BIOLOGICAL CONTROL STUDY ON MITE SPECIES *TETRANYCHUS URTICAE* KOCH ON OKRA PLANTS IN ISMAILIA GOVERNORATE BY THE PREDACEOUS MITE *PHYTOSEIULUS PERSIMILIS* (ATHIAS-HENRIOT) (ACARI : TETRANYCHIDAE : PHYTOSEIIDAE)

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Abstract

A preliminary study was conducted during two successive seasons 2003-2004 on okra plants at Kasasin, Ismilia Governorate to control the two-spotted spider mite, *Tetranychus urticae* Koch by releasing the predatory mite, *Phytoseiulus persimilis* Athias-Henriot at the rate of 10 or 5 individuals/bit using bean leaflets harbouring the predator individuals. In 2003 season the predator was released on April 12th. Few predators were recorded on the treated bits during the different post-count probably due to the prevailing unfavourable environmental condition where several hot spells coincided with the time of predator release which might have negatively affected the predator activity. In 2004 season, the predator was early released on March 12th and satisfying results were obtained. Releasing the predator using bean leaflets at the rate of 10 or 5 individuals/bit greatly reduced the *T. urticae* population 4 weeks of the predator release. Mean reduction of the pest population over the experimental period was 97.8% (10 predators/bit) and 96.9% (5 praetors/bit) when using bean leaflets carrying the predators, respectively.

INTRODUCTION

The importance of okra has increased in the recent years for local markets and exportation. The cultivated area in 2003 season reached about 15000 feddans, most of which in Qualubia, Alexandria and Ismailia Governorates. The total production of okra 100,000 tons in Egypt (season 2004). Okra is cultivated for its fresh fruits which are eaten as cooking food, cans, its seeds used as "Coffee in some countries and its stems used in paper industry. Okra is rich in riboflafen, niaseen and calcium.

The two spotted spider mite, *Tetranychus urticae* Koch is the major pest of okra and many vegetable crops in many countries. Using chemical pesticides are not advised nowadays aiming to produce clean products free of pesticides residues and to reduce environmental pollution and its negative effects on man health. Therefore, the predatory mite, *Phytoseiulus persimilis* (A.-H.) and other predators were released by several authors to control the two-spotted spider mite, *T. urticae*

in many vegetable crops, Oatman *et al.,* (1967), Oatman *et al.,* (1968), Oatman *et al.,* (1977), Bennison and Jacobson (1991), Benuzzi (1992), Tverdyukov *et al.,* (1992), Lukyanova and Verimeer (1993), Gonzalez *et al.,* (1993), Hance *et al.,* (1993), Heikal and Fawzy (2002) and Fawzy *et al.,* (2004)

The aim of this research is to study the role of releasing the predatory mite *Phytoseiulus persimilis* (A.-H.) on okra plants to control the two-spotted spider mite, *Tetranychus urticae* Koch in two successive seasons 2003 & 2004.

MATERIALS AND METHODS

Predators mass rearing and collecting: The predatory mite, *P. persimilis* was mass reared in the laboratory on bean plants infested with the two-spotted spider mite, *T. urticae.* The predator individuals were collected on bean leaflets harbouring, the predator individuals then put in paper bags and transferred to the field using an ice box.

Predator release: An area of about one Kerat (175 m^2) cultivated with okra plants, left without pesticide treatments was selected at Kasasin district Ismailia Governorate. Fifteen okra rows divided into five treatments each with three rows established in a randomized complete design. In 2003 season, the predator's individuals were released on April 12th with the rates 10 and 5 predators/bit on treatments A and B, respectively using bean leaflets harboring the predator individuals *P. persimilis.* The third treatment C near the treatment (A) and the treatment (D) near treatment (B) left to allow the dispersal of predators. While the treatment E (control) left without any predator away from other treatments.

Randomized samples of 30 leaves/treatment were taken just before the predator release as pre-count and then at weekly intervals as post-counts.

