

EFFICIENCY OF RELEASING OF *Trichogramma evanescens* WEST AS COMPARED WITH LANNATE INSECTICIDE FOR CONTROLLING THE COWPEA POD WORM ,*Etiella zinckenella* (TREIT) IN SOYBEAN FIELDS IN MIDDLE AND UPPER EGYPT.

Tohamy, T.H.* and M.A. El-Nagger**

*Trichogramma Mass Production Laboratory, Mallawi, Minia, PPRI, ARC.

**Plant Protection Research Institute , ARC, Dokki, Giza, Egypt.

ABSTRACT

This study was carried out in three successive seasons (2000, 2001 and 2002, respectively) at Mallawi (Minia), Sids (Beni-Suef) and El-Kharga (New Valley) regions to evaluate the efficiency of the egg-parasitoid, *Trichogramma evanescens* as a biological control tool, at rate of 0, 10000, 20000, 30000 wasps/fed., compared with Lannate insecticide at 300 and 150 g/ fed., against the bean pod borer, *Etiella zinckenella* Treit. in soybean fields. The results indicated that the soybean plants treated with the egg-parasitoid and insecticide significantly reduced the percentage of infested soybean pods, seeds and resulted in a higher seed yield the high egg-parasitoid or insecticide was the lower infestation obtained. The highest rate of parasitoid (30,000 wasps/ fed.) or Lannate 90% (300g /fed.) were highly effective in decreasing the pod infestation. Highly increasing in seed yield / fed. by (34.6, 38.6, 30.0%) and (36.4, 39.1, 30.9 %) during the in three season, respectively. On other hand, no significant differences was observed in pod and seed infestation between the plants treated with the highest rate of egg parasitoid and plants treated with Lannate insecticide in the recommended -dose 300 g/ fed. While, the lowest rate of parasitoid (10,000 wasps / fed.) or Lannate (150g /fed.) were least effective with low increasing in seed yield/fed (20.5, 14.8, 15.0) and 23.8, 21.2 15.5 %) in three regions, respectively. There were positive correlation between percentage of pod infestation and seed yield in all treatments. All treatments caused significant increase in number of seeds per plant and seed yield per plants and feddan. This increase was high in plots treated with the highest rate of egg parasitoid or with Lannate insecticide, and low in plots treated with the lowest rate of egg parasitoid or with Lannate insecticide compared with the control. Therefore, the local egg-parasitoid, *T. evanescens* as rate of 30000 wasps / fed. can be successfully applying against *E. zinckenella*. in soybean fields as an effective and safe agent.

INTRODUCTION

In the last thirty years, soybean, *Glycin max* (L.), has become the most important leguminous crop in Egypt. It plays an important role in various industries and nutritional aspects for people and animals serves as a good source of vegetable oil and protein for human and livestock consumption. The area under cultivation in Egypt steadily expanded since 1970, about 160000 fed, (Mesbah, 1995). The cowpea pod worm, *E. zinckenella* has become a serious and widespread pest on soybean fields (Ratcliffe *et al.*, 1964; Masaki and Naito, 1964). This pest destroy a great number of pods and seeds, consequently reduces its yield and quality. The application of insecticide has

undoubtedly contributed to the remarkable increase and stability of crop production. However, the heavy using of insecticides for control *E. zienckenella*, brought about undesirable effects on the human, agroecosystem and environment. Several authors used successfully the local egg- parasitoid, *Trichogramma evanescens* for the biological control of many lepidopterous insect pests in Egypt (Embaby , 1986 ; Abbas, *etal.*1989;Soliman and Ewais , 1997 ; Dakrouy *etal.* 2002 Shalaby *et al.* , 2002)

Therefore, this work aims to evaluate the egg - parasitoid, *T. evanescens* as a biological control agent against *E. zienckenella* in soybean fields compared with Lannate as a recommended insecticide

