthropod herbivore that feeds on a remarkably broad array of species, with more than 150 of economic crops. Spider mite is a major pest of greenhouse crops especially in solanaceae and cucurbitaceae (*e.g.*, tomatoes, eggplants, peppers, cucumbers, zucchini) and greenhouse ornamentals (e.g., roses, chrysanthemum, carnations), field crops (*e.g.*, maize, cotton, soybean, and sugar beet), and in perennial cultures (alfalfa, strawberries, grapes, citruses, and plums) **(Jeppson *et al.*, 1975)**, where it is infests 3,877 host plants in both field and greenhouse crops **(Migeon and Dorkeld, 2007)**.

This mite feeds by penetrating the cells of the leaf with its stylists and sucking out the cell contents, that causes cell collapse and manifests as spotting on the upper leaf surface. Heavy mite infestations disturb the water balance in leaf and accelerate transpiration resulting in hyper-necrosis, leaf drying and leaf drop **(Liesering, 1960; Bolland *et al*., 1998; Lee *et al.*, 2003; Landeros *et al*., 2004).** These effects lead to decrease yield, quality, and acceptance by consumers. Accordingly using selective acaricides for controlling this pest is necessary in control programs. So that the aim of this study was to evaluate the efficiency of some acaricides against the spider mite *Tetrenchus urticae* under field and laboratory conditions.

***Corresponding author: Tel. :** +201027038588
E-mail address: gnatwanhar@gmail.com

MATERIALS AND METHODS

Test Organisim

The two-spotted spider mite (*Tetranychus urticae*) was reared under laboratory condition on sweet potato leaves in glass jars containing tap water which was renewed every 48 hours. Each disc was placed on a pad of cotton, which was fully saturated with water as a source of moisture. The mite colony was kept under constant temperature of 26 ± 1˚C and relative humidity (R.H) of 70±5% as well as (12 hour light/ 12 hour dark) illumination using lamps **(Zhang, 2003)**.

Tested Acaricides

The concentrations used in the toxicity study of the tested acaricides against the two spotted spider mite, *T. urticae*, are presented in Table 1.

Laboratory Bioassay Experiment

The comparative effects of six acaricides on the adult of spider mite, *T. urticae,* were assessed in the laboratory. Each concentration was tested in 3 replicates with 10 mite per each replicate. The leaf dipping technique method was used. leaves were depped in each concentration of tested acaricides for 5 seconds. After that, the treated leaves were placed in glass petri-dishes that provided with a few drops of water daily to maintain suitable moisture content. The control experiment was done by soaking leaves in water only. The dishes were kept under laboratory conditions of 26 ±1˚C and relative humidity (R.H) of 70 ± 5%). Then, the mortality percentages were recorded after 24, 48 and 72 hr., post-treatment.

The toxicity index and relative potency were calculated according to **Sun (1950)** as follows :

$$\text{Toxicity index} = \frac{LC_{90} \text{ of the compound A}}{LC_{90} \text{ of the compound B}} \times 100$$

Where "A" is the most effective acaricide, "B" is the other tested acaricide.

$$\text{Relative potency} = \frac{LC_{50} \text{ or } LC_{90} \text{ of the compound A}}{LC_{50} \text{ or } LC_{90} \text{ of the compound B}} \times 100$$

Where "A" is any acaricides tested other them the most effective, "B" is the most effective acaricides.

Field Experiment

The experiments were carried out during summer seasons of 2016 and 2017. Experiments were set at a randomized block design. An area about (1225 m^2) was divided equally into 7 plots (6 treatment of acaricides and one control, each plot consists of three replicates). Motor sprayer (20 litter capacity) was used to apply the tested acaricides in a recommended dose. Thirty infested leaves were taken at random from each plot and the number of mites were counted just before treatment and after 1, 3, 7, 11 and 14 days post treatment.

The reduction percentages of mite population were calculated according to **(Henderson and Tilton, 1955)**.

$$\text{Reduction (\%)} = 1 - \frac{A \times C}{B \times D} \times 100$$

Where:

A = number of individuals in treatment after application.

B = number of individuals in treatment before application.

C = number of individuals in control before application.

