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Laboratory evaluation of some environmentally safe chemicals against the two spotted spider mite, *Tetranychus urticae* and its predator insect, *Stethorus gilvifrons*

Ahmed, A. Ismail
Pesticides Department, Fac. of Agric. Kafr El-Sheikh, Univ., Egypt

ABSTRACT

The present study was directed to evaluate the relative toxicity of eight compounds; four pesticides (abamectin, cypermthrin, etoxazole and chlorfluazuron), two mineral oils (Chemesol and Supermasrona) and two plant extracts Worm wood (*Chrysanthemum morifolium*) and *Melia azedarach* against adult females of the two spotted spider mites *Tetranychus urticae* and its predatory insect *Stethorus gilvifrons* using leaf-disc dip technique. The effects of sublethal doses of these compounds on some biological and behavioral characteristics of this mites and its predator was also examined. The results indicated that, abamectin was the highest toxic compound to the adult females of *T. urticae*, followed by chlorfluazuron and cypermethrin while etoxazole was the least toxic one. Abamectin still considered the best compound, which has a special effect to adult females of predator *S. gilvifrons*, followed by chlorfluazuron, and cypermthrin, in addition, etoxazole was the least toxic one. Moreover, chlorfluazuron, cypermethrin and Supermasrona were the most effective compounds on egg deposition of the adult female mites and caused the highest reduction in egg deposition comparable to the control treatment. Etoxazole had the least effect on egg deposition that confers a chance to produce eggs enough for predation including mite egg, the preferable stage, for some predators. Cypermethrin was highly toxic compound that caused the highest decrease in egg hatchability on leaf discs against egg stage of the *T. urticae* but etoxazole and worm wood extract were the least effective ovicidal action. Abamectin and cypermethrin were the most effective chemicals that caused a decrease in prey egg consumption comparable to the control treatment, while etoxazole had the least effect. Data also indicated that the predators egg deposited under the chemical treatment were less than that deposited under normal conditions (untreated). Cypermethrin was the most effective chemical, which caused a decrease in eggs deposited by adult female predator *S. gilvifrons* comparable to the controls. Etoxazole and worm wood extract were the safest compounds that allowed the predator's eggs to hatch producing the next stages necessary as biological agent that minimize prey populations.

INTRODUCTION

Phytophagous mites represent a special importance in our modern agriculture. Scarcely an agricultural crop without a mite problem could be found. Mite control using many of specific chemicals known as acaricides on agricultural crops was and still in some cases, a routine practice by farmers all over the world. As a result of continuous application of these acaricides and other chemicals for controlling mites in field crops, the resistance problem has taken place. The rise of resistance among mite population implies necessitates for alternating these chemicals from a group of certain mode of action to another one that has different mode of action.

The preducous insect *Stethorus sp.* is the most abundant of the natural enemies associated with spider mites on several crops. This species plays an important role in suppressing populations of phytophagous mites and must be safeguanded. Many laboratory and field investigations concluded that *Stethorus sp.* is an efficient predator of tetranychid mites (Nicolov *et al.*, 1983; Rather, 1983 and Ahmed and Ahmed, 1988). The integrated control of two-spotted spider mite (tetranychids) is possible through the combined effect of selective pesticides and the action of various beneficial arthropods.

The petroleum (Mineral) oils are used in large quantities as herbicides and for other crop protection purposes. They are of low chemical reactivity (physical poisons) and may be used as miticides, ovicides and as an emulsifiable carrier of pesticides. Besides, botanical pesticides in general possess low mammalian toxicity and their use in an agroecosystem is now emerging as one of the prime means to protect crop produce and the environment from pesticidal pollution, and there is no risk of developing pest resistance to these products, when used in natural forms.

Due to the above different chemicals that may be used against phytophagous mites and different biological control agents that may be combined with pesticidal control that lead to minimize the environmental pollution. There is a renewed interest in the use of integration between chemicals of different mode of action in combination with the use of perdatory insect *Stethorus gilvifrons* in tetranychid mite control.

The present study is directed to evaluate the relative toxicity of chemicals of different mode of action against the adult female mites *Tetranychus urticae* and its predatory insect *Stethorus gilvifrons*. The effects of sublethal doses of these chemicals on some biological aspects of the mite and its predator were also evaluated.

MATERIALS AND METHODS

Prey Cultures: Colonies of the two-spotted spider mite, *Tetranychus urticae* (Koch) (Acarina: Tetranychidae) were obtained from castor bean plants from Kafr El-Sheikh Governorate and reared under laboratory conditions according to Dittrich (1962). The prey culture was kept at 25 ± 2°C under 16 hrs photoperiod to encourage plant growth, and 70 ± 5 R.H.

Predator culture: The predator insect, *Stethorus gilvifrons* obtained from castor bean plants from Kafr El-Sheikh Governorate and reared under laboratory conditions on castor bean, *Ricinus communis (L)* plants as described by Overmeer *et al.* (1982). The culture was kept under the same conditions of temperature, humidity and photoperiod as *T. urticae* culture.

Chemicals used: All tested compounds were in the formulated form and the dosages were calculated on the basis of active ingredient. The chemical structure for the tested compounds are as follows: **Abamectin** (1.80% EC) a mixture containing a minimum of 80% avermectin B_1a (5-0 demethyl avermecin A_1a) and a maximum of 20% avermectin B_1 b [5-0-demethyl – 25 –de (1 methyl – propyl)–25- (1-methyl ethy) avermectin A_1 a], (Merck, Company). **Cypermethrin** (25% EC) (RS)– ∝ -cyano-3-phenoxy –benzyl (IRS, 3 RS; IRS,3 RS) –3- (2,2-dichlorovinyl) –2,2- dimethyl cycloperopane carboxylate, (El Helb Pesticides and Chemicals Company, Egypt). **Etoxazol** (10% S.C.) (RS) –s- tert-butyl–2-[2-(2, 6- difluorophenyl) –4,5- dihydro- 1.3 oxazol-4-yl] phenetole, (Merck, Company). **Chlorfluazuron** (5% EC) 1-(3, 5 dichloro -4-(3-chloro -5-trifluoromethyl-2-pyridyloxyl) phenyl)-3-(2, 6 difluorobenzoyl) urea (Syngenta Company). **Chemesol** Formulated mineral oil supplied by Alexandria Chemicals Company (kemex) as 95% EC and **Supermasrona**: formulated mineral oil supplied by El-Nasr of Petroleum Company as 94% EC.

