RESIDUAL EFFECT OF SOME ACARICIDES ON SOME BIOLOGICAL ASPECTS OF *TETRANYCHUS URTICAE* KOCH (ACARI: TETRANYCHIDAE)

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ABSTRACT

The management of the two spotted spider mite, *Tetranychus urticae* Koch, an economically important agricultural pest global wise feeding on a wide range of host plant, is mainly based on the use of acaricides. Mite reduction % after 3 and 7 days of spray and effect on some biological aspects of treatments with eight different acaricides were studied. After 3 days of treatment, the reduction of *T. urticae* reached to a maximum (96.64%) with the use of Vermin while a minimum (59.64%) was obtained with Komodo. After 7 days of treatment, the reduction of *T. urticae* reached to a maximum (97.97%) with the use of Buprolord and to a minimum (68.20%) with Vermin. The longest life cycle (16.1 days) was obtained with Solofan treatment while the shortest was (11.2 days) with Galesco and Komodo. The experiments were performed under laboratory conditions (25±1°C, 80±5% RH and 16:8 h (L: D). Individuals which treated with Galesco, Solofan and Vermin passed through the preoviposition period and did not complete their life cycle while individuals treated with Komodo reached oviposition period then died.

Keywords: *Tetranychus urticae* Koch**,** Acaricides, Biological aspects.

INTRODUCTION

The two spotted spider mite (TSSM), *T. urticae* is a member of the family Tetranychidae that contains many harmful species of plant-feeding mites **(Borror, *et al,* 1989).** Defoliation, loss of chlorophyll, leaf bronzing and even plant death occur due to direct feeding in severe infestation **(Meyer and Craemer, 1999).** Problem in the control of *T. urticae* is their ability to develop resistance rapidly to acaricides, their high reproductive potential and extremely short life cycle (allowing numerous generations in a growing season), combined with the frequent applications of acaricide usually required to contain mite populations low**. (Kim and Lee, 1990, Sridhar and Jhansi Rani, 2003, Kim, *et al*, 2004, Ramasubramanian *et al*, 2005, Sato, *et al*, 2005, Khajehali, 2011).** Results on chrysanthemum plants in India as recorded by **Reddy *et al,* 2014** indicated that, during first season, chlorfenapyr, abamectin and hexythiazox showed 100% mortality of *T. urticae* on day 5, 7, 10 and 15. However, in second trial, abamectin and bifenazate reported 100% mortality of mite on day 7, 10 and 15. In general, all the acaricides showed 97.13–99.88% reduction of mite over untreated control. **Reis *et al.* (2005)** reported that the biological cycle from egg to adult is of approximately 10 days. Observations of **Chahine and Michelakis, 1994** on

the longevity and fecundity of *T. urticae* females on several host plants demonstrated that longevity was of 10.7 days on egg plant (*Solanum melongena* L.), tomato (*Lycopersicon esculentum* Mill.) and beans (*Phaseoulus vulgaris*), and 8.6 days on cucumber (*Cucumeris sativus* L.). The host plant influenced more fecundity than longevity, 71 eggs/female on egg plant and 55.2 on beans. So, this investigation was carried out to study the effect of some acaricides on population of *T. urticae* in tomato fields and residual effect of four acaricides with three different active ingredient on some biological aspects of *T. urticae* .

MATERIALS AND METHODS

Acaricides used:

Data in table 1 illustrated the trade names, recommended dosage and manufacturer details of eight acaricides which used for this study. The acaricidal effect of these products against *T. urticae* was studied under field conditions in summer plantation.

Experimentation:

A) Field studies :

Experiments were carried out in a completely random design (CRD) .Seedlings of tomato were planted in an area of about 360 m^2 divided into 9 plots (8 acaricides treatments and control). Each plot contained 10 rows. The crop was grown following the recommended agriculture practices. Acaricides were sprayed as soon as the population of mites reached 5 individuals/one $inch^2$ of leaf sample. The backpack motorized mist sprayer (20 L) was used. The applications used were shown in table 1, the number of mites (all stages) was recorded before spray and 3 and 7 days thereafter. The reduction percentages of mite population were calculated using**, Henderson and Tilton equation (1955).** Observations were made on samples of 5 random leaves/replicate using stereomicroscope.

