SUSCEPTIBILITY OF *TETRANYCHUS URTICAE* KOCH FOR TWO DIFFERENT ACARICIDES UNDER LABORATORY AND FIELD CONDITIONS

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ABSTRACT:

This study was carried out under laboratory and field conditions in Fayoum governorate, Egypt to study the susceptibility of *Tetranychus urticae* Koch to two different acaricides. Spraying of Aakomic 1.8% EC (abamectin) and Ortus 5.0% EC (fenpyroximate) was conducted on bean plants *Phaseoulus vulgaris* L. at 0.4 and 0.5 respectively. Laboratory observations showed that there is no significant difference in susceptibility between different stages of *T. urticae* in Aakomic treatment, while moving stages were more susceptible than eggs in Ortus treatment. Generally, % reduction of mites increased gradually 3 days after application (78.57%) to reach maximum after 14 days (96.65%) with Ortus. No significant differences was found in case of Aakomic. Field studies showed similar result in case of Aakomic. However, the adult stage was more susceptible to Ortus compared with eggs, larvae and nymphs. The trend of susceptibility to application in the lab. also occurred in the field.

Keywords: *Tetranychus urticae* Koch**,** (Abamectin 1.8% EC, Aakomic), (Fenpyroximate 5% EC, Ortus),

INTRODUCTION:

The two-spotted spider mite, *Tetranychus urticae* Koch, (Acari: Tetranychidae) is known to be the most important phytophagous species . That attacks over 300 host plants including vegetables (e.g., beans, eggplant, peppers, tomatoes, and potatoes), fruits (e.g., strawberries, raspberries, currants and pear) and ornamental plants **(Le Goff *et al*., 2009)**. Defoliation, leaf burn, and even plant death can occur due to direct feeding damage. Indirect effects include decrease in photosynthesis and transpiration that lead to yellow-white discoloration of the leaves often referred to as bronzing, which caus loss of quality and yield or death of the host plants **(Park and Lee, 2002)**. The use of abamectin is recommended as a powerful tool for the control for *Tetranychus* sp. .This product is very safe for tomato production and roses cut-flower market as its residue was less than 5 ppb days after application **(Bisset and McClymont, 1990).** The effect of abamectin on ***T. urticae*** using a leaf disc technique exposing the mites to residues for 1, 3, 7, 14 days was tested by **(Cote, *et al*, 2002)** and there was significant mortality to adults 3, 7and 14 days after application. Different abamectin concentrations (1.6, 2.3, 3.2, 4.5, 6.3, 8.8 and 12.4 ppm) were also evaluated under laboratory conditions (27±2°C, 70±10% R.H.). The LC_{50} valueobtained was 1.50 ppm, and this was lower than the recommended field dose **(Vásquez and Ceballos,**

2009). The effect of abamectin at 18 g/litre on the seasonal abundance of *T. urticae* was studied in roses during 2005-06. At 0.12%, 0.1% and 0.08%, the efficiency of 18 g abamectin/litre was: 63.5-100%, 59.4-74% and 42.7-73.0% 2-3 days after treatment **(Duchovskienė, 2007).** Soft soap at three dosages (3 ml/L, 5 ml/L and 7 ml/L) and abamectin (12.5 mg/100L) were applied to bean plants to determine their residual effects. The soap at 3 ml/L and 5 ml/L did not suppress mites populations and could not provide satisfactory control when compared with soap at 7ml/L with abamectin (**Çobanoglu and Alzoubi, 2013).** Therefore this study aims to evaluate the susceptibility of the different developmental stages of *T. urticae* to two different acaricides recommended for control and to determine their effect on the propagation of population and field conditions.

MATERIALS AND METHODS:

Experimentation:

A) Laboratory tests: Seeds of bean *P. vulgaris* were planted in twenty one clay made plots (30×50 cm). Each pot contained three plants maintained to grow under laboratory condition (22-26°C and 60-70 RH%). Three separate groups of 7 pots (21 plants) each, were covered with a fine net cloth to protect plants from natural infestation. All groups were infested by *T.urticae* adult females after 60 days of sowing. The 1st group was untreated (control) The 2nd group was treated with Aakomic 0.4 and the 3rd group was treated with Ortus 0.5 cm\L. A hand sprayer was used for application to whole bean plants. Two weeks after infestation, four randomly selected leaves were collected from each group of plants. Eggs, adults and immatures were recorded before spray and then 1, 3, 7, 14 days after application. The reduction percentages in mite stages were evaluated using**, Henderson and Tilton equation (1955).**

B) Field tests : An area of about $4m^2$ containing 60 bean plants was subjected to treatments mentioned above. The experimental area was divided into 3 plots for two acaricides treatments and control. Each plot contained 20 plants. The previous applications which used in laboratory were conducted.