Plant materials: Worm wood (*Chrysanthemum morifolium*):- The leaf samples of worm wood (Fam. Composite) was thoroughly washed in detergent solution followed by rinsing in tap water, air dried at room temperature and in an oven at 40°C, then it was ground to fine powder. The powder was divided into batches, each weighed 200 gm, which was macerated in 300 ml of acetone/ methanol (1: 1 v/v) for 72 hours in dark bottle. During the maceration period, sample was shaken for 6 hours using an electric shaker. Extract was filtered and placed in a refrigerator for 24 hrs. The extract was then refiltered, dried over anhydrous sodium sulphate and evaporated to dryness using a rotary evaportor. The residue was considered as an active ingerdient, weighted and dissolved in acetone to form the desired concentrations. Triton x 100 was used as an emulsifier in this experiment at the rate of 1.0%. *Melia azedarach*:- An amount of 80g of seeds was washed with warm water then with tap water. The seeds were dried in the open air for three hours then they were put into an oven at 40°C for four hours. The seeds were milled, then added to 300 ml acetone and methanol (1:1), the seeds were shacked for two hours a day, for three days using an electric shaker. The extract was filtered and evaporated using a rotary evaporator until they were completely dryness after that 300ml acetone was added to obtain the pure substance. Triton X 100 was used as an emulsifier, at rate of 1.0%.

Experimental techniques: Leaf discs are convenient means of providing experimental of standard size. Standardization of size has the advantage that offering a known number of preys automatically provides those preys at a fixed density (number/unit area). Discs can be cut to provide a uniform surface with respect to feeding and oviposition sites than whole leaves.

Preparation of discs: Castor bean discs were cut using cork borer, so that they were bisected by the midrib, and placed lower surface upper moist on water soaked cotton wool bads in Petri dishes. The size of the disc varied depending on the nature of the experiment. In predation experiments, the required number of *T. urticae* eggs was then laid out on each disc. Discs were left for one hour after that they were checked in case any prey eggs had been damaged during transfer. Damaged eggs were replaced before predators were introduced to the discs. Unless otherwise stated, leaf disc experiments were conducted at 25 ±2°C, with a 16 hours photoperiod.

Production of prey eggs: Red spider mite eggs for use as prey were obtained by placing approximately 10 adult females *T. urticae* on a clean castor bean leaf disc placed upper side upon a water soaked cotton wool pad in Petri dish. Sufficient discs were set up to provide enough eggs for the following days. The adult mites were allowed to oviposite overnight and then were removed. Prey eggs were never longer than 24 hrs old at the start of an experiment. This ensured that they would not hatch during the experimental. period, which was never greater than 72 hours, prey eggs were used rather than other stages, firstly because they are easily collected and handled, secondly, because a proportion of motile stages might walk off the experimental arenas making an accurate assessment of the number of prey eaten difficult. Thirdly because eggs and larvae have been shown to be the prey stages preferred by the predator (Burnett, 1971 and Giboney, 1981)

Techniques for the assessment of tested chemicals: The most important consideration with any bioassay technique is that variation between test animals and between environmental conditions before, during or after testing should be minimized to ensure that consistent results are obtained. A detailed discussion of the most important biological and environmental factors which might influence the susceptibility of a test organism is given by Busvine (1971). When testing pesticides during the course of this study, care was taken to ensure that test mites, and experimental conditions and procedures were as uniform as possible.

1-Toxicity of tested compounds to the adult female mites *T. urticae* and its predator *S. gilvifrors* The toxic effects of tested chemicals to the adult female mites, *T. urticae* and its predator *S. gilvifrors* were evaluated by the leaf disc dip technique according to (Siegler, 1947). 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).

2-Effect of the tested compounds residues on *T. urticae* egg laying and its hatchability The residual effect of each tested chemical at LC_{25} level on adult prey mites was evaluated according to Keratum *et al.*, (1994).

3-Effect of compounds residues on egg consumption and egg laying and its hatchability by predatory insect *S. gilvifrors* The method which was adopted by Keratum *et al.*, (1994) was used to evaluate the effect of tested compound residues on egg consumption and egg laying and its hatchability by the predatory insect *S. gilvifrors*.

Equations:

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

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

2- The toxicity lines were statistically analyzed according to Litchfield and Wilcoxon (1949) as follows:- $Y = a + bx$

Where: Y= probit unit, a= constant value, b= slope of line and X= log concentration

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

Egg mortality = (a/b) X 100

Where: a= unhatched eggs, b= number of total eggs which counted before treatment with toxicant

4- Toxicity index of tested compounds were determined according to Sun (1950) as follows

Toxicity index = (LC_{50} of the most effective compound/LC_{50} of the tested compound) X 100

5- To evaluate the percentage of reduction, Handerson and Telton (1955) formula was used as follows:

% reduction = [1-(population in the control before spraying/population in the control after spraying) x (population in the treatment after spraying/population in the treatment before spraying)] x 100.

6- Selectivity ratio of tested chemicals on predator mite *S. gilvifrons* was determined as follow according to Wilkinson (1976).

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

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

RESULTS AND DISCUSSION

Toxicity of tested compounds against adult females of two-spotted spider mite *T. urticae*: Based on LC_{50} values (Table 1), results indicated that abamectin was the most toxic compound, followed by chlorfluazuron and cypermthrin to the adult females of *T. urticae* with LC_{50} values of 0.3659, 99.031 and 286.28ppm, Supermasrona and *M.azedarach* have a moderate toxicity to the adult females of *T. urticae* with LC_{50} values of 893.42 and 1499.02 ppm, respectively. Worm wood extract, chemesol and etoxazole were the least toxic to adult females of *T. urticae* with LC_{50} values of 2721.22, 3832.2 and 4200.6 ppm, respectively. In addition, the data in Table (1) indicated that abamectin was more toxic compound to the adult females, than chlorfluazuron, cypermethrin and etoxazole, while the mineral oil, supermasrona was more toxic than chemesol. *M. azedarach* extract was more toxic than worm wood extract to the adult females of *T.urticae*. Slope values of the log concentration-probit lines in Table (1) indicated that supermasrona and abamectin have the highest slope values of 0.9972 and 0.9958, while cypermethrin and chemesol have the lowest slope values of 0.8671 and 0.8908. Etoxazole, chlorfluazuron, worm wood extract and *M. azedarach* extract have slope values of 0.9730, 0.9919, 0.9850 and 0.9680, respectively.

It is known as reported by Hoskins and Gordon (1956) that the slope value of log concentration probit line is considered as a 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 at 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 indicate heterogeneous mite population, in its response to the chemical. Also, the same authors (1956) 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. The slopes of all compounds listed are considered of low value indicating a certain amount of heterogeneity in the population towards the tested compounds.