D = number of individuals in control after application.

Statistical Analysis

Data obtained were statistically analyzed. Duncans Multiple Range-test was used to determine the significant differences between the mean values of treatments according to **Snedecor and Cochran (1989)**.

RESULTS AND DISCUSSION

Toxicity of Acaricides Against Spider Mite, *Tetranychus urticae*

Results in Table 2 show that the LC_{50} values for the tested acaricides were 1, 5, 10, 45, 88 and 100 mg/l for abamectin 1.8%, buprofezin, abamectin 5%, chlorfenapyr, hexythiazox and fenpyroximate, respectively. While the corresponding LC_{90} for the same acaricides were 3, 13, 25, 98, 152 and 200 mg/l. In this respect, the toxicity of the acaricides showed that Abamectin

Table 1. Acaricides and concentrations used in the expermints

Common name	Trade name	Company	Concentration range (ppm)
Abamectin 1.8% EC	Gold	El-Heleb, New Damietta, Egypt	0. 1-1000
Chlorfenapyr 24% SC	Chalenger	UTC-BASF, Cairo, Egypt	0.1-1000
Abamectin 5% EC	Taramectin	AL-EZZ, Giza, Cairo	0.1-1000
Buprofezin 25% WP	Ovarlod	Eufcco, Cairo, Egypt	0.1-1000
Fenpyroximate 5% EC	pyroxiem	El-Naser, Giza, Egypt	0.1-1000
Hexythiazox 5% WP	Kirox	Kfr El-Zayat, Gharbia, Egypt	0.1-1000

Table 2. Acute toxicity of six acaricides against spider mite, *T.urticae* after 24, 48 and 72 hr., of exposure

Tested acaricide	Time of expesur	LC_{50} (mg/l)	LC_{90} (mg/l)	Slope	Toxicity index	Relativ potancy
Buprofezin 25 WP	24 hr.	5	13	1.2	20	20
	48 hr.	1	2.5	1.43	50	70
	72 hr.	0.5	1	1.5	40	90
Abamectin 5%Ec	24 hr.	10	25	0.85	10	10
	48 hr.	7	13	1.86	7	10
	72 hr.	2	7.2	1.27	10	22.5
Fenpyroximate 5% EC	24 hr.	100	200	1.33	1	1
	48 hr.	70	115	0.98	0.7	1
	72 hr.	45	73	1.86	0.4	1
Abamectin 1,8%EC	24 hr.	1	3	0.88	100	100
	48 hr.	0.5	1.5	1.45	100	140
	72 hr.	0.2	0. 56	0.99	100	225
Chlorfenapyr 24% SC	24 hr.	45	98	1.5	2.2	2.2
	48 hr.	33	75	0.95	1.5	2.12
	72 hr.	13	48	1.2	1.5	3.46
Hexythiazox 5% WP	24 hr.	88	152	0.97	1.14	1.14
	48 hr.	50	102	1.3	1	1.4
	72 hr.	24	68	1.33	0.83	1.88

1.8% after 24 hr., of treatment was 5 times more effective than Buprofezin, 10 times than abamectin 5%, 45 times than chlorfenapyr, 88 times than hexythiazox, and 100 times than fenpyroximatee at the level of LC_{50}. When compared at the LC_{90} the picture was not similar which was more effective with 4.3 times with buprofezin, 8.3 times with abamectin 5%, 32.6 times with chlorfenapyr, 50.6 times with hexthiazox and 66.6 times with fenpyroximatee. The tested acaricides could be arranged according to their effectiveness (at LC_{50} or LC_{90} levels) as follow: abamectin 1.8% > buprofezin > abamectin 5% > chlorfenapyr > hexthiazox > fenpyroximatee. The slope values ranged between 0.85 to 1.5 after 24 hr., of treatment, which refer to a wide range in heterogenicity of the tested population.

Also, the toxicity of the tested acaricides could be arranged in the following order according to their effectiveness: abamectin 1.8% > buprofezin > abamectin 5% > chlorfenapyr > hexthiazox > fenpyroximatee at both levels of LC_{50} and LC_{90} after 48 hr. The LC_{50} values were ranged between 0.5 to 70 mg/l, while LC_{90} ranged between 1.5 to 115 mg/l.

