

FURTHER ECOLOGICAL STUDIES ON ONION PESTS IN EGYPT

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Abstract

Field studies were carried out in Egypt during 2003/4 and 2004/5 seasons to determine the main pests of onion, their occurrence time and associated predators in addition to further studies of *Thrips tabaci* Lind. on different varieties in different regions during both seasons. Results obtained showed that seven main insect pests, 6 insect predators and 4 true spider predators were present on onion plants.

The population density of *T. tabaci* was higher in 2004/5 than 2003/4 season. The investigated regions could be arranged descendingly according to the total mean numbers of thrips (nymphs and adults) per plant as, Beni-Swief (64.01), Fayoum (44.91), Quna (39.81), Aswan (23.77) and Kafr-El-Shiekh (6.93 insect/plant). Giza 20, was the highest susceptible variety for thrips infestation as resulted a general mean for both seasons, 36.7 insect/plant followed by Giza 6 (35.4) then Shndawil 1 (29.0) while Behiry var. was the least susceptible one (16.0). Thrips attack onion in nursery and perennial field and its population peaked on March. Behiry var. is highly infested by thrips under Fayoum than Kafr-El-Shiekh conditions.

INTRODUCTION

Onion *Alium cepa* L. is an important field crop cultivated in all over Egyptian regions for fresh green onion or onion bulbs. Different onion varieties are attacked with many insect pests from seedlings until harvest causing sever damage to the plants and yield.

Onion thrips *Thrips tabaci* Lind. is the most damaging insect pest of onions in the tropics. Both adults and immaturs attack onion plants in Texas from Feb. until harvest in April or May with peak during early April (Edelson *et al.*, 1986). In Egypt, Haydar and Sherif, 1987 mentioned that, the onion maggot *Delia alliaris* causes minor losses whereas a small population was present throughout the season. Also, Hamdy and Salem 1994 found that, *T. tabaci* spends five generations on onion plants from mid Jan. to mid June. In Fayoum, thrips was evident from mid-December to mid-May with two peaks (El-Gendi, 1998). Duchovskiene (2003) found that, *Myzus persicae*, *Delia antique* and *Eumerus tuberculatus* infest onion plants grown in Lithuania.

The present work aims to determine the occurrence time of main onion pests and their associated predators and also to study the population of *T. tabaci* on two cultivars at two localities in addition to throw the light on population density of thrips in five different regions of Egypt and susceptibility of four onion cultivars to thrips infestation.

MATERIALS AND METHODS

Pests of Onion and Population Density of *T. tabaci*:

Onion seeds of Giza 20 and Behiry varieties were sown in nursery beds on 15th October, 2003 in Fayoum and Kafr-El-Shiekh. In 2004/5 season, only var. Giza 20 was sown in Fayoum in the same date. The experimental area for each region was 1/3 feddan, divided into 4 equal plots. Seedlings were transplanted to perennial field on 15th December. The experimental field received the normal agricultural practices and no insecticides were applied in both seasons.

Two weeks after sowing, the experimental area was examined and sweeping net samples were conducted every 10 days intervals from the nursery and subsequent perennial field to determine the occurrence period of the main onion pests and associated predators in Fayoum.

To study the population density of *T. tabaci* a sample of 5 plants of each plot was randomly collected after seedlings emergence until harvest within 10 days intervals. The samples were transferred to the laboratory and examined with stereomicroscope to record numbers of both nymphs and adults.

Population density of *T. tabaci* in certain varieties at different locations:

Three samples of 20 plants from each of the four varieties (Giza 20, Giza 6, Behiry and Shndawil 1) that cultivated on 15th December at farmer fields (experimental area received the normal agriculture practices and no insecticides were used) in Beni-Swief, Fayoum, Quna, Aswan and Kafr-El-Shiekh were collected in the same time during the maximum abundance of thrips in March in 2003/4 and 2004/5 seasons. The samples were transferred to the laboratory and the plants were examined for counting nymphs and adults of thrips. Obtained numbers were calculated apart from region or variety to obtain population density in different regions or susceptibility of onion varieties to thrips infestation. Data were analyzed with analysis of variance (ANOVA) test.