Concerning the toxicity index at LC_{50} level, the data in Table (1) confirmed that abamectin was the most toxic compound to the adult females of *T. urticae* with toxicity index of 100, followed by a drastic drop in toxicity index in case of chlorfluazuron with toxicity index of 0.369. Cypermethrin, supermasrona and *M. azedarach* have poor toxic effects to the adult females of *T. urticae* with toxicity indices of 0.128, 0.041 and 0.024, respectively. Worm wood extract, chemesol and etoxazole were the poorest toxic compounds to the adult females of *T. urticae* with toxicity indices of 0.013, 0.010 and 0.009, respectively.

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

Compound	LC_{50} (ppm)	Fiducial limits for LC_{50}		Toxicity Index*	Slope value
		Lower	upper		
Pesticides					
Abamectin	0.3659	0.2503	0.463	100	0.996
Cypemethrin	286.28	206.28	421.74	0.128	0.867
Etoxazole	4200.6	3850.5	4600.4	0.009	0.973
Chlorlluazuron	99.031	71.596	159.40	0.369	0.992
Mineral oils					
Chemesol	3832.2	3168.5	4426.2	0.010	0.891
Supermasrona	893.42	539.82	1546.2	0.041	0.997
Plant extracts					
C. morifolium	2721.22	2225.2	3278.0	0.013	0.985
M. azedarach	1499.02	1101.8	1977.0	0.024	0.968

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

The obtained results are in agreement with the result obtained by Green and Dybas (1984) who found that abamectin had intrinsic toxicity to *T.urticae* adult under laboratory conditions with LC_{90} value of 0.03 ppm which is toxic to all mite stages. Also, the results are in agreement with Camargo and Arrude (1987) who found that LC_{50} of abamectin was 0.1 ppm against *T. urticae* and more toxic than propargite to this mite. Gamieh *et al.* (2000) showed that abamectin at 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 the two spotted spider mite population on cotton. Moreover, cypermethrin was used representing as pyrethroids in this study, Hurkova (1984) found that cypermethrin was one of the pyrethroids tested against *T. urticae* that caused knockdown effect, whereas Kovach and Gorsuch (1986) indicated that this compound (3.9 a, i / 100 L) caused the highest mortality of *T. urticae*. Cypermethrin is known to be of moderate toxicity to spider mite but the low mammalian toxicity and it's environmental safety promote the awareness to be included in integrated pest management programs. The pyrethroids were found sometimes to be of limited interest because of their secondary effect especially on predator mite. These products will be in compatible to the biological control of phytophagous mite unless strains of these predators can be resistant to pyrethroids.

On the other hand, the mineral oils used in this study were of the second category after the specific acaricide and the insecticide cypermethrin in their toxicity to the spider mite *T. urticae*. Supermasrona was about four fold as chemesol in its toxicity against *T. urticae*. In general mineral oils are known to be physically effective on the different mite stages. Their effects depend on various facts. These oils used are used as insecticides, ovicides, herbicides and as emulsifiable carriers of oil–soluble pesticides. The hydrocarbon oils that are used for selective pest control on foliage are therefore carefully controlled boiling point fractions of petroleum and comprise a complex mixture of paraffinic hydrocarbons of low chemical reactivity and known to be of the least phytotoxic effect. It was suggested that physical poisons interfere with various processes which have in common the characteristic that they are integrated at the surface of a membrane or are dependent on membrane integrity. Saied *et al.* (2002) also found that supermasrona caused high residual effect (87.61%) against two spotted spider mite population in cotton crops. Many investigators proved that plant extracts were effective against phytophagous mites when tested in laboratory. EL-Halawany and El-Naggar (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 plant species plant extracts (red and spotted gum) showed very promising acaricidal activity on *Tetranychus spp.* Abd EL-Wahab (2003) indicated that caster oil treatment appeared to be the most effective against the population of *T.urticae* than soybean seed oil on cucumber.

Toxicity of tested compounds to the adult females of predator *S. gilvifrons*: The data in Table (2) showed that abamectin was the most effective compound on the adult females of predator *S. gilvifrons* with LC_{50} of 0.465 ppm, followed by chlorfluazuron and cypermthrin with LC_{50} values of 44.139 and 230.34 ppm, respectively. While *M. azedrach* extract and supermasrona have moderate toxicity with LC_{50} of 1499.86 and 1519.05 ppm, respectively. Worm wood extract, etoxazole and chemesol were the least toxic to the adult females with *S. gilvifrons* with LC_{50} values of 3401.85, 3500.2 and 5052.11 ppm, respectively. Referring to Table (2), it appears that supermasrona has the highest slope value of 0.9999 followed by *M. azedarach*, chemesol and cypermthrin with slope values of 0.9991,0.9977 and 0.9968, respectively.

Table (2): Toxicity of different tested compounds to the adult females of predatory insect, *S. gilvifrons*.

Compound	LC_{50} (ppm)	Fiducial limits for LC_{50}		Toxicity Index*	Slope value	Safety index	Selectivity ratio (S.R)	Selectivity index
		Lower	Upper					
Pesticides								
Abamectin	0.465	0.32	0.606	100	0.7339	0.009	1.271	74.65
Cypemethrin	230.34	175.0	287.4	0.202	0.998	4.559	0.805	47.353
Etoxazole	3500.2	3350.0	4300	0.013	0.9592	69.282	0.833	49.00
Chlorfluazuron	44.139	29.70	59.289	1.052	0.9546	0.874	0.446	26.235
Mineral oils								
Chemesol	5052.1	4181.6	7074.7	0.009	0.997	100	1.318	77.529
Supermasrona	1519.1	944.96	2299.7	0.031	0.999	30.068	1.700	100
Plant extracts								
C. morifolium	3401.9	2916.4	4145.1	0.014	0.787	67.335	1.250	73.529
M. azedarach	1499.9	1101.4	1977.8	0.031	0.999	29.688	1.00	58.882