Regarding the toxicity of the tested acaricides after 72 hr., results showed similar trend with those of 48 hr. The LC_{50} values after 72 hr., were 0.2, 0.5, 2, 13, 24 and 45 mg/l for abamectin1.8%, buprofezin, abamectin 5%, chlorfenapyr, hexythiazox and fenpyroximate. For LC_{90} values, the concentration tested killed 90% ranged between 0.56 to 73 mg/L. So at the LC_{90} values, the toxicity of the preceding acaricides could be arranged according to efficacy as follows: abamectin 1.8% EC > buprofezin > abamectin 5%>chlorfenapyr > hexythiazox > fenpyroximate

The obtained results are in agreement with those of **Vásquez and Ceballos (2009), Amjad *et al*. (2012), Shah and Shukla (2014) and Martin *et al.* (2015)** who studied the toxicity of Abamectin against *T. urticae* and concluded that all adult females were killed within 48 and 72 hr. In another study, hexythiazox was the least toxic compound (LC_{50} = 277.47 ppm) *i.e.* 711 times less effective than abamectin 1.9%, (**Alzoubi and Cobanoglu**, **2008)**.

Efficacy of the Tested Acaricides Against *Tetranychus urticae* Under Field Conditions

Efficiency of the tested acaricides against *T. urticae* on eggplant

First season (2016)

Results presented in Table 3 show that the mean number of *T. urticae* on eggplant decreased after treatment with all examined acaricides comparing with check control. The general mean numbers of *T. urticae* individuals/30 leaves were 126.4, 142.4 and 199 in cases of abamectin, fenpyroximate and hexythiazox, respectively, compared to the untreated control which was higher (363 individuals/30 leaves) than that of the tested acaricides.

As shown in Table 4, mean reduction percentages of *T. urticae* on eggplant during season 2016 caused by abamectin 1.8%, fenpyroximate and Hexythiazox reached 62.9, 43.2 and 42.01%, respectively, as mean residual reduction percentages. While, the initial reduction percentages for these treatments were 91.3, 74.5 and 46.8%, respectively. The general mean percentages of reduction caused by abamectin, fenpyroximate and hexythiazox were 77.1, 58.8 and 44.4%, respectively. The tested acaricides could be arranged according to their percentages of reduction in infestation in the follows order: abamectin > fenpyroximate > hexythiazox (Table 4).

Second season (2017)

Results in Table 5 show that all the tested pesticides significantly decreased the number of *T. urticae* in an irregular way compared to the untreated control. Results also cleared that all acaricides caused decrease till 11^{th} day after treatment. The general mean numbers of *T. urticae* were 126.8, 153.6 and 145.2 individual/ sample for abamectin, fenpyroximate and hexythiazox, respectively, comparing with 396.6 individual/30 leaves in control.

Results presented in Table 6 indicate that the mean initial reduction percentages of *T. urticae* population on eggplant after 24 hr., caused by abamectin, fenpyroximate and hexythiazox were 92.9, 85.2 and 75.19%, respectively. On the other hand, the mean reduction percentages

Table 3. Effect of the tested compounds against the two spotted spider mite *Tetranychus urticae* on eggplant at Tallrak, Awlad Saker, Sharkia Governorate during summer season of 2016

Aacaricide	Population No. before treatment	Mean No. of *T. urticae* after treatment (in days) (30 leaves)					General mean
		1	3	7	11	14	
Abamectin 1.8% EC	435	34	45	98	194	261	126.4
Fenpyroximate 5% EC	394	92	81	203	222	314	142.4
Hexythiazox 5% WP	378	185	103	175	208	324	199
Control	420	379	397	344	283	412	363
LSD	8.53	5.58	4.38	3.34	5.56	4.65	

Table 4. Reduction percentages of *T. urticae* caused by the tested compounds on eggplant at Tallrak, Awlad Saker, Sharkia Governorate during summer season of 2016

