

EVALUATION OF SOME ACARICIDES AGAINST THE TWO SPOTTED SPIDER MITE, *Tetranychus urticae* KOCH AND ITS PREDACOUS MITES ON KIDNEY BEAN PLANTS AT EL-GHARBIA GOVERNORATE, EGYPT

Allam, S. A.

Plant Protection Res. Institute, Agric. Res. Center, Dokki, Giza, Egypt

ABSTRACT

Three acaricides Indo 50% EC; Challenger 36% SC and Ortus 5% SC were investigated for controlling the phytophagous mites, *Tetranychus urticae* Koch at Sharbia Governorate on kidney bean plants during 2010 cultivated season. The application of these acaricides induced 94.22, 91.4 and 85.99 % reduction in the population of the tested spider mites, respectively. However, the tested compounds had slightly side effect on the population densities of the associated predacious mites where it gave a reduction percentages of 25.5, 23 and 28.0 % reduction for the same order of the compounds, respectively. The toxic effects of Indo 50% EC on *Phytoseiulus persimilis* Athias-Henriot biological aspects were evaluated. The obtained results indicated that the different biological aspects (developmental period, longevity and life span) of the predatory mite were decreased with application of acaricide but the fecundity of adult female was significantly increased with Indo applied.

Keywords : Acaricides, *Tetranychus Urticae*, Predacious mites, Kidney Beans.

INTRODUCTION

The two spotted spider mite, *Tetranychus urticae* Koch is a considerable economic importance as plant feeder, attaching field crops, orchard trees ornamental, medicinal plants and vegetable crops. It is usually fed on the leaves injuring the epidermis and resulting in yellow, brown blotch and accompanied by dry and leaf fall. Sever mite-feeding result in economic reduction in the quality and quantity of crop production. Continuous use of acute acaricides has caused serious suppression in natural enemies population, residual contamination of human foods, mammalian toxicity and environmental pollution. Therefore, new approaches in pest control were followed ,particularly the use of fermentation and natural plant extract pesticides that have received recently a considerable attention. Many trials allover the world have been succeeded by the use of acaricides in controlling mite pests in different fruit orchards and field crops. (Abo-El-Ghar *et al.*, 1986, Ibrahim *et al.* 1993, Ibrahim *et al.*, 1994, Amer *et al.*, 1988 and 1989, Aucejio *et al.*, 2003 ,Dimetry *et al.*, 1988, El-Ghobashy and El-Sayed 2002, El-Halawany *et al.*, 1989 .Kim *et al.*, 1999, Mansour and Ascher 1983, and ,Sato *et al.*, 2002). Testing programme represented by IOBC (International Organization for Biological Control), is not only meant to provide valuable information on the side effects of pesticides on beneficial organisms but it also gives the testing members an opportunity to improve testing techniques, compare results and exchange experience with colleagues in the Working Group (Hassan *et al.*, 1991). The present study aimed to evaluate the

efficiency of three acaricides against spider mite and their side effect on the dominant predacious mites on kidney bean plants in Egypt. Also, the side effect of Indo on the biological aspects of the predacious mite, *Phytoseiulus persimilis* Athias-Henriot was conducted under laboratory conditions.

MATERIALS AND METHODS

This experiment was conducted at (El-Gemeiza Research Station, El-Gharbia Governorate) in kidney bean Fields which were heavy infested with the two-spotted spider mites, *Tetranychus urticae* Koch to evaluate the efficiency of the three miticides, Indo 50% EC (600 cm³/feddan); Challenger 36% SC (50 cm³/100 letter of water) and Ortus 5% SC (50 cm³/100 letter of water) and their side effect on the predacious mites. The experimental areas were divided into three treatments including the control. Each treatment includes four replicates. The replicates were distributed in a complete randomized block design. Sample size was 20 leaves . Weakly samples were collected randomly after spraying. A pre-count was taken Just before spraying at each replicate. Lower surface of the leaves was examind carefully using stereoscopic binocular microscope, where alive spider mites and predatory mites were counted and recorded, Sprays applied by using a motor Sprays of 20-liter Capacity. Percentage reduction of mites after treatment was calculated using Henderson and Tilton (1955) formula as follows:-

$$\% \text{ Mortality} = \left(1 - \frac{\text{treatment after spraying} \times \text{control before spraying}}{\text{treatment before spraying} \times \text{control after spraying}} \right) \times 100$$