Table (1): List of acaricides used for field control of mites on tomato.

Acaricides	Active ingredient	Concentration	Application rate	Formulation
1-Buprolord	Buprofezin	25%	40cc / 100	S.C.
2-Canymite	Acitamiprid	15%	100cc/100	S.C.
3-Emacty	Emamectin benzoate	1.9%	70cc/ feddan	E.C.
4-Galesco	Hexathiazox	10%	100gm./100	W.P.
5-Komodo	Abamectin	1.8%	40cc/100	E.C.
6-Solofan	Sulfur	70%	200gm./100	S.C.
7-Vermin	Abamectin	1.8%	40cc/100	E.C.
8-Zoro	Abamectin	3.6%	25cc/100	E.C.

B) Laboratory studies:

This study was conducted in the Acarology Laboratory, Plant Protection Department, Faculty of Agriculture, Fayoum University. The experimental units were maintained at 25±1°C, 80±5% RH and 16:8 h (L: D).

Adult females of *T. urticae* were colleted from tomato plants treated with four acaricides namely, Galesco, Komodo, Solofan and Vermin. Rearing of these adults was made on tomato leaf discs (2-cm diameter) were on moist cotton pad in 22-cm diameter Petri dishes to avoid escape of mites.

For egg laying, females were carefully transferred from four acaricides treated tomato leaves to rearing units. Emerged larvae were maintained individually on 100 rearing units divided into equal five groups (four acaricides and control); and daily observed to obtain the different durations in the life cycle.

After emergence of adults, some males were confined individually for determination of their longevity, and other males were copulated with females to obtain longevity and fecundity of females. Results were statistically analyzed by ANOVA, Duncan test; Spss (20.0 -for windows).

RESULTS AND DISCUSSION

A) Field effectiveness of acaricides:

Results, table 2 and fig.1, indicated that, the eight acaricides used affected the population of *T. urticae*, after 3 to 7 days after treatment, with differences in % reduction of mites.

After three days of treatment, the % reduction reached to highest effective 96.6% with Vermin application followed by 91.33%, 90.27%, 88.51%, 74.87%, 71.11% and 70.45% for Buprolord, Solofan, Canymite, Zoro, Galesco and Emacty, respectively. The least effective was Komodo with only 59.64% reduction.

After seven days of treatment, the % reduction reached to highest effective 97.97% with Buprolord application followed by 96.41%, 96.16%, 95.40%, 94.94%, 82.12% and 77.30% for Solofan, Emacty, Canymite, Galesco, Komodo and Zoro, respectively. The least effective was Vermin with only 68.20% reduction. In confirmation of our results, **Bhardwaj and Sharma (2010)** found that out of seven acaricides evaluated against two spotted spider mite *T. urticae*, fenazaquin (0.001 %), hexythiazox (0.0025%), abamectin (0.01%) and propargite (0.05%) provided excellent control in apple.

B) Biological effects of acaricides applications on *T. urticae:*

a) Female immature siblings of acaricide treated mites:

As shown in table 3, the longest life cycle (16.1 days) occured with Solofan treatment and ranged between 14-18 days .On the other hand, the shortest was 11.2 days with each of Galesco and Komodo. Statistical analysis indicated that, significant differences between Solofan, Vermin and other acaricides were evident.

Table (2): *T. urticae* population reduction after application of eight acaricides in tomato fields at Beni-Suef Governorate.

