

**BIOLOGICAL CONTROL OF THE TWO-SPOTTED SPIDER MITE
TETRANYCHUS URTICAE KOCH BY THE PHYTOSEIID MITE
PHYTOSEIULUS PERSIMILIS (ATHIAS- HENRIOT) IN
CANTALOUPE FIELD IN SHARKIA GOVERNORATE
(ACARI, PHYTOSEIIDAE & TETRANYCHIDAE)**

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Abstract

Studies were carried out during two successive seasons; 2003 and 2004 in Cantaloupe field, at EL Salhia EL-Gededa, Sharkia Governorate, to control the two-spotted spider mite, *Tetranychus urticae* Koch by releasing the predator mite *Phytoseiulus persimilis* (A. H.) with the rates of the 30, 20 and 10 predator individuals/bit in the treatments A, B and C, respectively.

The pest populations were generally low or moderate at the time of the predator releases then decreased gradually until the last inspection.

The control treatment was left without any predator. The predator release was made by bean leaflets harbouring the predator individuals. The reduction of acarine mite population was 93, 88 and 75 % in the first seasons 2003 but reached 99.7, 96 and 94.5 % in the second seasons 2004 in treatments A, B and C, respectively.

A positive relationship occurred between the numbers of released predator and the percentage of pest reduction.

Obtained results indicated the possibility to control the two-spotted spider mite *T. urticae* when its average population density was moderate at 7.9, 7.5 and 7.9 moving stages/leaf in treatments A, B and C in the first season or small at 4.9, 5.0 and 4.8 pest individuals leaf for the previous treatments at the second season with the rates 30, 20, 10 predators/bit for the previous three treatments.

INTRODUCTION

Cantaloupe is considered one of the important summer vegetable crops in Egypt for local market and exportation. Its cultivated area reached about 61000 feddans in 2002 season with production of 458.000 tons. The exportation season extended from the end of November until May while the highest price exportation was in January and December. For European markets the preferable variety was Galia while for the French market the Sharantea variety was the best.

Most cantaloupe cultivations were in Nobaria district, Behera, Alexandria and Ismailia Governorates. The organic farms of cantaloupe which using biological control became the hope to increase the exportation amount of cantaloupe in future.

The two-spotted spider mite, *Tetranychus urticae* Koch is one of Cucurbitaceae important pests which includes cantaloupe. Recommendation of certain acaricides are

still the only method for controlling this serious cantaloupe pest. Nevertheless, different predatory mite species were released by several authors to control this pest on certain plants. (Hamlen, 1978; EL- Halawany *et al.*, 1992 and 1993, on citrus; Watanabe *et al.*, 1994 on cucumber and strawberry; Ramos & Rodriguez, 1995 on banana; Heikal & Mowafi, 1998 on bean; Heikal & Fawzy, 2002 and Fawzy *et al.*, 2004 on cucumber).

MATERIALS AND METHODS

Predator's source and collection. Individuals of the predator mite, *Phytoseiulus persimilis* (Athias-Henriot) were obtained from its mass rearing on spider mites *T. urticae* Koch on bean plants in a green house 60×9m² about 540 m² (EL-Halawany *et al.*, 2000 and Heikal and Ibrahim, 2002). Bean leaflets harbouring the predator individuals were also collected and kept in paper bags, then transferred to the field in ice boxes.

Predator's release. An open field of about two Kirats cultivated during July 7 2003 with cantaloupe plants "Galia" variety at El-Salhia EL-Gededa, Sharkia Governorate, and left without pesticide treatments. In the first year of study, 2003 season, twenty one cantaloupe lines were selected and were divided into three treatments and control. Each treatment contains three lines as replicates and a buffer area of three lines left without release between each two treatments. The predator individuals were released on July 21 after two weeks from cultivation when each plant host 5 - 7 true leaves. Releasing the predator in the three treatments A, B and C was with the rates of 30, 20 and 10 predator individuals/bit, respectively, while the buffer area and control were left free of release. In the second season of 2004, the previous experiment was repeated but predator release began early on April 6, 2004 with the same rates. The predator release was carried out with bean leaflets harboring the predator with the rate of 10 - 12 predators/leaflet. Each bit in treatment A had 3 bean leaflet, 30 predators/bit, while treatments B and C had 2 and 1 leaflets/bit which lead to 20 and 10 predators/bit respectively.

Randomized samples of 10 cantaloupe leaves/ replicate were investigated before the predator release to record the number of movable stages of *T. urticae* as pre-count, while post-counts were undertaken weekly.