RESULTS AND DISCUSSION

A- Effect of the acaricides Indo , Challenger and Ortus on spider mites at early season

Efficiency of the acaricides Indo 50% EC at the recommended concentration of 600 cm³/feddan, Challenger 36% SC at the recommended dose 50 cm³/100 letter of water and Ortus 5% SC at the recommended concentration of 50 CC/100 litter of water against the movable stages of spider mite infesting kidney bean fields was evaluated under the Egyptian environment and its sides effect on the dominant predacious mites was also estimated. Data in Table (1) indicated that the dominant mites were *Tetranychus urticae* Koch. Date in Table (1) also denoted the number of movable stages of spider mites on 20 leaves after spray where they decreased gradually till the end of the test.

Table (1): Effect of different acaricides on the population densities of the two-spotted spider mite *T.urticae* on kidney bean at Gharbia Governorate

Compound	Number before treatment	No. of movable stages/20 leaves after application				Total number
		3 days	1 week	2 week	3 week	
Indo 50% EC	238	17	14	8	7	46
Challenger 36% SC	219	23	18	14	8	63
Ortus 5%EC	230	44	29	21	14	108
Control without treatment	232	202	195	190	178	765

The obtained data indicated that Indo 50% EC was more potent there Challenger and Ortus where it gave the highest ratios 94.22 after three weeks of treatment compared with 91.4 and 85.99 % for challenger and Ortus, respectively, Table (2).

Table (2): The reduction ratio in the number of *T. urticae* after application of certain acaricides on kidney bean at Gharbia Governorate

Compound	% reduction of moving stages of <i>T. urticae</i> after application				Average percent reduction
	3 days	1 week	2 week	3 week	
Indo 50% EC	91.80	93.0	95.9	96.17	94.22
Challenger 36% SC	89.94	90.22	92.19	95.24	91.4
Ortus 5%EC	78.03	85.0	88.85	92.07	85.99
Control without treatment	-	-	-	-	-

B-Effect of the acaricides, Indo, Challenger and Ortus on predacious mites on kidney bean plants:

The predacious mites collected in this study were *Agistemus exertus* Gonzalez (Family : Stigmaeidae), *Phytoseiulus persimilis* Athias-Henriot and, *Euseius scutalis* (Athias-Henriot) (Family Phytoseiidae) .In case of predatory mites, Table (3).This table gives the number of predatory mites before and after application and the mean reduction in the population. The predacious mites (*P. persimilis* and *Euseius scutalis*) were recorded in case of all the tested compounds, but *A. exertus* and *P. ubiquitous* were found only in case of using Challenger and Ortus.The reduction percentage as shown in Table (4) was 25.5, 23.0 and 28.0 % in population of predacious mites when Indo, Challenger and Ortus were used against spider mites on kidney beans. From the above mentioned results the three acaricides Indo 50% EC; Challenger 36% SC and Ortus 5% SC can be used successfully in controlling the spider mites in the prescience of the predatory mites because of their lower side effect on these natural enemies. Kim *et al.*, (1999) noticed that the compound Tebufenpyrad was highly effective against different stages of *T.urticae* and *Amblyseius womersleyi*.The predator mite, *A. womersleyi* was more tolerant than *T.urtica* .Also ,the evaluation of the differential toxicity of pesticides to populations of the mite species *Neoseiulus californicus* and *T.urticae* was conducted by Sato *et al.*, (2002).The authors noticed that the predacious mite showed the higher tolerance than *T.urticae* to various pesticides especially to propargite. Similar results were also obtained by Aucejo *et al.*, (2003) where they tested ten compound against *T.urticae* in clementines.

Table (3): Effect of different acaricides on the population densities of the predacious mites on kidney bean leaves at El-Gharbia Governorate

Compound	Number before treatment	No. of movable stages/20 leave after application				Total number
		3 days	1 week	2 week	3 week	
Indo 50% EC	5	6	7	10	16	39
Challenger 36% SC	6	7	9	17	23	56
Ortus 5%EC	7	9	11	14	23	57
Control without treatment	8	12	19	27	35	88

Table (4): The reduction percentages in the number of the predacious mites after application of certain acaricides on kidney bean leaves at El-Gharbia Governorate