RESULTS AND DISCUSSION

1- Survey and occurrence time of onion pests and associated predators:

Field observations of insect pests and associated predators on onion plants (Giza 20 var.) from seedlings until harvest throughout 2003/4 and 2004/5 seasons in Fayoum showed that, 7 main insect pests, 6 insect predators and 4 true spider predators are presented as follows:

A- Pests:**The main pests of onion plants and their occurrence time were:**

- 1- *Gryllotalpa gryllotalpa* (L.) [Orthoptera : Gryllotalpidae] (mid Oct. – mid Dec.)
- 2- Cotton and onion thrips *Thrips tabaci* Lind. [Thysanoptera : Thripidae] (mid Nov. – early April)
- 3- Aphids a- *Aphis gossypii* Glov. b- *Myzus persicae* (sulz.) [Homoptera : Aphididae] (mid Nov. – early April)
- 4- Onion maggot *Delia alliaris* (Mg.) (Diptera: Anthomyiidae) (mid Nov. – early May)
- 5- Onion bulb fly *Eumerus amoenus* Loew (Diptera: Syrphidae) (mid March– early May)
- 6- Dried fruit beetle *Carpophilus hemipterus* Linne (Coleoptera : Nitidulidae) (end March – early May)

B- Insect Predators:

Aeolothrips fasciatus, *Coccinella undecimpunctata*, *Cryptolaemus montrouzieri*, *Syrphus corollae*, *Orius albidipennis* and *Chrysoperla carnea* (end February - early May).

C- True spider predators:

Lycosa glosa (Lycosidae), *Theridion tepidariorum* (Therididae), *Tapinopa bilineata* (Limyphiidae) and *Thanatus formicinus* (Philodromidae) (mid February - early May).

2- Population density of *T. tabaci* on onion (var. Giza 20) in Fayoum:

Data presented in Table (1) revealed that, onion thrips infestation (both nymphs and adults) were started in the nursery from November, 10th (25 days after planting) and remaining till harvest on May, 9th. The numbers increased steadily to a peak in perennial field (40.0 & 58.3 insect/plant) during the 3rd week of March when plants aged 150 days in 2003/4 and 2004/5, respectively then a sharp decline was recorded in the end of April during both seasons. Adult infestation started earlier than nymphs, the total minimum population densities were 0.2 and 0.5 insect/plant on November, 10th while the maximum were on March, 20th being 40 and 58.3 insects/plant in 2003/4 and 2004/5 seasons, respectively. Haydar and Sherif (1987) found that population of *T. tabaci* on onion began to build up in early February and reached a maximum during April, May and June. Also, Lu and Lee (1987) in Taiwan mentioned that, population density of thrips increased from November to April (especially in the low-temperature period of February-March) and fell sharply when temperatures were higher. In Brazil, Lorini and Ferreto (1991) found that, the population density of *T. tabaci* on onion increased with an increase in temperature combined with lack of rain the highest population density was 43 insects/plant.

Table 1. Population density of *T. tabaci* on Giza 20 onion var. in Fayoum during 2003/2004 and 2004/2005 seasons.

Inspection date	Plant age (days)	Mean no. thrips/plant					
		2003/4			2004/5		
		nymph	adult	total	nymph	adult	total
Nursery							
Oct. 31	10	0.0	0.0	0.0	0.0	0.0	0.0
Nov. 10	20	0.0	0.20	0.20	0.0	0.50	0.50
	20	0.25	0.20	0.45	1.0	0.50	1.50
	30	0.5	0.25	0.75	3.0	0.80	3.80
Dec. 10	50	0.65	0.25	0.9	5.20	1.20	6.40
	20	2.05	0.55	2.6	14.85	2.35	17.20
Perennial field							
	30	1.9	0.3	2.2	17.45	5.45	22.90
Jan. 9	80	1.25	0.45	1.7	7.60	6.75	14.35
	19	0.65	0.45	1.1	13.80	9.50	23.30
	29	0.5	1.1	1.6	17.85	6.30	14.1
Feb. 8	110	4.5	4.8	9.3	19.80	4.10	14.2
	18	16.15	12.5	28.65	14.35	6.25	20.6
	28	21.15	10.8	31.95	10.60	17.15	17.7
Mar. 10	140	5.4	4.1	38.1	20.4	6.1	26.5
	20	26.9	13.1	40.0	35.8	22.4	58.3
	30	19.15	5.55	24.7	49.4	6.5	55.9
April 9	170	31	4.85	35.85	37.9	15.8	53.7
	19	11.3	17.65	28.95	31.7	9.6	41.4
	29	12.2	2.25	14.45	7.9	0.7	8.2
May 9	200	3.4	0.3	3.7	1.8	0.5	2.3
Total		187.5	79.65	267.15	310.4	122.45	402.85

