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COMPARATIVE EFFICIENCY OF PESTICIDES AND SOME PREDATORS TO CONTROL SPIDER MITES:
I-TOXICOLOGICAL STUDIES OF SOME ENVIRONMENTALLY SAFE CHEMICALS AGAINST THE TWO SPOTTED SPIDER MITE, *Tetranychus urticae* AND THEIR PREDATORS A*mblyseius gossipi, Phytoseiulus macropili* AND *Stethorus gilvifrons*

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ABSTRACT

In the present study was carried out to evaluate the toxic effect of six compounds of different mode of actions, three are known as acaricides (abamectin , ethion and chlorfenapyr), one pyrethroid (cyhalothrin), one mineral oil(Nat- 1) and one plant extract (*Allium sativum*) against the eggs and adult females of the two spotted spider mite, *Tetranychus urticae* and adult females of their predators *Amblyseius gossipi, Phytoseiulus macropilis* and *Stethorus gilvifrons* using leaf- disc dip technique.The results indicated that Abamectin has a special position in mite chemical control or in integrated mite management because of its high toxic effect and it`s high toxicity index among different mite control agents. *A.sativum* extract was the least toxic compound to adult female *T.urticae*. Abamectin and cyhalothrin have a special effect on eggs of *T.urticae* and considered the best compounds that have a special importance in integrated mite management.The mineral oil Nat-1 was more toxic to egg stage of *T.urticae* than *A. sativum* extract. Nat-1 and *A.sativum* extract were the most safe compounds to the adults of predatory mites *A.gossipi* and *P.macropilis* and the predatory insect *S.gilvifrons*. Chlorfenapyr has the highest selectivity index and highest selectivity ratio in spite of its low safety values, so it can be recommended in IPM programs. Cyhalothrin,ethion, Nat-1 and *A.sativum* were the next compounds after chlorfenapyr in their selectivity ratio values , but Nat-1 has a special position and considered a promising oil in mite control programs. Abamectin has the least values of selectivity index and selectivity ratio and it's low safety index make us to keep it in mined under certain conditions (in case of rare predators with high level of phytophagous mites).

INTRODUCTION

The two spotted spider mite, *Tetranychus urticae* (Koch) has been recorded on more than 150 hosts of some economic value throughout the world (Jeppson *et al.*,1975). Spider mites cause serious economic damages to crops by feeding on foliage, the effect of which is to reduce photosynthesis, transpiration leaf chlorophyll content and leaf nitrogen, and increase transpiration (Golam, 2002). The continuous use of the conventional acaricides to control this pest has caused pest resurgence, outbreaks of secondary pests through decimation of natural enemies and environmental pollution (Joln *et al.*,1986). Also, resistance of mite to many of these compounds developed very rapidly (Huffaker *et al.*,1970). Therefore world are going to reduce chemicals use and trying to introduce predators and the entomopathogens (such as virus, bacteria and fungi) in itegrated pest management (IPM) programmes. The predators were used by several authors to control this pest on plants (Hamlen,1978;Hamlen and poole,1980 ; Osborne and petitt,1985;Beers *et al.*,2009 and Duso *et al.*,2009). These predators are frequently responsible for maintaining spider mite populations below damaging levels, and play an important role in their natural control (Croft and luh,2004). Pesticide resistance, the high cost of pesticides and loss of production time have raised interest by growers to introduce predators to manage spider mites and reduce their need for acaricide applications (Sabelis,1981).

The use of predators had proved the most effective control method for Tetranychid mites and the most effective predators A*mblyseius gossipi, Phytoseiulus macropilis* and *Stethorus gilvifrons* (Abou Awad and El-Banhawy,1985 and Duso *et al.*,2009). So, the present study was carried out to examine the toxic effect of six tested compounds against the eggs and adult females of the two spotted spider mite *T.urticae* (Koch) and three predators were used in this study namely *Amblyseius gossipi, Phytoseiulus macropilis* and *Stethorus gilvifrons* .

