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DEVELOPMENT OF ONION THRIPS, *Thrips tabaci* LINDEMAN, AS A FUNCTION OF CERTAIN AGRICULTURAL PRACTICES

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Abstract: The population fluctuation and development of onion thrips, *Thrips tabaci* Lindeman, on onion plants, under certain agricultural practices (locations, varieties and planting dates), was studied during two successive seasons (2004-2006). Under the traditional and newly reclaimed area, and during the two growing seasons, the obtained results revealed that the initial infestation occurred in December for Improved Giza 6 and Giza 20 varieties at the two planting dates. While, the maximum population exhibited in March for the two varieties and the tested two planting dates, except for Improved Giza 6 variety, that registed in February in the newly reclaimed area. Also, the results show that the infestation rate was lower in the newly reclaimed area than in the traditional cultivated land. The development of onion thrips population was divided into three phases (P_1 to P_3). The initial infestation P_1 occurred after 10 and 4 days after planting for the first and second planting dates on both varieties, respectively. The population increased to reach 10% of its maximum level (P_2), after 38.5, 45.5 and 56, 38.5days for Improved Giza 6, and Giza 20, during the first and second planting date, respectively. The maximum population density (P_3), achieved earlier on Improved Giza 6 than on Giza 20 in both planting dates. The coefficient of daily rate increase (α) seemed to be the same for both varieties during both planting dates. On the other hand, regarding the locations, (P_1) occurred earlier in newly reclaimed area than in traditional cultivated land, during the first planting date. While, *vice versa* were obtained during the second one. The 10% of maximum population (P_2) increase faster in newly reclaimed area than in traditional cultivated land for both planting dates. Concerning (P_3), found to be lower in the newly reclaimed area than in traditional cultivated land for both planting dates. The daily rate of population increase (α) was lower (0.012) in newly reclaimed area than in traditional cultivated land (0.017) in the first planting date. While, in the second planting date, it was higher (0.035) in newly reclaimed area than in traditional cultivated land (0.022).

Key words: onion thrips, population fluctuation, agricultural practices.

Introduction

Onion, *Allium cepa* L., is considered a vegetable crop of outstanding importance on account in Egypt, of its great value for local consumption and exportation to different countries. It well known that Assiut was among the main governorates that planting onion. Recently, onion plants are commonly cultivated in many areas to the extension of newly reclaimed areas.

The onion thrips, *Thrips tabaci* Lindeman, is considered among the main injurious insect pests that infesting onion crop (El-Serwiy *et al.* 1985, El-Saadany and Salman, 20000 and Sallam and Hossney, 2003). The agricultural measures of pest control are mainly concerned with development or adjustment of different agricultural practices so as to enable the plants to escape insect infestation, as much as possible.

The present investigation aims to study the relative abundance of *T. tabaci* and to clarify the effect of agricultural practices (locations, varieties and planting dates) on the developing of that pest during the two successive onion growing seasons of 2004-2005 and 2005-2006.

Materials and Methods

The present investigation was conducted at two locations in Assiut Governorate. The first one represented a traditional cultivated land (Fac. Agric. Exptl. Farm, Assiut Univ.) and the second one represented a newly reclaimed area (Arab Alawamer). In each experimental site, an area of about quarter feddan was chosen and divided into plots (1/400 feddans) with 6 rows (50 cm. apart). Two onion varieties were tested (Improved Giza 6 and Giza 20) and cultivated in two sequential planting dates, at 20 day intervals (Nov., the $2^{nd.}$ and $4^{th.}$ weeks). The normal agricultural practices were performed but no insecticides were used during the study period. After 21 of transplanting, in order to permit normal rooting, weekly samples (4 plants / plot) were taken early morning. Samples were separately kept in polyethylene bags and transferred to the laboratory for more carefully investigation by the aid of stereomicroscope. Number of thrips individuals (nymph and adult) on the whole plant, was counted and recorded.

