

BIOLOGICAL CONTROL OF *TETRANYCHUS URTICAE* KOCH ON WATERMELON IN OPEN FIELD AND GREENHOUSE BY USING THE PREDATORY MITE SPECIES *PHYTOSEIULUS PERSIMILIS* (A.-H.)

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Abstract

Biological control of the two-spotted spider mite, *Tetranychus urticae* Koch in Behera Governorate on watermelon field and greenhouse are possible by using the predatory mite, *Phytoseiulus persimilis* (A.-H.). The predacious mite was released at three levels 20, 30 and 40 individuals/bit in open field, while was released in greenhouse at one level with 30 individuals/bit, the best one in the level C (40 individuals/bit) followed by B and A levels, respectively. The percent reduction of *T. urticae* population in open field reached 98.25% after seven weeks from released at level C (40 individuals/bit), while reached 94.82 and 92.38% at levels B and A, respectively. The reduction percentage of *T. urticae* in greenhouse at rate 30 individuals/bit was 98.83% in the end of experiment. This results indicated that the possibility of this predator to control *T. urticae* on watermelon in open field and greenhouse.

INTRODUCTION

The two spotted-spider mite, *Tetranychus urticae* Koch is one of the serious mite pests, which infesting watermelon causing several damage for leaves and reduction of the quality and quantity of the production.

Watermelon is considered an important vegetable eaten fresh. The whole cultivated area in Egypt reached about 118,544 feddan, which producing 1,485,939 tons, with mean production rate 12.5 ton/feddan (Statistical Institute 2008).

The present work aim to using the biocontrol agent by predatory mite, *P. persimilis* for reduction *T. urticae* on watermelon in open field and greenhouse. *P. persimilis* was released by several authors to control this pest on certain plants, Decou (1994), Watanabe *et al.* (1994), Ramos and Rodriguez (1995), Heikal and Mowafi (1998), Heikal and Fawzy (2002), Heikal *et al.* (2004) and Fawzy *et al.* (2004&2006).

MATERIALS AND METHODS

Predator's source

Population of the predatory mite, *Phytoseiulus persimilis* (A.-H.) was reared in the laboratory on bean plants leaves (*Phaseolus vulgaris* L.), while mass rearing on the two-spotted spider mite, *Tetranychus urticae* Koch on bean plants in a greenhouse

60x90 m² about 540 m² according the technique followed by El-Halawany *et al.* (2000).

Experiments design

The area of the field experiment was about one feddan, but the greenhouse experiment was about 60x90 m² at Benha in Qualiobia Governorate, the two experiments were left without any pesticide treatments. In field, the predatory mite was released in three treatments (A, B and C) with rates of 20, 30 and 40 individuals/bit, respectively. Whereas, in greenhouse only one treatment was released at level 30 individuals/bit and control left without release.

Samples contain 10 leaves were randomly taken from each treatment before and after release, weekly samples were taken and examined in field using hand lens (20X).

The reduction of *T. urticae* populations were calculated according to the equation of Henderson and Tilton (1955).

RESULTS AND DISCUSSION

In open field

Data in Table (1) revealed that, when the predatory mite, *Phytoseiulus persimilis* (A.-H.) released in open field at three levels (A, B and C), the best one is C treatment (40 individuals/bit) followed by B (30 individuals/bit), while the last level was A treatment (20 individuals/bit).

Pre releasing counts of *T. urticae* were 13.4, 12.2 and 13.9 moving stages/leaf in A, B and C, respectively, compared with control, which reached to 11.8 moving stages/leaf.

The reduction percentage in level C increased gradually beginning of 53.86% in the first week followed by 70.37, 78.38 and 88.93% in the second, third and fourth weeks, respectively, reached to 98.25% in the seventh week. On the other hand, in level B the percent reduction beginning with 39.02% in the first week, after that the reduction increased gradually to 59.10, 65.15, 77.98, 89.74 and 91.68% in the second, third, fourth, fifth and sixth weeks, respectively, reached to 94.82% in the seventh week.

The reduction percentage was lowest in level A, the reduction beginning with 41.29% in the first week after that the reduction increased gradually until reached to 92.38% in the seventh week (Table 1).

In greenhouse

Data in Table (2) revealed that, when the predatory mite, *P. persimilis* released in greenhouse with only one level (30 individuals/bit), the reduction percentage was better than the level C (40 individuals/bit) in open field treatment.

Table 1. Release the predatory mite, *Phytoseiulus persimilis* for controlling the two-spotted spider mite, *Tetranychus urticae* on watermelon in open field.

