

MITES INFESTING THREE VEGETABLE CROPS IN ASSIUT GOVERNORATE

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ABSTRACT

A field experiment was carried out in El-Kossia district, Assiut Governorate during early summer plantations of 2013 and 2014 in order to study numerical density of three phytophagous mites (i. e. *Tetranychus urticae* Koch, *Tetranychus cucurbitacearum* (Sayed) (Acari: Tetranychidae) and *Aculops lycopersici* (Masse) (Acari: Eriophiidae)) inhabiting three vegetable crops squash, *Cucurbita pepo* L.; common bean, *Phaseolus vulgaris* L. and tomato, *Lycopersicon esculentum* Miller, in addition to study the survey of the soil mites under the previous three vegetable plantations.

Results indicate that *T. urticae* Koch infested the three vegetable crops; *T. cucurbitacearum* (Sayed) infested squash and the common bean. While *A. lycopersici* was found only on tomato plantations. The survey study revealed the presence of 33 mite species belonging to 20 families. The Mesostigmata mites ranked the first as they included the highest numbers of species (13 species) followed by the Cryptostigmata mites (11 species); the Prostigmata (6 species) and the Astigmata (3 species).

The results obtained in the present study should be taken into account in planning programs when conducting the integrated pest management in the three previous vegetable fields. On the other side, it must be performed exclusively survey for all mite species on either the green leaves or soil beneath of those vegetable plants at Assiut area.

Keywords: Squash, common bean, tomato, *Tetranychus urticae*, *T. cucurbitacearum*, *Aculops lycopersici*, soil mites, survey.

INTRODUCTION

The squash, *Cucurbita pepo* L. is one of the most popular vegetable crop grown in more than one season. It's ranked the second among the popular cucurbits preceded by water melon (El-Dars *et al.*, 2013).

The common bean, *Phaseolus vulgaris* L. is one of the important crop that fit for foreign and local markets, highly yielding seeds legume, it's one of the productive protein-rich fodder plants. In Egypt used for providing a cheap source of protein (Wahba *et al.*, 1986).

The tomato, *Lycopersicon esculentum* Miller is one of the most important vegetable crop in Egypt, for fresh consumption, processing and exportation (Ayad *et al.*, 2003).

The abovementioned vegetable plants are liable to be infested by several phytophagous mites, *Tetranychus urticae*; *T. cucurbitacearum* and *Aculops lycopersici* that cause severe damage to the plants by feeding on the plant sap in addition to plant viruses transmission (Farrag *et al.*, 1998; Omar *et al.*, 2000; Abou Attia *et al.*, 2004; Grissa & Sahraoui, 2007 and Magouz *et al.*, 2011).

The survey of soil mites inhabiting the soil beneath of the three vegetable crops (squash, common bean and tomato) may play an important role of the environmental balance of microorganisms in soil. However, the potential of using mites as biological control agents had rarely been studied (Abdel-Rahem, 1989; Trottin *et al.*, 1989; Abo-Donia, 1994; Tadros & Saad, 1995 and Ashoub *et al.*, 2006). Attention should be paid to study the role played by the predacious mite species in reducing the phytophagous pests. The objective of the present investigation is to study the average numbers of phytophagous mite species (*T. urticae*, *T. cucurbitacearum* and *A. lycopersici*) inhabiting squash, common bean and tomato, in addition, to study the survey of the soil mites under the soil of the previous vegetable crops.

MATERIALS AND METHODS

Experiments were conducted at El-Kossia district, Assiut Governorate during early summer plantations of 2013 and 2014 growing seasons in order to study the average numbers of phytophagous mites (movable stages) (*Tetranychus urticae*, *T. cucurbitacearum* and *Aculops lycopersici*) infesting squash, common bean and tomato vegetable crops. Area of about one feddan was equally divided between the previous hosts, and arranged in a complete randomized block design with four replicates for each vegetable crop. The plot area was about 17.5 m² comprising 5 rows of 70 cm apart and each of 5 m long. Sowing dates were 17th and 16th of February during 2013 and 2014 seasons. All the normal agricultural practices were followed and no insecticides were applied during the experimental period. Three weeks after planting till the end of the growing seasons, ten leaves representing all plant levels were weekly picked from each plot, kept in paper bags to be microscopically examined in the laboratory. The number of movable stages of mites were counted and recorded.