Population increasing of onion thrips was described in days as phase 1 (P_1), phase 2 (P_2), and phase 3 (P_3), where:

P_1 = time needed to detect the first onion thrips, P_2 = time needed for the population to reach 10% of maximum population, and P_3 = time to attain the maximum population density. The first and twentieth of December were considered the inspection starting date for the first and second planting dates,

respectively, and of each population phase (P_1 to P_3).

Coefficient of daily rate of population increase (α) was calculated according to Freier (1983): $\alpha = \frac{0.9}{P_3 - P_2}$

Results and discussion

Data presented in (Table 1) show the differential responses, of the two onion varieties, cultivated in two planting dates, during 2004-2005 and 2005-2006 seasons, to the infestation by onion thrips, *T. tabaci*.

Regarding of first onion variety (Improved Giza 6) cultivated in two planting dates (Table 1), *T tabaci* population started to appear (4.6 and 0.7 individuals/ plant) on December, the 10th. and 24th. for the first and second planting date, respectively, and increased gradually in small numbers in December for the first planting date (Nov. 2nd. week) and in December and January for the second planting date (Nov. 4th. week). The population increased in moderate numbers during January and February for both planting dates. While, in the first planting date, the population increased relatively in high numbers during February to reach its maximum (126.3 individuals / plant) on March, the 11th.. The population started to decrease gradually from the third week of March. Whereas, in the second planting date, the population increased relatively in high numbers during March to attain its maximum (253.6 individuals / plant) on March, the 25th., then the population started to decrease gradually during April. As concerns of onion variety (Giza 20), it is also clear that infestation of onion plant with *T. tabaci* started with few numbers (3.7 and 0.7 individuals / plant) on December (the 10th. and 24th.) for the first and second planting dates, respectively. Then after the counted numbers showed successive increase amongst the successive months, until reach the highest population on March, 25th. (216.0 individuals / plant) and April 8th. (179.0 individuals / plant) for the first and second planting dates, respectively.

Data presented in (Table 1) revealed that the general picture of the pest population during the first season (2004-2005) was almost the same that during the second one (2005-2006). It was higher (153.0, 160.29 and 93.09, 132.67 individuals / plant) on Improved Giza 6 and Giza 20 in the first and second planting dates, respectively. As for Improved Giza 6 variety in the two planting dates, the initial infestation was higher (2.0 individuals / plant) in the first planting date than that in the second one (0.7 individuals / plant). Afterwards, weekly inspection

showed gradual and successive increase until reached the highest peak of abundance (436.3 and 602.7 individuals / plant on March, the 11th. and 18th.) for the two planting dates, respectively. Regarding the variety Giza 20, the starting of initial infestation was occurred on December, (the 10th. and 24th.) for the two planting dates, respectively. Then the population showed gradual and successive increase until reached the highest counts (379.3 and 502.7 individuals / plant) on March, 25th. for the first and second planting dates, respectively.

Data in (Table 2) show the two season means of *T. tabaci* on Improved Giza 6 and Giza 20 onion varieties that subjected to two planting dates at Assiut. The data clearly confirmed what previously detected throughout each season alone. The results also revealed that the initial infestation starting on December, (the 10th. and 24th.) for both varieties, in the two planting dates. Then the population increased successively until reached the highest count on March, the 25th. for both planting dates in case of Giza 20 and on March, (the 11th. and 18th.) in case of Improved Giza 6 in the two planting dates, respectively.

The obtained data (Table 2) indicated that the beginning of infestation in newly reclaimed area (Arab Alawamer) occurred on December, (the 6th. and 27th.) for the two varieties in both planting dates. Afterwards, the mean counts of *T. tabaci* population increased successively until reached the peak of abundance on February, the 28th. and 21th. (226.3 and 411.3 individuals / plant) and on March, the 14th. and 7th. (144.7 and 237.3 individuals / plant) for Improved Giza 6 and Giza 20 onion in the first and second planting dates, respectively.