Compound	% reduction of moving stages of the predacious mites				Average percent reduction
	3 days	1 week	2 week	3 week	
Indo 50% EC	20.0	26.0	36.0	20.0	25.5
Challenger 36% SC	23.0	37.0	9.0	23.0	23.0
Ortus 5%EC	14.0	44.0	36.0	18.0	28.0
Control without treatment	-	-	-	-	-

Products Bermectine and Crater were very effective. Similar results were obtained by Abd El-Rahman *et al.*, (2005) where they tested two acaricides Challenger 36 % SC and Ortus 5%SC against *T. urticae* and their associated insect and mite predators on cotton plants in Egypt. The authors noticed that at the early seedling time, the application of Challenger and Ortus induced 81.34 & 81.04, 82.89 & 84.10 and 86.69 & 81.69 % reduction in the population spider mites at Beni Suef, Kafr El-Sheikh and El-Gharbia Governorates, respectively.

C - Side effect of Indo on the biological aspects of the predacious mite, *Phytoseiulus persimilis* Athias-Henriot after application on the field

The predatory mite *Phytoseiulus persimilis* Athias-Henriot is an economically important species in integrated spider mite *T. urticae* management and biological control of spider mites in many countries throughout the world. For optimal biological mite management, it is important to know if acaricides have adverse undesirable effects on the predatory mites. In this study the treated *P.persimilis* individuals with Indo 50 % EC were transferred to laboratory to study the different biological aspect of this mite after hatching the newly individuals from the treated eggs. The tested used prey were different movable stages of already treated individuals of the two spotted spider mite, *T. urticae*. In these results the different duration of the predatory mite males were lowest than those of female ones. The obtained data are presented in Table (5) showed that all biological aspects of the predator (developmental time, longevity and life span) were decreased after exposure to Indo.

Incubation period: Embryonic development of eggs which give rise to females laid on the leaf treated with Indo was not significantly differed in case of application on the eggs of the predacious mite, *P. persimilis* where this period lasted 3.11 days for treated individuals and 3.31 days for non-treated individuals in case of both male and female mites.

Life cycle: Considering the life cycle of the predator *P. persimilis* (egg to adult), this period was not significantly affected with treatment in comparison with those obtained without treatment and also between both male and female, mites. This period was averaged 8.10 and 8.51 days for males and 8.41 and 8.65 days for females in case of treated and non-treated individuals, respectively, Table (5).

Longevity: As shown in Table (5) the longevity of the predacious mite, *P. persimilis* was significantly affected when the mites treated with Indo recorded 13.5 and 14.4 days for treated and non-treated male individuals. On

the other hand, these periods lasted 16.8 and 19.6 days for females, respectively.

Life span: Accordingly, the life span of the predaceous mites as shown in Table (5) was affected by the side effect of Indo against *P. persimilis*. This period took 21.55 and 23.11 days when the mite males for treated and non-treated individuals, respectively, and this period lasted 25.22 and 28.32 days for female individuals, respectively, Table (5).

Fecundity: The number of deposited eggs by the *P. persimilis* females were significantly increased after the mother individuals were exposed to this acaricide in the field. The number of eggs was 42.25 eggs in comparison with those obtained in case of non-treated females (32.5 eggs only). The current observations showed that exposure to Indo at the field rate increased fecundity of *P. persimilis*. Generally, The present study revealed that acaricide Indo has significant influence on the biology of *P. persimilis*.

Table (5): Effect of indo on the biological aspects of the predaceous mite, *P. persimilis* after application treatment.

Biological aspect	Sex	Treated	Control
Incubation period		3.11±0.09	3.31±0.11
Developmental time	♂	5.0±0.32	5.20±0.21
	♀	5.26±0.24	5.25±0.13
Life cycle	♂	8.10±0.24	8.51±0.16
	♀	8.41±0.26	8.65±0.35
Longevity	♂	13.5±0.87	14.4±0.67
	♀	16.8±1.14	19.6±1.36
Life span	♂	21.55±1.60	23.11±1.54
	♀	25.22±1.68	28.32±1.59
Fecundity		42.25±2.23	32.5±2.24

