

Effect of Different Acaricides on the Populations, of the Two-Spotted Spider Mite, *Tetranychus urticae* and the Leaf Miner, *Liriomyza* sp. and their Predators

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ABSTRACT

A field experiment was conducted to study the efficacy of the two biocides namely Vertimec® 18EC and Challenger 36% Sc and the Super-mesrona 94%EC 9 (oil), Endo 50% EC and Acromice (40 %), as control agents for *Tetranychus urticae* Koch and the leaf miner, *Liriomyza* sp. on three cultivars of faba bean *Vicia faba* (L.), sunflower and maize and their predators during the season 2012-2013. Acromic and Vertimec 18 EC enhanced the highest reduction percentage (42.2 and 40.6%) of *T. urticae* on the sunflower cultivar, followed by Endo and Challenger 36% Sc after three days from treatment. On the other hand, Endo enhanced the highest reduction percentage of *T. urticae* on maize (62.5%); while Endo and Challenger gave the highest reduction percentage of the predators followed by Acromic and Vertimec.

Key words: Faba bean, sunflower, maize, *Tetranychus urticae*, Vertimec 18% EC, Challenger, Endo EC, Super-mesrona EC, Acromice.

INTRODUCTION

Tetranychus urticae Koch represents one of the most polyphagous arthropod herbivores, feeding on different host plants. It is a major pest in green house production and field crops, destroying annual and perennial crops such as faba bean, tomatoes, peppers, sunflower and maize.

Spider mites problem increased when natural enemies are destroyed by applications of broad spectrum insecticides, applied against other pests (Mainul Haque *et al.*, 2010). Spider mites have been rapidly developing resistance to a series of acaricides (Croft and van de Baan, 1988) and have recently assumed to a new aspect of multiple resistance (Pree *et al.*, 2002; Van Leeuwen *et al.*, 2004; Kim *et al.*, 2006; Dekeyser, 2005 and Van Leeuwen *et al.*, 2009).

To avoid these problems, it is necessary to minimize the chemical control by replacement such pesticides by using some biocides or oil with insecticides and acaricides.

So, the present work aimed to evaluate the efficacy of two common biocides (Vertimec® 18EC and Challenger 36% SC) Ethion (Endo 50% EC Ethion (Endo 50% EC Super-mesrona 94%EC) and Acromice (40 %) as control agents against *T. urticae* and *Liriomyza* sp. infesting different cultivars of faba bean *Vicia faba* (L.), sunflower and maize crops and their predators under field conditions.

MATERIALS AND METHODS

The present study was conducted at the farm of Gemiza Agricultural Research Station, El-Garbia governorate, Egypt, during the two successive seasons 2012 and 2013. An area of about one Feddan

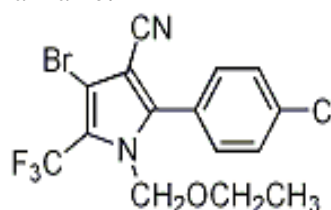
was divided into plots of equal size (1/200 feddan) and arranged in completely randomized blocks with three replicates for each planting.

The tested pesticides:

Five acaricides were screened for their widespread use on crops are:

- 1- Abamectin (Vertimec 18% EC) IRAC 6; avermectin. Vertimec® 18EC - is a commercial formulation of abamectin-100 cm³ /100 Liter water + 250 cm³ Oil kaby. -Vertimec®
- 2- Chlorfenapyr (challenger 36% SC). IRAC 13; arylpyrrole - Challenger 36% SC- is a commercial formulation of chlorfenapyr which is pyrroleacaricide - 75 cm³/100 Liter water + 250cm³ oil kaby.

Chemical name:



- 3- Ethion (Endo 50% EC) IRAC 1B; organophosphate

Chemical name: *S, S'* - methylene bis (O, O-diethyl) phosphorodithioate.

- 4- Super-mesrona 94%EC.

- 5- Acromice (40%).

Planting:

The experiment was carried out during successive winter and summer seasons of 2012 and 2013. In each season, an area of about one Feddan was prepared and divided into 9 plots of about 200 m² each. Every plot was separated from other by uncultivated two rows. The previous mentioned faba varieties were evaluated in complete randomized design. These varieties were

obtained from Ministry of Agriculture. All faba bean seeds were sown on December 21st and 23rd for first and second seasons. Throughout the summer season sunflower seeds were sown in the 2nd week of May on one side of the ridge at 20cm spacing for first and second seasons.