Acaricide	Initial effect (%)	Reduction (%) of *T. uritcae* after different periods (in days) (30 leaves)				Mean residual effect (%)	General reduction effect (%)
		3	7	11	14		
Abamectin 1.8%	91.3	89.18	72.55	51.4	38.8	62.9	77.1
Fenpyroximt 5%WP	74.5	78.4	37.17	38.62	18.8	43.2	58.8
Hexythiazox 5WP	46.8	71.44	43.88	40.05	12.67	42.01	44.4

Table 5. Effect of the tested compounds against the two spotted spider mite *Tetranychus urticae* on eggplant at Tallrak, Awlad Saker, Sharkia Governorate during summer season of 2017

Acaricide	Population No. before treatment	Mean No. of *T. urticae* after treatment (in days) (30 leaves)					General mean
		1	3	7	11	14	
Abamectin 1.8 EC	495	40	63	107	198	226	126.8
Fenpyroximate 5% EC	467	78	76	87	245	282	153.6
Hexythiazox 5% WP	331	93	63	98	161	311	145.2
Control	375	423	366	359	451	384	396.6
LDS	11.55	2.92	9.46	7.38	3.28	4.67	

Table 6. Reduction percentages of *Tetranychus urticae* caused by the tested compounds on eggplant at Tallrak, Awlad Saker, Sharkia Governorate during summer season of 2017

Acaricide	Initial residual effect (%)	Reduction (%) of *T. uritcae* treatment (in days) (30 leaves)				Mean residual effect (%)	General residual effect (%)
		3	7	11	14		
Abamectin 1.8% EC	92.9	86.2	77.4	66.76	55.49	71.47	82.18
Fenpyroximate 5% EC	85.2	79.9	80.5	56.45	41.14	64.5	74.8
Hexythiazox 5% WP	75.19	76.4	69.7	59.6	8.7	53.6	64.39

of residual effect were 71.47, 64.5 and 53.6% for the same tested acaricides, respectively. While, the mean reduction percentages of accumulation effect (general effect) were 82.18, 74.8 and 64.39% for abamectin, fenpyroximate and hexythiazox, respectively.

Efficiency of the tested acaricides against *T. urticae* on pepper

First season (2016)

The results in Table 7 shows that all the treatments significantly reduced *T. urticae* population in comparison with untreated control. The results also showed that all acaricides continued to affect the process of reducing the incidence of pest till the experiment end (14th day) after treatment. The general mean numbers of *T. urticae* were 158.2, 204.2 and 178.8 individuals/sample for buprofezin, chlorfenapyr and abamectin, respectively, comparing with 408.6 individuals/30 leaves in control.

Results in Table 8 show that all the treatments gave high reduction as initial kill according to the initial effect, the acaricide buprofezin was the most effective treatment followed by chlorfenapyr and abamectin which caused reduction percentages of 91.3, 83.4 and 81%, respectively.

About residual effect which was represented by the reduction of *T. urticae* population after 3, 7, 11 and 14 days of application, results showed that buprofezin proved the highest residual activity (51.7% reduction in infestation) followed by chlorfenapyr and abamectin, and recorded residual reduction effect of 44.9 and 38.77, respectively. While, the mean percentages of accumulation effect (general effect) were 71.5, 64.16 and 59.88% for buprofezin, chlorfenapyr and abamectin, respectively.

Second season (2017)

In 2017, the experiments conducted on the pepper plant to control *T. urticae* using acaricides, buprofezin, chlrofenapyer and abamectin showed high reduction percentage in the population of *T. urticae*, which led to a reduction in the incidence of the pest continued for a certain period. The general mean numbers of *T. urticae* were 105.8, 167.8 and 118.2 individuals/30 leaves for buprofezin, chlrofenapyer and abamectin, respectively, comparing with 526.8 individuals/30 leaves in control (Table 9).

In Table 10, results show that the treatments of acaricides gave a reduction effect ranged from 23.5 to 90%. According to the first effect, buprofezin was more effective (90% reduction infestation) followed by chlorfenapyr and abmectin, recording inatial activity of 83.4 and 71.9%, respectively. The residual mean of reduction percentages recorded 65.5, 50.3 and 61.08 for buprofezin, chlorfenapyr and abamectin, successively. While, the mean percentages of cumulative effect (general effect) were 77.8, 66.85 and 66.4 for buprofezin, chlorfenapyr and abamectin, successively.

