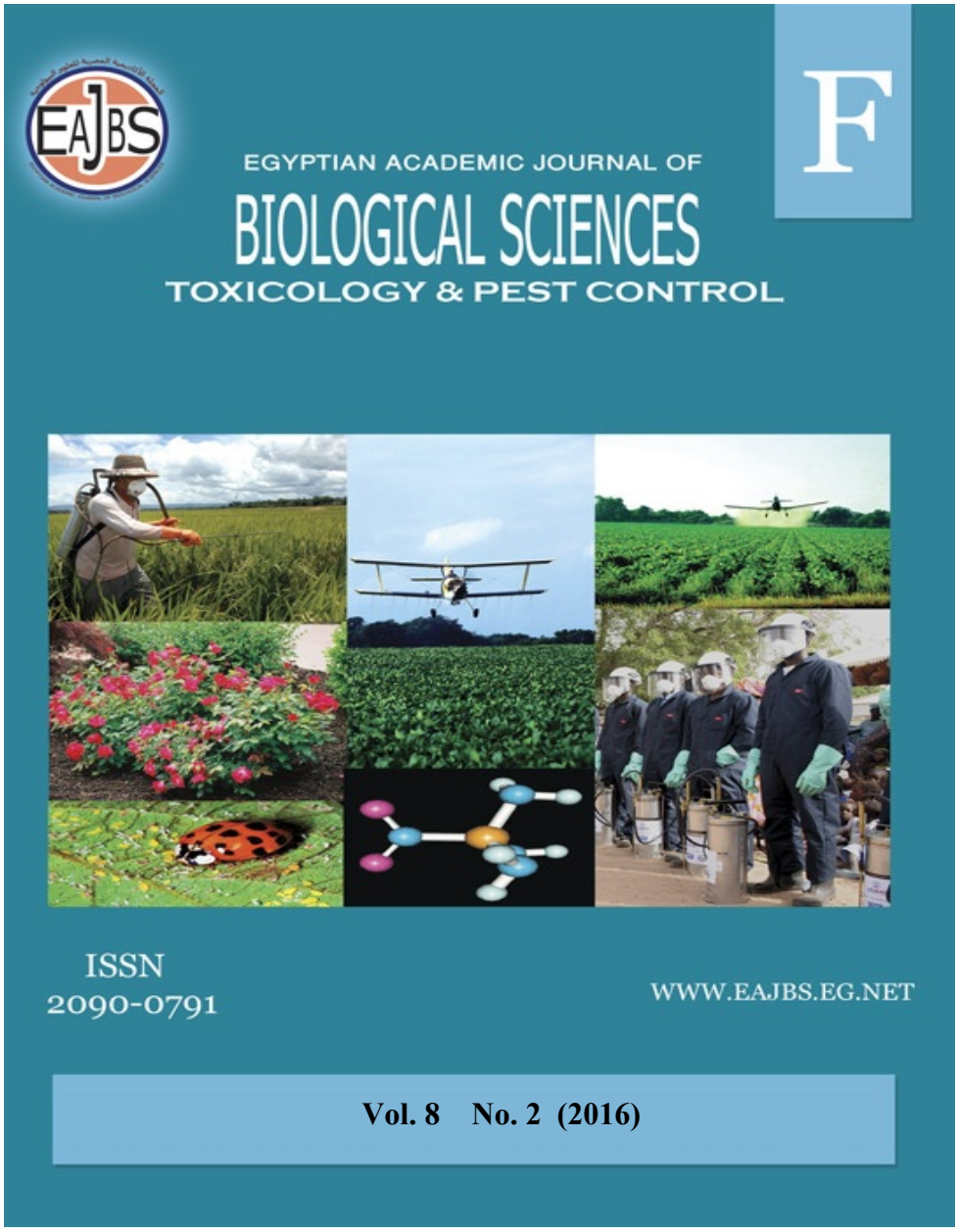


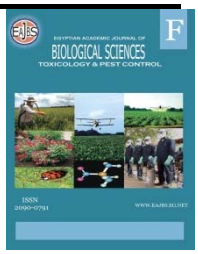
The journal of Toxicology and pest control is one of the series issued twice by the Egyptian Academic Journal of Biological Sciences, and is devoted to publication of original papers related to the interaction between insects and their environment.