Acaricides	Mites population after spray				
	Pre spray	After 3 days	% reduction	After 7 days	% reduction
1-Buprolord	18.75	2.25	91.33	0.75	97.97
2-Canymite	33.00	5.25	88.51	3.00	95.40
3-Emacty	16.50	6.75	70.45	1.25	96.16
4-Galesco	25.00	10.00	71.11	2.50	94.94
5-Komodo	8.50	4.75	59.64	3.00	82.12
6-Solofan	35.25	4.75	90.27	2.50	96.41
7-Vermin	10.57	0.5	96.64	6.75	68.2
8-Zoro	17.25	6.00	74.87	3.25	77.30
9-Control	9.75	13.5	--------	19.25	----------

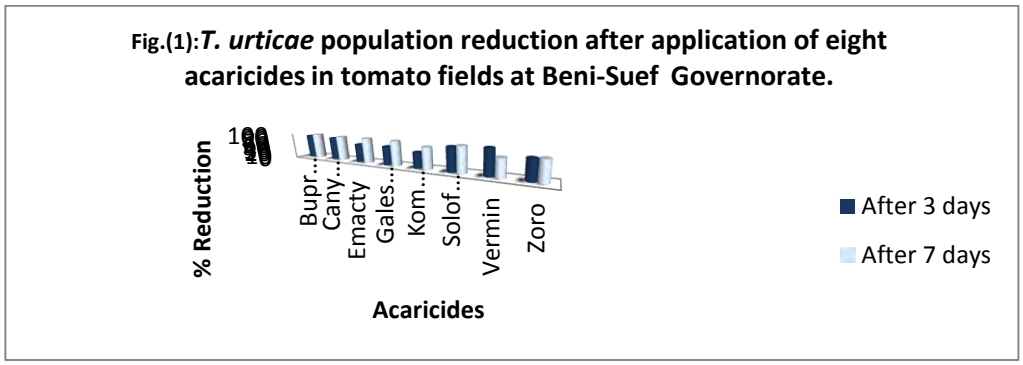


Fig.(1):*T. urticae* population reduction after application of eight acaricides in tomato fields at Beni-Suef Governorate.

Table (3): Female immature siblings of acaricide treated mites.

Acaricides	Mean	Incubation period	Immature stages			Life cycle
			Larvae	Protonymph	Deutonymph	
1-Galesco	M±SE R	3.6±0.16b 3-4	3.2±0.36bc 2-5	2.2±0.13a 2-3	2.2±0.13a 2-3	11.2±0.59a 9-14
2-Komodo	M±SE R	3.9±0.23b 3-5	2.3±0.15a l2-3	2.6±0.27ab 2-4	2.8±0.25a 2-4	11.2±0.6a 9-15
3-Solofan	M±SE R	5.1±0.18c 4-6	3.2±0.20bc 3-5	4.0±0.29c 3-5	3.8±0.32b 3-6	16.1±0.41c 14-18
4-Vermin	M±SE R	4.1±0.1b 4-5	3.4±0.30c 3-5	3.2±0.44b 2-6	2.8±0.53a 1-5	13.5±0.73b 11-19
5-Control	M±SE R	2.4±0.16c 2-3	2.7±0.15ab 2-3	2.7±0.26ab 2-4	3.6±0.67ab 3-5	11.4±0.52a 9-14

b) Female siblings of acaricide treated mites:

Individuals which treated with Galesco, Solofan and Vermin were passed through the preoviposition period and failed to reach the oviposition and the postoviposition periods. Significant differences were obtained between Galesco and Solofan (table 4). The members which treated with Komodo lived for a long time and passed throughout oviposition period then died, these individuals lived for 17.4 days compared with 24.5 days for control and deposited an average of 25.8 eggs/female with daily rate of 6.51 eggs/day/female and the hatchability of eggs which deposited from treated females was less than that for control as shown in table 5. Significant differences were observed between Komodo and other treatments that all treated members failed to reach the oviposition period.