Moving stages of *T. urticae* and *P. persimilis* were counted in the field with aid of hand lens (20 x) and the equation of Henderson and Tilton (1955) was applied to calculate the reduction percentage in spider mite populations.

RESULTS AND DISCUSSION

In the first year of study, infestations with the two-spotted spider mite, *T. urticae* was generally high as its populations at the pre-count on July 21 (the time of first release), were 7.9, 7.5, 7.9 and 7.9 moving stages/leaf in the treatment A, B, C and D, respectively (Table 1). This raise in population was mainly due to high temperature degrees in July. Mite populations on the released plants as a first post-counts were nearly similar to pre-count averaging, 8.2, 8.0, 8.1, 9.3 for the treatment A, B and C, respectively, while it increased in the check (9.3 mites) (Table 1). Then population decreased in successive post-counts until the last inspection in Aug. 20, reaching 1.2, 1.7, 3.8 moving stages/ leaf for treatments A (30 predators/ bit), B (20 predators/ bit) and C (10 predators/ bit), respectively. Comparatively high increase in the pest population was found on the non- released plants reaching its highest level in the last inspection (15.2 moving stages/ leaf). Subsequent pest reductions were obtained during the different post-counts. It attained 12, 10 and 12 % in the first post-count in the treatments A, B and C, respectively, while in the last inspection increased to 93, 88 and 75% in the same previous treatments, respectively, (Table 1).

In the second year of study, similar results to first year were obtained. Pest populations were low at the pre-count averaging 4.9, 5, 4.8 and 4.9 for treatments A, B, C and D (control) respectively, (Table 2). At first post-count nearly similar results of pest counts were recorded except in the control averaging; 5.1, 5.5 and 5 for treatments A, B and C respectively, (Table 2). Afterwards, the population level then gradually decreased to reach very low densities on the last inspection on May 25, 2004 reached 0.6, 0.8 and 1.0 moving stages/leaf in treatments A, B and C respectively. On the opposite, the control treatment D, increased from 4.9 moving stages/ leaf at the pre-count to 18.5 moving stages/ leaf in last post-count on May 25, 2004 Table 2.

Pest population was rapidly reduced on release plants with a range between 36 to 42 % in the first post count after a week from the predator release, then attained more than 90 % in all treatments in the last inspection. This result might be attributed to the low pest densities at time of the first release.

Results agreed with that of Heikal *et al.* (2004) who indicated that population of *T. urticae* infesting cantaloupe field at Ismailia Governorate was significantly reduced almost two weeks after the release of the predaceous mite, *P. macropilis*, with a rate of 5 predators/bit and that of Heikal and Mowafi (1998) who obtained satisfied results on bean plants when releasing the same predatory mite on low population density of *T. urticae* which gave the predator a suitable chance to play its role successfully.

Table 1. Effect of *P. persimilis* (A.-H.) release in cantaloupe field to control *T. urticae* during 2003 summer season.

Sampling date	Treatments	No. mites/ leaf		Reduction of
		<i>T. urticae</i>	<i>P. persimilis</i>	<i>T. urticae</i> %
July 21-2003 (pre-count, date of 1 st release)	A) 30 predators/ bit	7.9	-	-
	B) 20 predators/ bit	7.9	-	-
	C) 10 predators/ bit	7.9	-	-
	D) No release (check)	7.9	-	-
July 28-2003 (1 st post-count)	A) 30 predators/ bit	8.2	2.2	12
	B) 20 predators/ bit	8.0	1.5	10
	C) 10 predators/ bit	8.1	1.2	12
	D) No release (check)	9.3	-	-
Aug 6-2003 (2 nd post-count)	A) 30 predators/ bit	4.6	2.9	62
	B) 20 predators/ bit	5.1	2.0	55
	C) 10 predators/ bit	6.1	1.5	50
	D) No release (check)	12.0	-	-
Aug 13-2003 (3 ^{re} post-count)	A) 30 predators/ bit	2.9	3.7	77
	B) 20 predators/ bit	3.0	2.9	76
	C) 10 predators/ bit	4.8	1.9	63
	D) No release (check)	12.9	-	-
Aug 20-2003 (4 th post-count)	A) 30 predators/ bit	1.2	4.9	93
	B) 20 predators/ bit	1.7	3.5	88
	C) 10 predators/ bit	3.8	3.0	75
	D) No release (check)	15.2	-	-

Table 2. Effect of *P. persimilis* (A. H.) release in cantaloupe field to control *T. urticae* during 2004 spring season.