MATERIALS AND METHODS

Three Experiments were conducted at each of the Farm of Agricultural Research Station , Mallawi, El-Minia Governorate, Sids Beni-Suef Governorate and the farm at El -Kharga ,New Valley Governorate during 2000, 2001 and 2002 seasons , respectively to evaluate the role of the local egg- parasitoid , *T. evanescens*. as a biological control agent against the cowpea pod worm, *E. zinckenella*. in soybean fields. Experimental area of about two feddans was divided into 24 plots each plot included 9 rows,4 m. long with 60cm. distance between rows in complete randomized block design with six treatments. Plot was separated from the other by three ones to prevent connection between release plants.Four replicates(42m²/ each) was used for each treatment including the untreated each .Giza 82 variety of soybean was cultivated approximately in mid May of each. The regular agricultural practices were performed and no insecticides were applied in released plots throughout the growing seasons. The parasitoid , *T. evanescens*, was obtained from parasitized eggs of the lesser sugarcane borer , *Chilo agamemnon* Bles collected from sugar cane field and reared on eggs of the Angoumois moth,*Sitotroga cerealella* (Oliver) at the " *Trichogramma* Mass Production Laboratory" in Mallawi Agriculture Research Station which described before by Tohamy (2002). The paper cards with parasitized eggs were put in carton paper veils (8x2 cm.), covered with wire screen with the top and bottom to allow the parasitoid to pass out and prevent any predator getting into. Each veil was contained 5000 parasitized eggs with different ages and attached in the upper parts of soybean leaves using pieces of wire. Release of the parasitoid were tried in 4 treatments and started on the first of July when the pest adult laid the eggs until August 15 at10 -day intervals. Rates of releases were 0, 10000 , 20000,30000 wasbs per feddan. While the Lannate recommended insecticide was tried in two treatments at two rates ; 300 and 150 g/ fed. as a recommended and half-recommended dose.

At harvest-time, Samples of 100 plants were randomly collected from each treatment to determine the following:

1- The percentage of infested pods and seeds, Number of larvae per 100 pods, was calculated. The percent reduction infestation was calculated

according to the equation of Henderson and Titon (1955), 2- Number of pods and seeds per plant, 3- Seed weight per plant (g), and 100 Seed weight (g) 4- Plants harvested/m², and Seed yield (kg/fed.)

Statistical analysis was carried out by using F test and Duncan (1955) method through SAS- Computer program evaluate the differences in efficacy treatments.

RESULTS AND DISCUSSION

1-Percentage of infestation pods:

Data obtained in Table (1) indicated that the increasing rates of egg parasitoid, *T. evanescens* from 10000 to 20000 and 30000 individuals per feddan or lannate insecticide from 150g to 300g/ fed. in soybean fields increased significantly the reduction percentage of infested pod by *E. zinckenella*. as compared with the control (untreated) during 2000, 2001, 2002 at Mallawi, Sids and El-Kharga regions, respectively. At the rate of 30000 parasitoids/fed, and of 300 g/fed. recorded the least percentage of pod infestation 3.1, 2.8%, 3.5, 3.2 % and 4.9, 4.6 % and associated with highly reduction 69.6, 72.5% at Mallawi in 2000, 72.4, 74.8% at Sids in 2001 and 85.0, 85.9 at El -Kharga in 2002 season, respectively as compared with the control. While, at low rate of 10000 individuals/fed. (parasitoids) and lannate (150g/ fed.) exhibited least the percentage of pod infestation (7.0, 6.2 %), (7.1, 6.5%) and (15.7, 14.5 %) and associated with low reduction % by (31.4, 39.2), (44.1, 48.8) and (51.7, 55.5) as compared with the control during the three seasons, respectively. Mean while the plots treated with egg- parasitoid at rate of 20000 individuals / fed. Produced a moderate effect on the infestation in comparison with untreated plots.