In order to study the survey of the soil mites under the soil of squash, common bean and tomato vegetable crops, 500 g of soil were fortnightly taken using a metal cylinder of one cubic liter at 20 cm depth under the plants (Wafa *et al.*, 1965). Mites were extracted by using a modified Berlese's extractor apparatus and allowed to fall into small jar containing 75% ethyl alcohol + 5% glycerol. After one week, mites were isolated in small vials using a camel hair brush to avoid destruction of mite individuals, then transferred into concaved slide containing lactic acid used for mites clearing. The permanent preparations of mites were used before identification. The identification of mites was based on illustrated keys by: Krantz (1978); Zaher (1986a and b) and Evans (1992).

Statistical analysis adopted for this study was the analysis of variance (ANOVA) procedure and the L.S.D. values were used to determine the significance between means of mites.

RESULTS AND DISCUSSION

A-Mites infesting leaves of squash, common bean and tomato plantations:

I- *Tetranychus urticae* Koch:

Data in Tables (1 and 2) showed weekly changes in the population of *T. urticae* Koch (movable stages) on the three vegetable crops (squash, common bean and tomato) during the two seasons of 2013 and 2014. The *T. urticae* appeared during the 4th week of March in small average numbers of individuals (9.75, 9.00 and 2.00) and (16.50, 8.25 and 3.25) on squash, common bean and tomato plants during 2013 & 2014 seasons, respectively. Thereafter, the population increased gradually in April to reach 21.75, 23.00 and 7.75 and 26.50, 28.50 and 8.00 on squash, common bean and tomato, in both growing seasons, respectively. The average numbers of *T. urticae* decreased relatively during May (17.50, 11.25 and 2.25) and (19.00, 16.00 and 7.25) on squash, common bean and tomato, in both seasons, respectively.

The highest general mean numbers of *T. urticae* on squash 49.00 and 62.00 followed by common bean (43.25 and 52.75) and tomato (12.00 and 18.50) during the two seasons, respectively. The present findings are in quite proportional with those obtained by Pata (1991); Abo-El-Khear *et al.* (1999); Aggour *et al.* (2002); Hagrass *et al.* (2008) and El-Lakwah *et al.* (2010).

II- *Tetranychus cucurbitacearum* (Sayed):

Data in Tables (1 and 2) demonstrated weekly changes in the population of *T. cucurbitacearum* during 2013 and 2014 seasons. April recorded the highest mean numbers (14.25 and 10.25) and (17.00 and 13.75) of the pest (movable stages) in both growing seasons on squash and common bean, respectively. While May recorded an average numbers of 9.75 and 6.00 and 12.25 and 7.00 of the pest during both seasons on squash and common bean, respectively.

Table (1): Average numbers of mites on three vegetable crops (40 leaves/crop) at Assiut during 2013 growing season.

Date	<i>T. urticae</i>			<i>T. cucurbitacearum</i>		<i>A. lycopersici</i>
	Squash	Common bean	Tomato	Squash	Common bean	Tomato
10/3/2013	2.00	1.50	0.25	0.75	0.50	0.50
17	2.50	1.75	0.25	1.00	0.50	0.75
24	2.50	2.25	0.25	1.25	0.75	0.75
31	2.75	3.50	1.25	2.00	1.00	1.75
Mean	9.75	9.00	2.00	5.00	2.75	3.75
7/4	3.00	5.50	2.00	2.50	1.50	2.50
14	4.75	6.00	2.25	3.25	2.25	3.00
21	6.25	6.75	2.50	3.75	2.75	3.50
28	7.75	4.75	1.00	4.75	3.75	2.50
Mean	21.75	23.00	7.75	14.25	10.25	11.50
5/5	5.75	3.50	0.75	4.25	2.75	2.00
12	4.50	3.00	0.75	3.00	1.75	1.25
19	3.75	2.50	0.50	1.75	1.00	0.75
26	3.50	2.25	0.25	0.75	0.50	0.50
Mean	17.50	11.25	2.25	9.75	6.00	4.50
G. Mean	49.00	43.25	12.00	29.00	19.00	19.75

L.S.D. 5% mites 4.801

Also, data showed that, the highest general mean numbers of *T. cucurbitacearum* (Sayed) on squash (29.00 and 35.75) followed by common bean (19.00 and 24.50) through the two seasons, respectively, these results confirm those obtained by Atalla *et al.* (1970); Zeid & Herakly (1974); Hagrass *et al.* (2008b) and Ghallab *et al.* (2014).

