

Population Fluctuation of *Tetranychus Urticae* Koch and its Predacious Thrips, *Scolothrips Longicornis* Priesner on Cucumber and Bean Varieties, under Green-House Conditions

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ABSTRACT

The population fluctuation of the two spotted-spider mite, *Tetranychus urticae* Koch and the predaceous thrips, *Scolothrips longicornis* Priesner on cucumber and bean varieties were studied under green-house conditions, at the Experimental Research Center of El-Minia University, Shosha region, for the two consecutive seasons 2007 and 2008. The obtained data showed that both of *T. urticae* and *S. longicornis* exhibited one peak on cucumber and bean plants. Peaks of *T. urticae* and *S. longicornis* occurred on the 2nd and 3rd weeks of April for bean and cucumber in both seasons. The cucumber varieties differed in their infestation by *T. urticae*. Nile and Katia varieties harbored greater numbers of eggs and moving stages of *T. urticae* followed by Passandra and Asna varieties. Bean showed significant differences among Novax, Kentucky wonder and A Slin wonder varieties in their mite infestation. Generally, cucumber varieties mounted lower numbers of *T. urticae* than bean varieties. On the other hand, correlation between numbers of *S. longicornis* and the population density of eggs and moving stages of *T. urticae* on all cucumber and bean varieties in the two growing seasons was positively. Only cucumber varieties affected fertility of *T. urticae*.

Key Words: *Tetranychus urticae*, *Scolothrips longicornis*, cucumber, bean, varieties, green-house, populations.

INTRODUCTION

The technique of protected culture have currently taken place in Egypt, mainly over the past 25 years as research on protected cultivation started in 1968 (Abo-Attia *et al.*, 2004). The main goal of this technique is to produce crops (mainly vegetables and ornamentals) with high quality, good shape and in a specific timing to obtain high price. Recently the production of vegetable crops especially the cucumber, *Cucumis sativus* L. and common bean, *Phaseolus vulgaris* L. have pronouncedly increased to cover our local consumption and portion of export needs. However, the two-spotted spider mite, *Tetranychus urticae* Koch is one of the most important pests of cucumber and bean causing serious damage to plants and reducing yield quality of fruits (Metwally *et al.*, 1995 and Megali *et al.*, 1998). The announcement for minimizing the use of chemical pesticides was increased during the last few years to avoid their hazardous effects to our environmental elements and to human himself. The new approach in this respect is to study some basic elements of the Integrated Pest Management (IPM). The first step in this concern is to monitor the mite populations on different host plants. Also, biological control strategies for pests including various techniques, like use of predators. Predation is an important component of ecological aspects where flow of energy continues throughout a community. It also regulates and maintains the fitness of prey populations. The predaceous thrips, *Scolothrips longicornis* Priesner was successfully reared in the laboratory on both mulberry avens and potted bean

plants. The two-spotted spider mite, *T. urticae* was used as a prey (Heikal, 1996). Thus, the prime objective of the present work was to study the susceptibility of some cucumber and bean varieties to the two-spotted spider mite, *T. urticae* infestation and to study the population fluctuation of this pest as well as the predaceous thrips, *S. longicornis*.

MATERIALS AND METHODS

The present work was carried out at the Experimental Research Center of El-Minia University, Shosha region. The area is located 20 Km west Samalute. The work was done under green-house conditions during the two successive seasons of 2007 and 2008. Seeds of the cucumber, *Cucumis sativus* varieties (Katia, Passandra, Nile and Asna and bean, *Phaseolus vulgaris* varieties (Novax, Kentackey

Wonder and A Slin wonder) were planted in foam plates (7 × 12 wells). Plants of seventeen days old of both cucumber and bean were transferred into green-house during January of each season.

Weekly samples of 10 leaves of each cucumber and common bean varieties were randomly taken. Four replicates from the green-house (Northern, Center and Southern parts) and from three plant parts (designated lower, middle and Upper 1/3) through the two seasons were performed. Each leaf was carefully removed and sealed separately in a polyethylene bag and examined in the laboratory under stereomicroscope.