Sampling date	Treatments	No. mites/ leaf		Reduction of <i>T. urticae</i> %
		<i>T. urticae</i>	<i>P. persimilis</i>	
Apr.6, 2004 (pre-count, date of 1 st release)	A) 30 predators/ bit	4.9	-	-
	B) 20 predators/ bit	5.0	-	-
	C) 10 predators/ bit	4.8	-	-
	D) No release (check)	4.9	-	-
Apr.13, 2004 (1 st post-count)	A) 30 predators/ bit	5.1	3.8	42
	B) 20 predators/ bit	5.5	3.2	36
	C) 10 predators/ bit	5.0	3.1	42
	D) No release (check)	8.8	-	-
Apr.20, 2004 (2 nd post-count)	A) 30 predators/ bit	4.0	4.1	61
	B) 20 predators/ bit	4.5	3.7	57
	C) 10 predators/ bit	5.1	3.5	50
	D) No release (check)	10.2	-	-
Apr.27, 2004 (3 rd post-count)	A) 30 predators/ bit	2.1	3.7	84
	B) 20 predators/ bit	2.6	3.2	81
	C) 10 predators/ bit	3.8	2.9	71
	D) No release (check)	13.4	-	-
May 4, 2004 (4 th post-count)	A) 30 predators/ bit	1.6	3.1	90
	B) 20 predators/ bit	1.8	2.2	89
	C) 10 predators/ bit	2.2	1.5	85
	D) No release (check)	15.3	-	-
May 11, 2004 (5 th post-count)	A) 30 predators/ bit	1.2	2.2	92.8
	B) 20 predators/ bit	1.7	1.5	89.8
	C) 10 predators/ bit	1.9	1.2	88
	D) No release (check)	16.2	-	-
May 18, 2004 (6 th post-count)	A) 30 predators/ bit	1.0	1.8	94
	B) 20 predators/ bit	1.2	1.3	93
	C) 10 predators/ bit	1.5	1.2	91
	D) No release (check)	17.0	-	-
May 25, 2004 (7 th post-count)	A) 30 predators/ bit	0.6	1.5	99.7
	B) 20 predators/ bit	0.8	1.1	96
	C) 10 predators/ bit	1.0	0.9	94.5
	D) No release (check)	18.5	-	-

Finally, it could be concluded that foregoing results indicated the possibility of controlling the two spotted spider mite *T. urticae* in cantaloupe fields by releasing the predatory mite, *P. persimilis* at the rate of about 30 predators/bit using bean leaflets harboring the predator individuals could be effective when applied when pest population density is high.

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المكافحة الحيوية للعنكبوت الأحمر العادي *Tetranychus urticae* بإطلاق
المفترس الأكاروسي *Phytoseiulus persimilis* في حقل كنتالوب
بالصالحية - شرقية

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أجريت الدراسة لمدة موسمين صيفيين عامي ٢٠٠٣، ٢٠٠٤ علي نباتات الكنتالوب في حقل مفتوح بمنطقة الصالحية الجديدة بمحافظة الشرقية لمكافحة العنكبوت الأحمر العادي *Tetranychus urticae* بإطلاق المفترس الأكاروسي *Phytoseiulus persimilis* (A.H.) باستخدام وريقات الفاصوليا التي تأوي أعدادا معروفة من أفراد المفترس. وكان تعداد الآفة بصفة عامة منخفضاً أو متوسطاً أثناء إطلاق المفترس. وقد لوحظ انخفاض تعداد الآفة بالتدرج بعد إطلاق المفترس ليصل بعد ٤ أسابيع في الموسم الأول ٢٠٠٣ الي نسبة خفض ٧٥، ٨٨، ٩٣% للمعاملات أ، ب، ج التي أطلق فيها المفترس بنسبة ١٠، ٢٠، ٣٠ فرداً/ للجورة علي الترتيب.

بينما في الموسم الثاني وصلت نسبة الخفض في تعداد الآفة الي ٨٥، ٨٩، ٩٠% بعد أربعة أسابيع و ٩٤، ٩٦، ٩٩، ٧% بعد سبعة أسابيع لنفس المعاملات السابقة وقد دلت النتائج المتحصل عليها علي إمكانية مكافحة العنكبوت الأحمر *T.urticae* علي نباتات الكنتالوب في بداية عروة الربيع بإطلاق المفترس الأكاروسي *P. persimilis* بمعدل ٣٠ فرداً/ للجورة باستخدام وريقات الفاصوليا التي تأوي أفراد المفترس. كما إن بإطلاقه واحدة كانت كافية لمكافحة هذه الآفة الأكاروسية.