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

While, abamectin and worm wood extract were of the lowest slope values of 0.7339 and 0.7868, respectively. Chlorfluazuron and etoxazole have slope values of 0.9546 and 0.9592, respectively. In other word, cypermthrin has the highest slope value than chlorfluazuron, etoxazole and abamectin, while supermasrona has the highest slope value than chemesol. *M. azdarach* extract has the highest slope value than worm wood extract. The slope values of all compounds listed are considered of low value indicating a certain amount of heterogeneity in the population towards the tested compounds. Concerning the toxicity index at LC_{50} level, the data in Table (2) confirmed that abamectin was the most toxic compound to the adult females of *S. gilvifrons* with toxicity index of 100, followed by a drastic drop in toxicity index in case of chlorfluazuron with toxicity index of 1.053, while cypermthrin has poor toxic effect to adult female of *S. gilvifrons* with toxicity index of 0.202. Supermasrona, *M. azdarach* extract, worm wood extract, etoxazole and chemesol were the poorest toxic compounds to the adult females of *S. gilvifrons* with toxicity indices of 0.031, 0.031, 0.014, 0.013 and 0.009, respectively. In fact the toxicity index (Sun, 1950) of any toxic compound was suggested mainly to pool different information about this compound against different mite species and mite stages by comparing their LC_{50} values. The final values concluded from their calculation is the efficiency of the compound tested in integrated pest management. The safety index (Aref, 1997) is a value for the tested compound on predator by comparing LC_{50} value of the compound against the predator with that of the least effective one. The safety index, selectivity index and selectivity ratio values in Table (2) showed that chemesol is the most safe compound to adult predator with safety index of 100, followed by etoxazole and worm wood extract with safety indices of 69.282 and 67.335, respectively, while supermasrona and *M. azedarach* extract were moderately safe on the adult of predator with safety indices of 30.065 and 29.688, respectively. But cypermthrin, chlorfluazuron and abamectin were of the lower safe effect on the adult predator with safety indices of 4.559, 0.874 and 0.009, respectively. These results confirmed that supermasrona appeared to be high selective effect on the predator with selectivity ratio of 1.7 and selectivity index of 100. While chemesol, abamectin worm wood extract and *M. azedarach* extract have moderate selective effect with selectivity ratios of 1.318, 1.271, 1.250 and 1.001, respectively and selectivity index values of 77.52, 74.76, 73.52 and 58.88, respectively. Chlorfluazuron has the lowest selective effect with selectivity ratio of 0.446 and selectivity index of 26.235, while etoxazole and cypermethrin were about of the same effect on the predator with selectivity ratios of 0.83 and 0.80, respectively and selectivity index values of 49.00 and 47.35, respectively. The selectivity index is considered the most precise value that indicates how the compounds behave toward the two adult species (predator and phytophagous one).

In other words, the safest compound against the predator and at the same time the most toxic to the prey mite is the most suitable compound that must be advised to be involved in an integrated pest management. It is interesting to find out that supermasrona 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 programmes. The selectivity of a compound is more important that its safety for the predator due to the presence of the two organisms on the same host plant. Chemesol, abamectin, worm wood extract and *M. azedarach* extract were the next compounds in their selectivity ratio values, while chlorfluazuron had the least value (0.446).

The present data are occasionally in agreement with that of others investigators who showed the toxicity of the tested compounds against the adult predator *S. gilvifrons*. For example; Tsolakis *et al.* (1993) found that abamectin was considered to be not very harmful against all stages of 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. womerleyi* female adults at a concentration of 0.12 ppm. Kim and Paik (1996) indicated that abamectin was much less toxic to *A. womersleyi* than to the spider mite *T. urticae*. Moreover, El-Adewy *et al.* (2000) found that the value of the general selective toxicity ratio recommended fenpyroximate as the safest acaricide for mite predatory *S. gilvifrons* as compared to its prey *T. urticae*. On the other hand, El-Beheiry *et al.* (1987) found that cypermethrin 10% EC was less toxic than methomyl 90% WP to predatory mite *A. gossipi.* The tested mineral oil was appeared to have high safety index that means it is of low toxicity against the predatory mite. This is an advantage required for integrated pest management. Osman (1997) showed that Shokrona and Shokrona super have little adverse effect on predacious mite, *A. gossipi* compared with synthetic acaricides. Dhandapani *et al.* (1985) showed that neem products were ineffective against *Stethorus gilvifrons*. Ismail (1997) found that the safest material towards *S. gilvifrons* as compared to *T. urticae* in a descending order of desired selectivity were bromopropylate, methanol extract, petroleum ether extract and acetone extract of *M. azedarach* and etoxazole. However, EL-Adawy *et al.* (2001) showed that methomyl and pirimicarb had harmful effect on *Stethorus gilvifrons*.

Effect of compound's residues on biology of the two spotted spider mite *T. urticae*

Effect of compound's residues on egg deposition by the adult females of *T. urticae*: The effect of sublethal concentrations of the tested compounds (LC_{25}) on eggs deposited by the adult female of *T. urticae* was studied. Five adult females mite of *T. urticae* were allowed to oviposite on different compounds-treated leaf discs for a period of 5 days. The deposited eggs were counted daily for five days. Each treatment was replicated four times.

The data shown in Table (3) indicated that supermsrona, cypermethrin and chlorfluazuron caused the highest reduction in egg deposition comparable to the control treatment through the first day (79.1, 74.7 and 73.6% reduction), followed by *M. azedarach* extract, chemesol and abamectin (44.0, 41.8 and 37.4% reduction). While worm wood extract and etoxazole caused a moderate reduction (22.0 and 16.5 % reduction) and indicated about the same effect on egg deposition of the adult female mites.

Also, there were significant differences between their effects on egg deposition comparable to the control treatment through the first day. Through the second day of oviposition, chlorfluazuron, supermasrona and cypermethrin showed the highest effect on the fecundity of mite (71.7, 63.0 and 62.0% reduction), followed by *M. azdarach* extract, chemesol and abamectin (41.3, 38.0 and 34.8% reduction). While worm wood extract and etoxazole had the same effect on mite egg deposition and there were no significant differences between their effects on egg deposition (14.1 and 7.6% reduction), through the second 24 hrs. Through the third day of egg deposition, cypermethrin, chlorfluazuron and supermasrona were still of the highest effect on egg deposition of the spider mite *T. urticae* (55, 1, 54.1 and 48.0% reduction) followed by abamectin, *M. azdarach* extract and chemesol (35.7, 34.7 and 32.7% reduction). While worm wood extract and etoxazole had similar effects on egg deposition with percent reduction of 13.3 and 3.1%, respectively. Five days exhibited about the same trend. From the mean number of eggs deposited by adult female mites *T. urticae* on leaf discs treated by different compounds (Table 3), results showed that chlorfluazuron, cypermethrin and supermasrona were the most effective compounds on egg deposition, followed by abamectin, *M. azedarach* extract and chemesol. While worm wood extract and etoxazole had a moderate effect on that character and were similarly effective in reducing mite fecundity. In general, the efficacy of the tested treatments can be arranged descendingly as follows: Chlorfluazuron > cypermethrin > supermasrona > abamectin > *M. azdarach* extract > chemesol > worm wood extract > etoxazole > control.