Table 2: Mean numbers of *T. urticae* and *S. longicornis* / 10 bean leaves of bean varieties under green-house conditions, during 2007 and 2008 seasons

Season	Date	<i>T. urticae</i>								<i>S. longicornis</i>				
		Egg stage				Moving stages								
		Bean varieties												
		Novax	Kentackey wonder	A Slin wonder	Mean	Novax	Kentackey wonder	A Slin wonder	Mean	Novax	Kentackey wonder	A Slin wonder	Mean	
2007	Feb.	18 th	7.25	3.00	6.00	5.42	3.50	1.50	3.25	2.75	1.00	0.50	0.75	0.75
		25 th	12.25	5.00	9.25	8.83	5.25	2.75	4.75	4.25	1.00	0.50	0.50	0.67
	Mar.	4 th	21.75	7.50	12.00	13.75	6.75	5.00	6.00	5.92	1.25	0.75	0.75	0.92
		11 th	23.50	15.50	16.75	18.58	9.75	6.00	7.25	7.67	1.25	0.75	1.25	1.08
		18 th	34.25	16.00	22.50	24.25	13.50	6.75	9.50	9.92	1.75	1.00	1.25	1.33
	Apr.	25 th	36.00	22.00	24.75	27.58	15.75	8.25	9.50	11.17	2.00	1.00	1.25	1.42
		1 st	45.25	50.75	32.50	42.83	17.50	33.00	10.75	20.42	2.50	3.75	1.25	2.50
		8 th	75.25	48.25	39.00	54.17	57.00	25.75	27.75	36.83	8.25	3.25	1.25	4.25
		15 th	75.00	44.75	53.25	57.67	42.25	22.25	38.75	34.42	5.25	1.75	3.75	3.58
		22 nd	72.75	43.50	52.50	56.25	36.00	20.00	28.75	28.25	4.00	1.75	3.25	3.00
	May	29 th	70.00	42.00	52.00	54.67	29.50	14.75	23.50	22.58	3.25	1.25	3.25	2.58
		6 th	64.25	39.75	49.25	51.08	25.25	12.50	18.75	18.83	3.00	1.00	2.50	2.25
		13 th	63.75	37.75	49.25	50.25	22.50	11.25	16.50	16.75	2.25	1.00	1.50	1.83
		20 th	60.50	27.25	44.50	44.08	19.50	9.75	15.75	15.00	0.50	1.00	1.25	1.50
		Total	661.8	403.1	463.5		303.9	179.5	220.8					
		G. Mean	47.27 a	28.79 c	33.11 b	36.39	21.71 a	12.82 c	15.77 b	16.77	2.86 a	1.38 c	1.70 b	1.98
	LSD 0.05		1.711		3.696		1.104		2.385		0.307		0.6624	
	r.	0.800**	0.667**	0.813**		0.974**	0.834**	0.853**						
2008	Feb.	10 th	4.00	2.25	4.00	3.42	2.50	0.75	2.00	1.75	0.50	0.25	0.00	0.25
		17 th	7.75	3.25	6.25	5.75	4.00	1.25	3.25	2.83	0.75	0.25	0.25	0.42
		24 th	13.25	4.50	9.75	9.17	4.75	2.00	3.75	3.50	0.75	0.25	0.25	0.42
	Mar.	2 nd	16.75	10.25	10.50	12.50	6.50	3.25	4.75	4.83	1.00	0.25	0.25	0.50
		9 th	21.00	13.25	14.25	16.17	9.00	4.25	5.75	6.33	1.25	0.25	0.50	0.67
		16 th	25.50	14.75	20.00	20.08	11.00	5.75	6.75	7.83	1.25	0.50	0.50	0.75
		23 rd	34.50	21.00	23.25	26.25	13.75	8.00	9.50	10.42	1.50	0.50	0.75	0.92
	Apr.	30 th	46.50	28.75	25.25	33.50	17.25	10.25	10.75	12.75	1.75	0.50	0.75	1.00
		6 th	57.25	32.00	40.50	43.25	23.25	12.75	13.50	16.50	2.00	0.50	0.75	1.08
		13 th	106.50	71.25	66.00	81.25	54.25	34.50	43.50	44.08	6.00	1.50	2.50	3.33
		20 th	82.50	53.75	60.75	65.67	39.75	29.25	33.00	34.00	3.25	1.50	2.50	2.42
	May	27 th	73.00	46.75	58.75	59.50	34.00	21.75	23.00	26.25	2.75	0.75	1.25	1.58
		4 th	69.25	40.50	52.75	54.17	32.25	19.50	21.00	24.25	2.50	0.75	1.25	1.50
		11 th	60.00	40.00	45.50	48.50	25.75	15.50	17.25	19.50	2.25	0.50	1.00	1.25
		Total	617.8	382.2	437.5		278.0	168.7	197.8					
		G. Mean	44.13 a	27.30 c	31.25 b	34.23	19.86 a	12.05 c	14.13 b	15.35	1.96 a	0.59 c	0.89 b	1.15
	LSD 0.05		1.891		4.084		1.271		2.746		0.257		0.555	
	r.	0.938**	0.899**	0.903**		0.962**	0.949**	0.976**						

Table 3: Fertility percentages of *T. urticae* on some cucumber and bean varieties, under green-house conditions, during 2007 and 2008 seasons.