Comparing the two season means of *T. tabaci* in the two locations, it could be generally stated that the infestation rate was higher in the traditional cultivated land (99.7, 104.7, 66.4 and 85.0 individuals / plant for Improved Giza 6 and Giza 20 in the first and second planting dates, respectively) than in the newly reclaimed area (82.2, 98.6, 35.7 and 73.5 individuals / plant for Improved Giza 6 and Giza 20 in the first and second planting dates, respectively). As for the liability of onion varieties to infestation with *T. tabaci* in both locations, it is clear from the previous results (Tables 3 and 4) that Improved Giza 6 variety was more susceptible to infestation with *T. tabaci* (99.7, 104.7, 82.2 and 98.6 individuals / plant for the first and second planting dates, respectively) than Giza 20 variety (66.4, 85.0, 35.7 and 73.5 individuals / plant for the first and second planting dates, respectively). By regarding the planting dates in the two locations, it is also clear from the same table (2) that the first

Table(2): Means of weekly abundance of *T. tabaci* individuals/plant, on two onion varieties cultivated in two planting dates and two locations, 2004-2006 seasons.

Location		Assiut			
Month	Date of inspection	No. individuals of *T. tabaci*			
		Improved Giza 6		Giza 20	
		1st. planting date	2nd. Planting date	1st. planting date	2nd. Planting date
Dec.	10	3.3		2.2	
	17	3.9		2.8	
	24	4.7	0.7	4.9	0.9
	31	7.2	1.0	8.7	1.7
Jan	7	11.2	2.7	12.7	1.7
	14	47.0	10.0	19.5	12.7
	21	27.2	16.5	15.7	16.8
	28	43.2	8.2	18.9	25.0
Feb.	4	64.7	29.0	30.4	24.9
	11	79.0	42.3	26.4	41.4
	18	104.4	62.0	61.2	45.2
	25	186.7	79.4	96.4	107.2
Mar.	4	211.7	217.3	123.7	96.0
	11	281.3	312.0	131.0	164.5
	18	249.7	351.5	177.5	168.4
	25	209.3	336.7	297.7	316.9
Apr.	1	161.0	138.5	98.8	151.9
	8		67.2		185.0
Total		1695.5	1675.0	1128.5	1360.2
Mean		99.7	104.7	66.4	85.0
Location		Arab Alawamer			
Dec.	6	9.7		3.7	
	13	17.3		14.3	
	20	24.7		12.7	
	27	20.3	13.7	21.3	12.3
Jan	3	44.7	12.7	8.7	5.7
	10	79.0	16.7	15.3	10.0
	17	90.7	31.7	51.0	6.3
	24	106.7	12.0	27.0	6.7
	31	179.7	34.3	40.7	21.3
Feb	7	61.7	155.7	27.0	96.3
	14	106.0	73.0	42.3	119.7
	21	110.0	411.3	18.0	165.0
	28	226.3	269.3	41.3	180.0
Mar.	7	147.7	195.7	55.7	237.3
	14	66.7	89.7	144.7	63.7
	21	16.7	27.0	31.0	48.3
	28	7.0	30.0	16.7	41.0
Apr.	4		7.3		15.7
Total		1314.9	1380.4	571.4	1029.3
Mean		82.2	98.6	35.7	73.5

planting date harbored the least number of *T. tabaci* (99.7, 66.4, 82.2 and 35.7 individuals / plant for Improved Giza 6 and Giza 20 varieties, respectively) than the second one (104.7, 85.0, 98.6 and 73.5 individuals / plant for Improved Giza 6 and Giza 20 varieties, respectively).