In this respect, the efficiency of the tested acaricides on the two spotted spider mite, *T. urticae* were estimated in several studies *e.g.* **Gough (1990), Sato *et al*. (2004), Hossain *et al*. (2006), Vostrel (2010), Attia *et al*. (2012), Vassilis and Kitsis (2013), Bhika (2014) and Uddin *et al*. (2015)** that compared the efficiency of different acaricides against the two spotted spider mite, *T. urticae* infested different crops. Also, **Martin *et al.* (2015)** studied the combination of insecticides against *T. urticae*. **Zhang and Sanderson (1990)** stated that abamectin causes significant mortality and reduction in the mobility and fecundity of *T. urticae*.

Table 7. Effect of the tested compounds against the two spotted spider mite *Tetranychus urticae* on pepper plant at Tallrak, Awlad Saker, Sharkia Governorate during summer season (2016)

Acaricide	Population No. before treatment	Mean No. of *T. urticae* after treatment (in days) (30 leaves)					General mean
		1	3	7	11	14	
Buprofezin 25%WP	389	32	96	184	200	279	158.2
Abamectin 5% Ec	382	74	190	215	244	298	204.2
Chlorfenapyr 24% SC	372	64	123	187	228	292	178.8
Control	403	418	425	364	400	436	408.6
LDS	8.85	7.6	7.6	6.89	13.08	5.79	

Table 8. Reduction percentages of *T. urticae* caused by the tested compounds on pepper plant at Tallrak, Awlad Saker, Sharkia Governorate during summer season (2016)

Acaricide	Initial reduction effect (%)	Reduction (%) of *T. uritcae* treatment (in days) (30 leaves)				Mean residual effect (%)	General reduction effect (%)
		3	7	11	14		
Buprofezin 25% WP	91.3	76.6	47.9	48.6	33.7	51.7	71.5
Abamectin 5% Ec	81	52.8	38.18	36.2	27.9	38.77	59.88
Chlorfenapyr 24% SC	83.4	68.7	44.7	38.8	27.5	44.9	64.16

Table 9. Effect of the tested compounds against the two spotted spider *Tetranychus urticae* mite on pepper plant at Tallrak, Awlad Saker, Sharkia Governorate during summer season (2017)

Acaricide	Population No. before treatment	Mean No. of *T. urticae* after treatment (in days) (30 leaves)					General mean
		1	3	7	11	14	
Buprofezin 25% Wp	317	41	55	46	164	223	105.8
Abamectin 5% Ec	290	64	46	72	138	271	118.2
Chlorfenapyr 24% SC	390	78	78	152	246	285	167.8
Control	454	512	525	512	496	554	526.8
LDS	7.24	6.41	12.68	18.11	5.21	8.59	

Table 10. Reduction percentages of *Tetranychus urticae* caused by the tested compounds on pepper plant at Tallrak, Awlad Saker, Sharkia Governorate during summer season (2017)

Acaricide	Initial reduction effect (%)	Reduction (%) of *T. uritcae* treatment (in days) (30 leaves)				Mean residual effect (%)	General reduction effect (%)
		3	7	11	14		
Buprofezin 25% WP	90	79.9	87.2	52.6	42.45	65.5	77.8
Abamectin 5% Ec	71.9	86.34	78	56,5	23.5	61.08	66.4
Chlorfenapyr 24% SC	83.4	83.4.7	65.5	11.8	40.2	50.3	66.85

El-Ghobashy and El-Sayed (2002) noticed that Challenger 36% SC and GC-mite 20% EC gave reduction in the population density of the mite pest *T. arabicus* attiah which averaged 92.60 and 83.07%. Also a slight reduction in the dominant predatory mite, *E. scutalis* 28.28% and 20.54% on apple trees was noticed.