El-Gendi (1998) reported that, *T. tabaci* activity on onion varieties (Giza 20 and Behiry) at Fayoum, was evident from mid-December to mid-May with two peaks. The first peak of infestation occurred by the end of December, with 8.5 - 9.8 nymphs/plant during 1995/96 and 1996/97 seasons, respectively. The second peak occurred in mid-March with 39.0 - 56.5 nymphs/plant during the preceding seasons. In Sudan, Kannan and Mohamed (2001) noted a steady increase of thrips population from February or March and recorded a sharp decline in April.

3-Population density of *T. tabaci* on Behiry onion var. in Fayoum and Kafr-El-Shiekh during 2003/4 season:

Data presented in Table (2) showed that, the Behiry variety was more susceptible to attack with *T. tabaci* in Fayoum than Kafr-El-Shiekh conditions, whereas the total mean number of thrips through the season averaged 243.2 and

66.15, respectively. Population fluctuation showed three clear peaks in Fayoum, on January 9, February 8 and March, 30 being 9, 15.85 and 49.2 insects/plant, respectively. The peaks were not obvious in Kafr–El–Shiekh as a result of low population density of thrips. The obtained results confirmed that conditions in Kafr–El–Shiekh is relatively not favorable to thrips infestation as in Fayoum. In this respect, Hamdy and Salem (1994) in Egypt, observed three peaks of thrips abundance, through the period from mid-January to mid-June and the highest peak was on 11 April. In Qualiobia *T. tabaci* had 2 active peaks on onions during the 2nd week of March and the last week of April, Sharaf-El-Din *et al.*, (1993).

Table 2. Population density of *T. tabaci* on Behiry onion var. in Fayoum and Kafr-El-Shiekh during 2003/2004 season.

Inspection date	Plant age	Mean no. thrips/plant					
		El-Fayoum			Kafr-El-Shiekh		
		nymph	adult	total	nymph	adult	total
Nursery							
2003 Oct. 31	10	0.0	0.0	0.0	0.0	0.0	0.0
Nov. 10	20	0.0	0.0	0.0	0.0	0.1	0.1
	20	0.0	0.0	0.0	0.15	0.05	0.2
	30	0.0	0.1	0.1	0.05	0.0	0.05
Dec. 10	50	0.1	0.2	0.3	0.3	0.25	0.55
	20	0.5	0.1	0.6	0.35	0.45	0.8
Perennial field							
	30	7.45	0.25	7.7	0.25	0.5	0.75
2004 Jan. 9	80	8.15	0.85	9	0.4	0.45	0.85
	19	2.8	3.4	6.2	0.5	0.65	1.15
	29	3.5	4.6	8.1	0.6	0.8	1.4
Feb. 8	110	11.55	4.3	15.85	1.0	1.1	2.1
	18	11.65	3.65	15.3	3.95	2.85	6.8
	28	4.75	5.6	10.35	3.4	4.3	7.7
Mar. 10	140	8.5	2.8	11.3	2.35	3.95	6.3
	20	11.95	2.75	14.7	3.5	4.05	7.55
	30	31.45	17.75	49.2	3.95	3.55	7.5
April 9	170	28	4.4	32.4	4.0	4.05	8.05
	19	26.7	8.85	35.55	4.15	3.95	8.1
	29	21	3.2	24.2	2.30	2.85	5.15
May 9	200	1.6	0.75	2.35	0.3	0.75	1.05
Total		179.65	63.55	243.2	31.5	34.65	66.15