-Data analysis: Data were analyzed statistically by univariate variance analysis (ANOVA, Duncan test; Spss, 17.0 -for windows.

RESULTS AND DISCUSSION:

Effect of acaricides on different stages of *T. urticae*:

Two selected acaricides (Aakomic and Ortus) were used against *T. urticae* at laboratory and field. Sampling of treated plants before spraying (pre-spray) and for four times after spray taken at 1, 3, 7 and 14 days after application, resulted into the data in table 1 and figure 1 which could be explained as follows:

1- Under laboratory conditions:

a- Aakomic efficiency:

The highest effect on *T. urticae* occurred 7 days after application with % reduction 95.12% with no significant difference in susceptibility of the different mite stages. In general, reduction of mite stages increased gradually from 86.72 to 95.12 then decreased to 89.25 % during the test period after (14 days).

The effect on mite eggs was obvious with % reduction reaching 86.13 and 96.84 after 3 and 7 days of application, respectively, while the % reduction of larvae, nymphs and adults increased from 78.62, 86.56 and 90.74 after 1 day of application to reach 81.6, 96.6 and 91.12% after 3 days and 97.64, 95.84 and 90.15 after 7 days , then decreased to 74.31, 84.21 and 91.57 after 14 days.

a- Ortus efficiency:

The % reduction in mite stages was 73.89, 88.01, 90.36 and 96.61% for eggs, larvae, nymphs and adults, respectively. Susceptibility of eggs was significantly less than moving stages. The highest reduction % in mite numbers was recorded at 14 days after application (96.65%) while the lowest was at 3 days (78.57%) with no significant difference in susceptibility between 1 and 7 days samples (85.68 and 87.98%). Therefore, the moving stages were highly affected by Ortus compared to eggs.

It could be conducted that Abamectin causes gave the highest mortality and reduction in mobility and fecundity of *T. urticae* **(Zhang and Sanderson, 1990)**. For two weeks of treatments in the present experiment, abamectin affected *T. urticae* different developmental stages and also the residual effect of decreased more quickly in the lab. than that under field conditions disagreement with **Wright, *etal,* 1984** which recorded that abamectin residual effect decrease more quickly indoor environment than outdoor environment.

Abamectin was efficient against *T. urticae* with high biological persistence for 21 days after application as reported by **Daniel *et al,* 2013.**

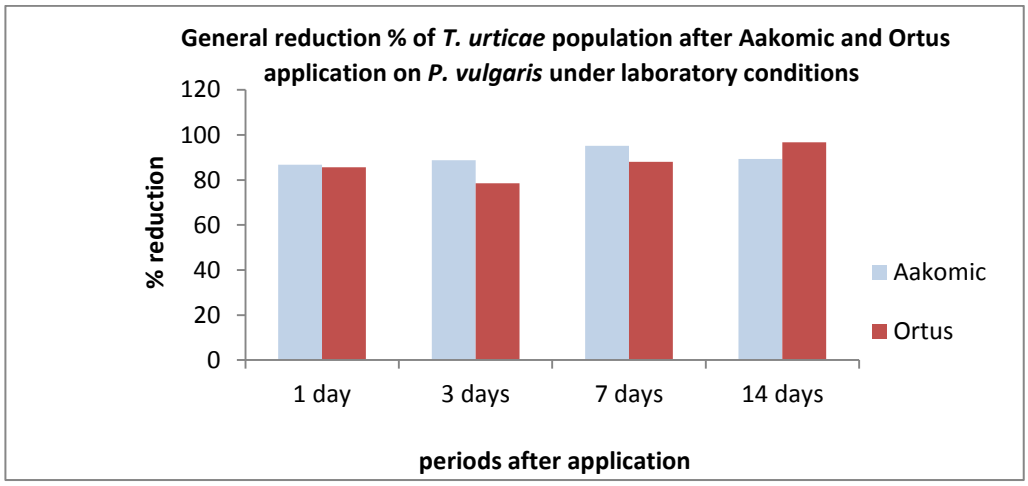
Statistical analysis (Duncan Multiple Range Test, $p \leq 0.05$) showed that, significant differences occurred % general reductions during periods of application in case of Ortus, while no significant differences in case of Aakomic was obtained.