Tested acaricides on the populations of *T.urticae*, *Ligromyza* sp. and their predators:

Each acaricide was applied at the recommended concentrations.

Experimental design:

Five experimental treatments were conducted; each was replicated three times. The replicate consisted of four lines (area for each was 0.5 meter width x 10 meters long). The experimental design comprised complete randomized blocks.

Sampling Procedure:

Samples of ten leaves each were randomly selected biweekly from upper, middle and lower level of faba bean, sugar cane, wheat, sunflower and maize from the four treatments on the two cultivars. Samples were transferred to the laboratory to determine the number of *T. urticae* and the leaf miner, *Liriomyza* sp. stages. *T. urticae* and the predators were counted and recorded at pre-spraying and after 3, 7, 14 and 21 days of application; while leaf miner and *Liriomyza* sp. individuals were recorded at pre-spraying and after 3, 7, 14 and 21, 35, 45, 49, 56 and 63 days. Upper and lower surfaces of the leaves were investigated. Also, percentage of reduction was calculated for each treatment according to Henderson and Tilton (1955).

RESULTS AND DISCUSSION

Effect of the acaricides on *T. urticae* infesting faba bean:

The results indicated that there were highly significant differences ($P>0.05$) in the reduction in population density of *T. urticae* compared between all treatments and control. Table (1), reveals that, the highest reduction percentage in population of *T. urticae* recorded 75.3% in Endo and 49.9% in Vertemic + super-masrona after 3 days of spraying.

While, after 7, 14 and 21 days the highest reduction averaged 93.2 % and 83.9%, respectively with Endo and Vertemic + supermasrona. On the other hand, Super-masrona recorded the lowest reduction percentage after 3 to 28 days of application, for *T. urticae* population on faba bean. These results agreed with that of Elmoghazy (2012).

The lowest reduction in *T. urticae* population was noted with Endo and super-masrona, respectively. (Table1).

Effect of the acaricide on reduction of *T. urticae* infesting sun flower and maize:

Results in Table (2) indicated that all treatments significantly ($P>0.05$) reduced the population of the *T. urticae*. Acromic and Endo enhanced the highest initial effect (42.2% reduction) on sunflower and 62.5 % reduction on maize; while the lowest reduction was obtained with Shalnger, 33.3 and 34.2% on sunflower and maize, respectively, compared with control, after 3 days of pesticide application. While, after 7, 14 and 21 days of Endo treatment high reduction averaged 81.1, 92.7 and 94.9 % were recorded on sunflower, respectively and 83.2, 90.4 and 94.7% were recorded, respectively. Also, Vertemic gave 73.4, 85.9 and 87.2 %, reduction, respectively, on sun flower and 67.6, 75.6 and 80.4%, respectively, for population density of *T. urticae* on maize.

On the other hand Shalinger and Acromice application led to the lowest effect on population density of *T. urticae*.

The high reduction percentage with Vertimec® 18EC is in agreement with Abd- Elhady and Heikal (2011) who reported that abamectin (Vertimec® 18EC) reveal recommended results to control *T. urticae* mite for 30 days after application. The lowest reduction was noted with Endo on sunflower and maize, (Table, 2).

Effect of the acaricides on leaf miners infesting faba bean

Results presented in Table 3 revealed that the tested acaricides enhanced significant reduction percentage in leaf miner population after 3-28 days application.

Table (1): Effect of tested pesticides on *Tetranychus urticae* Koch infesting faba bean plants (No. mites / square inch of leaf)

Pesticides	Rate (cm) ³ /100 liter water	pretreatment	Average number of <i>T. urticae</i> Koch								accumulated average		
			Days post treatment										
			3 d	R%	7 d	R%	14 d	R%	21 d	R%			
Vertemic	40 cm ³	4.97	2.52	41.06	1.30	70.1	1.05	75.8	1.02	76.5	1.47		
Vert+ super masrona		2.82	1.52	49.9	0.62	79.7	0.52	83.04	0.50	83.9	0.79		
Super masrona	1.5 lit.	4.90	3.42	35.15	2.17	59.07	1.85	65.5	2.20	59.03	2.41		
Endo	30cm ³	4.77	1.20	76.3	0.47			90.74	0.35	93.2	0.63		
Control	---	13.80	14.8	--	15.07	--	15.12	--	15.2	---	15.11		
L.S.D. 5%			5.74		6.26		6.36		6.38		----		