4- Population density of thrips in different regions of Egypt:

Data presented in Table (3) showed that, the mean numbers of *T. tabaci* regardless of varieties were different from region or season to another, whereas, higher in 2004/5 than 2003/4 season. In 2003/4 season the mean number of thrips per plant averaged 34.62, 32.70, 29.93, 22.35 and 6.93 for Beni-Swief, Fayoum,

Quna, Aswan and Kafr-El-Shiekh Governorates, respectively. The differences between the averages of first four regions were insignificant while they were significant when compared with the last region. In 2004/5, season such values were 57.40, 57.13, 49.70, 25.20 and 00.0 insect/plant, respectively. Because of resembling the weather conditions of Beni-Swief and Fayoum Governorates they showed nearly the same mean numbers of insects per plant, and the differences between them and the remaining regions or between Quna and Aswan were significant. According to the overall mean numbers of thrips per plant over the two seasons, the investigated regions could be arranged in descending order as Beni-Swief, Fayoum, Quna, Aswan and Kafr-El-Shiekh.

Table 3. Mean number of *T. tabaci* per plant on onion in different regions during 2003/2004 and 2004/2005 seasons.

Regions	Mean no. thrips/plant						Overall means
	2003/4 season			2004/5 season			
	Nymph	Adult	Total	Nymph	Adult	Total	
Beni-Swief	25.80	8.82	34.62a	47.05	10.35	57.40a	46.01
Fayoum	23.45	9.25	32.70a	42.65	14.48	57.13a	44.91
Quna	21.18	8.75	29.93a	43.05	6.65	49.70b	39.81
Aswan	17.04	5.31	22.35a	18.25	6.95	25.20c	23.77
Kafr-El-Shiekh	3.23	3.70	6.93b	-	-	-	6.93
LSD	14.81			2.05			

* Numbers followed by the same letters are not significantly different at 5% level.

5- Susceptibility of onion varieties to thrips infestation

Onion varieties were varied in their susceptibility to *T. tabaci* infestation as shown in (Table 4). In 2003/4 season the mean number of thrips (nymph and adults) averaged 33.48, 32.63, 24.24, and 6.93 insects/plant for Giza 20, Giza 6, Shndawil 1 and Behiry, respectively. In 2004/5 season the match varieties values were 39.92, 38.20, 33.85 and 25.02 insects/plant, respectively. According to the total general mean number of thrips over the two seasons, Giza 20 variety was relatively the highest susceptible for attacking with thrips than other varieties where the overall mean number reached, 36.70 insects/plant. On the other hand Behiry variety was the least susceptible (15.98), while Giza 6 and Shndawil 1 varieties showed intermediate means as 35.42 and 29.05 insects/plant, respectively. In Fayoum, El-Gendi (1998) found that cv. Giza 20 was relatively more susceptible to thrips infestation than cv. Giza 6 while cv. Behiry was the least susceptible to thrips infestation.

Table 4. Susceptibility of four onion varieties to *T. tabaci* infestation in 2003/2004 and 2004/2005 seasons in Egypt.

Variety	Mean no. thrips/plant						Overall mean
	2003/4 season			2004/5 season			
	Nymph	Adult	Total	Nymph	Adult	Total	
Giza 20	24.40	9.08	33.48a	34.60	5.32	39.92a	36.70
Giza 6	25.10	7.53	32.63a	31.40	6.80	38.20ab	35.42
Shndawil 1	18.07	6.17	24.24b	23.80	10.05	33.85b	29.05
Behiry	3.23	3.70	6.93c	18.07	6.95	25.02c	15.98
LSD	7.1			5.6			

* Numbers followed by the same letters are not significantly different at 5% level.

