

SEASONAL ABUNDANCE AND REDUCTION PERCENTAGES OF THE PINK BOLLWORM, *Pectinophora gossypiella* (SAUND.) IN *Trichogramma* RELEASING ZONES

Aref, S. A. and A. M. A. Azab

Plant Protection Research Institute, Agric. Res. Center, Dokki-Giza, Egypt.

ABSTRACT

The present investigation was directed to study the seasonal abundance and percent of reduction of the pink bollworm, *Pectinophora gossypiella* in *Trichogramma* releasing zones in cotton fields during 2003 cotton season. Flight activity studies using pheromone traps in the two locations (100 fed./location) far side 30 kilometers approximately at Kafr El-Sheikh district were evaluated. The release of the egg parasitoid started on June 21st till September 2nd at about 10 days intervals (eight waves of releases). The results revealed that the percent of reduction of pink bollworm male moths in treatment units ranged from 33.6 % to 29 %, while that of reduction in larval numbers in green bolls ranged from 38 % to 40 %.

INTRODUCTION

Egg-parasitoids belonging to the entomopolyphagous genus, *Trichogramma* has contributed a lot to natural control of many lepidopterous pests. The wasp, *T. evanescens* (Westwood) was recorded in Egypt and reported to be an egg-parasitoid for *Sesamia cretica* Led. (Kamal, 1951), the purple-lined borer, *Chilo agamemnon* Blezyski in corn (Kamal, 1936 & 1951 and Embaby, 1986 & 1996), in sugarcane fields (El-Sherif, 1974) and European borer, *Ostrinia nubilalis* Hübner in corn field (Fahmy, 1936), *Pectinophora gossypiella* eggs were the most preferred by females of the two species of *Trichogramma* (Abdel-Hafez, 2001).

This study was conducted to evaluate the role of the egg-parasitoid, *T. evanescens* as a biological control agent against *P. gossypiella* in cotton fields.

MATERIALS AND METHODS

Host rearing :

Eggs of angoumois grain moth, *Sitotroga cerealella* were used for mass rearing of *Trichogramma evanescens* in this study. The host insect was reared in the laboratory of Agriculture Moderate, Kafr El-Sheikh Governorate for several generations. The insect was reared in glass breeding jars (1-liter capacity) containing angoumois grain to be used as food and pupation site. The rearing materials were firstly sterilized at 60°C for 1-2 hours, scattered in a fine layer upon trays covered with muslin and kept under laboratory conditions (25-28°C and 60-70 % R.H.) until use. Eggs of the host were introduced into jars having food material, the jars were covered with wrapped cotton cloth fixed in position by a rubber band kept until pupation. After pupation, moths were allowed to mate and oviposit in glass chimney oviposition cages (described by Abdel-Hafez et al., 2001).

Parasitoid rearing :

The parasitoid *T. evanescens* was reared on eggs of angoumois grain moths at the formerly mentioned laboratory conditions. For efficient mass

rearing of the parasitoid, every 1000 host eggs were exposed to 100 parasitoid adult females in 0.4-liter glass jars provided with 10 % sucrose solution for parasitoid nutrition and covered with wrapped cotton cloth kept in position by rubber band. Host eggs were replaced by fresh unparasitized ones every 24 hr. The parasitized eggs were kept in clean vials (4 x 8.5 cm) (Klamp and Treeink, 1978).

Experimental technique :

The egg parasitoid was released at Kafr El-Sheikh district during 2003 cotton season. The experiment can be summarized as follows :

- 1- The release of the parasitoid, *T. evanescens* started from June, 21st till September, 2nd.
- 2- Rate of release was 20000 wasps/fed., and eight waves of releases were conducted at about 10-day intervals.
- 3- The area of release was about 200 fed., two locations 100 fed. each, the set obtained 9 units in two locations for away about 30 kilometers (Table 1).

Table (1): The locations and time of *T. evanescens* release during 2003 cotton season at Kafr El-Sheikh district.

	No. of unit			Area fed	Sowing date	Date of release
First location	1	Matbul	El-Banwan	16	26/3-28-3	21/6*
	2	Matbul	El-Banwan	15	14 - 4/4	1/7
	3	Matbul	El-Banwan	21	27/3-1/5	12/7
	4	Matbul	Tarik Eltifa	24	8/4 - 1/5	22/7
	5	El-Taifa	Elomada	24	22/3-27/4	2/8
Control	1	El-Taifa	El-Zawia	25	29/3-12/4	12/8
Second Location	1	El-Hamra	El-Hatia	19	17/4	23/8
	2	El-Hamra	El-Sharwa	22	14/4-25/4	2/9
	3	El-Hamra	Hekr El-Sabaen	33	4/4-18/4	
	4	El-Hamra	Awirathni	26	3/4 - 10/4	
Control	1	El-Hamra	Khalig El-Shahat	30	12/4-21/4	
	2		Awira Awal	29	24/3-22/4	

* Rate of release was 20.000 wasps/wave/fed.

