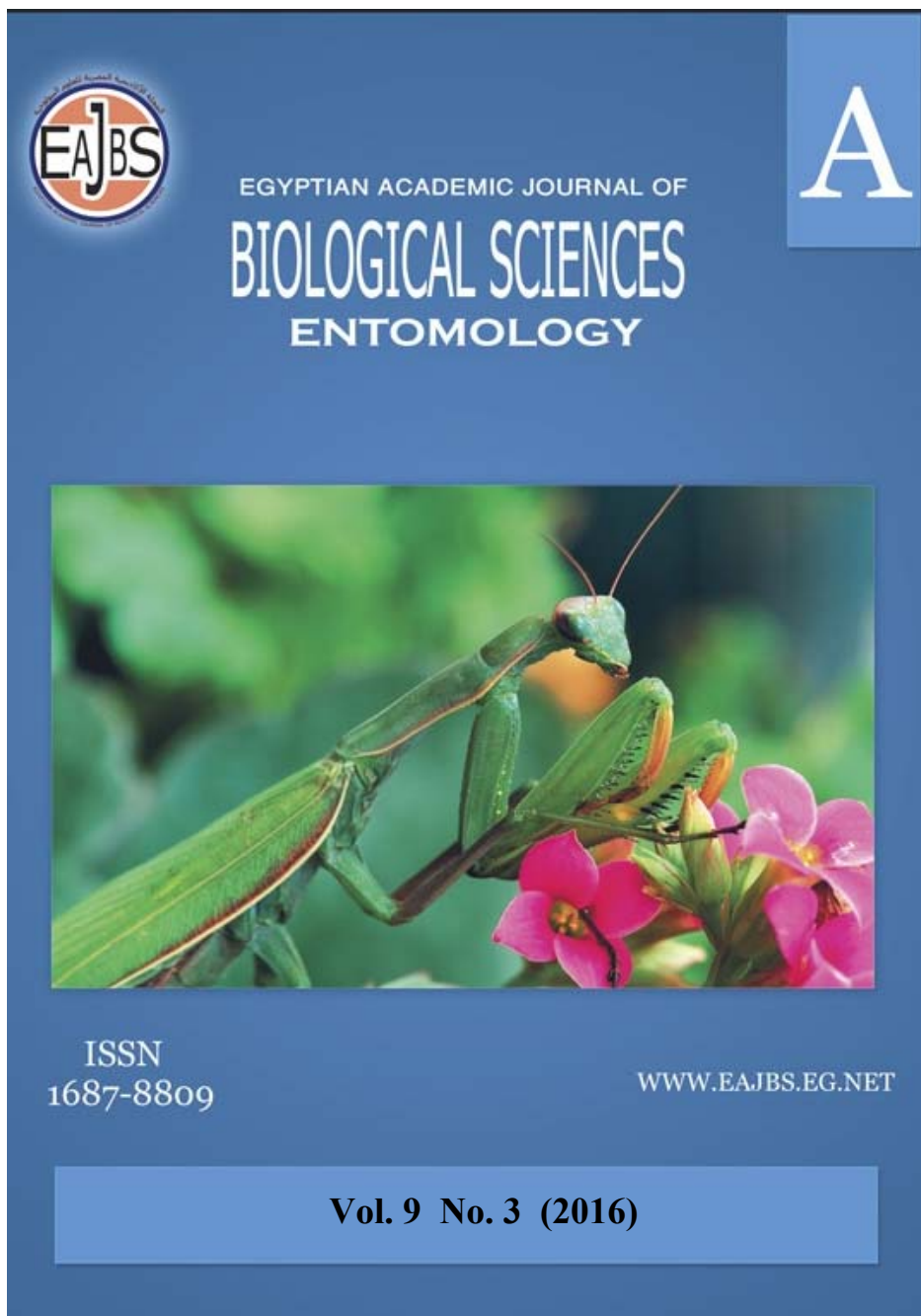
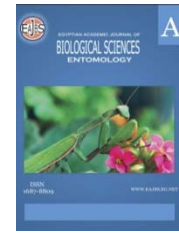


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The effect of Intercropping Tomato with Garlic Plants on the Corresponding infestation with some Pests at Beni-Suif Governorate