MATERIALS AND METHODS

Prey culture:

The two-spotted spider mite, *Tetranychus urticae* (Koch) (Acarina: Tetranychidae), reared according to Dittrich (1962). *Tetranychus urticae* colonies were obtained from castor bean plants from Kafr EI-Sheikh governorate and reared under laboratory conditions on castor bean (oil), *Ricinus communis* (L) leaves plants to be away from any contamination with pesticides before starting the experiments. 4-6 seeds of castor beans were planted in each pot and the growing seedlings were infested by clean culture of red mites. Mites were transferred from old to young plants by cutting heavily infested leaves into small sections which were then placed on new plants. Adult female of red spider mites were collected from stock cultures and allowed to oviposite overnight into castor been leaves. The females were then removed and the leaves infested with eggs were placed on clean plants. Groups of plants bearing eggs laid within 24 hours period were transferred to small cages. Adult females of uniform age were collected from the cultures for experimental use. The prey culture was kept at 25 ± 2°C under 16 hours photoperiod to encourage plant growth, and 70 ± 5 R.H. The provision of 16/days length ensured that mites would not enter diapause. An artist's brush (No.0) was used to transfer mites from plant to another.

Predators culture:

Three Predators used in this study are A*mblyseius gossipi, Phytoseiulus macropili* and *Stethorus gilvifrons* (Acarina: Photoseiidae), were collected and described by Overmeer *et al.* (1982). The predator was reared on pollen grains of castor bean(*Ricinus communis (L)* plants as described by Overmeer *et al.* (1982)

Chemicals used:

Six compounds were used. The chemical names for the tested compounds are:

1-Abamectin (1.8 % E.C**)**: A mixture containing a minimum of 80% avermectin B_1a (5-0-demethy1 avermectin A_1a) and a maximum of 20% avermectinB_1b[5-0demethy1-25-de-(1-methy1-propy1)-25-(1-methylethy1) avermectin A,a].

2-Ethion(50 % E.C **)**: 0,0,0,0- tetraethy1 s,s-methylene bis (phosphorodi-thioate).

3-Lambda-Cyhalothrin(5% E.C**):**A reaction product comprising equal quantities of (S) -2- cyano-3 ~ phenoxybenzy1 (z)-(1R3R)3- (2-chloro-3,3,3- trifluoropropeny1) -2,2 ~ dimethyl cyclopropane carboxylate and (R) -a- cyno-phenoxybenzyl (Z) - (1S, 3S) -3- (2 ~ chloro-3,3,3-triflur opropenyl) -2,2- dimethyl cyclopropane- carboxylate.

4-Chlorfenapyr (36 % S.C**) :** 4-Bromo-2- (chlorophenyl) (ethoxymethyl)-5-(trifluoromethyl)- 1H- pyrrole -3- carbonitrile ; 4- Bromo -2 - (4-chlorophenyl)–1-(ethoxymethyl) -5- (trifluoromethyl) pyrrole -3-carbonitrile.

5- Mineral oils : Nat 1 (96 % E.C) was provided by Central Agricultural Pesticides Laboratory-Natural oil was applied at rate of 1L / fedan.

6-Plant extract (*Allium sativum*): An amount of 80.0gm of clean seeds were added to 300 ml acetone and methanol (1:1.The extract was filtered and evaporated and 300ml acetone were added to go out the pure substance. Triton X 100 was used as an emulsifier, at rate of 0.1%

Experimental techniques:

1-Toxicity of tested compounds to adult female of two-spotted spider mite *T.urticae*

The toxic effects of tested chemicals to the two-spotted spider mite *T. urticae*, were evaluated by the leaf disc dip technique according to Siegler (1947). Mortality counts were recorded 24 hours after treatment. The natural mortality was recorded according to Abbott's formula (1925). Data were plotted on log dosage probit papers and statistically analyzed according to Litchfield and Wilcoxon (1949).

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

The effectiveness of tested compounds on *T.urticae* eggs was examined using the methods of Staal *et al.*, (1975).

Equations:

1-Abbott's formula (1925) was used to correct % mortality according to natural mortality.

$$\text{Mortality (\%)} = \frac{\text{Mortality \% of treatment- mortality \% of control}}{100 - \text{Mortality \% of control}} \times 100$$

2- The toxicity lines were statistically analyzed according to Litchfield and Wilcoxon (1949).