The goal of the journal is to advance the scientific understanding of mechanisms of toxicity. Emphasis will be placed on toxic effects observed at relevant exposures, which have direct impact on safety evaluation and risk assessment. The journal therefore welcomes papers on biology ranging from molecular and cell biology, biochemistry and physiology to ecology and environment, also systematics, microbiology, toxicology, hydrobiology, radiobiology and biotechnology.

www.eajbs.eg.net

Egypt. Acad. J. Biolog. Sci., 8(2): 19 - 26 (2016)

Egyptian Academic Journal of Biological Sciences
F. Toxicology & Pest control
ISSN: 2090 - 0791
www.eajbs.eg.net



Efficiency of Acaricides Ortus on Some Biological Aspects of *Tetranychus urticae* Koch and its Predaceous mite, *Euseius scutalis Athias-Henriot* under Laboratory Conditions

Basma, M. Abou El-Nour
Zoology Dep., Faculty of Science, (Girls), Al-Azhar University

ARTICLE INFO

Article History
Received:25/6/2016
Accepted: 30/7/2016

Key words: acaricides, *Tetranychus urticae* Koch , *Euseius scutalis* Athias-Henrio, biological aspects

ABSTRACT

The two-spotted spider mite, *Tetranychus urticae* Koch (Acari; Tetranychidae), is one of the most important pest worldwide. It is a major pest of crops, orchard trees, ornamental, medicinal plant and vegetable crops .Therefore, new approaches in mites control were applied, particularly the use of plant extracts that have received recently considerable attention. Many trials all over the world have succeeded through the use of bio-pesticides in controlling mite pests in different orchards and field crops.

Members of the family Phytoseiidae are the most effective and wide spread predators of injurious plant-feeding mites. The twospotted spider mite develops a resistance to most acaricides after prolonged use. Nevertheless, acaricides are used on a large scale to control phytophagous mites, thus affecting the population of phytoseiid mites Tawfiq and Isra (2013).

There were side effects of the acaricides on the abundance of its associated natural enemies and effect on the biological aspects of the most important predaceous mites (*Euseius scutalis* Athias-Henriot).

Some of the most common problems encountered during biological control for two spotted spider mites first, improper timing of the release of predator, so effectively use biological control is when the pests are at relatively low levels. Second, cultural or chemical practices which adversely affect the natural enemy.

INTRODUCTION

The toxicity of some acaricides to the predatory mite *phytoseiulus persimilis* and the two-spotted spider mite, *Tetranychus urticae* Koch (Acari :phytoseiidae, Tetranychidae) in laboratory. Five of the acaricides tested Bifenazate, Acequinolcyl, Chlorfenapyr, Flufenoxuron and Fenbutatin Oxide, were much less toxic to adult females of *Phytoseiulus persimilis* than those of *Tetranychus urticae*. Fenazaquin was very toxic to adult female of of *Phytoseiulus persimilis* Sangso *et al*. (2002).

Efficiency of a selective safe substances leave extracts of castor bean plant with three solvents (petrolium ether, hexane and water) for controlling the two spotted spider mite *Tetranychys urticae* Abd-elwahab (2003).

The necessity of using alternative control tactics such as biological control of mite pests became a compulsive trend during the last decades to avoid problems raised from intensive application of chemical pesticides in terms of organic farming. Predatory mites in family Phytoseiidae are cosmopolitan predators which were used as effective agents against a wide range of harmful insect and mite pests in biological control programs. (Inbar and Gerling, 2008 and Fouly and Al-Rehiayani 2009).

