

POPULATION DENSITY OF THE TOMATO FRUIT WORM, *Helicoverpa armigera* (Hübner) (LEPIDOPTERA: NOCTUIDAE) IN TOMATO FIELDS AT ASWAN GOVERNORATE, UPPER EGYPT

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ABSTRACT

Population density of the tomato fruit worm, *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) and estimating its rates of infestation in tomato fields at Thomas district, Lake Nasser region, Aswan Governorate, Egypt was studied. Estimation of the infestation rates using direct counts of the pest larvae and number of moths per pheromone trap was undertaken for two successive growing seasons 2006/07 and 2007/08. Highest rates of *H. armigera* infestation ranged between 20.8 and 21.3% in the first season and between 9.4 – 17.9% in the second season were recorded during the period extended from first week of February to mid-March, respectively. General seasonal means of infestation rate were 9.6 and 11.2% in seasons 2006/07 and 2007/08, respectively. General seasonal mean number of moths/trap was 9.8 and 7.5 moths /trap during the first and second seasons, respectively. Statistical analysis showed that there was a positive correlation between the rates of infestation and the number of trap catches in both seasons.

INTRODUCTION

Tomato is one of the main vegetable crops in southern region of Aswan Governorate. Its cultivated area is about 2014 feddans (18.3 % of the total area), represented mainly by Nile and winter lugs (World Food Program, assisted project Nasser lake report, 2004). Tomato plants are subject to be infested with several insect pests such as; whiteflies, aphids, leaf miners and some lepidopterous pests. The tomato fruit worm, *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae), is the major insect pest in the tomato fields in this region (Abbas, 1998 and El-Awady *et al.*, 2008).

Bues *et al.* (2005), Talekara *et al.* (2005) and Moral (2006) reported that *H. armigera* is a highly polyphagous pest that attacks over 100 plant species including such widely grown and economically important crops as cotton, maize, tobacco, pigeon pea, chickpea and tomato. In the Nile Valley region, *H. armigera* has five generations per year, three generations of them on cotton and two on vegetables. Seasonal infestation with the tomato fruit worm usually lasts from April to September in the valley, while it extends from October to May, according to the lug in southern region of Aswan. Larvae of *H. armigera* may attack tomato crops from transplanting until fruit maturity but the most sensitive growing period coincides with the most attractive phenological stages of ovipositing females, from the beginning to the ending

of the flowering stage. The predilection of this moth species for the harvestable fruiting parts, high polyphagous, wide geographical range, mobility, migratory potential, facultative diapause, high fecundity and propensity to develop resistance to insecticides are the many factors that contribute strongly to its pest status Selvanarayanan and Narayanasamy (2006). Larvae feed on the reproduction parts of the tomato plants such as; buds and flowers (Adashkevich and Rashidov, 1986). Infested fruits commonly contain rounded pits and holes that made by the larvae. The larvae prefer immature fruits at their conjunction part with the plants, where the front body of larva is seen inside the fruit and the back body is outside the fruit. Infestation's appearance on the leaves is similar to that of lepidopterous pests (Brochure of tomato pests in Egypt and IPM methods, 1995).

Few studies were found on the pest in southern region of Aswan (Abbas 1998 and El-Awady *et al.*, 2008). They reported that the tomato fruit worm, *H. armigera* is the major insect pest infesting tomato in the field at the new reclaimed land around Lake Nasser in Aswan Governorate, Egypt. The larvae bore into the green fruits and cause considerable loss in the yield. Highest rates of *H. armigera* infestations were recorded during March and April.

The aim of the present work is studying the population density of the fruit worm, *H. armigera* and estimating its rates of infestation in tomato fields at Lake Nasser region, Aswan, Egypt.

MATERIALS AND METHODS

Population dynamics of the infestation with the tomato fruit worm, *H. armigera* in the tomato fields was carried out in Thomas district, Lake Nasser region, Aswan Governorate, representing one of the largest tomato growing areas in the region, for two successive growing seasons 2006/07-2007/08.