3- Selectivity ratio of tested compounds on predatror mites *A.gosipi* and *P.macropilis was* determined as follow according to Wilkinson (1976):

$$\text{Selectivity ratio (S.R)} = \frac{LC_{50} \text{ of the compound on predator}}{LC_{50} \text{ of the compound on prey}}$$

4- Selectivity index = $\frac{\text{S.R of compound on predator}}{\text{S.R of the most selective compound (Compound of the highest S.R value)}}$ x 100

5- Egg mortality: The percentage of mortality was calculated as follows:

Egg mortality = (a/b) X 100

Where a= Un hatched eggs, b= number of total eggs which counted before treatment with toxicant

6- Toxicity index of tested compounds was determined according to Sun (1950) as follows:

$$\text{Toxicity index} = \frac{LC_{50}\text{ of the most effective compound}}{LC_{50}\text{ of the tested compound}} \times 100$$

7- Safety index of tested compounds on predator mite was determined according to Aref (1997) as follows:

$$\text{Safety index} = \frac{LC_{50}\text{ of tested compound on predator}}{LC_{50}\text{ of the least effective compound on predator}} \times 100$$

RESULTS AND DISCUSSION

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

Based on LC50 values (Table 1) results indicated that abamectin was the most toxic compound, followed by chlorfenapyr**,** cyhalothrin and ethion to adult females of *T. urticae* with LC_{50} values of 0.03, 25.69, 139.14 and 211.23 ppm respectively. While Nat-1 has a moderate toxicity to adult females of *T.urticae* with LC_{50} value of 463.90 ppm. *A. sativum* extract was the least toxic to adult females of *T.urticae* of LC_{50} value 2715.28ppm. Slope values of the log concentration-probit lines in Table (1) indicated that cyhalothrin has the highest slope value of (1.14) ,while abamectin has the lowest one (0.14). Nat-1, *A.sativum*, ethion and chlorfenapyr have slope values of 0.77, 0.41, 0.41 and 0.27 respectively.

Table (1): Toxicity of different compounds to adult females of the two-spotted spider mite *T.urticae*

Compounds	LC_{50} (ppm)	C.L for LC_{50} Lower	upper	Toxicity * Index	Slope value
Abamectin	0.03	0.012	0.059	100	0.14
Ethion	211.23	169.96	251.11	0.015	0.41
Cyhalothrin	139.14	107.12	174.52	0.023	1.14
Chlorfenapyr	25.69	17.93	33.58	0.123	0.27
Nat 1	463.90	419.17	509.22	0.007	0.77
Allium sativum	2715.28	2238.62	3289.39	0.001	0.41

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

Concerning the toxicity index at LC_{50} level, the data in Table (1) confirmed that abamectin was the most toxic compound to adult females of *T.urticae* with toxicity index of 100, followed by a drastic drop in toxicity index in case of chlorfenapyr with toxicity index of 0.123, while cyhalothrin, ethion, Nat-1 and *A.sativum* extract have poor toxic effects to adult females *T.urticae* of toxicity indexes of 0.023, 0.015, 0.007 and 0.001 respectively.

The obtained results are in agreement with the result obtained by Green and Dybas (1984) they found that abamectin had intrinsic toxicity to *T.urticae* adult under laboratory conditions with LC_{50} value of 0.03 ppm which is toxic to all mite stages.The results are also in agreement with Camrgo and Arrude (1987) that LC_{50} of abamectin was 0.1 ppm against *T.urticae* and more toxic than propargite to this mite. EL-Monairy *et al.* (1994) found that LC_{50} value of abamectin against adult stage of *T.urticae* was 0.21 ppm. Park *et al.* (1996) indicated that abamectin solution killed all *T.urticae* females within 24 hrs, after dipping. Gamieh and Saadoon (1998) also reported that abamectin was the most toxic compound with LC_{50} value of 0.12 ppm, it was more toxic than Neoron (bromopropylate), Sanmite (pyridaben), Ortus (fenpyroximate) and Biomite. In addition Gamieh *et al.* (2000) showed that Vertimec (abamectin) (40ml/100L water) was satisfactory in controlling the mite *T.cucurbitacearum* on soybean. Also, Saied *et al.* (2002) found that abamectin caused high initial kill (81.75%) against two spotted spider mite population on cotton. Ismail *et al.* (2006) found that abamectin was the most toxic compound followed by fenpyroximate to adult females of *T.urticae* with LC_{50} value of 0.003 and 103.59 ppm.