Chlorfenapyr and fenpyroximatee showed excellent acaricidal activity to mite. These results also supports the findings of others researchers who reported chlorfenapyr toxicity to *T. cinnabarinus* and *T. urticae* on carnation and rose under Polyhouse **(Valunj *et al*., 1999; Jeyachandran, 2003**). Abamectin was the most toxic to the nymphs followed by dicofol, hexythiazox, propargite, chlorfenapyr and fenpyroximatee **(Ismail *et al.,* 2007)**.

Singh and Choudhary (2008) showed that abamectin 1.9% EC was the most effective on okra for mite population reduction and propargite 0.05% was the next in efficacy.

In other findings, diafenthiuron at different formulations recorded the highest reduction of *T. urticae* population. A field trail conducted by **Misra (2011)** during 2008-2009 and 2009-2010 against *T. urticae* in tomato and recorded that fenzaquin at 125 and 150 g ai/ha registered significantly highest population reduction (90.27-92.13%) followed by dicofol. While hexythiazox recorded the lowest mortality. cyhalothrin and fenpyroximatee showed higher toxicity than seed extract when tested against adult and egg stages of *T. usurticae* **(Derbalah *et al*., 2013**)

In a study of **Patil *et al*. (2014)**, they found that abamectin 0.0025% was the best in effect with 63.34% reduction, followed by dimethoate 0.03% (57.97%), diafenthiuron 0.055% (57.01%), dicofol 0.05% (53.63%), fenazaquin 0.01% (51.77%), Fenpyroximatee 0.0025% (48.56%) and buprofezin 0.030% (43.75%). Also, chlorfenapyr, abamectin, hexythiazox and Fenpyroximatee showed excellent control of *T. urticae* on chrysanthemum grown under Polyhouse conditions **(Reddy *et al*., 2014).**

REFERENCES

Alzoubi, S. and S. Cobanoglu (2008). Toxicity of some pesticides against *Tetranychus urticae* and its predatory mites under laboratory conditions. Ame.-Eurasian, J. Agric. and Environ. Sci., 3 (1): 18-25.

Amjad, M., M.H. Bashir, M.D. Gogi, M. Aslam, K. Zia, M.A. Khan and L. Ali (2012). Evaluation of some acaricides against two spotted spider mite, *Tetranychus urticae* (Acari: Tetranychidae) on cotton crop under laboratory and field conditions. Pak. Entomol., 34 (2):125-129.

Attia, S., K.L. Griss, A.C. Mailleux, S. Heuskin, G. Logany and T. Hance (2012). Acaricidal activities of *Sontolina africana* and *Hertia cheirifolia* essential oils against the two spotted spider mite (*Tetranychus urticae*). Pest Manag. Sci., 68 (7): 1069-1076.

Bhika, P.S. (2014). Field scale study on efficacy of miticide against two spotted mites in

kenyamagro climatic zone. J. Agric. Vet. Sci., 7 (7): 11-13.

Bolland, H.R., J. Gutierrez and C.H.W. Flechtmann (1998). World catalogue of the spider mite family (Acari: Tetranychidae). Brill, Leiden Boston Koln, the Netherlands.

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. Egypt. J. Plant Prot. Res., 1 (3): 46-68.

Dinham, B. (2003). Growing vegetable in developing countries for local urban populations and export market: problems conforting small-scale producers. Pest Manag. Sci., 59: 575-582.

El-Ghobashy, M.S. and K.M. El-Sayed (2002). Efficacy of some biopesticides against the spider mite, *Tetranychus arabicus* Attiah, and the predator mite, Euseiusscutalis (A.-H.) on apple trees in Egypt. 2nd Int. Conf., Plant Prot. Res. Inst., Cairo, Egypt, 34–36.

Gough, N. (1990). Evaluation of miticides for the control of two- spotted mite, *Tetranychus urticae* koch on field roses in Southern Queensland. Crop Prot., 9 (2):119-127.

Henderson, C.F. and E.W. Tilton (1955). Test with acaricides against the brown white mite. J. Econ, Entomol., 48:157-161.

Hossain, S., M.M. Haque and N. Nher (2006). Control of two-spotted spider mite, *Tetranychus urticae* koch (Acari: Tetranychidae) by some selected chemicals. Univ. J. Zool. Rajshahi Univ., 25:15- 18.