Table (3): Effect of different compound's residues on egg deposition of *T.urticae*.

Compounds	No. of eggs deposited/5 adults					General Mean
	1st day	2nd day	3rd day	4th day	5th day	
Control	22.75 ± 0.96^{a}	23.0 ± 0.71^{a}	24.50 ± 0.58^{a}	29.25 ± 0.96^{a}	36.25 ± 0.97^{a}	27.15 ± 0.83^{a}
<u>Pesticides</u> Etoxazole	$19.0\pm.816^{b}$	21.26 ± 0.577^{a}	23.75 ± 0.96^{ab}	25.75 ± 0.50^{b}	28.75 ± 1.50^{g}	23.70 ± 0.87^{b}
Chlorfluazuron	6.0 ± 0.816^{g}	6.50 ± 0.58^{f}	11.25 ± 0.96^{g}	14.25 ± 0.50^{f}	18.25 ± 0.50^{h}	18.25 ± 0.67^{h}
Cypemethrin	5.75 ± 0.50^{gh}	8.75 ± 0.96^{de}	11.0 ± 1.15^{h}	16.75 ± 1.50^{g}	20.50 ± 1.00^{f}	12.55 ± 1.02^{g}
Abamectin	14.25 ± 0.96^{e}	15.00 ± 0.82^{bc}	15.75 ± 0.96^{e}	17.50 ± 0.58^{ef}	18.75 ± 0.96^{ab}	16.25 ± 0.85^{cf}
<u>Mineral oils</u> Chemesol	13.25 ± 0.96^{ef}	14.25 ± 0.50^{bc}	16.50 ± 1.29^{d}	20.25 ± 1.71^{d}	22.25 ± 1.71^{c}	17.30 ± 1.23^{d}
Supermasrona	4.75 ± 0.957^{h}	8.50 ± 1.0^{d}	12.75 ± 0.50^{f}	18.25 ± 1.25^{e}	21.75 ± 0.50^{cd}	13.20 ± 0.84^{f}
<u>Plant extracts</u> *C. morifolium*	17.75 ± 0.96^{c}	19.75 ± 0.96^{ab}	21.25 ± 0.95^{bc}	24.25 ± 0.50^{c}	27.50 ± 1.29^{b}	22.10 ± 0.93^{c}
M. azedarach	12.5 ± 0.5^{f}	13.50 ± 0.577^{cd}	16.00 ± 0.82^{e}	18.75 ± 0.50^{c}	21.00 ± 0.82^{de}	16.40 ± 0.64^{c}
$LSD_{0.05}$	0.650	0.850	1.381	0.942	0.722	

One of the principle aspects on which successful biological control depend, is the rate of prey egg production relative to that of its predator. There is no doubt that low levels of chemicals which do not cause mortality can influence this character. The present laboratory treatments simulate filed conditions where the mites will exposed to chemical residues on plant leaves by contact or as stomach action through feeding on contaminated cell contents. Nakashima and Croft (1974) suggested that the reduction in egg deposition in predaceous mite *A. fallacis* fed on benomyl treated prey may be due to inhibition of mitoses by a breakdown product of the pesticide known to affect cell division in fungi where benomyl has fungicidal effect. Direct interference with the division and growth of egg cells may be responsible for the suppression of egg laying in two-spotted spider mite exposed to the antibiotic cyclohximidine (Harries, 1961and 1963). Dittrich *et al.* (1974) found that egg laying in successive generations were increased if *T. urticae* was exposed to residues of carbaryl or DDT. They suggested that these effects may result from "hormotigoses" that is the stimulation of biochemical processes by small quantities of stressful chemical which, in this cases, is the pesticide.

The results obtained in the present study probably have a similar explanation. The oviposition in mites is known to be related to feeding and the antifeeding properties of some pesticides especially the pyrethroids that will indirectly affect egg laying. Fenvalerate deposit reduced oviposition of *T. urticae* due to the antifeeding properties of pyrethroid residues (Keratum, 1993). The obtained results are also in agreement with that reported by Ayyappath *et al.*(1997) and Hosny *et al.*(1998).

Spadafora and Lindquist (1973) indicated that benomyl at 0.03% a.i. depressed egg hatchability of *T. urticae* (Koch), they found that viability was reduced by direct application to the eggs through ingestion of treated plant tissue by gravid females. On the other hand, Singer *et al.*, (1988) suggested that oviposition preference and larval performance may be correlated within populations and may vary among individuals such that females prefer the plant species on which their larvae should have the greatest chance of surviving during their first 10 days of growth.

Effect of compound's residues on eggs hatchability of the two-spotted spider mite *T. urticae*: This experiment was carried out to determine the toxic effect of the tested compounds at LC_{25} level on mite eggs of *T. urticae*. Data in Table (4) indicated that, all compounds caused decrease in egg hatchability comparable to the control treatment in the first day, with percent of unhatching eggs between 72 and 100%. Chlorfluazuron and *M. azdarach* extract were the highest toxic compounds which decreased egg hatchability of *T. urticae*, followed by cypermethrin, chemesol and supermasrona. While abamectin, worm wood extract and etoxazole have moderate effect on egg hatchability. Through the second day most of the compounds caused an obvious decrease in egg hatchability except etoxazole and worm wood extract that were the least effective in this respect.

Table (4): Effect of different compound's residues on hatchability of the spider mite of *T. urticae*.