Table (1): % reduction of *T. urticae* different stage populations after Aakomic and Ortus application under laboratory conditions:

Acaricides	Periods	*T.urticae* stages				
		Egg	Larvae	Nymphs	Adults	%General Reduction
Aakomic	1 day	90.93±6.42 ^{ns}	78.62±23.05^{ab}	86.56±10.13 ^{ns}	90.74±6.77 ^{ns}	86.72±13.07^{ns}
	3 days	86.13±20.11 ^{ns}	81.6±29.1^{ab}	96.6±5.65 ^{ns}	91.12±12.88 ^{ns}	88.73±18.03^{ns}
	7 days	96.84±2.72 ^{ns}	97.64±3.16^{a}	95.84±2.9 ^{ns}	90.15±6.33 ^{ns}	95.12±7.33^{ns}
	14 days	95.55±2.13 ^{ns}	74.31±2.91^{ab}	84.21±10.47 ^{ns}	91.57±4.27 ^{ns}	89.25±12.61^{ns}
	Average±SE	92.36±10.51^{ns}	82.93±19.03 ^{ns}	90.81±9.09 ^{ns}	90.89±12.61 ^{ns}	---
Ortus	1 day	48.27±21.84^{c}	97.36±2.78^{a}	99.11±1.03 ^{ns}	97.98±2.4 ^{ns}	85.68±24.42^{ab}
	3 days	53.54±21.55^{bc}	88.23±12.37^{a}	91.13±11.94 ^{ns}	81.36±13.51 ^{ns}	78.57±20.61^{b}
	7 days	98.24±0.97^{a}	72.9±29.63^{ab}	98.04±2.83 ^{ns}	82.71±31.79 ^{ns}	87.98±22.41^{ab}
	14 days	95.53±2.88^{a}	93.5±8.26^{a}	98.16±1.89 ^{ns}	99.42±0.09 ^{ns}	96.65±4.66^{a}
	Average±SE	73.89±27.54^{b}	88.01±17.69^{a}	96.61±6.47^{a}	90.36±17.73^{a}	---

Numbers are means ± S. Underlined letters in each row are significantly different.

Figure 1: % reduction of *T. urticae* different stage populations after Aakomic and Ortus application under laboratory conditions:



Conclusion: Results in table 2 and figure 2 showed that:

2- Under field conditions:

a- Aakomic (1.8% EC):

The highest effect in field on different stages of *T. urticae* was on the nymphal stage while 91.84% reduction and the lowest (84.78 and 85.01%) were on eggs and adult stages, respectively. The overall reduction of mite stages increased gradually from 82.16, 86.04 and 92.14 then decreased to 88.1% after 1, 3, 7 and 14 days, respectively.

b- Ortus (Fenpyroximate 5% EC):

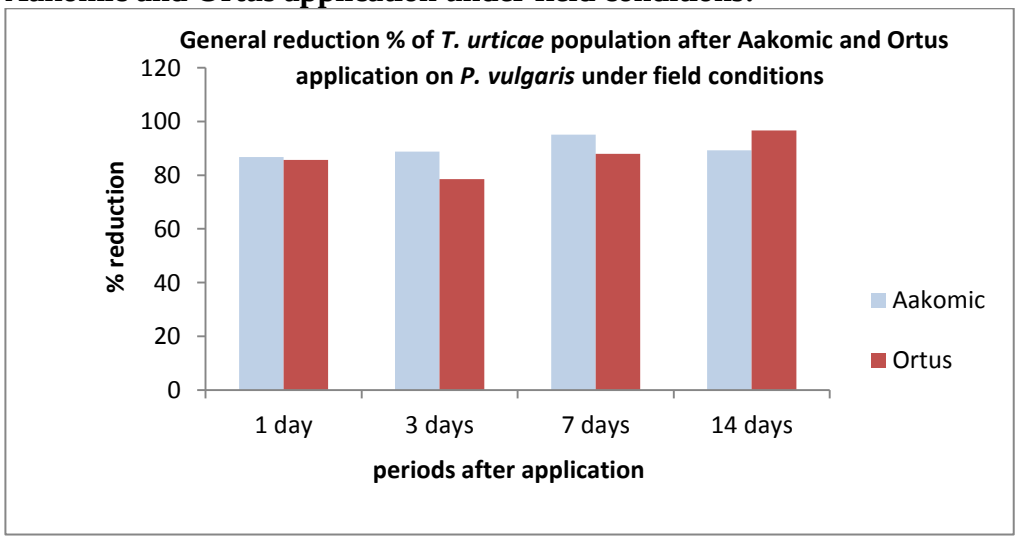
The same trend in overall reduction occured which increased gradually during the 14 days after application. The highest effect on adults was 95.52% reduction. The lowest was 70.03% on nymphal stages. No significant difference in effect between eggs and larvae stages.