The phytoseiid predatory mite *Euseius scutalis* (Athias-Henriot) was observed feeding on different phytophagous mites, in Hail region, Saudi Arabia. It was reared for the whole life span on immature stages (larvae and nymphs) of the tetranychid mites *Tetranychus urticae* Koch; in the laboratory. *Euseius scutalis* is considered a promising biological control agent against phytophagous mites, in Hail, Saudi Arabia Kholoud (2010).

In addition to the extreme polyphagy that makes it an important agricultural pest, *T. urticae* has a tendency to develop resistance to a wide array of acaricides that are used for its control Van Leeuwen *et al*, (2012).

The two-spotted spider mite, *Tetranychus urticae*, is a ubiquitous polyphagous arthropod herbivore that feeds on a remarkably broad array of species, with more than 150 of economic value. Migeon and Dorkeld (2013).

*Phytoseiulus persimilis***,** is an important predator of two spotted spider mites is attracted to the chemical odors produced by plants infected with spider mites as it searches for its prey by touch and scent. Both adults and nymphs actively search plants for two-spotted spider mites. *P. persimilis* can spread through as long as plant leaves are in contact with each other Lamband and Eshenaur (2014).

This present work was designed to study the toxic effect of the acaricides Ortus on the biological aspects of the adult females of *Tetranychus urticae* Koch (Acari; Tetranychidae) when fed on castor bean plant leaves treated with sub lethal concentration of Ortus at 25±2°C, 65±5% R.H. and its predaceous mites *Euseius scutalis Athias-Henriot[Amblyseius gossipi](*El badry*).*

MATERIALS AND METHODS

Mites culture Production method:

The two-spotted spider mite, *Tetranychus urticae* Koch culture were done by obtaining the spider mite colonies from castor bean plant from Giza Governorate and reared under laboratory conditions on sweet potato *Ipomea batas* L.Sweet potato were planted for growing. The plant procedures follow strict hygiene norms to avoid cross-contamination for using these mites as raw material. The growing plants were infested by clean culture of two-spotted spider mites. Mites were transferred from old to young plants by cutting heavily infested leaves into small sections and then placed on the new plants. These plants placed into small cages to prevent from contamination with pesticides before starting the experiments. Large numbers of mites free Sweet potato plant, non-contaminated with acaricides and supplied with water only were grown for use in colony maintenance.

The predator culture:

The predator used in this work was *Euseius scutalis* Athias-Henriot *[Amblyseius gossipi] (*El-Badry*).* (Acari:Phytoseiidae) which was collected and described by El-Badry (1967).The predator was reared on pollen grains of castor bean plant *Ricinus communis* L.as described by McMurty and Scriven (1967).

Preparation of discs:

Castor bean plant discs was cut using crock borer, so that they was bisected by midrib, and placed the lower surface upper on moist on water soaked cotton wool pads in Petri dishes. Leaf disc experiment was conducted at 25±2°C.

To measure the toxic effect of Ortus on *Tetranychus urticae* Koch and the predatory mite *scutalis* [*gossipi*] the treatment was evaluated by leaf discs dip-technique. A series of concentrations of Ortus was prepared. Then, four discs of castor bean plant leaves were dipped in each concentration for 5 seconds and left to dry. A number of the prey, *T. urticae* was added as food for *Euseius scutalis*. Then, 5adult female predatory mites were transferred to each disc using a brush (No 00).the discs were placed on moist filter paper, which rested on a moist cotton wool pads in Petri dishes and kept under conditions of 25±2°C, 65±5%R.H. Mortality counts recorded 24 and 7 days after treatment. Correction for the mortality was made by using (Abbott's formula 1925).

To assay the residual effect of tested Ortus at LC_{25} level to *T. urticae*, a number of adult female mites were placed on a single leaf of castor bean plant leaf in Petri dishes on moist cotton wool, to deposited eggs, the emerging adult females of the same age were placed singly, each on treated disc with the required concentration of Ortus.

These discs placed in Petri dishes on moist cotton wool. These adult females leaved to lay eggs and the development of emerged larvae to adult and mortality of these treated females were recorded. Control treatments were used for comparison using water only to compare the female longevity, oviposition, incubation periods, number of eggs of the predator and prey .All residue tests were conducted at 25±2°C, 65±5%R.H.

abbott's formula (1925): used to correct% mortality according to natural mortality.