Results in (Table 3) clear that infestation of onion plants with *T. tabaci* in Assiut Governorate occurred after (10.0 and 4.0 days, P_1) from the beginning of inspection, for both varieties cultivated in the first and second planting dates, respectively. The population increased to reach 10% (P_2) of the maximum population after (38.5 days) for Improved Giza 6 in the first planting date, while take long time (56.0 days) for Giza 20 in the first planting date. On the contrary, during the second planting date, Giza 20 manifested lower time (38.5 days) than Improved Giza 6 (45.5 days). This means that the population of *T. tabaci* tended to establish in onion field, during these times (5 and 6 weeks for Improved Giza 6 in the first and second planting dates, also 8 and 5 weeks for Giza 20 in the first and second planting dates). As for the maximum population density of *T. tabaci* (P_3), the recorded periods for Giza 20 in both planting dates were clearly longer than these of Improved Giza 6. The recorded periods for Giza 20 in the first and second planting dates were (105.0 and 98.0 days) and those for Improved Giza 6 variety were (91.0 and 87.5 days) from the initial infestation (15 and 14 weeks for Giza 20, also 13 and 12 weeks for Improved Giza 6 in the first and second planting dates, respectively), nearly during the last three weeks of March. The occurred peak of *T. tabaci* population during this period of the year may be due to the favourable weather conditions prevailing during this period that seems to be the optimum for development and reproduction of *T. tabaci* and to the suitability of the host plant. The duration from the appearance of the thrips individuals up to reach the maximum population density (P_1 to P_3) was about 12 weeks for Improved Giza 6 and about 14 weeks for Giza 20 in both planting dates. Accordingly, the duration that elapse from the initial infestation until reach the highest peak was longer for Giza 20 either in the first or second planting date than Improved Giza 6 in both planting dates. The most active period of *T. tabaci* population development (P_2 to P_3) was closely equal for both varieties in the first planting date (7 weeks), while it was shorter for Improved Giza 6 (6 weeks) than Giza 20 (8 weeks) in the second planting date. Concerning the rate of population increase (α), it was nearly the same for both varieties in the first planting date (0.017 and 0.018 for Improved Giza 6 and Giza 20, respectively).

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While, in the second planting date, the rate of population increase for Improved Giza 6 (0.022) was higher than that of Giza 20 (0.015).

The previously explained data clearly show that the onion variety Giza 20 cultivated on the 2nd. week of November recorded the longer duration for reaching the maximum density (P_3), elapsing period to attain 10% of initial infestation (P_2), and correlated with moderate increasing rate (α). Accordingly, earlier planting of onion variety Giza 20, may be recommended as a method to escape from higher infestation rates of *T. tabaci* and give the chance to control the thrips before reaching the economic threshold.

Data in (Table 4) indicate the population increasing of *T. tabaci* on the onion varieties and two planting dates in the two locations. While, the initial infestation of thrips (P_1) for the first planting date in Arab Alawamer (newly reclaimed area) occurred earlier before the beginning of inspection in Assiut (traditional cultivated land). Whereas, the contrary occurred in the second planting date, the earlier initial infestation was in Assiut than Arab Alawamer from the beginning of inspection. By comparing, reaching of 10% of the maximum population (P_2) in Arab Alawamer, for both planting dates, regardless the varieties, was faster for the first and second planting date, respectively, than in Assiut at the first and second planting date, respectively. In other words, the population exhibited shorter period in the newly reclaimed area than in traditional cultivated lands to reach 10% of the maximum density of thrips, regardless of the varieties and/or planting dates. Concerning (P_3), it is also clear that the needed period to reach the maximum population density was lower in Arab Alawamer than in Assiut at the first and second planting dates, respectively. This means that the maximum population density take (13 and 9 weeks in Arab Alawamer, also 14 and 12 weeks in Assiut during the first and second planting dates, respectively), nearly during the first and third week of March for Arab Alawamer and Assiut, respectively. The peak of *T. tabaci* population occurred earlier in Arab Alawamer than in Assiut, may be due to the differences of weather conditions that prevailing during this period in both locations, and the maturity of plants that affect their acceptability for thrips infestation. The duration from the appearance of the thrips population up to reach the peak (P_1 to P_3) was the same in the first planting date about 12 weeks for both locations, while, in the second planting date, it was shorter in Arab Alawamer (8 weeks) than in Assiut about (12 weeks). As for (P_2 to P_3) phase, the longer and shorter elapsed period (81.5 and 28 days) were recorded in Arab Alawamer,