Cyhalothrin is known to be of moderate toxicity to spider mite but the low mammalian toxicity and its environmental safety promote the awareness to be included in integrated pest management programs. The pyrethroids were found to be of limited interest because of their secondary effect especially on predator mite. These products will be incompatible to the biological control of phytophagous mite unless strains of these predators can be resistant to pyrethroids.

The mineral oil used in this study was of the second category after the specific acaricide and the insecticide cyhalothrin in their toxicity to spider mite *T.urticae*. In general,oils are known to be physically effective on the different mite stages.The mineral oils were evaluated again against the different stages of spider mite by other authors and indicated to be successful (Nassef, 1998; Rizk *et al.* 1999 and Gamieh *et al.* 2000). Saied *et al.* (2002) also they found that Supermasrona cuased high residual effect (87.61%) against two spotted spider mite population in cotton crops. Ismail *et al.* (2006) found that Supermasrona has a moderate toxicity to adult females of *T.urticae* with LC_{50} value of 1480.60 ppm.

Many investigators proved that plant extracts were effective against phytophagous mites when tested in laboratory. EL-Halawany and EL-Nagaar (1984) reported that cumin oil was more toxic for adult stage of *T.arabicus* than other tested extracts, while Nassef (1998) found that the vegetative oil (black cumin) had a considerable toxicity to *T.urticae* (LC_{50}= 110 ppm). 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 soya 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 worm wood extract was the least toxic to adult females of *T.urticae* with LC_{50} value of 2721.22 ppm. Ismail *et al.* (2009) indicated that black cumin extract was the poorest toxic compound to adult females of *T.urticae.*

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

Based on LC_{50} values (Table 2) results indicated that abamectin was the most toxic ovicide followed by cyhalathrin against the egg stage of spider mite *T.urticae* with LC_{50} values of 1.045 and 10.13 ppm respectively. While ethion, chlorfenapyr and Nat-1 have a moderate toxicity to egg stage of *T.urticae* with LC_{50} values of 109.43, 168.11 and 699.46 ppm, respectively. *A. sativum* extract was the least toxic to eggs of *T.urticae* of LC_{50} value 2642.26 ppm.

Table (2): Toxicity of different compounds to eggs of the two-spotted spider mite *T. urticae* :

Compounds	LC_{50} (ppm)	C.L for LC_{50} Lower	upper	Toxicity * Index	Slope value
Abamectin	1.05	0.88	1.25	100	0.15
Ethion	109.43	88.87	130.67	0.96	0.16
Cyhalothrin	10.13	8.62	11.56	10.37	0.24
Chlorfenapyr	168.11	106.43	218.87	0.62	0.46
Nat 1	699.46	670.23	730.71	0.15	0.69
Allium sativum	2642.26	2176.53	3269.42	0.04	0.15

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

Concerning the toxicity index at LC_{50} level, the data in Table (2) confirmed that abamectin was the most toxic compound to egg stage of *T.urticae* with toxicity index of 100, followed by cyhalothrin with toxicity index of 10.37, while ethion and chlorfenapyr have a moderate toxic effect to egg stage of *T.urticae* with toxicity indexes 0.96 and 0.62. Nat-1 and *A. sativum* extract have low toxic effects to egg stage of *T.urticae* with toxicity indexes of 0.15 and 0.04 respectively.

These results can be supported with those obtained by several investigators. EL-Monairy *et al.* (1994) indicated that the 3-days old eggs were more susceptible for abamectin than one and two-days old. Ibrahim and Yee (2000) reported also that 1-day old eggs of two –spotted spider mite *T.urticae* was more susceptible for Andalin than 2 and 3 days old eggs. Mousa and EL-Sisi (2001) indicated that cotton seed oil was effective in its initial and residual effects against eggs of spider mite *T.urticae* on squash crop. Keratum (2001) indicated that fenpyroximate was the most potent compound against eggs of *T.urticae*, followed by abamectin. Also, Hosny *et al.* (2003) indicated that abamectin was more toxic to eggs of *T.urticae* than fenpyroximate.Also they indicated that cypermethin was one of the most effective compounds on eggs of *T.urticae*. Ismail *et al.* (2006) indicated that abamectin was the most toxic compound against the egg stage of *T.urticae* with LC_{50} value of 2.88 ppm. Also, they indicated that cypermethrin was one of the most effective compounds on eggs of *T.urticae*. Also Ismail *et al.* (2009) indicated 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.