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ABSTRACT

An experiment was conducted in a field at Beni Suif Governorate to estimate the effect of intercropping of garlic plants on the population of different pests, mites, *Tetranychus urticae*, Thrips, *Thrips tabaci* and tomato leaf miner, *Tuta absoluta* with tomato plants during the cultivated seasons, 2014 and 2015. The obtained results indicated that the populations of the two spotted spider mite, thrips and *T. absoluta* recorded 144.3, 111.3, 222.4 with an average of 16.03, 12.37 and 24.71 individuals in case of tomato solely, during 2014 season, respectively, which changed to 630, 420 and 77.7 with an average number of 70, 46.67 and 8.63 individuals of the same pests in case of tomato plants intercropped with garlic, respectively in the same year. On the other hand, the population of the collected pests were 199.6, 77.4 and 261.3 individuals during 2015 season for tomato plants without intercropping with an average of 22.178, 8.6 and 29.03 individuals, respectively, while in case of intercropping system, these numbers were 498.4, 271 and 69.6 with an average of 55.378, 30.11 and 7.73 individuals, respectively when the tomato plants intercropped with garlic plants. The results showed that the correlation was positively between the factors on the population of different pests in case of tomato plants only and in case of application of intercropping method with garlic plants.

INTRODUCTION

Intercropping considers the agricultural practices of cultivating two or more crops in the same habitat. It is commonly used in tropical zones, Altieri (1991), but in Egypt is far or less widespread. Intercropping may demonstrates reliable crop yield or the treatment of related pests. Intercropping of compatible plants also encourages biodiversity, by providing a habitat for a Variety of insects and soil bio-components that would not be occurred in a single crop inhabiting selected environment. This biodiversity can in turn help to limit outbreaks of crop pests, Altieri (1994) by increasing the diversity of abundance of related natural enemies. such as spiders or parasitic wasps. Such method demonstrates good results in Fayoum eco-system, based on wheat and clover, Ghabbour *et al.*, (1994), and when using tomato and faba bean & tomato and termis, Rizk and Mikhail, (2000). Several advantages have been attributed to this polyculture system, one of the harbor lower susceptibility to pests and diseases infestation, Trenbath (1974); and Dash *et al.*, (1987).

Disadvantages of intercropping was reported by Tantawy *et al.*, (1992), who reported that certain crop combination in the intercropping system may increase damage losses. Jones and Gillett (2005) indicated that sunflower plantings within rows of vegetable crops may indeed be an effective way to attract beneficial insects inhabiting cropped fields. The tomato leaf miner *Tuta absoluta* (Meyrick) became a serious pest to tomato cultivations in Egypt since 2009, where it causes great damage to the crop. Egypt has an appropriate climate for tomato cultivation and the annual production of the crop is 9 204 097 tons of tomato fruits from about 9 000 ha of the cultivated area (Moussa *et al.*, 2013). So, it is considered as the fifth largest tomato producer in the world (WPTC, 2011).

MATERIALS AND METHODS

Field trials were carried out at Mimouna Village, Wasta District at Beni Suif Governorate ecosystem during the tomato (50-43 hybrid Varsity) cultivated seasons 2014 and 2015. A field of one feddan was divided into three equal areas. The tomato tested variety was sown in mid of January of the two seasons, in complete randomized blocks. Each area included four similar replicates. Tomato plants were planted in hills with 3 cm depth and 40 cm apart. The natural agricultural practices were conducted including weeding, no insecticides used and irrigation was every 3 weeks. The garlic Varsity (Red China) cultivated during mid of October 2013 and 2014. The harvested date of garlic was during the beginning of April but the tomato crop was harvested during the end of April 2014 and 2015. The examination of samples was carried out as follows:

- 1- The two spotted spider mite, *Tetranychus urticae* Koch. Samples of 10 leaflets were inspected early in the morning. The number of larvae, nymphs and adults were counted and recorded using the aid of a stereomicroscope.
- 2- Thrips; samples were made by collecting 20 leaflets/ plants and dusting them on a white paper sheet. Thrips were collected, categorized, counted and kept in 70 % ethanol until examination by stereomicroscopes.
- 3- Tomato Leaf Miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae): *T. absoluta* was investigated and collected by the naked eye, where the insect live inside the leaf tunnels.

RESULTS AND DISCUSSION

In this experiment, monitoring the effect of garlic plants intercropping with tomato was considered based on the population densities and the rate on infestation of spider mites, thrips and tomato leaf miner, *Tuta absoluta* and the obtained results were represented in Tables (1-4).