Table (2): % reduction of *T. urticae* different stage populations after Aakomic and Ortus application under field conditions:

Acaricides	Periods	*T.urticae* stages				%General Reduction
		Egg	Larvae	Nymphs	Adults	
Aakomic	1 day	84.02±12.99^{ns}	67.19±22.33^{ab}	78.86±35.98^{ns}	98.58±1.64^{ns}	82.16±22.99^{ns}
	3 days	86.33±15.71^{ns}	86.61±23.35^{ab}	95.05±9.82^{ns}	76.16±44.75^{ns}	86.04±25.02^{ns}
	7 days	88.89±16.04^{ns}	95.21±8.01^{a}	96.38±3.78^{ns}	88.07±19.88^{ns}	92.14±12.68^{ns}
	14 days	79.87±31.05^{ns}	98.23±3.54^{ab}	97.07±3.25^{ns}	77.24±40.42^{ns}	88.1±24.95^{ns}
	Average±SE	84.78±18.42$^{\underline{ns}}$	88.81±19.5$^{\underline{ns}}$	91.84±18.54$^{\underline{ns}}$	85.01±29.93$^{\underline{ns}}$	---
Ortus	1 day	75.18±24.19^{ab}	88.19±12.08^{a}	37.05±38.61^{b}	93.36±8.28^{ns}	73.19±29.26^{b}
	3 days	85.0±6.89^{a}	54.56±23.24^{b}	76.92±23.37^{a}	93.55±7.82^{ns}	78.78±20.15^{b}
	7 days	85.73±21.34^{a}	93.21±7.4^{a}	74.07±37.48^{a}	95.92±2.9^{ns}	87.24±21.48^{ab}
	14 days	97.71±2.07^{a}	99.07±0.97^{a}	92.07±2.51^{a}	99.24±0.54^{ns}	97.02±4.97^{a}
	Average±SE	85.98±16.88$^{\underline{ab}}$	83.76±23.81$^{\underline{ab}}$	70.03±33.77$^{\underline{b}}$	95.52±5.81$^{\underline{a}}$	---

Numbers are means ± S. Underlined letters in each row are significantly different.

Figure 2: % reduction of *T. urticae* different stage populations after Aakomic and Ortus application under field conditions:



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الملخص العربى

حساسية تترانيكس يورتيكا لمبيدين اكاروسيين مختلفين تحت ظروف المعمل والحقل

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تمت دراسة حساسية العنكبوت الاحمر تترانيكس يورتيكا لنوعين مختلفين من المبيدات الاكاروسية (اكوميك ١.٨% و اورتس ٥% بالمعدلات الموصى بها ٠.٤ و ٠.٥ سم/لتر على الترتيب) على نبات الفاصوليا تحت الظروف الظروف المعملية ٢٢-٢٦°م ورطوبة نسبية ٦٠-٧٠% وكذلك تحت الظروف الحقلية. وقد اوضحت الدراسات المعملية وجود فروق غير معنوية فى الحساسية بين الاطوار المختلفة للاكوميك بينما فى حالة المبيد الثانى اورتس كانت النسب المئوية للخفض للاطوار المتحركة لليرقات ٨.٠٣% و للحوريات ٩٦.٦١% و ٩٠.٣٦% للاطوار الكاملة واقلها طور البيض (٧٣.٨٩%) كذلك زادت نسبة الخفض العامة لكل الاطوار تدريجيا بعد ٣ ايام من الرش (٧٨.٥٧%) لتصل لاعلى معدلاتها بعد ١٤ يوم من الرش (٩٦.٦٥ %). اما بالنسبة للتطبيق الحقلى فقد اوضح نفس النتيجة بالنسبة للمبيد الاول اكوميك بينما فى حالة المبيد الثانى اورتس كانت نسبة خفض الاطوار الكاملة (٩٥.٥٢%) تبين كونها اكثر حساسية مقارنة بالبيض (٨٥.٩٨%) واليرقات (٨٣.٧٦%) والحوريات (٧٠.٠٣ %).