Season	Date		% Fertility						
			Cucumber				Bean		
			Katia	Passandra	Nile	Asna	Novax	Kentackey wonder	A Slin wonder
2007	Feb.	18 th	52.79	28.12	38.69	47.92	50.74	50.00	54.76
		25 th	37.05	38.69	35.38	38.89	42.31	56.25	50.97
	Mar.	4 th	43.25	44.51	53.44	50.15	31.97	69.25	52.83
		11 th	34.84	46.22	32.74	51.07	41.95	42.10	43.82
		18 th	29.41	41.53	32.50	63.41	39.96	41.87	42.55
		25 th	24.05	35.61	30.83	30.64	44.22	37.91	38.18
	Apr.	1 st	32.34	28.95	32.31	40.39	39.26	65.26	32.94
		8 th	35.55	28.47	40.20	34.42	75.77	53.81	73.74
		15 th	46.61	46.89	53.70	60.01	56.60	50.04	74.53
		22 nd	29.37	45.07	48.87	40.47	50.33	45.15	55.26
		29 th	31.28	40.45	43.42	39.81	42.37	35.66	46.92
	May	6 th	34.08	37.82	39.04	32.83	40.02	31.79	39.26
		13 th	30.87	33.13	32.76	31.40	35.34	30.40	33.64
		20 th	37.34	32.17	34.36	34.70	32.35	35.88	36.48
		Mean		35.63 B	37.69 AB	39.16 AB	42.58 A	44.51 A	46.07 A
	LSD 0.05		6.445				4.550		
2008	Feb.	10 th	40.48	35.45	35.84	52.08	62.08	33.33	43.75
		17 th	24.38	36.83	50.40	13.34	62.88	39.58	51.67
		24 th	34.31	42.22	45.10	30.48	38.24	43.75	39.02
	Mar.	2 nd	43.55	51.10	82.22	33.49	40.22	32.91	45.63
		9 th	33.38	38.64	59.61	45.40	42.15	32.98	40.38
		16 th	40.86	33.80	36.41	46.65	43.57	40.57	33.66
		23 rd	47.82	39.51	51.85	43.06	40.53	38.62	40.63
		30 th	48.81	39.89	47.08	48.72	37.28	39.06	45.36
	Apr.	6 th	47.57	44.11	43.12	41.41	40.55	40.06	33.87
		13 th	39.21	38.64	51.56	44.09	51.96	48.64	66.64
		20 th	43.86	38.84	44.59	30.93	49.25	54.49	54.30
		27 th	41.22	54.59	46.39	56.39	47.09	46.45	39.10
	May	4 th	29.37	45.16	42.35	55.15	46.73	49.54	39.77
		11 th	37.02	39.63	48.96	48.09	43.02	38.75	38.55
		Mean		39.42 B	41.31 B	48.96 A	42.09 B	46.11 A	41.34 A
	LSD 0.05		4.903				6.119		

then Passandra (12.80 and 11.29), while Asna variety showed the lowest susceptibility (10.59 and 9.23).

In case of bean varieties, $LSD_{0.05}$ values are presented on Table 2 for egg stage (= 1.711 and 1.891) and for moving stages (= 1.104 and 1.271) in the first and second seasons, respectively. As for egg stage, it could be concluded that among the tested three varieties, Novax was most susceptible variety to infestation with this pest (47.27 and 44, 13) followed by A Slin variety (33.11 and 31.25), whereas Kentackey wonder was the least susceptible variety (28.79 and 27.30). On the other hand, the three varieties took the same arranging in case of moving stages of *T. urticae* where Novax was the most susceptible variety (21.21 and 19.86 mites / 10 leaves) followed by A Slin wonder variety which showed an intermediate susceptibility to infestation (15.77 and 14.13). Kentackey wonder was the least susceptible variety to infestation with this pest (21.82 and 12.05) and is recommended for planting. Abdel-Rahman *et al.* (2007) showed significant differences towards the average numbers and abundance of the phytophagous mite *T. urticae* on six faba bean varieties.

3-The relation between *S. longicornis* and the population density of *T. urticae* on some cucumber and bean varieties:

Data in Tables 1 and 2 revealed positive correlation between *S. longicornis* and the population density of eggs and moving stages of *T. urticae* on all cucumber and bean varieties in the two growing seasons. In 2007 season, positive and highly significant correlation was observed on Katia, Passandra, Nile and Asna cucumber varieties in case of egg stage ($r=0.891$, 0.936 , 0.896 and 0.942) respectively. Also, highly significant correlation calculated with moving stages of *T. urticae* on all cucumber varieties ($r=0.802$, 0.908 , 0.848 and 0.958) for Katia, Passandra, Nile and Asna cucumber varieties, respectively.