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. Exp. Appl. Acarol., 43: 129–135.

Jeppson, L.R., H.H. Keifer and E.W. Baker (1975). Mites injurious to economic plants. Univ. Calif. Press, Berkeley, 683.

Jeyachandran, M. (2003). Evaluation of new acaricides against rose mites, Pestol., 27 : 28–30.

Landeros, J., L.P. Guevara, H. Badiim, A.E. Flores and A. Pamanes (2004). Effect of different densities of the two spotted spider mite *Tetranychus urticae* on Co_2 assimilation, transpiration, and stomatal behavior in rose leaves. Exp. Appl. Acarol., 32: 187- 198

Lee, Y.S., M.H. Song, K.S. Ahn, K.Y. Lee, J.W. Kim and G.H. Kim (2003). Monitoring of acaricide resistance in two-spotted spider mite (*Tetranychus urticae*) populations from rose greenhouses in Korea. J. Asia-Pacific Entomol., (6): 91-96.

Liesering, V.R. (1960). Beitragzumphy to pathologi schenwir kungme chanisms of *Tetranychus urticae* Koch. Z. Pflkrankh., 67: 524-542.

Martin, D.E., M.A. Lattheef and J.D. lopez (2015). Evaluation of selected acaricides against two spotted spider mite (acari: tetramychidae) on greenhouse using multispectral data. J. Exp. Appl. Acarol., 66 (2): 227-245.

Migeon, A. and F. Dorkeld (2007). Spider mites web: a comprehensive database for the Tetranychidae. Available source: http:/ /www .monotpellier. inra.fr/CBGP/spmweb

Misra, H.P. (2011). Bio-efficacy of fenazaquin 10EC against two spotted Spider mite, *Tetranychus urticae* Koch. (Acari: Tetranychidae) in tomato. Pest Manag. Hort. Ecosystems, 17 (1) : 19-22

Patil, D.L., K.A. Patel, N.R. Toke and A.T. Ambule (2014). Bio-efficacy of acaricides against two spotted spider mite, *Tetranychus urticae* Koch (Acarina: Tetranychidae) infesting Carnation (cv. Beaumonde) under protected cultivation. Int. J. Plant Prot., 7 (2): 429-432.

Reddy, D.S., R. Nagaraj, M. Pushpalatha and R. Chowdar (2014). Comparative evaluation of novel acaricides against two spotted spider mite, *Tetranychus urticae* Koch. infesting cucumber (*Cucumis sativus*) under laboratory and green house conditions. The Bioscan., 9 (3): 1001-1005.

Sato, M.E. T. Miyata, M.D. Silva, A. Raga and M.F.D.S. Filho (2004). Selections for Fenpyroximatee resistance and susceptipility and inheritance, cross resistance and stability of Fenpyroximatee resistance in *Tetranychus*

urticae koch (Acari:Tetranychide). J. Appl. Entomol. Zool., 39 (2) : 293-302 .

Shah, R.D. and B. Shukla (2014). Chemical control of two-spotted spider mite, *Tetranychus urticae* (Koch.) infesting gerbera (*Gerbera jamesonii* L.) under polyhouse condition. Pest Manag. Hort. Ecosystems, 20 (2): 155-161.

Singh, S. and D.P. Choudhary (2008). Efficacy of some acaricides against mite, *Tetranychus urtica*e Koch (Acarina, Tetranychidae) on okra. Pestol., 32 (11): 25-27.

Snedecor, G.W. and G.W. Cochran (1989). Statistical methods, 8th Ed. Iowa Stat Univ. Press. Ame., Iowa, USA.

Sun, Y.P. (1950). Toxicity index on improved method of comparing the relative toxicity of insecticides. J. Econ. Entomol., (43): 45-53.

Uddin, M.N., V. Miah, M.Z. Alam, M.R.U. Miah, M.I.H. Mian and K.E.M. ustarin (2015). Toxicity of pesticides to *Tetranychus urticae* Koch (acari: tetranychidae) and their side effect on *neoseiulus californicus* (acari: phytiseiidae). Int. J. Acarol, 41 (8): 688-693.

