J. Agric. Sci. Mansoura Univ., 31 (10): 6781 - 6787, 2006

UTILIZATION OF *Trichogramma evanescens* (WESTWOOD) (HYMENOPTERA: TRICHOGRAMMATIDAE) AS A BIOLOGICAL CONTROL AGENT AGAINST *Earias insulana* (BOISD.) IN OKRA IN NORTH SINAI

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ABSTRACT

The present study aimed at the use of *Trichogramma evanescans* (Westwood) to decrease the population of the spiny bollworm, *Earias insulana* on okra plants in North Sinai Governorate. Evaluation of the efficacy of *T. evanescens* as a controlling agent was carried out for two successive seasons (2005 & 2006). The percentages of okra infestation in releasing area and control in both seasons were calculated. One parasitoid release was made In 2005 season. The highest infestation with *E. insulana* was4% in the releasing area in August and September while it was16% in September in the control.Percentage of reduction was75 %. The lowest infestation was 0 % and 3% in July in the releasing area and the control in September. Two parasitoid releases were made in 2006 season. The highest infestation was1% in June and July in the releasing area while it was 14% in control in September. Percentage of reduction was 92.86%.The lowest infestation was 0 % in the releasing and control areas. It is concluded that *T. evanescens* bring down the infestation of *E. insulana* on okra plants in North Sinai and two parasitoid releases / season are needed for bringing down okra bollworm populations.

INTRODUCTION

Okra is one of the most important vegetables in Egypt. Numerous insects attack okra plants, pest management is an important aspect for okra production. Okra and its pest complex form "Okra ecosystem" which includes natural enemies living on these pests. Observations on parasitoids on *Earias vittella* egg showed that it is well adapted to a wide range of ecological conditions (Telang *et al* 2004). Recently, okra was successfully planted in North Sinai that characterized with sandy soil. This pest is considered important on okra and have recently became a rather severe pest on several crops in Egypt, and is associated with the expansion in application of organic pesticides which presumably lead to a change in the natural balance of pests and associated natural enemies (Hafez& Khalifa, 1975).

To avoid the change in natural balance, use of pesticides must be rationalized and the use of bio-control take place. The trichogrammatid Parasitoids represent a group of major bio-control agents currently affecting populations of these insects as well as other lepidopteran pests as well as other lepidopteran pests (Parsons and Ullyett. 1936; Sangwan *el al.* 1972 ; Khandage *et al.* 1980; Tawfike *et al* 1992).The pink bollworm, *Pecfmophora gossypiella* (Saund.) and the spiny bollworm, *Earias insulana* (Boisd.) were studied by many authors (Willcocks And Bahgat. 1937 and Moawad *el al.*, 1996). Eggs and larvae of the noctuids Earias spp. and *Heliothis armigera* on cotton and okra in Karnataka, India (Naganagoud and Thontadarya, 1984).

The aim of this study is to evaluate the efficiency of the parasitoid *Tricogramma evanescens* in reducing the population density of the spiny bollworm, *E. insulana* (Boisd.) on okra plants.

MATERIALS AND METHODS

The study had been carried out during two seasons (2005&2006) in two plots.

The first plot was in the Agricultural Research Station at El Arish in North Sinai Governorate. The second plot was owned by a farmer.The distance between the two plots was three Kms. Each plot was 25X25 m. Sampling was carried out at weekly intervals. In season 2005, the okra seeds were sown in mid July while the seeds were sown in mid April in season 2006.Recommended agricultural practices were followed. The first plot was utilized for releasing the trichogrammatid wasps, while the second plot served as control area. One sex pheromone trap was used for each releasing area and control to capture the first appearing bollworm moth (Page *el al.*. 1984 and Salem *et al.,* 1990). The parasitoid *T. evanescens* was released just after the appearance of the first moth. The release was done once in July 6 th in season 2005 and twice in season 2006, on May 28 th and July 30 th. Four sheets, each bear approximately 1500 parasitized eggs were used for each release. Each sheet was hanged on okra plant stalk by using a piece of thread inside the experimental field, 10m from the edge of the field. One hundred green fruits of okra were randomly picked and checked for infestation. The percentage of infestation was evaluated and the percentage of reduction was calculated as follows:

$$\frac{\text{\% Infestation in control - \% Infestation in releasing area}}{\text{\% Infestation in control}} \times 100$$

The natural enemies were calculated in the two seasons.

RESULTS AND DISCUSSION

Percentage of Infestation:

One hundred fruits of okra were checked for infestations with *E. insulana* and were chosen randomly from the plant in parasitoid released and control areas. Data are presented in Tables(1),(2),(3), (4) and (5) and Figs.(1) and(2).The spiny bollworm *E. insulana* was the only bollworm species that present all over these seasons.