Seed infestation, the data shown in Table (1) indicated that, by releasing *T. evanescens* in the soybean fields the percentage of infested seeds infestation by *E. zinckenella* significantly reduced as compared with the control (untreated), where the infestation ranged between 2.3-2.9% in the plots treated with egg-parasitoid at the rate of 30000 individuals / fed. and ranged between 2.0-2.4 % in the insecticides plots at the rate of 300g/ fed. Whereas it ranged between 4 -11.4% in released plots at the rate of 10000 individuals/ fed., and ranged between 3.8 - 10.5 in plots treated with Lannate at the rate of 150g / fed according to the region and the season.

Number of larvae / 100 pods, the same trend was observed in number of larvae / 100 pods where the percent reduction averaged between 72.9, 72.6 and 82.2% in case of plots treated with parasitoid at the rate of 30000 individuals / fed. and 47.9, 53.2, 55.9% in plots treated with parasitoid at the rate of 10000 individuals / fed. Whereas it was 75.0, 75.8 and 83.9% in plots treated with Lannate (300g/ fed.) and 50, 54.8, 61.9 in plots treated with Lannate (150g/ fed.) in comparison with untreated plots at three seasons, respectively.

Table 1: Efficiency of *T. evanescens* for controlling the cowpea pod worm, *E. zinckella* compared with Lannate insecticide in soybean fields, Middle, Upper Egypt during 2000,2001 and 2002.

Region/season	Treatments	Application rates/ fed.	% infested pods	% reduction	% infested seeds	% reduction	No of larvae /pod	% reduction
Mallawi/2000	Untreated	Conrol	10.2 a	-	7.6 a	-	4.8 a	-
	Parasitoid	10000	7.0 b	31.4	4.0 b	47.4	2.5 b	47.9
	Parasitoid	20000	5.5 c	46.1	3.4 bc	55.3	2.0 bc	58.3
	Parasitoid	30000	3.1 d	69.6	2.3 c	69.7	1.5 c	72.9
	Lannate	300g	2.8 d	72.5	2.0 c	73.7	1.2 c	75.0
	Lannate	150	6.2 b	39.2	3.8 b	50.0	2.4 b	50.0
Sids/2001	Untreated	conrol	12.7 a	-	10.2 a	-	6.2 a	--
	Parasitoid	10000	7.1 b	44.1	5.3 b	48.0	2.9 b	53.2
	Parasitoid	20000	5.8 c	54.3	4.2 bc	58.8	2.3 c	62.9
	Parasitoid	30000	3.5 d	72.4	2.6 c	74.5	1.7 c	72.6
	Lannate	300g	3.2 d	74.8	2.3 c	77.5	1.5 c	75.8
	Lannate	150	6.5 b	48.8	5.4 b	47.1	2.8 b	54.8
El-Kharga 2002	Untreated	conrol	32.6 a	-	25.3 a	-	11.8 a	-
	Parasitoid	10000	15.7 b	51.8	11.4 b	54.9	5.2 b	55.9
	Parasitoid	20000	11.2 c	65.6	8.6 c	66.0	3.6 c	69.5
	Parasitoid	30000	4.9 d	85.0	2.9 d	88.5	2.1 d	82.2
	Lannate	300g	4.6 d	85.9	2.4 d	89.2	1.9 d	83.9
	Lannate	150	14.5 b	55.5	10.3 b	59.3	4.5 b	61.9

Means followed by different small letters are significantly different at $P < 0.05$ as determined by Duncan's(1955) multiple rang test.

The present investigations obviously indicated that, there were significant differences in the percentage of infested pods and seeds as well as number of larvae / 100 pods among any of the treatments and the untreated (control). While, no significant differences were observed between plots treated with high rate of parasitoid (30000 wasps / fed.) and plots treated with Lannate insecticide in the recommended dose 300 g/ fed.

So, it can be concluded that, *T. evanescens* can be used as effective , easy and safe method in decreasing cowpea pod worm damage in soybean fields. These results agree with those of Solemn and Ewers(1997) who showed that the highest rate of, *T. evanescens*(28.000 wasps/ fed.) was as highly effective as Furadan- recommended dose (6kg/ fed.), and significantly was better than Furadan- half dose (3kg/ fed.) in rice stem borer control.