Compounds	Unhatched eggs at indicated day					General Mean	Hatchability %
	1st day	2nd day	3rd day	4th day	5th day		
Control	13.50±0.577^{h}	10.00±0.816^{h}	5.25±0.50^{g}	1.25±1.50^{g}	0.50±0.577^{h}	6.10±0.794^{h}	75.60
<u>Pesticides</u> Etoxazole	18.00±0.816^{g}	14.57±0.50^{g}	9.75±0.50^{f}	8.25±0.50^{e}	4.25±0.50^{f}	11.00±0.563^{g}	56.00
Chlorfluazuron	25.00±0.001^{a}	20.75±0.957^{bc}	14.25±0.50^{c}	9.75±0.957^{d}	7.50±0.50^{de}	15.45±0.582^{ef}	38.20
Cypemethrin	24.75±0.50^{e}	23.50±1.29^{a}	19.50±0.577^{a}	16.00±0.816^{a}	13.00±0.816^{a}	19.35±0.799^{a}	22.60
Abamectin	23.25±0.96^{d}	18.75±0.957^{d}	16.00±0.816^{bc}	12.75±0.957^{c}	10.25±0.957^{c}	16.40±0.928^{cd}	34.40
<u>Mineral oils</u> Chemesol	13.50±0.577^{b}	21.25±0.957^{b}	18.25±0.50^{ab}	14.25±0.957^{b}	11.50±0.50^{b}	17.95±0.698^{ab}	28.20
Supermasrona	24.25±0.50^{bc}	22.75±0.957^{ab}	17.75±0.50^{bc}	11.75±1.25^{cd}	10.25±0.957^{c}	17.35±0.832^{b}	30.60
<u>Plant extracts</u> *C. morifolium*	18.25±0.956^{f}	15.50±0.577^{f}	11.00±0.816^{d}	8.25±0.50^{e}	5.00±0.50^{e}	11.60±0.733^{f}	53.60
M. azedarach	25.00±0.005^{a}	20.75±0.957^{bc}	14.25±0.50^{c}	9.75±0.957^{d}	9.75±0.857^{d}	15.45±0.582^{d}	38.20
$LSD_{0.05}$	0.791	3.330	0.872	0.941	1.0120		

The same results were found in the next day (third day) except etoxazole which was the least effective in egg hatchability. In the other days (fourth and fifth days) cypermethrin, chemesol, abamectin and supermasrona were highly toxic compounds, followed by chlorfluazuron and *M. azdarach* extract, while etoxazole and worm wood extract were the least effective in egg hatchability. In general, the different compounds (Table 4) can be arranged descendingly according to their efficacy as follows: cypermethrin > chemesol > supermasrona > abamectin> chlorfluazuron> *M. azdarach* extract > worm wood extract > etoxazole > control. From the percent hatchability (Table 4), results showed that cypermethrin was the most effective compound on egg hatchability (22.6%) followed by chemesol (28.2) and supermasrona (30.6%). While abamectin, chlorfluazuron and *M. azdarach* extract had a moderate effect on that character (34.4, 38.2 and 38.2%).Worm wood extract, and etoxazole were the least effective in egg hatchability (53.6 and 56.0%).

Some investigators found similar results to that of the present experiment. El-Banhawy and Reda (1988) found that the susceptibility of *T. urticae* egg increased progressively with increasing age for synthetic pyrethroids (cypermethrin 500 ppm and pyridaphenthion 10 ppm). While abamectin was effective only on older eggs. El-Atrouzy *et al.* (1989) indicated that a correlation was existed between hatchability and egg age in the flufenoxuron-treated eggs. No doubt that the compounds that have an ovicidal effect may act to prevent the embryo formation or if this embryo has already formed in the next day after egg treatment, the compound may be toxic to the developmental larva inside the egg membrane before hatching. Practically in nature where egg stage of mites receives direct pesticide spray or as residue in the field one can not expect an importance for egg- age variations. The scientific importance of this point is just to select the suitable selective compound that differentiate between different egg stages of mite that exposed for its sprays in integrated mite programes. Park *et al.* (1995) found that abamectin significantly affect the hatchability of one-day-old- eggs of *T. urticae* at 0.06-0.6 ppm. Four-days-old-eggs were much more susceptible to abamectin than one-day-old-eggs. Abamectin at selective sublethal concentration (i.e., 0.012-0.06 ppm) could be of value in adjusting predator/prey ratios in the integrated management of *T. urticae*. Wu-Young *et al.* (1997) found that no effect against eggs was observed after the adult females were treated with abamectin at the LC_{50} level. Gamieh and Saadoon (1998) found that abamectin, bromopropylate, fenpyroximate, pyridaben at LC_{25} level adversely affected the egg viability of *T. urticae*. However, abamectin was more harmful, 51% reduction in hatchability occurred than other tested compounds.

The hydrocarbon oils are known to be used as insecticides, herbicides and as emulsifiable carriers of oil- soluble pesticides. In such cases the oils assist the main toxicant to penetrate into lipid surfaces since it is absorbed in and thereby softens and disrupts the waxy layer in leaves, insect cuticle or fungal spore walls and mite egg wall. The nature of physical toxicity of the hydrocarbon oils make them safe compounds from the environmental point of view, they are of low chemical reactivity, so relatively they could be used at concentrations much higher than those which would have been chemically toxic. Gamieh *et al.*(2000) found that hatchability of mites eggs of *T. Cucurbitacearum* treated with LC_{50} mineral oils increased as the eggs got older, being 45.43, 57.83 and 70.69% with KZ- oil and 50.51, 44.21 and 69.47% with supermasrona oil for one, two and three days-old-eggs, respectively. Amer *et al* (2001) found that KZ-oil was more toxic to *T. urticae* during the egg stage than to adult female.

Effect of compound's residues on biology of the predator *S. gilvifrons:* Several workers have shown a pesticidal effect on predatory mites. It is well known that the role of the predaceous mite deals with the feeding capacity on prey mite and oviposition capacity of predatory mite to produce number enough to minimize the phytophagous mite population to tide economic injury level beside other control agents. So, the spider mite *T. urticae* eggs were introduced on pesticides- treated leaf discs to adult predaceous insect *S. gilvifrons* to record the effect of chemical residues on prey egg consumption by adult females of predaceous insect. The oviposition capacity of the predatory insect and its hatchability were also recorded.

Effect of compound's residues on feeding capacity of predator *S. gilvifrons*: The data of this study shown in Table (5) indicated that most of tested compound's residues caused a decrease in prey egg consumption comparable to the control treatment through the egg meal of the first day. Abamectin and cypermethrin caused the highest decrease in prey egg consumption by the predator, followed by chlorfluazuron, supermasrona and *M. azedarach* extract. Chemesol and worm wood extract caused moderate effect, while etoxazole has the least effect. Through the second day it was indicated that abamectin and cypermethrin were the most effective chemicals in decreasing prey egg consumption comparable to control treatment, followed by *M. azedarach* extract, chlorfluazuron and supermasrona. Chemesol and worm wood extract caused a moderate effect, while etoxazole has the least effect. It is apparent from the calculated average number of eggs consumed by one adult predator through the first and second days, that abamectin and cypermethrin were the most effective compounds that reduced the prey egg consumption (25.25 eggs/adult/day and 29.0 eggs/adult/day), respectively comparable with control (65.0 eggs/adult/day) followed by chlorfluazuron, *M. azedarach* extract and supermasrona (39.0, 39.50 and 39.75 eggs/adult/day, respectively). While chemesol and worm wood extract caused a moderate effect (50.0 and 51.0 eggs/adult/day). Etoxazole was the least effective compounds in this respect but not similar to control treatment (56.0 eggs / adult / day).