These results are not the first documented case of pesticide increasing fecundity in a phytoseiid mite. Kavousi and Talebi (2003) showed that heptenophos at the recommended concentration increased the fecundity of *P. persimilis*. Also, James (1997) reported increased fecundity in *Amblyseius victoriensis* by imidacloprid. The fecundity-enhancing property of Indo can make *P. persimilis* an excellent choice as a biological control agent in different field crops. Van de Vrie *et al.*, (1972) believed that certain pesticides can stimulate mite reproductive physiology; therefore, positive effect of Indo at this concentration on reproduction may be physiological. In Iran, Kavousi and Talebi (2003) investigated side-effects of heptenophos, malathion and pirimiphosmethyl on *P. persimilis*. Also, Nadimi *et al.*, (2008) in the same country studied the side effects of three acaricides on the predatory mite, *P. persimilis* under laboratory conditions and mentioned that the total effect of all concentrations of fenpyroximate, as well as, one half the concentration of abamectin were found toxic to predatory mite and above upper threshold. The current results also indicated that further studies on the effect of different acaricides on fecundity and reproduction of *P. persimilis* and other phytoseiid mite species are clearly warranted. For example, investigation of different concentrations of pesticides especially lower rates and comparative effects on the other stages should be assessed.

REFERENCES

- Abd El-Rahman, S. I.; A.A. Ibrahim and E., M. A. Yassin (2005). Evaluation the efficiency of two bio-acaricides against two spotted spider mite and their side effect on the dominant predacious insects and mites on cotton plants in Egypt. *Egypt. J. Agric. Res.*, 83 (1): 69-76.
- Abo-El-Ghar, G. E. ; A.E. El-Sheikh and A. A. Osman (1986). Toxicity of some plant extracts of the two spotted spider mite, *Tetranychus urticae* Koch (Acarina : Tetranychidae) in Egypt. *Monoia J Agric. Res.*, 11: 1003-1010.
- Amer, A.A. ; M. K. El-Shemy and A.A. Farag (1988). Acaricidal action of tumip plant on some biological aspects of *Tetranychus urticae* Koch. *Bull. Zool. Soc. Egypt*, 36:5-10
- Amer, A. A, S. Reda and N. Z. Dimetry (1989). Activity of *Abrus precatorius* L. extracts against the two-spotted spider mite, *Tetranychus urticae* Koch (Acarina: Tetranychidae). *Acarologia*, 30: 209-215.
- Aucejjo, S.; M. Foo; M. Ramis; P. Troncho; A.Gomez-Cadenas and J. Jacas (2003). Evaluation of the effectiveness of some miticides against *Tetranychus urticae* Koch (Acari : Tetranychidae) in Clementines. *Boletin de Sanidad Vehetal, Plagas*, 29 (3): 453-459.
- Dimetry, N. Z.; S. L. Gengaihl A.S. Reda and S. A. Amer (1988). Toxicity of some compounds isolated from *Abrus precatius* L. seeds towards the two-spotted spider mite, *Tetranychus urticae* Koch. *Bull. Zool., Soc., Egypt*, 36: 121-132.
- El-Ghobashy, M.E. and K. M. El-Sayed (2002). Efficacy of some bio-pesticides against the spider mite, *Tetranychus arabicus* Attiah and the predator mite, *Euseius scutalis* (A.-H.) on apple trees in Egypt. 2nd Int. Conf. of Plant Protection Res. Inst., Cairo, Egypt.: 34-36.
- El-Halawany, M. E; G.A. Ibrahim, G. Abo-El-Ghar and M. E. Nassar (1989). Repellency and toxic effect of certain plant extracts on *Tetranychus arabicus* Attiah. *Agric. Res. Rev.*, 67 (1): 69-74.
- Hassan, S. A., F. Bigler; H. Bogenschutz; E. Boller, J. Brun; J. N. Calis; N. M., Chiverton; J. Coremans-Pelseneer; C. Duso; G. B. Lewis; F. Mansour; L. Moreth; P.A. Oomen; W.P. J. Overmeer;L. Polgar; W. Rieckmann;L. Samsøe-Petersen; A. Staubli; G. Sterk; K. Tavares, J. J. Tuset and G. Viggiani (1991). Results of the fifth Joint Pesticide Testing Programme of the IOBC/WPRS-working group Pesticides and Beneficial Organisms. *Entomophaga*, 36: 55-67.
- Henderson; C. F. and E. W. Tilton (1955). Tests with acaricides against the brown wheat mite. *J. Econ. Entomol.*, 48: 157-161.
- Ibrahim, G.A.; M. E. El-Halawany and M. A. Abdel- Samad (1993). Effect of some biologically active compounds (IGRs) against *Tetranychus urticae* Koch and their mixtures with Nu-Film 17 on apple trees. *Menofia J. Agric. Res.*, 18 (1): 401-414.
- Ibrahim, G.A.; M. E. El-Halawany, H. M. Ibrahim; M. A. Abdel-Samad and M. S. El-Ghobashy (1994). The effect of insect growth regulator (Andalin 25 % EC) on *Tetranychus urticae* Koch. *Menofia J. Agric. Res.*, 19 (1): 329-335.
- James, D. J. (1997). Imidacloprid increases egg production in *Amblyseius victoriensis* (Acari: Phytoseiidae). *Experimental and Applied Acarology*, 21: 75-82.