2-Yield and agronomic characters of soybean :

Data in Table 2 showed that the number of pods per plant, number of seeds/ plant, seed weight/ plant(g). 100- seed weight(g), seed yield significantly increased by increasing the rate of egg parasitoid, up 30000 individuals/fed. and Lannate up 300 g/ fed. The Maximum seed yield was obtained from plots treated with the highest rate of parasitoid and plants treated with Lannate insecticide in the recommended -dose 300 g/ fed

.whereas It was 1477,1429 and 1741kg/ fed. with an high increasing by 34.6, 38.6 and 30.0% in case the plots released with the highest rate of parasitoid , and 1520 ,1440 and 1762 kg/ fed. with increasing by 36.4,39.1 and 30.9 % in plots treated with Lannate insecticide at the rate of 300g / fed. compared with the control.. While the minimum seed yield was observed in the plots treated with the lowest rate of egg parasitoid, (1215,1029 and 1433 kg/fed.) with low increasing by 20.5, 14.8 and 15.0% and of Lannate(1267, 1113 and 1442 kg/ fed) with an increasing by 23.8 , 21.2, and 15.5 as compared with the control treatment at the three districts in three seasons, respectively .

In general, the egg parasitoid, *T. evanescens* applied at the rate of 30000 individuals / fed.) proved to be highly effective against of the cowpea pod worm *E. zincknella* and reduced the damage rate of soybean plants. Similar results were reported by Tohamy (2002) who reported that utilization of *T. evanescens* at rate of 20000 adult/fed in sugarcane plantations against the purple- lined borer *Chilo agamemnon* (Bles.) resulted in 60,6 and 63.3 % reduction in the total infestation and resulted in 9.4 and 12.6% increasing in yield cane.

Table 2: Effect of releasing of *T. evanescens* for controlling *E. zincknella* compared with Lannate insecticide on yield and some agronomic characters of soybean at Middle , Upper Egypt during 2000,2001 and 2002.

Region/ season	Character	Application egg- parasitoid, <i>T. evanescens</i> /fed.			Lannate dose/fed		
		control	10000	20000	30000	300 g	150 g
Mallawi 2000	No. of pods/ plant	29.2 d	32.3 c	35.5 b	39.5 a	40.4 a	32.6 c
	No. of seeds/ plant	65.5 d	72.4 c	78.7 b	87.2 a	89.5 a	73.3 c
	Seed weight/ plant(g)	7.8 d	9.3 c	10.4 b	12.1 a	12.3 a	10.4 b
	100-seed weight(g)	14.2 c	14.3 b	14.6 b	15.5 a	15.7 a	14.3 b
	Plants harvested/m ²	29.5 c	31.1 b	31.5 b	33.0 a	33.3 a	31.3 b
	Seed yield (kg/fed.)	966 d	1215 c	1376 b	1477 a	1520a	1267 b
	% increasing	-	20.5	29.8	34.6	36.4	23.8
Sids 2001	No. of pods/ plant	27.2 d	31.5 c	33.7 b	37.9 a	38.5 a	31.4 c
	No. of seeds/ plant	61.1 d	66.5 c	75.7 b	82.3 a	84.8 a	67.6 c
	Seed weight/ plant(g)	6.8 d	7.9 c	10.2 b	11.0 a	11.3 a	9.8 b
	100-seed weight (g)	15.1 c	15.4 b	15.7 b	16.0 a	16.2 a	15.5 b
	Plants harvested/m ²	30.7 d	31.0 c	32.8 b	33.1 a	33.5 a	31.9 c
	Seed yield (kg/fed.)	877 d	1029 c	1305b	1429 a	1440a	1113b
	% increasing	-	14.8	32.8	38.6	39.1	21.2
El-Kharga 2002	No. of pods/ plant	30.6 d	35.2 c	37.6 b	42.7 a	44.3 a	35.5 c
	No. of seeds/ plant	69.5 d	81.4 c	85.2 b	91.3 a	93.1 a	82.8 c
	Seed weight/ plant(g)	9.6 c	10.8 b	11.1 b	12.5 a	12.7 a	10.9 b
	100-seed weight (g)	13.8 bc	14.0 b	14.4 b	15.6 a	15.6 a	14.2 b
	Plants harvested/m ²	30.2 c	31.6 b	31.8 b	33.2 a	33.3 a	31.5 b
	Seed yield (kg/fed.)	1218d	1433 c	1483 b	1741 a	1762 a	1442c
	% increasing	-	15.0	17.9	30.0	30.9	15.5