Table (2): Average numbers of mites on three vegetable crops (40 leaves/crop) at Assiut during 2014 growing season.

Date	<i>T. urticae</i>			<i>T. cucurbitacearum</i>		<i>A. lycopersici</i>
	Squash	Common bean	Tomato	Squash	Common bean	Tomato
9/3/2014	2.75	1.75	0.50	0.75	0.50	0.75
16	3.75	2.00	0.50	1.25	0.75	0.75
23	4.75	2.00	1.00	1.75	1.00	1.25
30	5.25	2.50	1.25	2.75	1.50	2.25
Mean	16.50	8.25	3.25	6.50	3.75	5.00
6/4	5.50	6.00	1.50	3.00	2.50	3.75
13	6.25	7.00	1.75	4.00	3.25	4.50
20	6.50	7.00	2.00	4.75	4.25	5.00
27	8.25	8.50	2.75	5.25	3.75	4.75
Mean	26.50	28.50	8.00	17.00	13.75	18.00
4/5	7.75	4.75	2.75	4.75	3.00	3.25
11	4.50	3.75	3.25	3.50	2.00	2.50
18	3.50	3.75	0.75	2.25	1.25	1.75
25	3.25	3.75	0.50	1.75	0.75	1.25
Mean	19.00	16.00	7.25	12.25	7.00	8.75
G. Mean	62.00	52.75	18.50	35.75	24.50	31.75

L.S.D. 5% mites 6.287

II- *Aculops lycopersici* (Masse):

Results in Tables (1 and 2) revealed the average numbers of *A. lycopersici* on tomato vegetable crop.

In 2013 season, one peak number was recorded on tomato in the third week of April with an average number of 3.50 individuals and the general mean number of mite was 19.75. In 2014 season, the peak number of *A. lycopersici* on tomato was recorded through the third week of April with an average number of 5.00 mite individuals; also the general mean number of mite was 31.75 individuals. Similar results were recorded earlier by Kay (1986); Wangmei (2008); Abdel-Azeim *et al.* (2010); Glas (2013) and Houten *et al.* (2013).

Generally, the average numbers of phytophagous mites, *T. urticae*, *T. cucurbitacearum* and *A. lycopersici* took the same trend in the two seasons. April was the most favorable month for mites' activity. On the other hand, the mites population in 2014 season was more than that recorded in 2013 season, this may be due mainly to the changes in the climatic factors (i.e. temperature and relative humidity)

Therefore, the control measure of the previous mites must be applied before April by using the recommended and more safe acaricides.

B- Mites inhabiting soil of squash, common bean and tomato plantations:

Data in Table (3) showed the mite fauna extracted from the soil under squash, common bean and tomato plants during 2013 and 2014 seasons.

The survey of mites proved the occurrence of 33 mite species belonging to 29 genera and 20 families. Of these 13 Mesostigmata mite species pertaining to 8 families, 11 Cryptostigmata species belonging to 5 families, 6 Prostigmata species belonging to 6 families and 3 Astigmata species belonging to a single family.

Table (3). Checklist of mites species so far reported from soil under squash, common bean and tomato plantations during 2013 and 2014 seasons in Assiut Governorate.