and the moderate elapsed period (54.5 and 42.5 days) were recorded in Assiut for the first and second planting dates, respectively. By regarding the rate of population increase (α), it was lower (0.012) in Arab Alawamer than in Assiut (0.017) in the first planting date, on one hand. While, on the other hand, in the second planting date, the rate of increase in Arab Alawamer (0.035) was higher than in Assiut (0.022).

It can concluded from the obtained data of the both onion growing season that the grand mean counts of *T. tabaci* was higher during the second season (2005-2006) than that of the first one (2004-2005) for both varieties, at the two planting dates. This may resulted due to the prevailing weather factors and the movement of insects to the neighbouring crops that thrips adults overwintering on it. Shrick (1951) stated that the thrips overwiter principally as adults on clover and Lucerne, and onion become infested by the adults migration from clover, Lucerne and other sources. Khalil *et al.* (1973) in Minia Governorate, mentioned that the numbers of nymphs and adults of *T. tabaci* on onion crop, were found to be very small during December and increased rapidly until reaching the maximum abundance throughout April. Dent (1991) mentioned that the seasonal phenology of insect numbers, the numbers of generations and the level of insect abundance at any location influenced by the environmental factors at that location.

The results also showed that the highest peak occurred in March for both seasons. These findings are in agreement with (Hassanein *et al.*1970; Edelson *et al.*1986; Lu and Lee, 1987; Afifi and Haydar, 1990; Haydar and Sherif, 1990 and Hamdy and Salem, 1994). Hassanein *et al.*(1970) indicated that two peaks occurred throughout the period extended from March till the first half of May. Edelson *et al.*(1986) found that adults and larvae of *T. tabaci* were presented from February until harvest with abundance peak in early April. Lu and Lee, (1987) indicated that the population density of *T. tabaci* increased from November to April (especially during February and March). Afifi and Haydar, (1990) noticed small number of *T. tabaci* on onion up to early February and thereafter numbers increased until late March. Haydar and Sherif, (1990) mentioned that *T. tabaci* began to build up its population in early February and reached a maximum during April. Hamdy and Salem, (1994) determined three peaks of *T. tabaci* abundance from mid-January to mid-June and recorded the highest peak on April.

Respecting of the onion varieties and planting dates, it is obvious that the onion variety Giza 20 recorded

the lowest liability of infestation. Also, the lowest infestation was concomitant with the earliest planting date. Ibrahim (1996) stated that Improved Giza 6 onion variety was more susceptible to infestation by *T. tabaci* than Giza 20 and the population was found to be increased by retarding the planting date. Salman (2000 a and b) mentioned that onion variety Giza 20 showed the least infestation level by *T. tabaci*, and reported that sowing date of onion crop had significant effect on the incidence and rate of infestation by *T. tabaci*.

As for the location, it is observed that the traditional cultivated land harboured the highest infestation of *T. tabaci* compared with the newly reclaimed area for both varieties in the planting dates. These results may be due to the difference of prevailing weather factors, soil fertility and nature of growth. These findings are in agreement with those finding by Passlow (1973) reported that number of onion thrips increasing on the vigor plants than weak ones. Ragheb (1976) found that different onion ecotypes grown at Assiut Governorate were generally better in growth, yield and bulb qualities than when grown at the New Valley Governorate. Dent (1991) who reported the seasonal phenology of insect numbers, the numbers of generations and the level of insect abundance at any location influenced by the environmental factors at that location.