- 4- Green cotton bolls were collected randomly and inspected in the laboratory. For 11 inspections starting from July, 15th to Sept., 13th 2003. The larvae of pink bollworm were recorded in the plots of treatments and control as well as percentage of green bolls infestation were recorded.
- 5- Three insecticides spraying programs (different groups differing in the timing of treatment were applied to protect the cotton bolls from bollworms when the green boll infestation reached 3 %. The insecticides used are Pestban (O.P.), Sumi-gold (synthetic pyrethroids), and Calical (carbamate).

Monitoring the adult male of the pink bollworm population by using pheromone traps :

Approximately, one delta sticky trap baited with one capsule dispenser containing 2 mg gossypure for the pink bollworm was positioned in center of each unit in the experimental area from April, 15th till the end of the season.

Pheromone dispenser was replaced by new one every two weeks. The sticky plates were changed every 3 days, checked and number of captured adult males was counted.

Statistical analysis of data :

The percent reduction of pink bollworm infestation was calculated according to Henderson and Tilton equation (1955).

RESULTS AND DISCUSSION

I- Population dynamic of pink bollworm, *P. gossypiella* :

The number of generations of pests in a year and the time of broad emergence are essential features that are to be known specially for pests like borers of crops. In such cases, release of egg-parasitoid, i.e., *Trichogramma* species) in the field may be made to coincide with the appearance of adults or the major period of egg-laying or the application of foliar pesticides having longer residual toxicity can be so timed that the toxicant may produce its effect on the newly hatching larvae before they enter the green bolls and causing the damage.

Seasonal fluctuation of infestation level of pink bollworm (PBW) was investigated. Field studies were carried out at two locations of Kafr El-Sheikh district; namely Pestban (O.P.), Sumi-gold (synthetic pyrethroids), and Calical (carbamate).

Monitoring the male adults of pink bollworm populations were done using delta pheromone baited- traps.

Data presented in Table (2) and illustrated in Fig. (1) show the numbers of male moths of PBW, *Pectinophora gossypiella* (Saunders) per trap per 3 days during the period extending from June, 4th till September, 19th during 2003 cotton season. The PBW moths exhibited two sharp peaks during cotton season. The first generation started at middle July and continued till approximately the last week of July in both locations. The average captured males during July ranged between 6 & 42 and 8.5 & 25 moths/6 days in first and second locations, respectively.

The second generation started within the first week of September and continued up to the third week of this month. The average number of captured male moths/6 days ranged between 10-43 and 7-28 in the first and second locations, respectively.

This results agree with the previous findings of many investigators. Guirguis *et al.* (1991) indicated that *P. gossypiella* had three generations with three sharp peaks on cotton during the period started early in May and extended till the first week of October. Abdel-Hamid *et al.* (1999) detected five PBW generations during the whole year; however, three of which coincided with the cotton season.

II- Population density in *Trichogramma* releasing :

Data presented in Tables (2 & 3) show the numbers of male moths of pink bollworm in egg parasitoid as well as control units pre- and post release of *Trichogramma* (male/trap/6 days). The first release of parasitoid was practiced on June, 21st.