Counts of moving stage of *P. persimilis* and *T. urticae* were estimated in the field by a special magnified hand lens (20X) in 30 leaves/treatment.

The equation of Henderson & Tilton (1955) was applied to calculate the reduction of *T. urticae* populations.

The previous experiments were conducted during two seasons 2003 & 2004.

RESULTS AND DISCUSSION

In 2003 season, infestations with the two spotted-spider mite, *Tetranychus urticae* Koch in the pre-count averaged 11, 12, 11, 13 and 12 moving stages/leaf in treatments A (10 predators/bit), B (5 predators/bit), C (treatment near A treatment), D (near B treatment) and E (control without any predators), respectively Table 1.

The pest population and predator release on okra plants continued to increases during the first post-count 12, 14 moving stages/leaf for treatments (A & B), respectively due to the dispersal of predators to the adjacent rows. The same values decrease in the other post-count because the predator began to produce and lay its eggs until the inspection on May 20th to reach 4 and 5 moving stages/leaf for A and B treatments, respectively Table 1. Also, the pest population *T. urticae* increased in the treatments C and D in the following post-count. Then pest population decreased until the last inspection on May 20th, 2003 where it were 11 and 10 moving stages/leaf due to the dispersal of predator individuals, while the pest population in control treatment (E) increased gradually and reached its highest level infestation 389 moving stages/leaf in the last inspection on May 20th.

On April 12th 2003, the reduction of pest population was 39, 43, 55 and 28% for the treatments A, B, C and D, respectively, while in last inspection the reduction reached 97, 93, 97 and 96% for the previous mentioned treatments, respectively Table 1. There was a significant difference between the pest population in control and other predator released treatments while the difference between the other treatments was not significant.

As the same trend, in 2004 season the numbers of *T. urticae* mite in the pre-count on March 12th in averaged 10, 11, 10, 12 and 12 moving stages/leaf in the treatments A, B, C, D and E, respectively Table 2. The mite pest continued increasing in the first post-count averaging 14, 17, 19, 18 and 24 moving stages/leaf for the previous mentioned treatment. This increasing continued until the last inspection on April 20th where it was 72, 101, 80 and 62 moving stages/leaf for the treatment A, B, C and D, respectively Table 2. But the increasing of control treatment (E) on April 20th reached 394 moving stages/leaf.

The reduction in pest population of *T. urticae* increased after releasing the predators from 25, 21.4, 44 and 25% on March 16th 2004 until the last inspection on April 20th where it reached 99.5, 99.6 and 99.4% for the treatments A, B, C and D, respectively Table 2.

Significant differences were obtained at 5%. The two releases levels varied from the control treatment but not from each other (L.S.D. at 5% level = 5.4).

Finally, the foregoing results indicated that the possibility of controlling the Two-spotted spider mite, *T. urticae* on okra plants by using the predatory mite, *Phytoseiulus persimilis*. Single release of the predator individuals at the rate of about 10 predators/bit using bean leaflets harbouring the predator individuals was effective when applied early in the season about mid-March.

Table 1. Effect of *P. persimilis* (A.-H.) release using leaflets of bean in okra field to control *T. urticae* during 2003 season.

Sampling date	Treatments	No. mites/leaf		Reduction
		T. urticae%	*P. persimilis*	*T. urticae*%
April 12th 2003 pre-count, date of release	A)10 predators/bit	11	-	
	B) 5 predators/bit	12	-	
	C) Adjacent A treatment	12	-	
	D) Adjacent B treatment	11	-	
	E) Control	13	-	
April 19th	A)10 predators/bit	12	3	39%
	B) 5 predators/bit	14	2	34%
	C) Adjacent A treatment	18	-	55%
	D) Adjacent B treatment	16	-	28%
	E)Control	18	-	
April 26th	A)10 predators/bit	8	2	84%
	B) 5 predators/bit	10	2	86%
	C) Adjacent A treatment	105	-	
	D) Adjacent B treatment	14	2	91%
	E) Control	11	-	86%
May 6th	A)10 predators/bit	6	4	85%
	B) 5 predators/bit	9	3	89%
	C) Adjacent A treatment	150	-	
	D) Adjacent B treatment	12	-	90%
	E) Control	10	-	85%
May 13th	A)10 predators/bit	16	5	85%
	B) 5 predators/bit	8	4	89%
	C) Adjacent A treatment	170	-	
	D) Adjacent B treatment	12	2	94%
	E) Control	10	-	91%
May 20th	A)10 predators/bit	4	7	97%
	B) 5 predators/bit	5	5	93%
	C) Adjacent A treatment	389	2	
	D) Adjacent B treatment	11	1	97%
	E) Control	10	-	96%