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

Sun (1950) as follows:

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

RESULTS

Results of the effect Ortus at sub-lethal concentration on the biological aspects of *T. urticae* Koch when fed on castor bean plant leaves at 25±2°C, 65±5%R.H.indicated in Table (1) it seems that the Ortus decreased the eggs incubation period with average of 7.2days compared with 8.3 days for the control of the female, while the incubation period of the male was 7.2 and 5.8 days for Ortus and control respectively.

The duration of larvae of the male and female were decreased to 1.6 and1.25days compared with 2.0 and 2.33days for control respectively.

The total immature stage recorded 9.0 days and 9.66 days for adult female *T. urticae* Koch for Ortus and control, respectively.

Statistical analysis revealed that, Ortus was significantly shortened the female immature stage, while the difference was significant between the male treated with Ortus and untreated.

Results revealed also that the life cycle of adult female and male *T. urticae* increased to 18.91 and 17.75 days for ortus than control which recorded 14.6 and 14.5days for control, respectively.

The duration for this stage was a significantly difference in regard to Ortus or sex, but it was generally observed that female survived longer than males.

Table 1: Developmental duration of different stages adult females of *Tetranychus urticae* Koch when fed on castor bean plant leaves treated with sub lethal concentration of Ortus at 25±2°C, 65±5%R.H.

Developmental stages	sex	Duration of different stages (in days)	
Incubation period	Female	Ortus	Control (untreated)
	Male	7.2±0.25	8.3±0.66
Larva	Female	7.2±0.25*	5.8±0.20
	Male	1.25±0.25*	2.33±0.211
	Male	2.0±0.00	1.66±0.334
Total immature	Female	1.0±396*	2.0±0.00
	Male	9.0±1.002*	9.66±0.66
Life cycle	Female	10.68±0.22*	9.0±1.002
	Male	18.91±1.504*	17.9±1.007
		17.75±0.629*	14.5±0.501

±Standard error

From Table (2) it was noticed that the oviposition period which were 2.9 and 25.66 days for Ortus and control respectively. Ortus was significantly shortened the duration of oviposition period.

The duration of the life span averaged 25.25 and 44.5 days for adult females and 22.0 and 27.0 days for adult male treated with Ortus and control respectively, with a significant difference between the acaricide Ortus and control. The total number of deposited eggs per female which decreased from 152 eggs in control to 9.33 for Ortus with significant difference between treated and untreated.

Table 2: The oviposition period and life span of adult females of *Tetranychus urticae* Koch when fed on castor bean plant leaves treated with sub lethal concentration of Ortus at 25±2°C, 65±5%R.H.

Treatments	sex	Ortus		Control	
Oviposition period (in days)		2.9±1.07*		25.66±1.3	
Life span	female	25.25±1.75*		44.5±1.50	
	male	22.0±2.30*		27.0±1.00	
Number of deposited eggs		Total average	Daily means	Total average	Daily means
		9.33±2.88*	3. 21	152±12.91	5.923

±Standard error

Results of the duration of different stages of the predacious mite *gossipi* when fed on adult females of *T. urticae* Koch treated with Ortus at sub-lethal concentrations as compared with the control at 25±2°C, 65±5%R.H.are presented in Table (3) for the incubation period of females it seems that for the acaricide Ortus recorded 2.67 days as compared to 2.60 days in control.

However the incubation period of males recorded 2.2 and 2.4 days for Ortus and control respectively, with no significant difference between treated and untreated.

On the other hand the duration of larval stage of female increased to 2.8 days for Ortus when compared with control 1.34 days with a significant difference between treated and untreated females. The male larval stage recorded 2.2 and 1.2 days for Ortus and control respectively, without a significant difference.