Toxicity of tested compounds to adult females of predatory mites:

Toxicity to predatory insect *Stethorus gilvifrons:*

The data in Table (3) showed that abamectin was the most effective with LC_{50} of 0.0008 ppm, followed by chlorfenapyr with LC_{50} value of 10.95 ppm,while cyhalothrin,ethion and Nat-1 have a moderate toxic effect with LC_{50} of 69.08 , 83.31 and 182.25 respectively. *A.sativum* extract was the least toxic compound to adult females of *S.gilvifrons* with LC_{50} value 708.19 ppm. Based on LC_{50} values in Table (3) the data showed that abamectin and chlorfenapyr were more toxic to adult females of *S.gilvifrons* than cyhalothrin and ethion but *A.sativum* extract was the least toxic one, while the mineral oil Nat-1 was more toxic than *A.sativum* extract.

Table (3): Toxicity of different compounds to adult females of *Stethorus gilvifrons*

Compounds	LC_{50} (ppm)	C.L for LC_{50} Lower	upper	Toxicity * Index	Slope value
Abamectin	0.0008	0.0005	0.001	100	0.14
Ethion	83.31	73.88	92.33	0.0009	0.62
Cyhalothrin	69.08	64.52	73.87	0.001	1.01
Chlorfenapyr	10.95	9.09	12.78	0.007	0.42
Nat 1	182.25	145.92	228.99	0.0004	0.31
Allium sativum	708.19	591.51	852.70	0.0001	0.42

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

Concerning the toxicity index at LC_{50} level, the data in Table (3) confirmed that abamectin was the most toxic compound to adult females of *S.gilvifrons* with toxicity index of 100, followed by a drastic drop in toxicity index, in case of, chlorfenapyr and cyhalothrin with toxicity indexes of 0.007 and 0.001 respectively. Ethion and Nat-1 have low toxic effect to adult females of *S..gilvifrons* with toxicity indexes of 0.0009 and 0.0004 respectively, while *A.sativum* extract was the poorest toxic compound to adult females of *S. gilvifrons* with toxicity index of 0.0001.

Toxicity to Predatory mite *Amblyseius gossipi*.

The data in Table (4) showed that abamectin was the most effective compound on adult females of predator mite *A.gossipi* with LC_{50} of 0.0005 ppm, followed by chlorfenapyr and cyhalothrin with LC_{50} values of 13.14 and 65.40 ppm respectively. Ethion and Nat-1have a moderate toxic effect with LC_{50} of 88.04 and 213.54ppm respectively, while *A. sativum* extract was the least toxic compound to adult females of *A.gossipi* of LC_{50} value of 888.08 ppm.

Concerning the toxicity index at LC_{50} level, the data in Table (4) confirmed that abamectin was the most toxic compound to adult females of *A.gossipi* with toxicity index of 100, followed by a drastic drop in toxicity index in case of chlorfenapyr with toxicity index of 0.004. Cyhalothrin, ethion and

Nat-1 have low toxic effect to adult females of *A.gossipi* with toxicity indexes of 0.0008, 0.0006 and 0.0002 respectively, while *Allium sativum* extract was the least toxic compound to adult females of *A.gossipi* with toxicity index of 0.00006.

Table (4): Toxicity of different compounds to adult females of *Amblyseius gossipi*.