Means followed by different small letters are significantly different at P< 0.05 as determined by Duncan's(1955) multiple rang test.

So, its clear that *T. evanescens* approved to be a good biological control agent for the integrated pest management control programme to the cowpea pod worm.

REFERENCES

- Abbas, M.S.T. ; A.H. El-Sheriff and M.M. Embaby (1989), Utilization of *Trichogramma evanescens* West. To control lesser sugarcane borer, *Chilo agamemnon* Bles. in sugarcane fields in Egypt. 3- Three Waves Release Technique.Proc. 1st Int Conf. Econ. Egypte, 11: 87- 92.
- Dakroury, M.S.I. ; M. A. Eweis, H.A.A.Abul Fadl (2002). Mass production and utilization of *Trichogramma evanescens* Westw. As a biocontrol agent against date fruit pests in Siwa Oasis, Egypt. 2nd International conference . Plant Protection Research Institute, Cairo, Egypt,27p
- Duncun, D.B. (1955). Multiple range and (F) tests Biometrics, 11: 1-42.
- Embaby, M. M. (1986). Evaluation of the role of *Trichogramma evanescens* Westwood as a biological agent for management of sugarcane borer, *Chilo agamemnon* leszynski in selected sugarcane agroecosystem in Middle Egypt . M. Sc. Thesis, Fac. Agric., Minia Univ. , Egypt, 213 pp.
- Henderson, C.F. and TF.W. Titon (1955). Tests with acaricides against the brown wheat mite J. Econ. Ent., 48: 157-161.
- Masaki, J and Naito (1964). Studies on the distribution and abundance of lima bean pod borer , *Etiella zinckenella* Treitscke and soybean borer , *Grapholitha glycinivorella*
- Matsumura. J. Kanto Tosan Agric. Exp. Sta., 16: 189- 208, Konosu , Saitama.
- Mesbah,I.I.(1995).Determination of the economic injury level of *Spodoptera littoralis* (Boisd.) on soybean plants of Kafr EL-Sheikh regeion.J.Agric.Res. Tanta Univ.,21(2):311-322.
- Ratcliffe, R.H. ; T.L.Bissell and W. E. Bickley (1964).Observations on soybean insects in Maryland . J. Econ. Entomol., 53: 131-132.
- Shalaby, F.F.; Alia Abd El- Hafez ; E.F. El- Khayat and Manal A.A. El-Sharkawy (2002). Applied control of *Pectinophora gossypiella* (Saund.) and *Earias insulana* (Boisd.) in cotton fields by releasing *Trichogrammatoidae bactrae* Nagaraja. 2nd International conference . Plant Protection Research Institute , Cairo, Egypt,30p.
- Soliman, A.M. and M. A. Ewais (1997).Evaluation of *Trichogramma vanescens* parasitoid as compared with recommended furadan insecticide, against *Chilo agamemnon* Bles. In rice field. Egypt. J. Agric. Res. 75 (1).
- Tohamy, T.H. (2002). The role of *Trichogramma evanescens* West in controlling the purple-lined , *Chilo agamemnon* Bles. In different sugarcane plant ages in Middle Egypt. The Proc. of Minia 1st Conference for Agric. And Environ. SCI. (MCAESIST), 22:1549-1565

تأثير إطلاق طفيل التريكوجراما ايفاتسنس - مقارنة بمبيد اللانيت الموصى به في مكافحة دودة قرون اللوبيا في حقول فول الصويا في مصر الوسطى والعليا.