Table 2. Effect of *P. persimilis* (A.-H.) release using leaflets of bean in okra field to control *T. urticae* during 2004 season.

Sampling date	Treatments	No. mites/leaf		Reduction
		T. urticae%	*P. persimilis*	*T. urticae*%
March 12th 2004 pre-count, date of release	A)10 predators/bit	10	-	
	B) 5 predators/bit	11	-	
	C) Adjacent A treatment	10	-	
	D) Adjacent B treatment	12	-	
	E) Control	12	-	
March 16th	A)10 predators/bit	14	2	25%
	B) 5 predators/bit	17	2	21.4%
	C) Adjacent A treatment	19	-	44%
	D) Adjacent B treatment	18	-	25%
	E)Control	24	-	
March 26th	A)10 predators/bit	26	4	97%
	B) 5 predators/bit	24	2	96%
	C) Adjacent A treatment	90	-	99%
	D) Adjacent B treatment	102	-	99%
	E) Control	135	-	
April 6th	A)10 predators/bit	67	5	98.8%
	B) 5 predators/bit	45	2	98%
	C) Adjacent A treatment	56	-	98.5%
	D) Adjacent B treatment	52	-	98.7%
	E) Control	150	-	
April 13th	A)10 predators/bit	31	10	97.8%
	B) 5 predators/bit	24	9	96.9%
	C) Adjacent A treatment	71	-	99%
	D) Adjacent B treatment	53	-	98%
	E) Control	180	-	
April 20th	A)10 predators/bit	72	15	99.5%
	B) 5 predators/bit	101	9	99.6%
	C) Adjacent A treatment	80	1	99.6%
	D) Adjacent B treatment	62	1	99.4
	E) Control	394	-	

REFERENCES

1. Bennison, J. A. and R. Jacobson. 1991. Integrated control of *Frankliniella occidentalis* (Pergnde) in UK cucumber crops-evaluation of a controlled release system of introducing *Amblyseius cucumeris* Mededolingen-Van-de-Faculteit-Landbouwetnschappen, Rijksuniversiteit, Gent, Vol 56 (2a): 251-258.
2. Benuzzi, M. 1992. Biological integrated defense of strawberries. Informatore-Agrario Vol. 48 (11): 53-57.
3. Fawzy, M. M. H., N. M. Aly and K. M. El-Sayied. 2004. Biological control of the two-spotted spider mite (Acarina : Tetranychidae) with *Phytoseiulus persimilis* (Acarina : Phytoseiidae) on commercial cucumber in Sharkia Governorate. Annal of Agric. Sc. Moshtohor Vol. 42 (1): 357-364.
4. Gonzalez, Z. J. E., F. Garcia-Mari, A. Ribes, J. Saques, L. Masiello and S. Genga. 1993. Binominal and sequential sampling programmers for *Tetranychus urticae* Koch (Acari : Tetranychidae). Boletin-de Sanidad Vegetal, Plagas Vol. 19 (4): 559-586.
5. Hance, T., Impe, G. Van, P. Lebrum, P. Nihoul, F. Benoit, N. Ceustermans and N. Van Imp. 1993. Comparison of the efficacy of a chemical control technique and a biological control technique for protection of the cultivation of tomato against the spider mite, *Tetranychus urticae* (Acari : Tetranychidae). Agronomie Vol. 11(9): 799-806.
6. Heikal, I. H. and M. M. H. Fawzy. 2002. A preliminary study on biological control of *Tetranychus urticae* Koch on cucumber (Acari : Tetranychidae). Egypt. J. Agric. Res., 81 (4): 93-100.
7. Henderson C. F. and E. W. Tilton. 1955. Test with acaricides against the brown wheat mite. J. Econ. Entomol., 48 : 157-161.
8. Luk' Y. T. G. and N. I. Vermeev. 1993. Biological protection has become routine technique. Zashchita-Rastenii-Moskva, No. 12, 42.
9. Oatman, E. R., J. A. McMurtry, H. H. Shorey and V. Voth. 1967. Studies on integrating *Phytoseiulis persimilis* releases, chemical applications, cultural manipulations and natural predation for control of the two-spotted spider mite on strawberry in southern California. J. Econ. Entomol., 60 (5): 1344-1351.
10. Oatman, E. R., J. R. McMurtry and V. Voth. 1968. Suppression of the two-spotted spider mite on strawberry with mass releases of *Phytoseiulus persimilis.* J. Econ. Entomol., 61 (6): 1517-1521.