The total immature stage of females recorded 8.02 and 6.162 days for Ortus and control respectively, with significant difference between treated and untreated females, while for males recorded 6.3and 5.6 days for Ortus and control respectively, without a significant difference between treated and untreated.

The duration of life cycle stage of females increased to 10.68 days for Ortus

with a significant difference between treated and untreated.

The male life cycle duration recorded 8.5 and 8.0 days for Ortus and control without a significant difference between treated and untreated.

Table 3: Developmental duration of different stages *Euseius scutalis* Athias-Henriot [*Amblyseius gossipi*] (El-Badry) when fed on adult females of *Tetranychus urticae* Koch treated with Ortus at 25±2°C, 65±5%R.H.

Developmental stages	**sex**	**Duration of different stages (in days)**	
		Ortus	**Control(untreated)**
Incubation period	Female	2.67±0.13	2.60±0.33
	Male	2.2±0.12	2.4±0.00
Larva	Female	2.8±0.33	1.34±0.097
	Male	2.2±0.1	1.20±0.40
Total immature	Female	8.02±0.32*	6.162±0.837
	Male	6.3±0.30	5.6±0.39
Life cycle	Female	10.68±0.22*	8.662±0.46
	Male	8.5±0.1	8.0±0.56

±Standard error

In Table (4) data showed that, the oviposition period was 9.3days and 13.3 days for ortus and control respectively, the total number of deposited eggs per female *Amblyseius gossipi* was 8.6 and 14 eggs for Ortus and control respectively, with daily means 0.921and 1.05 eggs with a significant difference between treated and untreated.

Table 4:effect of Ortus on the oviposition period and fecundity of *Euseius scutalis* Athias-Henriot [*Amblyseius gossipi*] (El-Badry) when fed on adult females of *Tetranychus urticae* Koch treated with Ortus at 25±2°C, 65±5%R.H.

Treatments	Oviposition period (in days)	Number of deposited eggs	
		Total average	Daily means
Ortus	9.33±1.05	8.6±1.51*	0.921
Control	13.3±0.88	14.0±2.621	1.05

±Standard error

DISCUSSION

Our results illustrated that evaluating the toxicity of an acaricide to phytoseiids by measuring only female mortality underestimates the real effects of residual exposure, and assessment of sublethal effects is important to determine the total impacts of acaricides on performance of predatory mites. The present study also demonstrated that the evaluation of acaricides effects based solely on treated mites would have incomplete end points. Therefore, to evaluate the total effects of the acaricides on predators, determining these effects on subsequent generation is necessary.

The present study showed that the adult female oviposition period of *T. urticae* Koch was significantly shortened when treated with Ortus acaricide to 2.9 days when fed on castor bean plant leaves compared to 25.6 days in the control.

The recorded total Number of deposited eggs per female when fed on castor bean plant leaves were reduced significantly when using Ortus which recorded 9.3 eggs to 152 eggs for untreated.

These previous results were in agreement with that recorded by Barakat *et al*. (1984)showed that the number of eggs laid by *T. urticae* Koch were reduced significantly by all treatments with extracts of garlic,canna and lupine. Dimetry *et al*. (1993) found that,

hypaphorine isolated from seeds of *Abrus precatorius* reduced the oviposition period and female fecundity.

Iskander *et al*. (1996) showed that the biological aspects of *T. arabicus* were more affected by shih than sorrel and Kalakh extracts, they were found that, the average durations of life cycle were 16.0,14.13 and 12.70 days, respectively.

Oviposition period were significantly shortened after the treatment of adult females with plant extracts as compared with control .the total number of deposited eggs per female was reduced, ranged between 3.67and 28.80eggs as compared with control which was 65.80eggs.

Doik *et al.* (2000) found that, the mean number of eggs laid per *T. urticae* Koch female were 0.0 and 18.5 at 100ppm and 0.0ppm concentration, of Neem Azal. T/S respectively.

Fouly *et al*. (2013) recorded that in oviposition, an average female lives for 1.00, 2.04 and 1.57 days when *E. scutalis* female was provided with pollen grains, *T. urticae* and *B. tabaci*, respectively.