Compounds	LC_{50} (ppm)	C.L for LC_{50} Lower	upper	Toxicity* Index	Slope value
Abamectin	0.0005	0.0002	0.0009	100	0.14
Ethion	88.04	72.73	103.88	0.0006	0.56
Cyhalothrin	65.40	58.89	71.32	0.0008	0.94
Chlorfenapyr	13.14	10.34	16.57	0.004	0.39
Nat 1	213.54	162.87	297.69	0.0002	0.30
Allium sativum	888.08	725.39	1178.87	0.00006	0.42

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

Toxicity to Predatory mite *Phytoseiulus macropilis*

The data in Table (5) showed that abamectin was the most effective compound on adult females of predator mite *P. macropilis* with LC_{50} of 0.002 ppm, followed by chlorfenapyr with LC_{50} value of 16.68 ppm.Cyhalothrin, ethion and Nat-1 have a moderate toxic effect with LC_{50} of 64.72, 86.28 and 182.01 ppm respectively,while *A.sativum* extract was the least toxic compound to adult females of *P.macropilis* of LC_{50} value of 927.63 ppm.

Table (5): Toxicity of different compounds to adult females of *Phytoseiulus macropilis*.

Compounds	LC_{50} (ppm)	C.L for LC_{50} Lower	upper	Toxicity *Index	Slope value
Abamectin	0.002	0.001	0.004	100	0.13
Ethion	86.28	73.45	94.68	0.002	0.57
Cyhalothrin	64.72	59.22	69.72	0.003	0.98
Chlorfenapyr	16.68	13.05	23.59	0.012	0.39
Nat 1	182.01	130.53	261.61	0.0010	0.29
Allium sativum	927.63	758.24	1245.55	0.0002	0.42

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

Concerning the toxicity index at LC_{50} level, the data in Table (5) confirmed that abamectin was the most toxic compound to adult females of *P.macropilis* with toxicity index of 100, followed by a drastic drop in toxicity index in case of chlorfenapyr with toxicity index of 0.012. Nat1, ethion and cyhalothrin have low toxic effect to adult females of *P.macropilis* with toxicity indexes of 0.001, 0.002 and 0.003 respectively, while *A. sativum* extract was the least toxic compound to adult females of *P.macropilis* with toxicity index of 0.0002.

The safety index, selectivity index and selectivity ratio values in Table (6) showed that *A.sativum* extract is the most safe compound to adults of predatory insect *S. gilvifrons* with safety index of 100, followed by Nat-1 with safety index (25.73), while ethion, cyhalothrin and chlorfenapyr were of moderate safety effect on adults of *S. gilvifrons* with safety indexes of 11.76, 9.75 and 1.55 respectively. But abamectin was of the least safety value on adult predatory insect *S. gilvifrons* with safety index of 0.0001.

The data in Table (6) indicated that in most cases, there was no apparent difference between safety index of the same compound against the two predatory mites *A.gossipi* and *P. macropilis*. These results confirmed that chlorfenapyr appeared to be of high selective effect on predatory insect *S. gilvifrons*,*A.gossipi* and *P.macropilis* with selectivity ratio of 0.43 and selectivity index of 86.00 for *S. gilvifrons* , while for *A.gossipi* with selectivity ratio of 0.51 and selectivity index of 100 and for *P.macropilis* with selectivity ratio of 0.65 and selectivity index of 100. Cyhalothrin and ethion,Nat-1 and *A. sativum* extract have a moderate selective effect with selectivity ratio of 0.50, 0.39, 0.39 and 0.26 for *S. gilvifrons* ,0.47,0.42,0.46 and 0.33 for *A.gossipi* and 0.47, 0.41,0.39 and 0.34 for *P.macropilis* respectively,and selectivity index values of 100,78.0,78.0 and 52.0 for *S. gilvifrons* ,92.16,82.35,90.2 and 64.71 for *A.gossipi* and 72.31,63.08,60.00 and 52.31 for *P.macropilis* respectively.