In season 2005, the percentage of infestation in parasitoid released plot with *E. insulana* ranged between 0% in the second week of July and 4% in the second , third week of August and first week of September (Table 1and Fig.1).The average percentage of infestation was 2.26%. Infestation with *E. insulana* had three peaks, the I st peak (2%) occurred on July 6th, the 2nd peak (4%) occurred on August17 th and the 3th peak (4%) occurred on September 7th.

Table (1): Percentages of infestation by *E.Insulana* in okra (100 plants Examined per sample) in parasitoid released plot, El-Arish, North Sinai during (2005) season.

Sampling date	No. of okra in the sample		% Infestation
	Infested	Uninfested	
Jul. 6, 2005 x	2	98	2*
13	0	100	0
20	1	99	0
27	2	98	2
Aug .3	3	97	3
10	4	96	4
17	4	96	4*
25	1	99	1
Sep.1	2	98	2
7	4	96	4*
15	1	99	1
23	3	97	3
Total	27	1173	
Average percentage of infestation			2.26

X = Date of releases of the parasitoid

Table (2): Percentages of infestation by *E. Insulana* in okra in control, El-Arish, North Sinai during (2005) season.

Sampling date	No. of okra in the sample		Total no. of okra in the sample	% Infestation
	Infested	Uninfested		
Jul. 6, 2005 x	3	97	100	3
13	5	63	68	7.35
20	8	92	100	8
27	4	24	28	14.29 *
Aug.3	3	22	25	12
10	4	96	100	4
17	6	94	100	6*
25	4	96	100	4
Sep. 1	10	90	100	10
7	7	43	50	14*
15	2	33	35	5.71
23	4	21	25	16
Total	60	771	831	
Average percentage of infestation				7.22

The percentage of infestation in control ranged between 3% in the first week of July and 16% in the third week of August (Table2 and Fig.1).

Infestation had three peaks. The Ist peak (14.29%) occurred on July27 th,the 2nd peak (6%) occurred on August17th and the 3th peak (14%) occurred on September 7 th.

In season 2006, the percentage of infestation with *E. insulana* in parasitoid released plot ranged between0%and1% (Table 4 and Fig.3).The average percentage of infestation was 0.21%.Infestation had three peaks, the

I[st] peak (1%) occurred on June 4 [th],the 2[nd] peak (1%) occurred on July 9 [th] and the 3[rd] peak (1%) occurred on July30[th].The percentage of infestation in control ranged between 0% in the fourth week of May and 14% in the first week of September (Table 5 and Fig.3). Infestation had two peaks, the I[st] peak (3%) occurred on May 11[th] and the 2[nd] peak(9%)occurred on August 6[th].

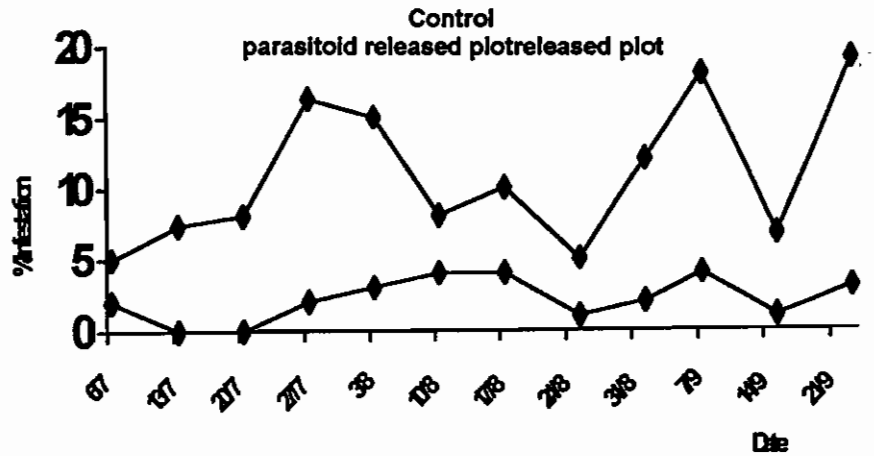

Fig.(1): Percentage of infestation by E.insulana in parasitoid released plot and control during 2005 season

Table (3): Percentages of infestation by *E. insulana* in okra (100 plants examined per sample) in parasitoid released plot, El-Arish, North Sinai during (2006) season

Sampling date	No. of okra in the sample		% Infestation
	Infested	Uninfested	
May, 28,2006 x	0	100	0
Jun.4	1	99	1 *
11	0	100	0
18	0	100	0
24	0	100	0
Jul.2	0	100	0
9	1	99	1 *
16	0	100	0
23	0	100	0
30 x	1	99	1 *
Aug.6	0	100	0
13	0	100	0
20	0	100	0
27	0	100	0
Sept.3	0	100	0
Total	3	1447	
Average percentage of infestation			0.21