Valunj, A.R., S.A. Pawar, U.K. Kadam and V.M. Khaire (1999). A new acaricide AC-303-630 (Chlorfenapyr 10 EC) against carnation mite, *Tetranychus cinnabarinus* Biosd, Pest Manag. Hort. Ecosystems, 5 (1): 21-23.

Vásquez, C. and M.C. Ceballos (2009). Efficacy of chlorfenapyr and abamectin to control of *Tetranychus urticae* Koch. (Acari: Tetranychidae). I DESIA., 27 (1):23-28.

Vassilis, V.A. and P. Kitsis (2013). Acaricide resistance in *Tetranychus urticae* (Acari: Tetranychidae) population from Cyprus. J. Econ. Entomol., 106 (4): 1848-1854.

Vostrel, J. (2010). Bifenazate, a prospective acaricide for spider mite (*Tetranychus urticae* Koch) control in czeech Hops. Plant Prot. Sci., 46 (3): 135-138.

Zhang, Z.Q. (2003). Mite in Greenhouses: Identification, Blology and Control. CABI publishing, Walling Ford, 47-64.

Zhang, Z. and J.P. Sanderson (1990). Relative toxicity of abamectin to the predatory mite *Phytoseiulus persimilis* (Acari: Phytoseiidae) and two spotted spider mite (Acari: Tetranychidae). J. Econ. Entomol., 83: 1783–1790.

فعالية بعض المبيدات الأكاروسية ضد أكاروس العنكبوت الأحمر ذو البقعتين على الباذنجان والفلفل تحت الظروف المعملية والحقلية

خيريه محى الدين محمد صالح - على أحمد على أيوب - على عطا على شلبى - محمد عبدالعال هنداوى

قسم وقاية النبات – كلية الزراعة – جامعة الزقازيق – مصر

أجريت هذه الدراسة بهدف تقييم فعالية ستة مبيدات أكاروسية على أكاروس العنكبوت الأحمر ذو البقعتين الذى يصيب نباتات الباذنجان والفلفل خلال موسمي ٢٠١٦-٢٠١٧ تحت ظروف المعمل والحقل حيث تمثلت المبيدات الأكاروسية المختبره فى الأبامكتين ١,٨%، بوبرفيزين ٢٥%، أبامكتين ٥%، كلورفنبير ٢٤%، هكسيثيازوكس ٥% و فنبيروكسيميات ٥%، أظهر مبيد الأبامكتين ١,٨% أعلى تأثير سميه يليه بوبرفيزين، أبامكتين ٥%، كلورفنبير، هسيثيازوكس وفنبيروكسيمات وكانت قيم التركيز القاتل ل ٥٠% من الأفراد ١، ٥، ١٠، ٤٥، ٨٨ و١٠٠ميلجرام/لتر، على الترتيب، كما سجلت المبيدات المختبرة خفض معنوي في تعداد أكاروس العنكبوت الأحمر ذو البقعتين على نبات الباذنجان تحت ظروف الحقل خلال الموسم الأول والثانى حيث كانت نسبة الخفض ٧٧,١، ٥٨,٨ و ٤٤,٤% خلال الموسم الأول (٢٠١٦) و٧١,٤٧، ٦٤,٥ و٥٣,٦% خلال الموسم الثانى (٢٠١٧) لمبيدات أبامكتين ١,٨%، الفنبيروكسيمات والهكسيثيازوكس، على الترتيب، وعلى الجانب الأخر، سجل كلا من البوبروفيزين، الكلورفنبير والأبامكتين ٥% خفض معنوى في تعداد أكاروس العنكبوت الأحمر ذو البقعتين على نبات الفلفل خلال الموسم الأول والثانى حيث كانت ٧١,٥، ٦٤,١٦ و ٥٩,٨% و ٧٧,٨، ٦٦,٨٥ و ٦٦,٤%، على الترتيب.

المحكمـــــون:

١- د. علـي عبـدالعزيز الشـيخ رئيس مركز بحوث وقاية النبات – مركز البحوث الزراعية.

٢- أ.د. السيد عبدالمالك الشيخ أستاذ وقاية النبات – كلية الزراعة – جامعة الزقازيق.