Table (6): Toxicity parameters of different compounds to adult female of the predators *Stethorus gilvifrons Amblyseius gossipi* and *Phytoseiulus Macropilis*

Compounds	*Stethorus gilvifrons*			*Amblyseius gossipi*			*Phytoseiulus Macropilis*		
	Safety index	Selectivity ratio(S.R)	Selectivity index	Safety index	Selectivity ratio(S.R)	Selectivity index	Safety index	Selectivity ratio(S.R)	Selectivity index
Abamectin	0.0001	0.03	6.00	0.00006	0.02	3.92	0.0002	0.07	10.77
Ethion	11.76	0.39	78.0	9.91	0.42	82.35	9.30	0.41	63.08
Cyhalothrin	9.75	0.50	100	7.36	0.47	92.16	6.98	0.47	72.31
Chlorfenapyr	1.55	0.43	86.0	1.48	0.51	100	1.80	0.65	100
Nat 1	25.73	0.39	78.0	24.05	0.46	90.20	19.62	0.39	60.00
Alliumsativum	100	0.26	52.0	100	0.33	64.71	100	0.34	52.31

Abamectin has the lowest selective effect with selectivity ratio of 0.03 for *S.gilvifrons*,0.02 for *A.gossipi* and 0.07 for *P.macropilis*,and selectivity index (6.0,3.92 and 10.77) for the three predators *S.gilvifrons*, *A.gossipi* and *P.macropilis*. It is interesting to find out that chlorfenapyr has the highest selectivity index and highest selectivity ratio in spite of its low safety index value. The present results, therefore has recommended this compound in IPM programs. The selectivity of a compound is more important than its safety for predatory mites due to the presence of the two organisms on the same host plant.Cyhalothrin and ethion, Nat-1 and *A.sativum* were the next compounds in their selectivity ratio values, while abamectin had the least value.

Reviewing the above results about the toxic effect of different tested compounds to adult females of predatory *S.gilvifrons***,** *A.gossipi* and *P.macropilis*, the following points could be concluded:

1- Nat-1 and *A.sativum* extract are the safest compounds to adults of predatory mites *A.gossipi* and *P.macropilis and* predatory insect *S.gilvifrons*.

2-Chlorfenapyr has the highest selectivity index and highest selectivity ratio in spite of its low safety values, so it can be recommended in IPM programs.

3-Cyhalothrin,ethion, Nat-1 and *A.sativum* were the next compounds after chlorfenapyr in their selectivity ratio values, but Nat-1 has a special position and considered a promising oil in mite control programs.

4- Abamectin has the least values of selectivity index and selectivity ratio and it's low safety index make us to keep it in mined under certain conditions (in case of rare predators with high level of phytophagous mites).

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,Tsolakis *et al.* (1993) found that abamectin was considered to be not very harmful against predatory mite *A. andersoni*. Biddinger and Hull (1995) found that abamectin was toxic to larvae and adult of predatory mite *S.punctum*, while Park *et al.* (1995) found that abamectin did not significantly affect the survival and mobility of *A.womersleyi* adult females at a concentration of 0.12 ppm. Kim and Paik (1996b) indicated that abamectin was much less toxic to *A.womersleyi* than to the spider mite *T.urticae*. El-Adawy *et al.* (2000) found that the value of the general selective toxicity ratio recommended fenpyroximate as the safest acaricide for predatory insect *S.gilvifrons* as compared to its prey *T.urticae*. El-Beheiry *et al.* (1987) found that cypermethrin 10% EC was less toxic than Lannate 90% WP to predatory mite *A.gossipi*. The tested mineral oil was appeared to be of high safety index that means it's of low toxicity against the predatory mite. This is an advantage required for integrated pest management. Osman (1997) showed that Shokrona and Shokrona Super were of little adverse effect on predacious mite *A.gossipi* comparing with synthetic acaricides. Dhandapani *et al.* (1985) showed that neem products were ineffective against *S.gilvifrons*.Ismail (1997) found that the safest materials towards *S.gilvifrons* as compared to *T.urticae* in a descending order of desired selectivity are bromopropylate, and etoxazole. On the other hand, EL- Adawy *et al.* (2001) showed that methomyl and pirimicarb had harmful effect on *S.gilvifrons*.Kavousi and Talebi (2003) found that pirimiphos-methyl was harmful and heptenphos was harmless to the predatory mite *P.persimilis*. Khan *et al.* (2005) found that after 24 hrs, higher mortalities were caused by Ordoval (100%) while lower by Apollo (5.49%),Confidor (6.43%), Masai (2.35%) and ME605 (13.66%). Data recorded after 72 hrs showed that Metasystox and Telmio also caused 100% mortality. Based on the toxicity level, Metasystox, Ordoval and Telmion were slightly toxic, while Apollo, Confidor Masai and ME60 were harmless to predatory mite *Typhlodromus pyri.* Cloyed *et al.* (2006) found that both rates of chlorfenapyr and spiromesifen and the single rate of bifenazate were not harmful to *Neoseiulus californicus* with percent live values >=85% for chlorfenapyr and >= 95% for spiromesifen, and substantially toxic to *P.persimili* with percent live mite values of <= 63% for all the miticides tested. Saenz *et al.* (2007) showed that, fenpyroximate was considered slightly persistent for *Galendromus occidentalis* and *P.persimilis*,while abamectin was also slightly persistent for *P.persimilis* only. Ismail (2007) indicated that abamectin has a special effect to adult females of predator *S.gilvifrons*,followed by chlorfluazurn and cypermethrin,in addition,etoxazole was the least toxic one. Also, Ismail *et al.* (2009) found that Nat-1 and black cumin extract are the safest compounds to adult females of both predatory mites *A.fallacis* and *P.persimilis*.Cyhalothrin has the highest selectivity index and highest selectivity ratio, in spite of it's low safety index,while abamectin has the least values of selectivity index and selectivity ratio and it's low safety index.