Results, from Fouly *et al.* (2013) also concluded that pollen grains shortened the mean generation time and gave the best parameters followed by a diet of *T. urticae*. While fly *B. tabaci* proved to be the least suitable food source for the predatory mite *E. scutalis*.

The present study also showed the biological aspects of *Euseius scutalis* when fed on adult females of *Tetranychus urticae* Koch treated with Ortus and revealed that the life cycle was prolonged compared with control, but the oviposition was shortened according to control.

These results are similar to Abd-El-Samad *et al*. (1996) who showed that ,adult females fecundity of *Euseius scutalis* Athias-Henriot *[Amblyseius gossipi](*El-Badry) reduction when treated with neem extract was 9.2%in number of deposited eggs/female and showed that the toxic effect of neem was very low on the predator with percentage mortality 6.52%.

Longevity of *P. plumifer* was strongly affected by the sublethal concentrations of fenpyroximate in both treated females and their offspring. Reduction in female longevity of *Galendromus occidentalis* Nesbitt after using this acaricide was reported by Sa´enzde-Cabezo´n Irigaray and Zalom (2006). Shortened longevity of both treated females and their offspring may be partially explained by reduced food uptake.

Nadimi *et al*. (2008) showed that from the three acaricides evaluated in the laboratory, hexythiazox may be incorporated in integrated mite pest management and biological control of spider mites programs based on *P. persimilis*. The other two acaricides fenpyroximate and
abamectin were too toxic.

CONCLUSION

This acaricide ortus may be advisable for combined use with of *Euseius scutalis* Athias-Henriot *[Amblyseius gossipi]* (El-Badry) for biological controlling *Tetranychus urticae* Koch

REFERENCES

Abbott, W. S. (1925): Amethod of computing the effectiveness insecticide. J. Econ. Entomol., 18:265-267.

Abd-El-Samad, M. A.; El-Halawany, M. E. and Saied, K. M. (1996): Utilizing *Esieus scutalis* Athias-Henriot to control *Eutetranychus orientalis* (Klein) on citrus trees. Egypt. J. Agric. Res., 74(3):671-684.

Abd-El-Wahab, H. A. (2003): Efficiency of leaves extracts of castor bean plant against *Aphis gossypii* (Glover) and *Tetranychus urticae* Koch on cucumber plant. J.

Agricol. Sc. Mansoura Univ., 28(5): 4029-4038.

Barakat, A. A.; Shereef, G. M.; Abdallah, S. A. and Amer, S. A. A. (1984): Effect of some pesticides and plant extracts on some biological aspects of *Tetranychus urticae* Koch. Bull. Ent. Soc. Egypt, Econ. Ser., 14:225-232.

Dimetry, N. Z.; Amer, S. A. A. and Reda, A.S. (1993): Biological activity of two neem seed kernel extracts against the two-spotted spider mite, *Tetranychus urticae* Koch. J. Appl. Entomol., 116(3):308-312.

El-Badry, E. A. (1967): Five new phytoseiid mites from U. A. R. with collection nots on three other species (Acarina: phytoseiidae). Ind J. Entomol., 29:177-184.

El-Halawany, A. S. H. and Abd El-Wahed, N. M. (2013): Effect of temperature and host plant on developmental times and life table parameters of *Tetranychus urticae* koch on persimmon trees. (acari: tetranychidae). Egypt. J. Agric. Res., 91 (2): 595.

Fouly, A. H. Nassar ,O. A. and Osman, M. A. (2013): Biology and Life Tables of *Esieus scutalis* (A.-H.) Reared on Different Kinds of Food. Journal of Entomology, 10: 199-206.

Iskander, N. G.; Iskander, A. K. F.; El-Sisi, A. G. and Ibrahim, S. M. (1996): Pesticidal efficiency of some plant extracts as emulsifisable concentrates. J. Agric. Res., 74(2):333-343.