Order	Sub-order	Family	Scientific name	
Prostigmata	Actinedida	Cynaxidae	<i>Cunaxa</i> sp.	
		Pyemotidae	<i>Pyemotes</i> sp.	
		Tarsonemidae	<i>Tarsonemus</i> sp.	
		Cheyletidae	<i>Cheyletus malaccensis</i> (Oudemans)	
		Eupodidae	<i>Eupodes</i> sp.	
		Nonorchestidae	<i>Speleorchestes</i> sp.	
Cryptostigmata	Oribatida	Oppiidae	<i>Oppia bayoumi</i> Shereef & Zaher	
			<i>Oppia stinikovae</i> (Shereef)	
			<i>Oppia concolor</i> Koch	
			<i>Steroppia</i> sp.	
			Oribatulidae	<i>Oribatula tadrosi</i> (Popp)
				<i>Zygoribatula sayedi</i> El-Badry & Nasr
			Galumnidae	<i>Pilogalumne ornatula</i> Grandjean
				<i>Galumna</i> sp.
			Epilohmanniidae	<i>Epilohmannia cylindrical</i> (Berl.)
				<i>Epilohmannia pallida</i> (Bayomi)
Astigmata	Acaridida	Belbidae	<i>Belba</i> sp.	
		Acaridae	<i>Rhizoglyphus robini</i> Claparede	
			<i>Tyrophagus putrescentiae</i> (Schrank)	
Mesostigmata	Gamasida	Parasitidae	<i>Parasitus</i> sp.	
		Ascidae	<i>Blattiosocius</i> sp.	
			<i>Lasioscuis</i> sp.	
			<i>Protogamesellus denticus</i> Nasr	
			<i>Protogamesellus aegyptica</i> Nasr	
			<i>Proctolaelaps orientalis</i> Nasr	
			<i>Ololaelaps bregetovae</i> (Shereef & Soliman)	
			Rhodacaridae	<i>Rhodacarus</i> sp.
			Ologamasidae	<i>Gamasiphis parpulchellus</i> Nasr & Mersal
			Laelapidae	<i>Laelapus astronomicus</i> (Koch)
			Bachylaelapidae	<i>Pachylaelaps aegypticus</i> Hafez & Nasr
			Uropodidae	<i>Urobovella ovalis</i> Hirshmann
			Phytoseiidae	<i>Amblyseius ovatus</i> (German)

From the abovementioned survey (Table 3) the Mesostigmata and the Cryptostigmata mite species ranked the first as they included the highest

numbers (13 and 11 species), followed by Prostigmata (6 species) and Astigmata (3 species).

The obtained results are in agreement with those obtained by Sharshir *et al.* (2003) who stated that Cryptostigmata and Mesostigmata mites were the most frequent and abundant followed by Prostigmata and Astigmata mites in the survey of soil samples under cucumber and tomato plants.

Also, in harmony with these results, Abou El-Saad (2006) reported that the Mesostigmata and Cryptostigmata mites in the soil of cucumber and common bean, were found to be predominated over other groups of mites such as Prostigmata and Astigmata.

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الأكاروسات التي تهاجم ثلاث محاصيل خضري في محافظة أسيوط

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أجريت هذه الدراسة في مركز القوصية - محافظة أسيوط خلال موسمي الزراعة الصيفي المبكر ٢٠١٣، ٢٠١٤ وذلك لدراسة الأكاروسات النباتية، أكاروس العنكبوت النوع الأخضر *Tetranychus urticae* Koch والنوع الأحمر *T. cucurbitacearum* (Sayed) وأكاروس صدأ الطماطم *Aculops lycopersici* (Masse) التي تهاجم ثلاث محاصيل خضري (الكوسة، الفاصوليا والطماطم). لقد أظهرت النتائج تواجد العنكبوت الأخضر علي محاصيل الخضر الثلاث بينما النوع الأحمر تواجد علي الكوسة والفاصوليا، أما أكاروس صدأ الطماطم وجد فقط علي نباتات الطماطم. كما تم دراسة الأكاروسات المتواجدة بالتربة في محاصيل الخضر الثلاث حيث أظهرت النتائج عن تواجد ٣٣ نوع من أكاروسات التربة تتبع عشرون فصيلة وتقع تحت أربع رتب أكاروسية (*Mesostigmata*، *Prostigmata* و *Astigmata*) وكانت أكثر الأنواع تواجدا هي التي تقع تحت رتبتي ذات الثغر المتوسط *Mesostigmata* ورتبة مختفية الثغر *Cryptostigmata* (١٣ و ١١ نوع) علي التوالي. بينما رتبة ذات الثغر الأمامي *Prostigmata* (٦ أنواع) وأخيراً رتبة عديمة الثغر *Astigmata* (٣ أنواع). بناء علي النتائج المتحصل عليها في هذا البحث فإنه يمكن رش المركبات الأكاروسية الآمنة والموصي بها علي الأكاروسات النباتية المتواجدة بمحاصيل الخضر الثلاث السابق الإشارة إليها خلال شهر مارس من كل عام لوصول مجموع الأكاروسات النباتية لأعلي متوسط خلال شهر أبريل.