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الفعالية النسبية لبعض المبيدات وبعض المفترسات لمكافحةالعنكبوت الاحمر:
1- دراسات توكسيكولوجية لبعض الكيماويات الامنه بيئياً ضد العنكبوت الاحمر وبعض المفترسات أمبليسيس جوسيباي، فيتوسيلس ماكروبلس واستيثروس جلفيفرونس

عطية يوسف قريطم، عبد العزيز حسن حسنى و ناهد السيد حسن
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لقد أجريت الدراسة الحالية لتقييم التأثير السام لستة مركبات مختلفة ، ثلاثة مبيدات أكاروسية (أبامكتين واثيون وكلورفينابير) ومبيد بيرثرويد (سيهالوثرين) وأحد الزيوت المعدنية (نات واحد) ومستخلص نباتى (الثوم) ضد البيض والإناث البالغة للأكاروس النباتى (تترانيكس أورتيكا) والإناث البالغة للأكاروسات المفترسة (أمبليسيس جوسيباي، فيتوسيلس ماكروبلس) واستيثروس جلفيفرونس) وذلك باستخدام القرص الورقى0

أظهرت النتائج ان المبيد الأكاروسى (أبامكتين) له وضعاً خاصاً فى المكافحة الكيماوية وفى برنامج المعالجة المتكاملة للأكاروس تترانيكس أورتيكا وذلك بسبب تأثيره السام العالى بين المركبات المختبرة الأخرى. المستخلص النباتى(الثوم) أقل المركبات سمية على الإناث البالغة للأكاروس تترانيكس أورتيكا. كان المبيدين أبامكتين وسيهالوثرين يحتلان وضعا خاصاً فى التأثيرعلى بيض الأكاروس النباتى، ويعتبرا من أفضل المركبات والتى لها أهمية خاصة فى برنامج المعالجة المتكاملة بينما كان الزيت المعدنى (نات واحد) أكثر سمية على بيض الأكاروس تترانيكس أورتيكا عن مستخلص الثوم**0**ويعتبرالزيت المعدنى(نات واحد) ومستخلص الثوم أكثر المركبات أماناً على الاناث البالغة للمفترسات أمبليسيس جوسيباي، فيتوسيلس ماكروبلس واستيثروس جلفيفرونس. أظهر المبيد كلورفينابير أعلى اختيارية وأعلى نسبة فى الاختيارية وبسبب ارتفاع قيمة الامان له يمكن ان ينصح به فى برامج المعالجة المتكاملة. كان الزيت المعدنى، والمبيد سيهالوثرين ، واثيون المركبات التالية بعد المبيد كلورفينابير فى قيم الاختيارية، ولكن الزيت المعدنى كان له وضعاً خاصاً وواعداً فى برامج المعالجة. مبيد ابامكتين احتل القيمة الاخيرة فى الاختيارية، ونسبتها و أمانه المنخفض يجعلنا وضعه تحت الظروف الضرورية (فى حالة اطلاق المفترسات تحت معدل الاكاروس العالى).

قام بتحكيم البحث

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