Experimental field (5 feddans) was divided into three plots, used as replicates for the study in the first season, 2006/07, while one field (2 feddans) was used in the second season 2007/08. The experimental field was planted during the 1st week of September in both seasons using the tomato variety "Kasey rock", the common and recommended variety in the region. Experimental plots received regular cultural practices except using pesticides during the two seasons.

In each plot, one sex pheromone trap for *H. armigera* moths was placed in the center of the plot. Fresh pheromone lures were exchanged every 4 - 6 weeks. Direct inspection and count of total numbers of fruits and infested ones on 20 random tomato plants /plot/date, as well number of *H. armigera* moths/ trap was undertaken biweekly/plot/date through a period lasted from September to April 2006/07 and 2007/08 growing seasons. Obtained data were recorded, summarized and statistically analyzed using ANOVA statistical method.

RESULTS AND DISCUSSION

I- Season 2006/07

Direct infestation counts

First occurrence of *H. armigera* larval infestation was recorded in the second week of October 2006 by low rates (1-1.7%); about 40-45 days post sowing date, and then started to increase gradually up to end of February 2007. Highest rates of the pest infestation in the three plots, ranged between 20.8 and 21.3%, were recorded by first week of February 2007 (Table 1). General mean rate of infestation for the whole season was calculated as 9.6 % (ranged between 1.33 and 20.5 %). Statistical analysis showed significant differences in the rate of *H. armigera* larval infestations among the three plots.

Table (1): Percentages of infestation with *Helicoverpa armigera* (Hb.) in tomato fields at Thomas district, Lake Nasser region, Aswan Governorate seasons 2006/07 and 2007/08

Date of Inspection	Season 2006/07				Season 2007/08
	R1	R2	R3	Mean	Mean
1 st week Oct.	1.3	1.7	1	1.33	0
3 rd week Oct.	7.5	6.5	3.6	5.87	2.3
1 st week Nov.	7.4	8.4	6.4	7.40	9.4
3 rd week Nov.	9.4	14.5	11.8	11.90	13.1
1 st week Dec.	12.7	9.7	9.3	10.57	15.8
3 rd week Dec.	14.5	13.2	11.6	13.1	14.6
1 st week Jan.	8.4	11.3	13.2	11.0	16.4
3 rd week Jan.	11.6	9.4	9.6	10.2	17.9
1 st week Feb.	20.8	19.4	21.3	20.5	17.7
3 rd week Feb.	16.4	10.6	17.3	14.8	13.4
1 st week Mar.	7.3	5.2	5.3	5.9	7.9
3 rd week Mar.	2.7	3.2	1.3	2.4	5.9
Total	120	113.1	111.7	114.9	134.4
Mean	10	9.4	9.3	9.6	11.2

Pheromone trap catches

First catch of *H. armigera* moths in the pheromone traps was found in the second week of October, 2006. As shown in Table (2), numbers of moths counted in the traps were largely oscillated throughout the season. Highest mean numbers of moths /trap (17.7 and 22.0) were recorded during December 2006 and February, 2007, respectively. These months represent the highest infestation period with *H. armigera* in tomato fields in the region. General mean numbers of moths /trap for the whole season was calculated as 9.8 moths/ trap (ranged between 2.33 and 22). Statistical analysis showed that there were significant differences in the number of *H. armigera* moths /trap among the three plots.

II- Season 2007/08

Data of the direct infestation counts as well as the pheromone trap catches were collected from only one plot in this season.

Table (2): Number of *Helicoverpa armigera* (Hb.) moths/pheromone trap in tomato fields at Thomas district, Lake Nasser region, Aswan Governorate seasons 2006/07 and 2007/08

Date of inspection	Season 2006/07				Season 2007/08
	R1	R2	R3	Mean	Mean
1 st week Oct.	2	3	2	2.33	1
3 rd week Oct.	1	7	5	4.3	3
1 st week Nov.	7	7	4	6.0	5
3 rd week Nov.	8	6	6	6.7	8
1 st week Dec.	19	13	21	17.7	13
3 rd week Dec.	13	18	19	16.7	8
1 st week Jan.	8	12	0	6.7	15
3 rd week Jan.	9	6	14	9.7	4
1 st week Feb.	27	21	18	22.0	12
3 rd week Feb.	17	9	8	11.3	9
1 st week Mar.	10	4	6	6.7	9
3 rd week Mar.	7	6	2	5.0	4
Total	138	112	105	118.3	91
Mean	11.5	9.3	8.7	9.8	7.5