Sampling date	Treatment	Number and reduction% of moving stages of <i>T. urticae</i> /10 leaves			<i>P. persimilis</i>	
		Number		Reduction %	Total	X`/leaf
		Total	X`/leaf			
Jan., 3, 2009	(A) 20 individuals	134	13.4	-	-	-
	(B) 20 individuals	122	12.2	-	-	-
	(C) 20 individuals	139	13.9	-	-	-
Pre-count	(D) No release	118	11.8	-	-	-
Jan., 10	(A) 20 individuals	92	9.2	41.29	31	3.1
	(B) 20 individuals	87	8.7	39.02	34	3.4
	(C) 20 individuals	75	7.5	53.86	41	4.1
1 st Post-count	(D) No release	138	13.8	-	-	-
Jan., 17	(A) 20 individuals	78	7.8	53.90	37	3.7
	(B) 20 individuals	63	6.3	59.10	45	4.5
	(C) 20 individuals	52	5.2	70.37	56	5.6
2 nd Post-count	(D) No release	149	14.9	-	-	-
Jan., 24	(A) 20 individuals	71	7.1	61.17	22	2.2
	(B) 20 individuals	58	5.8	65.15	46	4.6
	(C) 20 individuals	41	4.1	78.38	61	6.1
3 rd Post-count	(D) No release	161	16.1	-	-	-
Jan., 31	(A) 20 individuals	61	5.1	70.81	42	4.2
	(B) 20 individuals	42	3.2	77.98	51	5.1
	(C) 20 individuals	24	2.4	88.93	63	6.3
4 th Post-count	(D) No release	184	18.4	-	-	-
Feb., 7	(A) 20 individuals	34	3.4	84.87	45	4.5
	(B) 20 individuals	21	2.1	89.74	44	4.4
	(C) 20 individuals	16	1.6	93.14	78	7.8
5 th Post-count	(D) No release	198	19.8	-	-	-
Feb., 14	(A) 20 individuals	22	2.2	91.23	65	6.5
	(B) 20 individuals	19	1.9	91.68	86	8.6
	(C) 20 individuals	11	1.1	95.77	102	10.2
6 th Post-count	(D) No release	221	22.1	-	-	-
Feb., 21	(A) 20 individuals	21	1.6	92.38	71	7.1
	(B) 20 individuals	13	0.9	94.82	98	9.8
	(C) 20 individuals	5	0.5	98.25	114	11.4
7 th Post-count	(D) No release	243	24.3	-	-	-

Table 2. Release the predatory mite, *Phytoseiulus persimilis* for controlling the two-spotted spider mite, *Tetranychus urticae* on watermelon in greenhouse.

Sampling date	Number and reduction% of moving stages of <i>T. urticae</i> /10 leaves					<i>P. persimilis</i>	
	Release area			Control		Total	X` /leaf
	Total	X` /leaf	Reduction%	Total	X` /leaf		
Feb., 10, 2009	151	15.1	-	126	12.6	-	-
Feb., 17	112	11.2	44.37	168	16.8	37	3.7
Feb., 24	79	7.9	67.20	201	20.1	61	6.1
March 3	56	5.6	79.77	231	23.1	64	6.4
March 10	41	4.1	88.08	287	28.7	69	6.9
March 17	24	2.4	94.19	345	34.5	86	8.6
March 24	16	1.6	96.58	391	39.1	112	11.2
April 2	6	0.6	98.83	428	42.8	139	13.9

The pre releasing counts of *T. urticae* averaged 9.6 moving stages/leaf compared with 8.4 moving stages/leaf in control.

The reduction percentage of *T. urticae* after one week of release was 43.57% increased gradually to reach 98.83% in the end of the experiment. This might be due to the greenhouse conditions (temperature and relative humidity) are suitable for density and effectiveness of the predatory mite against the two-spotted spider mite, so this predator became more effective inside the greenhouse (Table 2).

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المكافحة الحيوية للعنكبوت الأحمر العادي *Tetranychus urticae* Koch

علي البطيخ في الحقل والصوبة باستخدام المفترس الأكاروسي

Phytoseiulus persimilis (A.-H.)

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تم إطلاق المفترس الأكاروسي *Phytoseiulus persimilis* لمكافحة العنكبوت الأحمر العادي *Tetranychus urticae* علي نباتات البطيخ في الحقل وداخل الصوبة في محافظة البحيرة وقد تم إطلاق المفترس الأكاروسي في الحقل بإستخدام ثلاث مستويات وهي ٢٠، ٣٠، ٤٠ فرد للجورة الواحدة وأوضحت النتائج أن المستوي الثالث ٤٠ فرد للجورة هو الأفضل حيث اعطى نسبة خفض في التعداد للعنكبوت الأحمر العادي بلغت ٩٨,٢٥% بعد سبعة أسابيع من الاطلاق أما المستوي الثاني والثالث ٣٠ فرد، ٢٠ فرد فقد أعطيا نسبة خفض بلغت ٩٤,٨٢، ٩٢,٣٨% على التوالي.

أما بالنسبة للصوبة فقد تم استخدام مستوى واحد للاطلاق وهو ٣٠ فرد للجورة و قد أعطى نسبة خفض في التعداد أفضل من الحقل حيث بلغت نسبة الخفض ٩٨,٨٣% وهذا يرجع الى زيادة كفاءة المفترس داخل الصوبة وقدرته العاليه على الإفتراس والحد من تعداد العنكبوت الأحمر العادي.