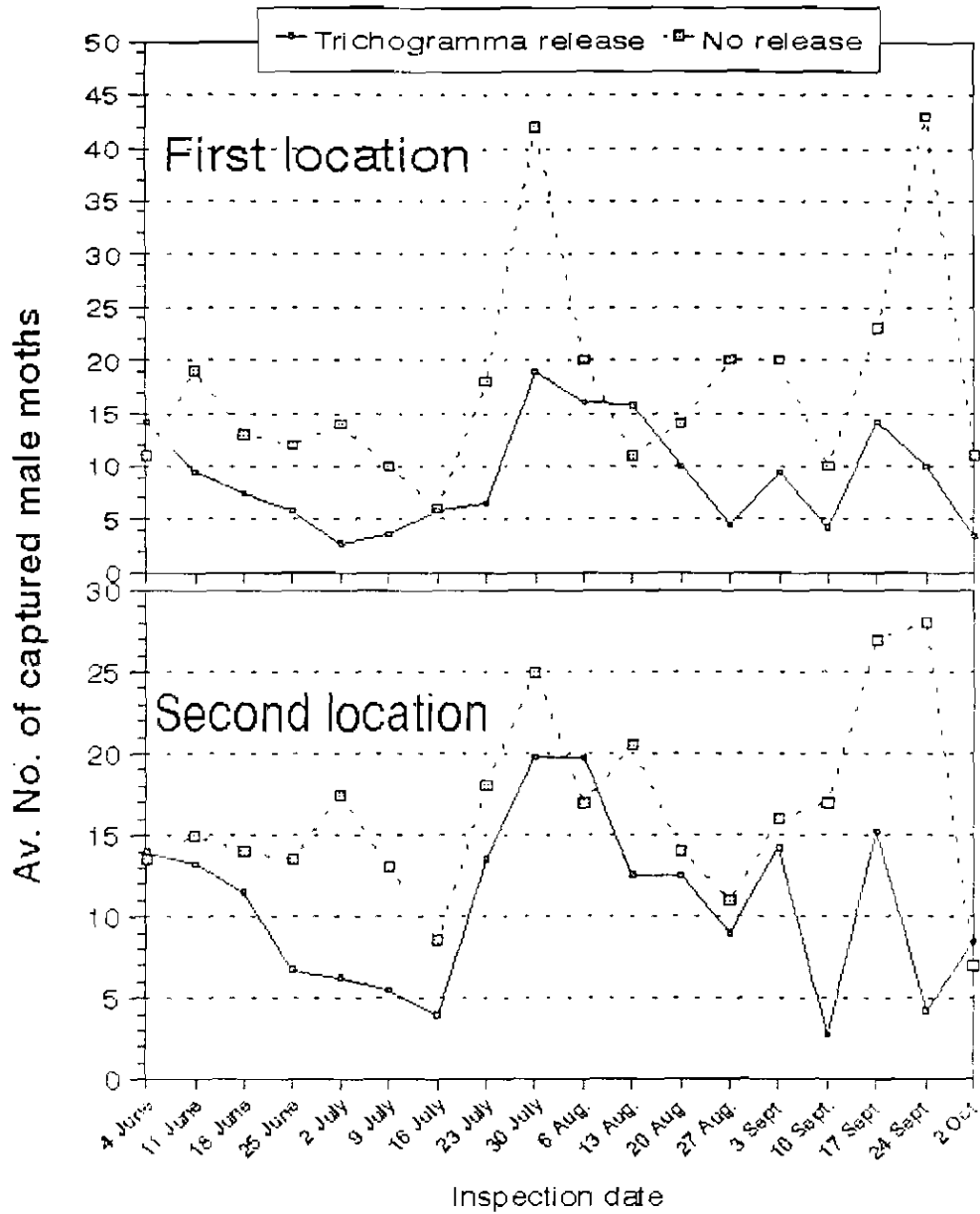


Fig. (1). Average numbers of captured *Pectinophora gossypiella* male moths by pheromone traps (per trap/6 days) in *Trichogramma* released and unreleased plots.

Table (2): Average numbers of captured *Pectinophora gossypiella* male moths by pheromone baited traps in *Trichogramma* released and unreleased plots.

Period of inspection	First location		Second location	
	<i>Trichogramma</i> release	No release	<i>Trichogramma</i> release	No release
Pre-release				
June 4-9	14.2	11	14.00	13.5
10-15	9.4	19	13.25	15.0
16-21	7.4	13	11.50	14.0
Post-release				
22-27	5.8	12	6.75	13.5
28-3	2.8	14	6.25	17.5
July				
4-9	3.6	10	5.50	13
10-15	5.8	6	4.00	8.5
16-21	6.6	18	13.50	18
22-27	19.0	42	19.75	25
28-2	16.0	20	19.75	17
Aug				
3-8	15.75	11	12.50	20.5
9-14	10.00	14	12.50	14
15-20	4.50	20	9.00	11
21-26	9.40	20	14.25	16
27-1	4.25	10	2.75	17
Sept				
2-7	14.2	23	15.25	27
8-13	10.0	43	4.25	28
14-19	3.4	11	8.50	7

Table (3): Reduction percentages of pink bollworm male moths in *Trichogramma* releasing zone during 2003 cotton season.

Treatment	Total average number in			
	First location		Second location	
	<i>Trichogramma</i> release	No release	<i>Trichogramma</i> release	No release
Pre-release	10.33	14.33	12.92	14.16
Post-release	8.74	18.26	10.28	15.87
% Reduction	33.6 %	-	29.0 %	-

Pre-release of *Trichogramma* :

Average numbers of pink bollworm males in the first location units recorded 10.33 and 14.33 male/trap/6 days in both treatments and control units, respectively; whereas the average numbers in second location recorded 12.92 and 14.16 male/trap/6 days in treatment and control units, respectively.

Post-release of *Trichogramma* :

Average numbers in first location recorded 12.92 and 14.16 male/trap/6 days in treatment and control unit, while the average numbers recorded 10.28 and 15.87 male/trap/day in treatment and control units at second location.