2014 cultivated season:

As shown in Table (1) the spider mites population on tomato plants (without intercropping) begin with lower number 1.7 mites during the beginning of March, which increased gradually to reach the highest abundance in the end of the first season 2014 (46 individuals). On the other hand the population of thrips began with low numbers, which increased gradually reaching to the highest abundance during mid of April of the same cultivated season (35.3 insect), which in turn decreased tomato plants only to the end of season. However, the insect *Tuta absoluta* population represented in all counting sampling dates but the peak of this pest was noticed during the first of June (60.7 individuals), Table (1). The tabulated data in Table (2)

showed the population of *T. urticae* in the same season 2014 but when the tomato plants were intercropped with garlic plants as the population was highest in case of intercropping and recorded 180.7 mites during the end of season (180.7 individuals). The same table showed that the population of thrips during the same cultivated season when application of intercropping method reached to its peak on tomato plants during mid of April (100.7 individuals), while *T. absoluta* population recorded 20 insect (highest abundance) during the end of season, when tomato plants intercropped with garlic, Table (2).

Table 1: Population of the different pests inhabiting tomato plants without intercropping during 2014 cultivated season

Sampling dates	Population of different pests		
	Spider mite	Thrips	<i>Tuta absoluta</i>
February 1	0	0	0.7
15	0	2	2.7
March 1	1.7	4	5.3
15	3.3	11.3	12
April 1	11.3	20.7	23
15	18	35.3	32.7
May 1	28	24.7	39.3
15	36	13.3	46
June 1	46	0	60.7
Total number	144.3	111.3	222.4
Mean	16.03	12.37	24.71

Table 2: Effect of tomato intercropping with garlic plants on the population of different pest during 2014 cultivated season

Sampling dates	Population of different pests		
	Spider mite	Thrips	<i>Tuta absoluta</i>
February 1	0	4.6	0
15	4.3	10.7	1.3
March 1	15.3	37.3	4
15	28.7	60	5.7
April 1	52.3	82	7.3
15	83.3	100.7	10.7
May 1	118.7	74	12
15	146.7	38.7	16.7
June 1	180.7	12	20
Total number	630	420	77.7
Mean	70.0	46.67	8.63

2015 cultivated season:

As shown in Table (3), the levels of infestation by *T. urticae* on tomato plants alone reached to 60 different mite stages during first of June 2015 in comparison with 141.3 mites in the same period when the tomato plants intercropped with garlic plants. The total number of *T. urticae* when the tomato plants sown alone recorded 199.6 different stages with an average number of 22.18 mites changed to 498.4 with an average of 55.4 mites when tomato plants intercropped with garlic plants during the cultivated season 2015. On the other hand the total number of Thrips during the cultivated season 2015 was 77.4 insect when the tomato sown alone, with an average of 8.6 insect, Table (3) which changed to 30.11 insect with an average of 30.11 individuals when intercropping with garlic method was applied, Table (4). The leaf miner, *T. absoluta* population recorded the total number of 261.3 insect with an average number of 29.3 insect when the tomato plants were sown without

intercropping with garlic plants, Table (3), while the total number of the pest recorded 69.9 with an average mean number of 7.73 insect as in case of intercropping application, Table (4). The statistical analysis of obtained data, Tables (1-4) indicated that the L.S.D. at 0.05 level was 30.185, 16.03 and 11.197 for mites, thrips and tomato leaf miner, respectively.

Table 3: Population of the different pests inhabiting tomato plants without intercropping during 2015 cultivated season

Sampling dates	Population of different pests		
	Spider mite	Thrips	<i>Tuta absoluta</i>
February 1	0	0	0
15	0	0.7	2
March 1	2.6	4	6
15	6	6	21.3
April 1	16.7	12	29.3
15	26	23.3	42
May 1	39.3	39.3	50.7
15	49	22.7	64.
June 1	60	8.7	46
Total number	199.6	77.4	261.3
Mean	22.178	8.6	29.03

Table 4: Effect of tomato intercropping with garlic plants on the population of different pest during 2015 cultivated season

Sampling dates	Population of different pests		
	Spider mite	Thrips	<i>Tuta absoluta</i>
February 1	0	4	0
15	3.3	12	0.3
March 1	14	31.3	3
15	22.7	1.7	3.3
April 1	44	63.7	6.7
15	59.7	85.3	8.7
May 1	90.7	23	11
15	122.7	37.3	18.3
June 1	141.3	12.7	18.3
Total number	498.4	271	69.6
Mean	55.378	30.11	7.73