Table (4): Longevity and life span of female siblings of acaricide treated mites:

Acaricides	Mean	Adult longevity			Total longevity	Life span
		Pre-oviposition	Oviposition	Post-oviposition		
1-Galesco	M±SE R	1.9±0.28b 1-3	---------	---------	1.9±0.28a 1-3	13.1±0.60ab 11-17
2-Komodo	M±SE R	1.6±0.27ab 1-3	4.2±0.51 2-6	---------	5.8±0.55b 5-9	17.4±0.58c 5-20
3-Solofan	M±SE R	1.2±0.13a 1-2	---------	---------	1.2±0.13a 1-2	17.3±0.47c 15-19
4-Vermin	M±SE R	1.4±0.51ab 1-2	---------	---------	1.4±0.31a 1-2	14.9±0.72bc 12-20
5-Control	M±SE R	1.5±0.17ab 1-2	10.4±0.72 8-12	1.2±0.13 1-2	13.1±0.60c 11-17	24.5±0.83d 21-29

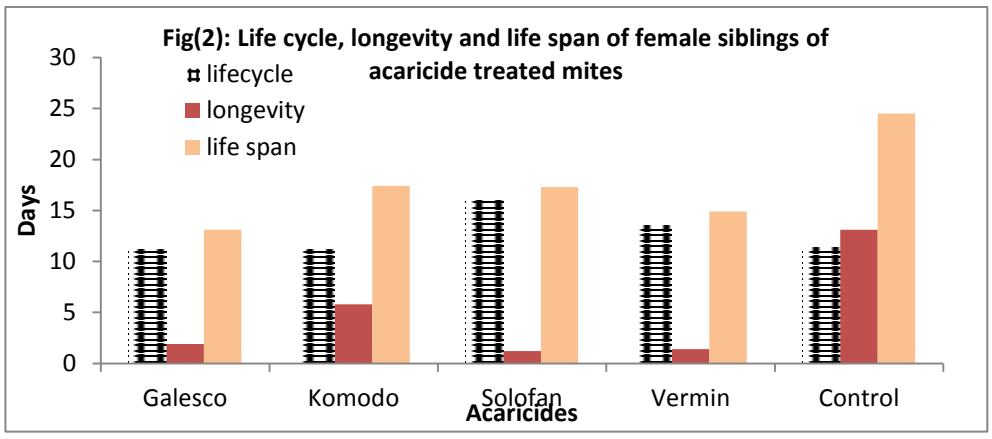


Table (5): Fecundity of female siblings of acaricide treated mites:

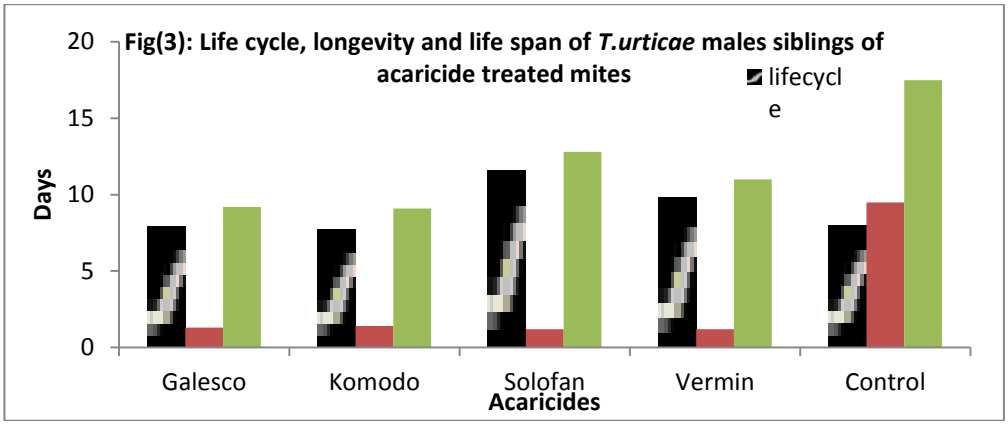
Acaricides		Females fecundity		% Hachability
		Eggs/Female	Eggs /female/day	
1-Galesco	M±SE R	---	---	---
2-Komodo	M±SE R	25.8±4.56 2.0-46.0	6.51±1.19 1.0-10.7	55.78 ±6.53 20.0-81.25
3-Solofan	M±SE R	---	---	---
4-Vermin	M±SE R	---	---	---
5-Control	M±SE R	41.3±1.69 36.0-52.0	4.18±0.38 2.4-6.5	89.31±1.89 76.9-97.3

c) Male siblings, immature and adults of acaricides treated mites:

As shown in tables 3 and 6, in general, durations of immature stages of males 7.9, 7.7, 11.6 and 9.8 days were shorter than females 11.2, 11.2, 16.1 and 13.5 days when Galesco, Komodo, Solofan and Vermin were applied, respectively.