Kholoud A. Al-Shammery (2010): Different Biological Aspects of the Predaceous Mite *Euseius scutalis* (Acari: Gamasida: Phytoseiidae) and the Effects due to Feeding on Three Tetranychid Mite Species in Hail, Saudi Arabia. Asian Journal of Biological Sciences, 3: 77-84.

Lamb, E. and Eshenaur, B. (2014): Greenhouse Biocontrol Workbook. NYS Integrated Pest Management Program. Cornell University Cooperative Extension. 84 pp. http://www.nysipm.cornell.edu/

Mcmurtry, J. A. and Scriven, G. T. (1964): Studies on the feeding reproduction and development of *Amblyseius hibisci* (acarina: phytoseiidae) on various food substances. Annl. Entomol. Soc. Am., 57(5): 649-655.

Nadimi, A., Kamali, K., Arbabi, M.and Abdoli, F. (2008): Side-effects of three Acarides on the predatory mite, *Phytoseiulus persimilis* Athias-Henriot (Acari: Phytoseiidae) under laboratory conditions. Munis Entomology & Zoology, 3(2): 556-567.

Sangsoo, K. Sangasum, Y.; Kim, S. S. and Yoo. S. S. (2002): Comparative toxicity of some acaricides to the predatory mite, *phytoseiulus persimilis* and two spotted spider mite *Tetranychus urticae* .Biocontrol,47(5):563-573.

Schmidt R. A. (2014): Leaf structures affect predatory mites (Acari: Phytoseiidae) and biological control: a review Exp. Appl. Acarol. Jan., 62(1):1-17.

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

Tawfiq M. A., Isra W. S. (2013): The effects of three acaricides on egg hatchability of three populations of the two-spotted spider mite *Tetranychus urticae* Koch (Acari: tetranychidae). Jordan Agric. Sci., 9(3):343–350

Van Leeuwen, T., Vontas, J., Tsagkarakou, A., Dermauw, W. and Tirry, L. (2012): Population bulk segregant mapping uncovers resistance mutations and the mode of action of a chitin synthesis inhibitor in arthropods.

Proceedings of the National Academy of Sci., 109: 4407-4412.

Zhang Z.Q. (2003): Mites of greenhouses: Identification, biology and control. CABI Publishing, Wallingford, UK: CAB International, 244 pp.

ARABIC SUMMERY

تاثير مبيدالاورتس على بعض الخطوات البيولوجية لاكا روس العنكبوت الاحمر والمفترس *Euseius scutalis*

بسمة ابو النور
جامعة الازهر كلية العلوم- بنات- قسم الحيوان

استهدفت الدراسة تاثير المبيد الاكاروسي اورتس علي بعض المظاهر البيولوجية للاكاروس *Euseius scutalis* ومفترسه عندما يتغذي علي اوراق نبات الخروع *Tetranychus urticae*, 25±2°C 65±5%R.H. في الظروف المعمليه تحت درجة حراره ورطوبه.

وقد تم دراسة فتره الحضانة للبيض ومتابعة الاطوار الغير كامله حتي نهاية دورة الحياه وقد لخصت النتائج كالتالي:

كان للمبيد الاكاروسي اورتس تأثيرا معنويا علي متوسط فترة الحضانة بالنسبه للأنثي فقد انخفضت فترة الحضانة للأنثي المعامله بالمبيد الي٧.٢يوم بالمقارنه بالأنثي الغير معامله ٨.٣ يوم ،اما متوسط فترة حضانة الذكر المعامل بالمبيد فكان٧.٢ يوم بالقارنه بالغير معامل الذي كان ٨.٥يوم فلا يوجد تأثير معنوي بالنسبه للذكر.

أدت المعامله الي ازدياد دورة حياة الأنثي الي ١٨.٩ يوم بالمقارنه الي ١٧.٩يوم في الاناث الغير معامله،وارتفاعها ايضا في الذكورالمعامله الي١٧.٧ يوم من ١٤.٥في الذكورالغير معامله.

ومن الملاحظ ان للانثي مقدره اعلي علي البقاء حيه عن الذكر.