L.S.D. at 0.05 levels Mites = 30.185

Thrips = 16.0317

Tuta absoluta = 11.197

The tabulated obtained data in Table (5) showed the correlation between the different factors on the population of different pests. The results showed that the correlation was positively between the factors on the population of different pests in case of tomato plants only and in case of application of intercropping method with garlic plants. The obtained results were not similar to those obtained by Hata *et al.*, (2016) when studying the effect of aromatic plants on number of two spotted spider mite (TSSM), *Tetranychus urticae*, when intercropped with strawberry was assessed in the field. The garlic plants were intercropped between rows of strawberry at three densities in greenhouse and field. The three densities of garlic plants (one, two and three rows among the strawberry rows) reduced TSSM mobile forms by 49, 53 and 60 % (greenhouse) and 44, 51 and 65 % (field), and eggs by 38, 43 and 64 % (field), respectively. The results suggest that intercropping garlic plants between strawberry rows is a promising strategy to reduce TSSM populations. A field experiment was conducted in Karnataka, India by Manjunatha *et al.*, (2001) to determine the effect of intercropping of chilli with tomato, coriander, garlic, onion, carrot, cotton, soyabean, green gram, groundnut and stylosanthes on the incidence of mites

(*Polyphagotarsonemus latus*) and Thrips [*Scirtothrips dorsalis*] on chilli. The population of Thrips was lowest, and chilli yield was highest in chilli-tomato intercropping.

Table 5: Correlation between the different factors on the population of different pests

Host	Season	Corr ®	Slope (b)	Y Int (a)
Tomato only	2014	0.176	0.127	10.323
	2015	0.609	0.351	5.191
Tomato with garlic	2014	0.123	0.064	42.16
	2015	0.122	0.062	28.363

Habashy *et al.*, (2009) studied the effect of intercropping of four aromatic plants on the population of three main pests and their associated predators with three bean varieties at Fayoum and Gharbia Governorates, Egypt. The obtained results indicated that the infestation with main sucking pests *T. urticae*, onion trips *T.tabaci* and their common association predators was higher in Fayoum than Gharbia Governorate. The intercropping with rocket plants harbored generally recorded the highest numbers of all pests compared to the bean cultivars solely (as check), while bean with mint recorded the lowest infestation on the three tested cultivars in both governorates

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RABIC SUMMERY

تأثير تحميل نباتات الطماطم مع نباتات الثوم على معدل الإصابة ببعض الآفات في محافظة بنى سويف

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اجريت الدراسة الحقلية فى محافظة بنى سويف لدراسة تأثير تحميل نباتات الثوم على معدل الإصابة ببعض الآفات مثل العنكبوت الاحمر ذى البقعين *Tetranychus urticae* و التريبس *Thrips tabaci* و صانعات انفاق الطماطم *Tuta absoluta* على نباتات الطماطم موسمي ٢٠١٤ و ٢٠١٥. حيث تشير النتائج المتحصل عليها ان تعداد الآفات السابقة الذكر هو ١٤٤.٣ و ١١١.٣ و ٢٢٢.٤ بمتوسط تعداد مداره ١٦.٠٣ و ١٢.٣٧ و ٢٤.٧١ فرد على نباتات الطماطم المنزرعة منفردة على الترتيب تغيرت لتسجل ٦٣٠ و ٤٢٠ و ٧٧.٧ بمعدل متوسط تعداد مداره ٧٠ و ٤٦.٦٧ و ٨.٦٣ فردا على الترتيب وذلك على نبات الطماطم المحملة بنباتات الثوم وذلك فى موسم الزراعة الاول ٢٠١٤. ومن ناحية اخرى سجلت الآفات محل الراسة تعدادا مقداره 199.6 و 77.4 و 261.3 لكل من العنكبوت الاحمر والتريبس وصانعات انفاق الطماطم على التريبس بمتوسط تعداد مقداره 22.178 و 8.6 و 29.03 فرد على نباتات الطماطم الغير محملة فى موسم الزراعة 2015 والتي تغيرت لتسجل تعدادا مقداره 498.4 و 271 و 69.6 بمتوسط مقداره ٥٥.٣٧٨ و ٣٠.١١ و ٧.٧٣ فردا على الترتيب عند تحميل نباتات الثوم على نباتات الطماطم.