تهامى حامد تهامى * - مصطفى عبد الحميد النجار**

معمل إكثار طفيل التريكوجراما بملوى - معهد بحوث وقاية النباتات*

* معهد بحوث وقاية النباتات- مركز البحوث الزراعية- الدقى القاهرة *

تم عمل هذه الدراسة في ثلاثة مناطق خلال ثلاثة مواسم : ملوى (المنيا) موسم ٢٠٠٠ ، سدس (بنى سويف) موسم ٢٠٠١ ، والخارجة (الوادى الجديد) موسم ٢٠٠٢ لتقييم طفيل التريكوجراما بمعدلات (صفر ، ٣٠٠٠٠، ٢٠٠٠٠، ١٠٠٠٠٠، ومبيد اللانيت الموصى به (٣٠٠، ١٥ جرام/فدان) ضد دودة قرون اللوبيا ويمكن تلخيص النتائج كالتالى: مقارنة بالمبيد - القطع المعاملة بالطفيل أو المبيد بأي من الجرعات المختبرة خفضت معنوياً نسبة الإصابة بالقرون والبذور وعدد اليرقات فى القرون مع زيادة إنتاجية الفدان من البذور بالمقارنة بالقطع الغير معاملة (كنترول).

- حيث أن الجرعة العالية من الطفيل (٣٠٠٠٠ طفيل / فدان) أو الجرعة الموصى بها من المبيد (٣٠٠ جرام / فدان) كانت الأكثر تأثيراً على نسبة الإصابة بالأفة حيث زادت نسبة الانخفاض فى نسبة الإصابة بالقرون إلى ٦٩,٦ ، ٧٢,٤ ، ٨٥,٠ % بالنسبة للطفيل ، ٧٢,٥ ، ٧٤,٨ ، ٨٥,٩ % بالنسبة للمبيد مما أدى إلى زيادة فى إنتاجية الفدان من البذور قدرها ٣٤,٦ ، ٣٨,٦ ، ٣٠,٠ % بالنسبة للطفيل ، ٣٦,٤ ، ٣٩,١ ، ٣٠,٩ % بالنسبة للمبيد خلال الثلاثة مواسم على التوالي. ومن ناحية أخرى لا توجد فروق معنوية فى درجات الإصابة بهذه الأفة بين القطع المعاملة بالجرعة العالية من الطفيل والجرعة الموصى بها من المبيد.

- حقق استخدام الجرعة المنخفضة من الطفيل (١٠٠٠٠ طفيل / فدان) والجرعة المنخفضة من المبيد (١٥٠ جرام / فدان) أقل خفصاً للإصابة حيث كانت ٣١,٤ ، ٤٤,٢ ، ٥٧,٧ % بالنسبة للطفيل ، ٣٩,٢ ، ٤٨,٧ ، ٥٥,٥ % بالنسبة للمبيد مع زيادة فى الإنتاج قدرها ٢٣,٨ ، ٢١,٢ ، ١٥,٥ % بالنسبة للمبيد وزيادة قدرها ٢٠,٥ ، ١٤,٨ ، ١٥,٠ % بالنسبة للطفيل. فى كل من المناطق الثلاثة بسنواتها المختلفة .

- كل المعاملات من الطفيل أو المبيد أدت إلى زيادة عدد القرون ، عدد البذور ، إنتاجية النبات من البذور ، (بالوزن) وكانت هذه الزيادة عالية فى القطع ذات الجرعة العالية من الطفيل والجرعة الموصى بها من المبيد.

لهذا يمكن استخدام طفيل التريكوجراما بمعدل (٣٠٠٠٠ طفيل/ فدان) فى مكافحة دودة قرون اللوبيا بكفاءة عالية ومؤثرة لا نقل عن مبيد اللانيت الموصى به فضلا عن توفير التكاليف والمحافظة على الأعداء الحيوية والمحصول والبيئة .