Table (2): Effect of tested pesticides on the leaf miner *Liriomyza* sp. infesting faba bean plants (No. of mites / 10 leaves)

Pesticides	Rate (cm) ³ /100 liter water	Average number of <i>Liriomyza</i> sp.											Accumulated averaged
		pretreatment	Days post treatment										
			3d	7d	14d	21d	28d	35d	45d	49d	56d	63d	
Vertemic	40 cm ³	6.75	3.92	2.45	2.22	2.37	1.75	2.12	2.52	3.12	3.85	4.02	2.75
R%			56.0%	72.8%	80.1%	79.3%	85.8%	82.7%	80.2%	76.0%	69.3	67.8	-
Vert+ super masrona	0.5 super+40cm ³ vert.	6.87	4.1	1.22	1.15	1.45	1.35	1.65	2.22	2.37	3.6	3.65	2.25
R%			54.8%	87.2%	89.9%	87.8	88.9%	87%	82.8%	82%	73.4%	73.4	-
Super masrona	1.5 L. /100 L water	7.37	5.92	4.57	3.55	5.55	4.57	4.72	5.07	5.60	6.27	6.50	5.17
R%			39.2%	55.5%	71.2%	58.3%	65.7%	64.4%	63.7%	60.6%	56.8%	55.3	-
Endo	600cm ³ /200 lit.	7.82	2.95	0.55	0.27	1.25	1.60	1.85	2.57	3.60	3.03	3.35	2.099
R%			71.4%	94.9%	97.8%	90.8%	88.7	87%	82.6%	76.1%	80.4%	78.3	-
Control	-	8.52	11.28	11.90	14.15	14.35	15.45	15.53	16.15	16.05	16.83	16.83	14.84
L.S.D. 5%			5.76	3.33	4.60	5.65	5.51	6.01	5.92	5.94	5.66	5.76	--

Table (3): Effect of tested pesticides on *Tetranychus urticae* Koch infesting sunflower and maize plants (No. mites / square inch)

Pesticides	Rate (cm) ³ /100 liter water	pretreatment	Average number of <i>T. urticae</i> Koch						Accumulate average		
			3d			7d					
			R%	14d	R%	21d	R%				
Sunflower plant											
Vertemic	40 cm ³	6.3	3.8	40.6	2.3	73.4	2.1	85.9	2.2	87.15	2.6
Shalnger	60cm ³	6.2	4.2	33.3	2.8	67.6	2.7	81.6	2.6	84.5	3.07
Acromic	40cm ³	5.8	3.4	42.2	2.6	67.3	2.5	81.8	2.5	84.1	2.75
Endo	30cm ³	5.8	3.7	37.1	1.5	81.1	1.0	92.7	0.8	94.9	1.76
Control	-	6.4	6.5		8.8		15.2		17.4		11.97
L.S.D. 5%			1.25		2.94		5.90		6.91		
Maize plant											
Vertemic	40 cm ³	5.0	3.6	43.8	2.9	67.6	2.8	75.6	2.6	80.4	2.97
Shalngersuper 24%Sc	60cm ³	4.5	3.8	34.2	3.1	61.5	3.1	70.0	2.6	78.2	3.15
Acaromic	40cm ³	5.2	3.8	43.0	3.4	63.5	3.2	73.2	3.1	77.5	3.37
Endo	30cm ³	5.0	2.4	62.5	1.5	83.2	1.1	90.4	0.7	94.7	1.43
Control	-	5.3	6.8		9.5		12.2		14.1		10.65
L.S.D. 5%			1.62		3.11		4.39		5.37		

Number of moving stages square inch for leaf

Table (4): Effect of tested pesticides on the moving stages of predator mite *Amblyseius swirskii* and predator insects *Oruis* spp., *Coccenella* sp. and *Chrysoperla carnea* associated with Faba bean plant (No. mites / 10 leaves)