11. Oatman, E. R., J. R. McMurtry, F. E. Gilstrap and V. Voth. 1977. Effect of release *Amblyseius californicus, Phytoseiulus persimilis* and *Typhlodromus occidentalis* on the two-spotted spider mite on strawberry in southern California. J. Econ. Entomol., 70 : 45-47.

12. Tverdyukov, A. P., P. V. Nikonov and N. P. Yushchenko. 1992. Integrated system of protection for greenhouse vegetable crops. Zashchita-Rastenii. Maskva No. (2): 46-47.

دراسة المكافحة الحيوية لأكاروس العنكبوت الأحمر ***Tetranychus Urticae*** علي نباتات الباميا بمحافظة الإسماعيلية بالمفترس الأكاروسي ***Phytoseiulus Persimilis*** **(A.-H.)**

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في دراسة حقلية تم إطلاق المفترس الأكاروسي *Phytoseiulus persimilis* A.-H. بمعدل ١٠، ٥ أفراد/جورة مرة واحدة في كل من موسمي ٢٠٠٣، ٢٠٠٤ بواسطة وريقات الفاصوليا التي تحمل المفترس لمكافحة أكاروس العنكبوت الأحمر *Tetranychus urticae* Koch في مساحة ١٧٥ م٢ بمنطقة القصاصين بمحافظة الإسماعيلية.

في موسم ٢٠٠٣ أنخفض تعداد أكاروس العنكبوت الأحمر علي زراعات الباميا في مستويي الإطلاق مقارنة بمعاملة الكنترول وإزداد معدل الإنخفاض بمرور الوقت حيث كان بنسبة ٣٩، ٤٣% للمعاملة أ ، ب ١٠، ٥ مفترس/للجورة علي الترتيب ووصل في نهاية الموسم ٢٠ مايو ٢٠٠٣ الي ٩٧، ٩٣%. بينما في موسم ٢٠٠٤ بدأ الإطلاق مبكرا في ١٢ مارس ٢٠٠٤ وكانت نسبة الخفض بعد الإطلاق بأسبوع ٢٥، ٢١,٤% للمعاملة أ ، ب. بينما كانت النسبة في نهاية الموسم ٢٠ أبريل ٢٠٠٤ ٩٩,٥، ٩٩,٦% للمعاملات السابقة علي التوالي. أي أنها أعلي من الموسم السابق وذلك لبدء عملية المكافحة الحيوية مبكرا في شهر مارس حيث درجة حرارة الجو مناسبة لسرعة تكاثر المفترس.

ومن هنا يتضح إمكانية إجراء المكافحة الحيوية للعنكبوت الأحمر العادي علي نباتات الباميا بإطلاقة واحدة من الفترس *P. persimilis* مبكرا في نصف شهر مارس بمعدل ١٠ فرد/جورة.