The presence of a pollutant (chemical) and the morphological features of the host plant may disturb the searching activities of the predator to find its food material (egg stage). In spite of the egg, stage of spider mite is the main food of the predator *S. gilvifrons*, the leaf surface may have negative or positive chemical stimuli that determine or evaluate the contact process. Renwich and Redke (1988) stated that visual stimuli might play a role in landing process on plant leaves. This step may also decide, for a certain extent, the rate of egg consumption of the prey mite by the predator.

Effect of compound's residues on oviposition capacity of the predator insect *S. gilvifrons:* The studies that investigate the correlation between egg consumption and egg production indicated a positive correlation under normal condition. The deposited eggs by the adult females predator under the effect of the tested compound's residues were studied through one successive day. The data in Table (5) indicate that the predators eggs deposited under the chemical effect were less than that deposited under normal conditions (untreated).

The number of predator egg production indicated that cypermethrin is the most effective chemical which caused a decrease in eggs deposited by adult female of predator *S. gilvifrons* comparable to control (16.0 eggs/day comparable to control treatment of 61.0 eggs/day), followed by chlorfluazuron, abamectin and *M azedarach* extract (23.0, 27.0 and 28. 25 eggs/day, respectively). Supermasrona has a moderate effect (31.50' eggs/day), while worm wood extract, chemesol and etoxazole have a little effect on egg deposition by the predator comparable to other tested compounds (43.0, 49.0 and 57.25 eggs/day) and were significantly different from control.

It is well known that there is a positive correlation between the prey egg consumption and predator oviposition. This relation may take the linear appearance if it was free from any disruptive factors. The presence of chemicals on leaf dices which is considered a disruptive factor may be coincide with the unsuitable structures of the host plant leaves to increase the above mentioned disruption leading to disturbed relation between egg consumption and predator egg deposition.

Effect of compound's residues on eggs hatchability of the predator insect *S. gilvifrons*: Hatchability of eggs laid by predator *S. gilvifrons* was recorded four days after egg laying. The hatchability of predator eggs was shown in Table (5) and exhibited that the most safe compounds were etoxazole and worm wood extract (65.5 and 59.0%) that allowed the predator's eggs to hatch to produce the next stages necessary to complete the biological agent to minimize prey populations. The data in Table (5) also indicate that cypermethrin and supermasrona were the most effective compounds on hatching of eggs produced by the predator (24.5 and 28% respectively) comparable to control treatment (73.5%). *M. azedarach* extract, abamectin, chlorfluazuron and chemesol were of moderate effect on predator's egg hatchability (41.0, 42.0, 47.0 and 48.0% respectively), and exhibited similar effect in this respect.

The obtained results were in agreement with that recorded by many investigators. Discussing the foregoing results, it could be noticed that successful biological control depends upon several factor concerning the predator's biology. One of these important factors is the rate of prey consumption. Certainly low concentration level of chemicals such as LC_{25} for adult mites, who do not cause enough mortality, can affect other responses such as functional response, and this is why the prey egg consumption was recorded under chemical treatments. The decrease in feeding capacity by *S. gilvifrons* exposed to chemicals-contaminated eggs on leaf discs could arise a non-toxic influence of a change in the nature of the surface on which predator fed. It is interesting to know that the deposited eggs were not in a relation with the eaten ones. The existence of relationship between feeding and oviposition and feeding and mite activity and connection between the levels of these elements and the nature of the surface on which mites were placed suggest that disturbances in all these patterns of behaviour could be triggered by the effects of sensory detection of the chemical on the surface. Mite activity can be influenced by the nature of the substrate of the surface (Blommers *et al.* 1977 and Everson, 1979: and 1980). The activity pattern of *S. gilvifrons* which was not measured the present study may be responsible for the non-correlated relation betwe feeding and oviposition in the predatory. The presence of chemicals in lov levels, on the leaf surface may be irritant enough to make the adult females predator in contact with the contaminated prey eggs accordingly the consumed eggs seemed to be almost at the same level of untreated control.

Table (5): The residual effect of different compound's residues on consumed, laid egg and hatchability of eggs the predatory insect *S. gilvifrons*

Compounds	No. of consumed eggs/adult/day		Average	Deposited eggs/adult/day	Predator eggs unhatching	% H*
	1st day	2nd day				
Control	67.0±1.44	63.0±2.45	65.0±1.41	61.0±1.83	13.25±1.25	73.5
<u>Pesticides</u>						
Etoxazole	58.0±0.82	54.0±1.83	56.0±1.42	57.25±3.20	17.25±0.96	65.5
Chlorfluazuron	38.0±2.45	40.0±1.63	39.0±2.0	23.0±1.41	26.50±3.30	47.0
Cypemethrin	29.0±2.16	29.0±1.41	29.0±1.53	16.0±1.42	37.75±2.22	24.5
Abamectin	25.0±1.41	25.25±3.85	25.25±3.85	27.0±3.55	29.0±0.82	42.0
<u>Mineral oils</u>						
Chemesol	50.75±2.06	43.0±2.44	50.0±2.16	49.0±2.58	26.5±3.31	48.0
Supermasrona	38.75±0.96	40.75±2.22	39.75±1.99	31.5±2.38	36.0±2.38	28.0
<u>Plant extracts</u>						
C. morifolium	51.0±1.41	51.00±0.82	51.0±1.41	43.0±1.40	20.5±2.39	59.0
M. azedarach	39.50±1.29	39.50±1.29	39.50±1.29	28.25±1.25	29.0±0.82	41.0
$LSD_{0.05}$	1.79	2.07	1.50	2.10	2.30	

% H* = % of Hatchability

The suffering adult females are expected to stop oviposition in spite of the stored food (prey eggs eaten) that was enough for oviposition process in a normal number of eggs. Barritt (1984) found the linear relationship between the number of eggs eaten and laid by *A. fallacis*, and when she calculated an expected value for egg production using Giboney's regression equation (1981) she found a good agreement between observed and expected oviposition when feeding was affected by bupirimate. Sabelis (1981) suggested that adult female predator lay a constant number of eggs and that if the rate of oviposition was rapid, the oviposition period would be short, conversely if eggs were laid slowly the predator will, continue to oviposit for a longer time until it deposits full complement. Hosny and Keratum (1995) found decreased feeding and oviposition in *A. fallacis* when deltamethrin was used on prey *T. urticae*. Moreover, Abou-Awad and El-Benhawy (1985) found an increased mortality of *A. gossipi* as a daily consumption of prey *T. urticae* treated with cypermethrin or cyfluthrin.