Pesticides	Rate (cm) ³ /100 liter water	Pre treatment	Average number of predators on faba bean								Accumulate average
			3d				7d				
			R%	14d	R%	21d	R%	28d	R%	35d	
<i>Amblyseius swirskii</i>											
Vertemic	40 cm ³	9	8	28	11	52.3	12	48	12	66.7	10.75
Endo	30cm ³	9	3	73	2	86.7	1	95.7	1	97.2	1.75
Shalnger	60cm ³	7	5	94.9	7	40	7	61	8	71.2	6.75
Super masrona	1.5 L.	9	6	46	8	46.7	7	69.7	7	80.5	7
Acromic	40 cm ³	8	7	29.1	7	47.5	9	56.1	12	62.5	8.75
Control	-	9	11		15		23		36		21.25
L.S.D. 5%			2.73		4.36		7.38		12.12		
<i>Oruis</i> spp.											
Vertemic	40 cm ³	18	15	20.8	18	24	21	38.2	22	48.7	19
Endo	30cm ³	16	3	82.1	2	90.5	1	96.7	1	97.4	1.75
Shalnger	60cm ³	15	9	43	12	39.2	13	56.9	13	63.6	14.75
Super masrona	1.5 L.	16	11	34.7	14	33.2	14	53.6	15	60.6%	13.5
Acromic	40 cm ³	18	12	36.6	15	36.7	16	52.9	17	60.3	15
Control	-	19	20		25		36		45		31.5
L.S.D. 5%			5.71		7.55		11.47		14.59		
<i>carnea Chrysoperla</i>											
Vertemic	40 cm ³	23	22	4.34%	29	31.9%	30	37.4%	35	42.1%	29
Endo	30cm ³	24	5	79.1%	4	91%	2	96%	1	98.4%	3
Shalnger	60cm ³	23	9	60.9%	11	74.2%	15	68.6%	12	80%	11.75
Super masrona	1.5 L.	22	22	28%	15	63.1%	16	95.1%	19	67.2%	18
Acromic	40 cm ³	24	16	33.3%	19	57.3%	20	68%	22	65.2%	19.25
Control	-	25	35		46		52		65		19.25
L.S.D. 5%			10.72		14.94		17.03		22.3		
<i>spp. Coccenella</i>											
Vertemic	40 cm ³	38	36	5.3%	35	27.2%	25	67.1%	25	71.7%	30.25
Endo	30cm ³	39	6	84.8%	4	91.8%	2	97.4%	1	98.8%	3.25
Shalnger	60cm ³	35	15	57.1%	11	75.1%	11	84.3%	9	88.9%	11.5
Super masrona	1.5 L.	29	19	34.5%	22	40%	15	74.1%	15	77.5%	17.75
Acromic	40 cm ³	39	25	35.9%	27	45.3%	15	80.8%	16	83.4%	20.75
Control	-	39	39		49		77		89		63.5
L.S.D. 5%			7.26		9.17		5.4		6.00		

After then, the reduction percentage decreased gradually until 63 days after treatment. Endo showed the highest initial effect (71% reduction) in population density of the leaf minor on faba bean, after 3 days of treatment; while the highest reduction percentage was recorded with Vertemic after 28 days (85.8% reduction). On the other hand application of Vertemic + super-masrona, super-masrona and Endo revealed high reduction percentage after 14 days (89.9, 71.2 and 97.8 %, respectively) on faba bean compared with control.

The lowest accumulated mean was 2.099 individuals of moving stages/square inch compared with 14.849 of moving stages.

Effect of the acaricides on predators:

Data presented in table 4 showed that all acaricides treatments significantly reduced the population of the predators; Endo had the highest initial effect (84.8%, 82.1%, 79.1% and 73% reduction) for *coccenella* spp., *Oruis* spp., *Chrysoperla carnea* Stephen and *Amblyseius swirskii* Athias-Henriot, respectively. The lowest effect was obtained with Vertemic 4.34, 5.3%, 20.8% and 28% for *C. carnea*, *coccenella* spp. *Oruis* spp. and *A.swirskii*, respectively, after 3 days of treatment. While, after 7, 14 and 21 days of treatment Endo recorded the highest reduction; while Vertemic revealed the lowest

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