In 2008 season, highly positive correlation was observed concerning eggs ($r=0.915$, 0.955 , 0.913 and 0.934) and moving stages of *T. urticae* ($r=0.949$, 0.971 , 0.920 and 0.936) on Katia, Passandra, Nile and Asna varieties, respectively.

As for bean, data in Table 2 indicated that the simple correlation coefficient values were positive and highly significant with eggs ($r=0.800$, 0.667 and 0.813 for 2007 season, 0.938 , 0.899 and 0.903 for 2008 season) and moving stages ($r=0.974$, 0.834 and 0.853 for 2007 season, 0.962 , 0.949 and 0.976 for 2008 season) on Novax, Kentackey wonder and A Slin wonder common bean varieties, respectively. Parvin and Haque (2008) determined the release of *Scolothrips sexmaculatus* Pergande as predator to control the two-spotted spider mite, *T. urticae* population on potted plants at different levels of infestation. They found that population of this mite species remained high on which the predator was

released after one week of mite infestation. But this mite species reached its highest numbers on which *S. sexmaculatus* was released after three weeks of mite infestation. However, it was reduced to very low levels of infestation in 8th and 9th week on early and late released treatments. Pakyaria *et al.* (2009) suggested that *S. longicornis* may be more effective for biological control of two-spotted spider mite in warmer conditions.

4-Impact of varieties on the fertility of *T. urticae*:

Data presented in Table 3 suggest insignificant differences of the fertility percentage of *T. urticae* among the three bean varieties in the two tested seasons (2007 and 2008). Cucumber varieties showed significant differences in the two seasons. In the first season (2007), the highest percentage of fertility (42.58 %) was recorded on Asna variety followed by Nile and Passandra varieties (39.16 and 37.69 %) with insignificant difference among them, respectively. The lowest percentage was registered on Katia variety (35.63 %) with significant difference only with Asna variety. In the second season (2008), Nile variety achieved the highest percentage of fertility (48.96 %) followed with significant difference by the three varieties Asna, Passandra and Katia (42.09, 41.31 and 39.42 % respectively), while the differences among these last three varieties were insignificant. Generally, the highest percentage of fertility was recorded on Nile variety, while the lowest one was recorded on Katia variety with significant difference. However, the varieties Asna and Passandra exhibited moderate percentage with insignificant difference between them for both growing seasons. These results agreed with those obtained by Abdel-Rahman *et al.* (2007) who found variable significant differences in the average numbers of all stages of *T. urticae* on different faba bean varieties.

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الملخص العربي

تقلبات تعداد آكاروس العنكبوت الأحمر *Tetranychus urticae* Koch والتربس
المفترس *Scolothrips longicornis* Priesner على بعض أصناف الخيار
والفاصوليا تحت ظروف الصوب

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تم دراسة تقلبات تعداد آكاروس العنكبوت الأحمر *Tetranychus urticae* Koch والتربس المفترس *Scolothrips longicornis* Priesner على بعض أصناف الخيار والفاصوليا تحت ظروف الصوب في مركز الأبحاث التجريبية بجامعة المنيا - منطقة شوشة خلال موسمين متتاليين (٢٠٠٧ / ٢٠٠٨).
أوضحت النتائج أن كل من آكاروس العنكبوت الأحمر والتربس المفترس لهما قمة تعداد واحدة على الخيار والفاصوليا. وقد سجل أعلى تعداد في الأسبوع الثاني والثالث من أبريل على الفاصوليا والخيار في كل من الموسمين على التوالي.
أيضا أظهرت النتائج أن أصناف الخيار اختلفت في إصابتها بآكاروس العنكبوت الأحمر. فقد سجل صنف نيل *Nile* و *Katia* أعلى متوسط في أعداد البيض والأطوار المتحركة لآكاروس العنكبوت الأحمر متبوعا بصنف *Passandra* بينما سجل صنف *Asna* أقل متوسط ، كذلك سجلت أصناف الفاصوليا اختلاف معنوي بين الأصناف تحت الدراسة في درجة إصابتها بالآكاروس. بصفة عامة أوضحت النتائج أن أصناف الخيار كانت أقل تعرضا للإصابة بآكاروس العنكبوت الأحمر عن أصناف الفاصوليا تحت ظروف الصوبة.
على جانب آخر، أظهرت نتائج التحليل الإحصائي أن هنالك ارتباط موجب بين كل من تعداد البيض والأطوار المتحركة لآكاروس العنكبوت الأحمر وتعداد التربس المفترس على كل أصناف الخيار والفاصوليا تحت الدراسة. من ناحية أخرى ، كان لأصناف الخيار تأثير على درجة الخصوبة لآكاروس العنكبوت الأحمر بينما لم يوجد تأثير لأصناف الفاصوليا.