- Kavousi, A. and K. Talebi. (2003). Side-effects of three pesticides on predatory mite, *Phytoseiulus persimilis* (Acari: Phytoseiidae). Experimental and Applied Acarology, 31: 51-58.
- Kim, Y., H. Lee; S. Lee; G. Kim and Y. Ahn (1999). Toxicity of tebufenpyrad to *Tetranychus urticae* (Acari : Tetranychidae) and *Amblyseius womersley* (Acari : Phytoseiidae) under laboratory and field conditions. J. Econ. Entomol., 92 (1): 187-192.
- Mansour, F.A. and K. R. Ascher (1983). Effect of neem (*Azadirachta indica*) seed kernel extracts from different solvents on the carmine spider mite *Tetranychus cinnabarinus*. Phytoparasitica, 11: 177-181.
- Nadimi, A.; K. Kamali; M. Arbabi and F. Abdoli (2008). Side effects of three acaricides on the predatory mite, *Phytoseiulus persimilis* Athias-Henriot (Acari : Phytoseiidae) under laboratory conditions. Mun. Ent. Zool. Vol. 3, (2):556-567.
- Sato, M. E.; M. Silva; L. Goncalves; M. Souza-Filho; D. Raga and M. Souza (2002). Differential toxicity of pesticides to *Neoseiulus californicus* (McGregor) (Acari : Phytoseiidae) and *Tetranychus urticae* Koch (Acari : Tetranychidae) on strawberry. Neotropical Entomology, 31 (3) : 449-456.
- Van de Vrie, M.; J. A. McMurty and C. B. Huffaker (1972). III. Biology, ecology, and pest status, and host plant relations of tetranychids. Hilgardia, 41: 343-342.

كفاءة بعض المركبات الاكاروسية ضد العنكبوت الاحمر العادي *Tetranychus urticae* Koch والاكاروسات المفترسة المصاحبة له على نباتات الفاصوليا

في محافظة الغربية

سعيد عبد العظيم علام

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة - مصر

أجريت في هذه الدراسة دراسة تأثير ثلاث مركبات اكاروسية وهي اندو ٥٠ % EC. وشالنجر ٣٦ % SC و اورتس ٥ % SC وذلك على الأطوار المتحركة للعنكبوت الاحمر العادي *Tetranychus urticae* Koch وذلك على أوراق نباتات الفاصوليا في محافظة الغربية في موسم ٢٠١٠ ولقد لوحظ في هذه التجربة أن هذه المركبات أعطت نسب زيادة مقدارها ٩٤.٢٢ و ٩١.٤ و ٨٥.٩٩ % حينما استخدمت على الترتيب. من ناحية أخرى كان التأثير الجانبي لهذه المركبات على الاكاروسات المفترسة المصاحبة للاكاروسات النباتية بسيط نسبيا حيث كانت نسبة الخفض في تعدادها ٢٥.٥ و ٢٣.٠ و ٢٨.٠ % عند استخدام المركبات المستخدمة على الترتيب مما يفيد بان هذه المركبات يمكن استخدامها في مكافحة العنكبوت الاحمر العادي على نباتات الفاصوليا. وبدراسة التأثير الجانبي لمركب Indo على المظاهر البيولوجية للمفترس الاكاروسي *Phytoseiulus persimilis* وجد أن مدة فترة التطور Developmental period وفترة الحياة للأفراد البالغة Longevity والفترة الكلية للأفراد Life span قد نقصت بينما زاد عدد البيض الذي تضعه أنثى المفترس Fecundity عند استخدام المبيد.

قام بتحكيم البحث

كلية الزراعة - جامعة المنصورة
مركز البحوث الزراعية

أ.د / عمر عبد الحميد ندمار
أ.د / حسن علي طه