Direct infestation counts

First infestation records with *H. armigera* larvae in the second season occurred in the first week of October 2007; about 35 days post planting date, earlier than that of the first season. High rates of infestation were recorded during the period lasted from end of November 2007 up to end of February 2008 (ranged between 2.3 – 17.9 %), with an average of 11.2 % during this period and then they decreased towards the end of the season to reach 5.9 % by early April. General mean rate of infestation for the whole season was calculated as 11.2%, compared with 9.6 %, season 2006/07 (14.3 % more infestations in the 2nd season). Statistical analysis showed significant differences in the rate of *H. armigera* larval infestation between the two seasons of the study.

Pheromone trap catches

H. armigera moths occurred early in the traps, during the first week of October, 2007 (about a week earlier than the first records of larval infestation but at the same time of the first season), with very low numbers (1-3 moths /trap). They increased gradually to reach the peaks of 13/trap in the first week of December 2007 and 15/trap in the first of January 2008 and then oscillated till the end of the season. Generally, the number of moths /trap in the second season was less than that of the first season. General mean numbers of moths /trap for the whole season was calculated as 7.5 moths compared with 9.8 in the first season. Statistical analysis showed that there were significant differences in the number of *H. armigera* moths /traps between the two seasons.

Statistical analysis showed also that there were positive correlations between the rate of infestation and the number of trap catches in both seasons. The correlation was larger in the second season; $r = 0.8271$ in season 2006/07 and 0.7205 in season 2007/08. As concluded, the rate of *H.*

armigera's infestation in the tomato fields at Thomas district, Lake Nasser region, Aswan Governorate had peaked during February and early March. Obtained results differed than what El-Awady *et al.*, 2008 had reported. They found that the high infestation with the pest increased by the end of the season (March and April) and its seasonal general mean percentage didn't exceed 6.5% in the two seasons 2004/05 and 2005/06. Although the statistical analysis had showed positive correlation between the rate of infestation and the numbers of trap catches in both seasons, the numbers of moths counted in the traps were largely oscillated throughout the season, therefore, it might not be an accurate indicator for monitoring the pest population in the field.

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كثافة تعداد دودة ثمار الطماطم (*Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) في حقول الطماطم بمحافظة أسوان، مصر العليا

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تم دراسة كثافة تعداد دودة ثمار الطماطم *Helicoverpa armigera* Hubner (Lepidoptera: Noctuidae) وتقدير معدلات الإصابة في حقول الطماطم بمنطقة بحيرة ناصر، محافظة أسوان، مصر. تم تقدير معدلات الإصابة باستخدام العد المباشر ليرقات الآفة على النبات وعد أعداد الفراشات في المصائد الفرمونية على مدى موسمي نمو متتاليين ٢٠٠٧/٢٠٠٦ & ٢٠٠٨/٢٠٠٧. تراوح أعلى تعداد للإصابة بالآفة بين ٢٠,٨ - ٢١,٣ % في الموسم الأول وبين ٩,٤-١٧,٩ % في الموسم الثاني سجلت خلال الفترة الممتدة من الأسبوع الأول من شهر فبراير حتى منتصف مارس. بلغ المتوسط العام الموسمي لنسبة الإصابة ٩,٦ & ١١,٢ % في موسمي ٢٠٠٧/٢٠٠٦ & ٢٠٠٨/٢٠٠٧، على التوالي. بلغ المتوسط العام الموسمي لأعداد الفراشات ٩,٨ & ٧,٥ % فراشة / مصيدة خلال الموسم الأول والثاني، على التوالي. أظهر التحليل الإحصائي وجود علاقة إيجابية بين معدل الإصابة وعدد الفراشات في المصيدة في الموسمين.