Reduction percentages in the male moths :

The reduction in total pink bollworm male moths in the two locations reached 33.6 and 29.0 %, by applying 20000 parasitoids/ fed., in both first and second locations, respectively.

III- Population density of pink bollworm larvae during the release of *Trichogramma* :

Concerning the effect of *T. evanescens* release on pink bollworm larvae, the data presented in Table (4) revealed that the reduction percentages in number of pink bollworm larvae in the released area were 38

Table (4): The average number of pink bollworm larvae/100 green bolls in treatment and control units during 2003 cotton season and reduction of infestation in release and control units.

No. of unit	Inspection duration												No. of sample	Av. no. of larvae/sample	% Reduction
	July 15-20	July 21-26	July 27-1	Aug. 2-7	Aug. 8-13	Aug. 14-19	Aug. 20-25	Aug. 26-31	Sept. 1-6	Sept. 7-12	Sept. 13-18				
First location															
1	1.0	1.0	0.0	1	1	1	2	1.0	0.0	1	3	11			
2	1.0	0.0	0.0	1	1	1	1	0.0	0.0	2	2	11			
3	0.0	0.0	1.0	3	2	1	2	3.0	1.0	2	4	11	1.25	38 %	
4	0.0	0.0	1.0	2	1	1	2	3.0	0.0	1	7	11			
5	0.0	0.0	0.0	2	2	1	1	1.0	0.0	1	4	11			
Control	1.0	0.0	1.0	3	4	6	4	3.0	2.0	3	9	11	3.27		
Second location															
1	0.0	0.0	1.0	0.0	1.0	2.0	1.0	1.0	1.0	2	4	11			
2	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	2	5	11	1.0	40 %	
3	0.0	0.0	1.0	3.0	1.0	0.0	1.0	1.0	1.0	1	2	11			
4	0.0	0.0	1.0	1.0	0.0	2.0	0.0	0.0	0.0	1	1	11			
Control	0.0	0.0	1.0	3.0	3.0	7	3.0	2.0	0.0	3	6	11	2.5		
	0.0	2.0	3.0	1.0	3.0	4	2.0	1.0	1.0	4	7	11			

% and 40 % in both first and second locations, respectively, throughout the season. This could be due to the eight waves of release associated to the parasitoid under field conditions.

These results are in full agreement with the previous finding of Tuhan *et al.* (1987) who reported that although releasing 20000 newly emerged *T. brasiliensis* adults/acre per week in combination with sprays of carbaryl, dimethoate and monocrotophos reduced significantly the damage caused to cotton by *E. insulana* and *P. gossypiella*, but release at the same rate but at intervals of 15 and 30 days were less effective. Moreover, Nazir *et al.* (1996) mentioned that parasitoid *T. chilonis* was more effective in controlling *P. gossypiella* than controlling *E. insulana*. Abdel-Hafez (1994) confirmed the effectiveness of *T. evanescens* Westwood and *T. bactrae* Nagaraja in parasitizing pink and spiny bollworm eggs.

It is of interest to mention that the obtained results revealed that the role of releasing *T. evanescens* Westwood is essential for controlling pink bollworm as a component of IPM programme. Regarding the numbers of waves and numbers of adult females of parasitoid per one wave, it may be more effective if the rate was raised two or three folds with decreasing the numbers of waves. Also, the wave of release should be precisely timed to be carried out prior to the peak of PBW eggs. This could be achieved by following the life table of the pink bollworm.

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الوفرة الموسمية ونسبة الخفض في تعداد دودة اللوز القرنفلية في مناطق إطلاق طفيل الترايكوجراما

صفوت عبد السلام عارف، عادل محمد حنفى عزب
معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الدقى - الجيزة.

تمت دراسة الوفرة الموسمية لدودة اللوز القرنفلية وكذا نسبة الخفض في تعدادها في أماكن إطلاق طفيل الترايكوجراما في حقول القطن في موقعين يبعدان عن بعضهما مسافة ٣٠ كيلومترا بمحافظة كفر الشيخ وبمساحة ١٠٠ فدان لكل موقع خلال موسم قطن ٢٠٠٣. وكان إطلاق الطفيل يتم من خلال ٨ موجات إطلاق بفاصل زمني ١٠ أيام بين كل إطلاق والأخرى، وتمت أول إطلاق بتاريخ ٢١ يونيو وأخر إطلاق بتاريخ ٢ سبتمبر. وأفادت النتائج بأن نسبة الخفض في تعداد الفراشات يتراوح بين ٣٣,٦ % و ٢٩,٠ %، بينما نسبة الخفض في تعداد اليرقات يتراوح بين ٣٨ % و ٤٠ % وذلك في مناطق الإطلاق.