Table (6): Immature and adult stages of *T.urticae* male siblings of acaricide treated mites:

Acaricides	Mean	Incuba-tion period	Immature stages			Life cycle	Adult stages	
			Larvae	Proto-nymph	Deuto-nymph		longevity	Life span
1-Galesco	M±SE s R	2.5±0.21 ab 2-4	2.6±0.27 cd 2-4	1.3±0.15 a 1-2	1.3±0.15 a 1-2	7.9±0.14 a 6-10	1.3±0.15 a 1-2	9.2±0.44 a 7-12
2-Komodo	M±SE s R	2.9±0.23 b 2-4	1.5±0.17 a 1-2	1.5±0.22 ab 1-3	1.8±0.25 ab 5-11	7.7±0.61 a 5-11	1.4±0.16 a 1-2	9.1±0.53 a 7-12
3-Solofan	M±SE s R	4.0±0.15 c 3-5	2.2±0.13 bc 2-3	2.6±0.16 c 2-3	2.8±0.70 c 2-4	11.6±0.34c d 10-13	1.2±0.13 a 1-2	12.8±0.45 a 9-20
4-Vermin	M±SE s R	3.1±0.10 b 3-4	2.3±0.30 bcd 1-3	2.3±0.45 bc 1-5	2.1±0.43 abc 1-4	9.8±0.69 bc 7-15	1.2±0.13 a 1-2	11.0±0.68 a 9-16
5-Control	M±SE s R	2.1±0.18 a 1-3	1.7±0.15 Ab 1-2	1.7±0.26 ab 1-3	2.6±0.27 bc 2-4	8.0±0.45 ab 6-10	9.5±0.50 b 7-12	17.5±0.69 b 15-22



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الاثر المتبقى لبعض المبيدات على المظاهر البيولوجية للعنكبوت الاحمر

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جامعة الفيوم – كلية الزراعة – قسم وقاية النبات

تم دراسة تاثير المعاملة بثمانية انواع مختلفة من المبيدات علي تعداد اكاروس العنكبوت الاحمر علي نباتات الطماطم في الحقل بمحافظة الفيوم وقد ادت هذه المعاملات الي خفض تعداد افراد الاكاروس بعد ٣و ٧ ايام من الرش وقد اختلفت نسبة هذا الخفض من مبيد لاخر واظهرت النتائج انه بعد ٣ ايام من الرش كانت اعلى نسبة خفض ٩٦,٦٤ % عند المعاملة بمبيد فيرمن واقلها ٥٩,٦٤ % عند المعاملة بمبيد كومودو اما بعد ٧ ايام من الرش كانت اعلى نسبة خفض ٩٧,٩٧ % عند المعاملة بمبيد ببرولورد واقلها ٦٨,٢% عند المعاملة بمبيد فيرمن.

وقد تم ايضا دراسة الاثر المتبقي لأربعة انواع من الثمانية السابقة تابعة لثلاثة مواد فعالة مختلفة وهى جاليسكو، سلوفان، فيرمن، كومودو علي المظاهر البيولوجية للعنكبوت الاحمر في المعمل.

وقد اظهرت النتائج ان الافراد الناتجة من الاناث المعاملة بمبيد كومودو هى فقط التى استطاعت ان تصل لفترة وضع البيض بينما فى الثلاث مبيدات الاخرى ماتت بعد فترة ما قبل وضع البيض مباشرة وقد تاثرت ايضا خصوبة هذه الاناث ووضعت عدد قليل من البيض (٢٥,٨ بيضة) بالمقارنه بالكنترول (٤١,٣ بيضة) هذا بالاضافة الى انخفاض نسبة الفقس فى البيض الناتج عن معاملة الاناث بمبيد كومودو (٥٥,٨%) عن الكنترول (٨٩,٣%).