REFERENCES

1. Duchovskiene, L. 2003. Dynamics of pest harmfulness in onion crop depending on growing technique. *Sodininkyste, ir, Darzininkyste*, 22 (1): 153-163.
2. Edelson, J. V., B. Cartwright and T. A. Royer. 1986. Distribution and impact of *Thrips tabaci* (Thysanoptera: Thripidae) on onion. *J. Econ. Entomol.*, 79 (2): 502-505.
3. El-Gendi, S. M. 1998. Population fluctuation of *Thrips tabaci* Land on onion plants under Fayoum environmental conditions. *Arab-Universities J. Agricultural Sciences*, 6 (1): 267-276.
4. Hamdy, M. K. and M. Salem. 1994. The effect of plantation dates of onion, temperature and relative humidity on the population density of the onion thrips, *Thrips tabaci* Lind. in Egypt. *Ann. Agric. Science Cairo*, 39 (1): 417-424.
5. Haydar, M. F. and L. S. Sherif. 1987. Ecological aspects and developing method of onion pest control. *Bull. Entomol. Society of Egypt, Econ. Series*, 16: 119-126.
6. Kannan, H. O. and M. B. Mohamed. 2001. The impact of irrigation frequency on population density of thrips, *Thrips tabaci* (Thripidae, Thysanoptera) and yield of onion in El Rahad, Sudan. *Ann. Appl. Bio*, 138 (2): 129-132
7. Lorini, I. and M. Ferreto. 1991. Evaluation of damage of *T. tabaci* Lindeman (Thysanoptera, Thripidae) in onion cultivation. *Anais da Sociedade Entomologica do Brasil*, 20 (2): 271-275.
8. Lu, F. M. and H. S. Lee 1987. The life history and seasonal occurrence of onion thrips (*Thrips tabaci* Lindeman). *J. Agric. Res. China*, 36 (1): 118-124.
9. Sharaf-El-Din, A.A.A., I.I. Ismail, M.A. Ali and M.Y. Hashem. 1993. Effect of intercropping systems and planting methods on the population of onion pests. *Bull. Entomol. Society of Egypt*, 71: 139-152.

دراسات ايكولوجية على آفات البصل في مصر

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أجريت دراسات حقلية خلال موسمي ٢٠٠٣/٠٤ و ٢٠٠٤/٠٥ لتحديد أهم آفات محصول البصل في مصر و تواريخ تواجدها والمفترسات الحشرية والعنكبوتية المصاحبة لها بالإضافة لدراسة تعداد تريبس البصل *Thrips tabaci* Lind. في مناطق وعلى أصناف مختلفة. وأوضحت النتائج وجود سبعة آفات حشرية رئيسية وستة مفترسات حشرية وأربعة مفترسات عنكبوتية على نباتات البصل في الحقل. وكانت الكثافة العددية لتريبس البصل أعلى في الموسم ٢٠٠٤/٥ عن الموسم الأول ٢٠٠٣/٤. وكان الترتيب التنازلي لمناطق الدراسة حسب شدة الإصابة بالتريبس هو بني سويف (٤٦,٠١) - الفيوم (٤٤,٩١) - قنا (٣٩,٨١) - أسوان (٢٣,٧٧) - كفر الشيخ (٦,٩٣ فرد/نبات). و بصفة عامة كان أكثر الأصناف قابلية للإصابة بالتريبس هو صنف جيزة ٢٠ يليه الصنف جيزة ٦ ثم شندويل ١ بينما كان الصنف بحيري احمر هو أقل الأصناف قابلية للإصابة حيث كان متوسط عدد أفراد التريبس (حوريات + حشرات كاملة) لكل منهم ٣٦,٧ ، ٣٥,٤ ، ٢٩,٠ ، ١٦,٠ فرد/نبات على الترتيب. كما أوضحت دراسة التقلبات العددية للتريبس أن الإصابة تبدأ من المشتل وتستمر في الحقل المستديم ويصل التريبس لأعلى تعداد له خلال مارس. وكان تعداد التريبس على الصنف بحيري احمر أعلى تحت الظروف الجوية للفيوم عنه تحت الظروف الجوية لمحافظة كفر الشيخ.