Osman *et al.* (1979) studied some biological aspects of predatory mite *A. gossipi* (El-Badry) affected by different acaricides; Profenofos and kelthane with two concentrations (LC_{50} and LC_{25}). The egg laying capacity and percentage hatch had decreased but larval and nymphal duration increased. The same authors studied the effect of these pesticides on food requirements of *A. gossipi* and they found that food consumption had decreased. Hassan and Shereef (1986) found that kelthane was effective against fecundity of adult females predator *P. persimilis*, as it stopped egg laying completely.

The obtained results are in agreement with these recorded by many investigators, Abou-Awad and El-Banhawy (1985) found that residues of the synthetic pyrethroids (cypermethrin, flucythrinate, fenvalerate and cyfluthrin) even at a non toxic level to predaceous mite *A. gossipi* interrupted oviposition and markedly reduced reproduction. The increase in the daily consumption of prey *T. urticae* treated with cypermethrin caused an increased in mortality at high prey density. Keratum (1989) reported that chemically treated surfaces with deltamethrin, *A. fallacis* showed decreased feeding and oviposition compared with control. Also, Ford *et al.* (1989) found that there was a reduction in the number of eggs eaten by *A. fallacis* on treated discs by deltamethrin with a decrease in the predator's oviposition. Zhang and Sanderson (1990) found that abamectin did not affect the hatch of eggs of *Phytoseiulus persimilis* at 1-16 ppm using leaf disc-dip technique. Veire *et al.* (1992) found that fenpyroximate had no effect on fecundity and fertility of the predator *P. persimilis*. Keratum and Hosny (1994) found that the effect of sublethal concentration of cypermethrin on the feeding and oviposition of the predatory mite *P. persimilis* using a modified leaf disc technique caused significant reduction in feeding and oviposition. Also, they found that that very low concentration of cypermethrin and deltamethrin caused marked reduction in feeding with a further more gradual decline with higher concentration.

There was a highly significant linear relationship between feeding and egg laying. It is concluded that the effect of these chemicals on egg laying is related to the known antifieeding properties of pyrethroid residues. Park *et al.* (1995) found that abamectin did not affect the hatchability of eggs of *A. womersleyi*, also when adult female predators were dipped in a 0.6- 0.12 ppm solution, their reproduction was not affected, but at 6 ppm it decreased by 35%. Also Kim and Paik (1996) found that reproduction was not significantly reduced of adult females of *A. womersleyi* at any of the concentrations tested of fenpyroximate, where as at 6.25-50 ppm fenpyroximate did not affect the hatchability of *A. womersleyi* eggs.

The success of any integrated pest management depends on the judicious use of chemicals applied to control key pests and diseases. The importance of avoiding adverse effects on predatory species was reflected by the fact that chemicals which might be used on certain crops must be subjected to routine screening to assess their toxicity to beneficial arthropods to select the safer compounds. The rate of development of resistance to insecticides in the predaceous mites would be another important evaluation, which must be taken in consideration in IPM programmers.

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الملخص العربي

التقيم المعملى لبعض المركبات الكيماوية الامنة بيئيا ضد اللاكاروس الاحمر (تترانيكس اورتيكا) والمفترس الحشرى (استيثورس جليفرونس)

أحمد عبد الحميد ابو زيد اسماعيل

قسم المبيدات ـ كلية الزراعة ـ جامعة كفر الشيخ

لقد وجهت الدراسة الحالية لتقييم التأثير السام لثمانية مركبات من مجاميع كيمائية مختلفة ،أربعة مبيدات أكاروسية و حشرية (أبامكتين وسيبرميثرن وايتوكسازول والأتابرون) واثنان من الزيوت المعدنية الهيدروكربنية (كيمسول وسوبرمصرونا) واثنان من المستخلصات النباتية (الزنزلخت والشيح البلدي) ضد العنكبوت المتطفل علي النبات (تترانيكس أورتيكا) و المفترس الحشري (استيثورس جليفرونس) باستعمال تكنيك غمر القطاعات النباتية .كما تم تقييم التأثيرات الجانبية لهذه المركبات علي بعض الصفات البيولوجية لكل من الأكاروس النباتي و المفترس الحشري.

وقد أظهر المبيد الاكاروسي أبامكتين اعلى سمية يليه مبيد الأتابرون و السيبرميثرن علي الإناث البالغة للأكاروس النباتى تترانيكس أورتيكا، بينما الايتوكسازول (الباروك)المبيد الأكاروسي كان أقل المركبات سمية. ما زال مبيد الابامكتين اكثر المركبات سمية واظهر وضع خاص فى التاثير على الاناث البالغة للمفترس الحشرى (استيثورس جليفرونس) يليه الأتابرون والسيبرميثرن وكان مركب الايتوكسازول ايضا اقل المركبات سمية. واوضحت النتائج ان الاتابران والسيبرميثرن وسوبر مصرونا اكثر المركبات تاثيرا على خصوبة الاناث البالغة الاكاروس حيث وجد انخفاض كبير فى عدد البيض الموضوع مقارنة بالكنترول.

كان مركب ايتوكسازول اقل المركبات تاثيرا على البيض الموضوع وهذا يمنح الفرصة لانتاج الكم الكافى من البيض للافتراس وهو الطور المفضل لبعض المفترسات. كما اظهرت معظم المركبات المستخدمة تاثيرا جيدا على البيض وكان السيبرمثرين اكثر المركبات تاثيرا فى انخفاض فقس البيض وذلك بالمقارنة بباقى المركبات واظهر الايتوكسازول تاثيرا قليلا على البيض.

مبيد السيبرميثرن ومبيد الأبامكتين لهما تأثيرا عاليا على التغذية للمفترس الحشري مقارنة بالكنترول بينما مبيد ايتوكسازول له تأثير منخفضا على التغذية. واظهرت النتائج ان وضع البيض للمفترس الحشرى تحت تاثير المركبات المختلفة اقل كثيرا منه فى الحالة العادية (الكنترول) وكان مبيد السيبرميثرن له تأثير واضح على عملية وضع البيض للمفترس الحشري وذلك بالمقارنة بالكنترول. اما مبيد ايتوكسازول والمستخلص النباتي للشيح البلدي مركبات ذات امان عالى على بيض المفترس الحشرى ادى الى فقس البيض والوصول الى الطور التالى وزيادة اعداد المفترس الحشرى.