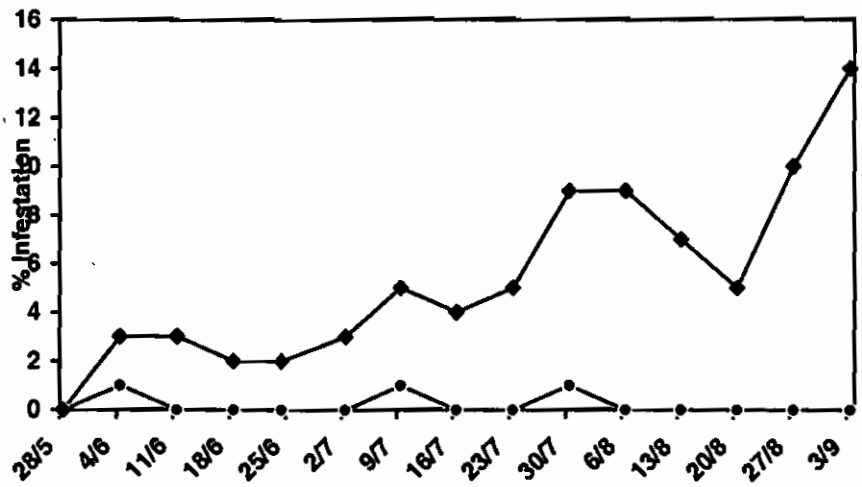

Fig.(3).Percentage of infestation in parasitoid released plot and control during 2006 season

Table (4): Percentages of infestation by *E. insulana* in okra (100 plants examined per sample) in control, El-Arish, NorthSinai during (2006) season

Sampling date	No. of okra in the sample		% Infestation
	Infested	Uninfested	
May,28, 2006 x	0	100	0
Jun.4	2	98	2
11	3	97	3 *
18	2	98	2
24	2	98	2
Jul.2	3	97	3
9	4	96	4
16	4	96	4
23	5	95	5
30 x	8	92	8
Aug.6	9	91	9 *
13	7	93	7
20	5	95	5
27	10	90	10
Sept.3	14	86	14
Total	78	1422	
Average percentage of infestation			5.38

Predator:

Table (5): Number of predators in okra (10 plants examined per sample) in, El-Arish, North Sinai during 2005 and 2006 seasons.

Season	Biological enemies			
	Coccinella spp	*Chrysopella carnea*	*Orius spp.*	*Scymnus spp.*
2005	8	6	18	16
2006	14	17	1	26

From the above mentioned results, it could be concluded that the egg parasitoid, *T. evanscens* suppresses the population of cotton bollworm, *E. insulana,* it is safe and effective than using insecticides which are highly expenses as well as the problems of pollution and insect resistance, Abd El-Salam *et. al.* (1991) tested the effect of sequences of bollworms insecticides from 3rd week of July and continued every two weeks, and their results showed that the bollworm infestation increased with some sequences and the percentage of reduction was less than 50%, but the other different sequences were varied between effective and non-effective insecticides.

So, the choice for using the natural enemies' agents, especially the egg parasitoid, *T. evanscens* in IPM programs is considered highly effective in okra fields in North Sinai and two releases / season are enough for bringing down the bollworm populations.

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استخدام طفيل التريكوجراما في خفض تعداد دودة اللوز الشوكية في البامية في محافظة شمال سيناء

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معهد بحوث وقاية النباتات – مركز البحوث الزراعية

تمت الدراسة الحالية لتقدير كفاءة استخدام طفيل تريكوجراما ايفانيسينس (ويستود) في تخفيض تعداد دودة اللوز الشوكية في البامية في محافظة شمال سيناء علي مدار موسمين متتاليين ٢٠٠٥ و ٢٠٠٦، وقد تم عمل إطلاق واحد فقط في موسم ٢٠٠٥ وعمل إطلاقين في موسم ٢٠٠٦ ، وقد سجلت النتائج التالية : في موسم ٢٠٠٥ كانت اعلي نسبة إصابة بدودة اللوز الشوكية في ثمار البامية ٤% في شهر يوليو وأغسطس في منطقة الإطلاق بينما كانت ١٦% في شهر سبتمبر بالنسبة للكنترول وذلك بنسبة خفض ٧٥% ، بينما كانت اقل نسبة إصابة 0% و ٣% في شهر يوليو في منطقة الإطلاق والكنترول علي الترتيب .

في موسم ٢٠٠٦ كانت اعلي نسبة إصابة بدودة اللوز الشوكية ١% في منطقة اطلاق الطفيل و١٤% في الكنترول في شهر يونيو و يوليو و سبتمبر في منطقة الإطلاق والكنترول علي الترتيب وذلك بنسبة خفض ٩٢,٨٦% ، بينما كانت اقل نسبة إصابة 0% في منطقة الإطلاق والكنترول ، وكان هناك ثلاث ذروات للإصابة.

ومما سبق يتضح أن طفيل التريكوجراما يفيد في خفض إصابة الباميا بدودة اللوز الشوكية وان انسب كمية إطلاق هي عمل إطلاقين في الموسم علي الأقل .