Generally, from the forementioned results, it can be concluded that any of the onion varieties (Improved Giza 6 and Giza 20) cultivated on November the 2nd. and 4th. weeks in the traditional cultivated land, or on November the 2nd. week in the newly reclaimed area, may be recommended as agriculture practices to control of *T. tabaci*.

Finally, from the forecited results, it can be deduced that the three studied variables (locations, onion varieties and planting dates) play an important role in regulating population density of *T. tabaci*.

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نمو وتطور تربس البصل كمحصلة لتأثير بعض العمليات الزراعية

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تمت دراسة تعداد ونمو حشرة تربس البصل في حقول البصل في محافظة أسيوط تحت ظروف معاملات زراعية معينة (الأماكن، الاصناف، مواعيد الزراعة) خلال موسمي زراعة البصل 2005/2004 و 2006/2005. اظهرت الدراسة إن الإصابة تبدأ في ديسمبر تحت ظروف كل من الاراضي الزراعية القديمة والاراضي الحديثة الإستصلاح، بينما وصل أقصى تعداد للمجموع خلال شهر مارس لكل من الصنفين خلال موعدي الزراعة، بإستثناء صنف جيزة 6 محسن في الأراضي الحديثة الإستصلاح خلال موعدي الزراعة حيث سجل أعلى تعداد للمجموع شهر فبراير. كما أظهرت النتائج ان الإصابة في الأراضي الحديثة الإستصلاح كانت اقل من الاراضي القديمة. تم تقسيم المجموع الحشري لهذه الآفة إلى ثلاثة مراحل من P_1 إلى P_3. بالنسبة للأصناف فقد وجد أن اول إصابة (P_1) سجلت للصنفين بعد 10، 4 يوم خلال موعدي الزراعة الاول والثاني على التولي، ثم يأخذ المجموع في الزيادة حتى يصل التعداد الى 10% من أعلى كثافة عددية (P_2) بعد 38,5 ، 45,5 يوم لصنف جيزة 6 محسن وبعد 56 ، 38,5 يوم لصنف جيزة 20 خلال موعدي الزراعة الاول والثاني على التوالي. يصل المجموع لأقصى تعداد له (P_3) بعد 91، 87.5 يوم لصنف جيزة 6 محسن وبعد 105 ، 98 يوم لصنف جيزة 20 خلال موعدي الزراعة الاول والثاني على التوالي. وقد كان معدل الزيادة اليومي (α) لحشرات التربس (0,017 ، 0,018و 0,022 ، 0,015) لصنف جيزة 6 محسن وصنف جيزة 20خلال ميعاد الزراعة الأول والثاني على التوالي. أما بالنسبة للاماكن، فقد وجد أن (P_1) تظهر بعد(6 و 10 يوم) خلال ميعاد الزراعة الأول، (7 و 4 يوم) خلال ميعاد الزراعة الثاني في الأراضي الحديثة والأراضي القديمة على التوالي. لوحظ أن الزيادة في المجموع حتى يصل إلى (P_2) كانت أسرع في الأراضي الحديثة الإستصلاح (9,5 ، 35,0 يوم) مقارنة بالأراضي القديمة (43,5 ، 45,0 يوم) خلال ميعادي الزراعة الأول والثاني على التوالي. بالنسبة إلى (P_3) فكانت أقل (91 ، 63 يوم) في الأراضي الحديثة الإستصلاح عن الأراضي القديمة (98 ، 87,5 يوم) خلال موعدي الزراعة الاول والثاني على التوالي. فيما يخص معدل الزيادة اليومي (α) فقد كان أقل في الأراضي الحديثة (0,012) مقارنة بالأراضي القديمة (0,017) وذلك خلال ميعاد الزراعة الاول، بينما وجد العكس خلال ميعاد الزراعة الثاني (0,035) في الأراضي الحديثة، (0,022) في الأراضي القديمة.