

OCCURRENCE AND MOVEMENTS OF THE SPINY BOLL WORM, *Earias insulana* (BOISD.) WITHIN SOME ITS HOST PLANTS

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ABSTRACT

Field experiments were conducted at the Farm Horticulture Services Unit, Gemmiza, Agric. Res. Station (Middle Delta), Santa, Gharbia Governorate, during two successive seasons of 2008 and 2009 to study the occurrence of the spiny boll worm,(SBW), *Earias insulana* (Boisd.) in some its host plants. The hosts were Cotton, *Gossypium barbadense* L. (Varity Giza 86); Maize, *Zea maize* L. (Pioneer 3062); Khtmia weed, *Hibiscus trionum* L.; Okra, *Hibiscus esculentus* L.; Roselle, *Hibiscus sabdarifa* L. Occurrence period of the SBW larval infestation in the cotton terminal shoots and fruit structures extended from mid May to the end of September and occurred in three peaks. In the silk and ears of maize the SBW larval infestation period occurred from late July to late September at one peak. In bladder capsules, the larval infestation period started from the first week of June and extended to the third week of September at 2-3 peaks. In okra, it occurred from the first week of August and extended to last week of October at 2 peaks. In Roselle, it was recorded from mid September to mid November at 2 peaks. The bladder weed acted as a source of SBW infestation followed by cotton, Maize then okra, and was the most important host in summer for the occurrence of the SBW population. While some other hosts as Roselle acted as source of SBW infestation followed by wintry hosts, which were grown, in Egypt, had the sustain of SBW infestation during a critical period of its seasonal history that extended from December to April.

Keywords: *Earias insulana*, Fluctuation, Hosts

INTRODUCTION

Earias spp, population varies considerably from one place to the other and has been altered greatly in some cases during different seasons of the year. However, it is often the most important component of the pest complex in many of the different cotton growing areas in North Africa, the Middle East and in several areas of the Indian subcontinent. Regarding, the importance of the *Earias insulana* (Boisd.) as a pest, however, will depend on the extent to which the cotton crop and alternative hosts of *E. insulana* are complementary or competitive, in respect of the insect (Mathews and Tunstall, 1994).

In Egypt , *E. insulana* is a well known affecting pest on cotton, *Gossypium barbadense* L. ; maize, *Zea maize* L.; bladder khatmia (a weed), *Hibiscus trionum* L.; okra, *Hibiscus esculentus* L. and Roselle, *Hibiscus Sabdaria* L. (Abul-Nasr et al., 1972; Tahr , 1983; Kostandy, 1988; Ahmed, 1990; Hossain, 1990; Khidr et al., 1990, Abdel-Salam et al., 1994; Makkar and Kostandy, 1995; Ragab, 1999; Hoda Salem et al., 2004; Afsah, 2005 and Nada et al., 2009). The insect caused about 80% damage to cotton in south Khorrasn region in Iran (Fasell, 1977). It has a wide range of alternative host plants either crops such as maize, okra, mallow pea, various legumes,

terminal shoots of cotton and green bolls. In each case, the main period of infestation usually associates the cotton which is often associated with the extended of maize areas rather than other host plants. An initial population will increase on Maize or okra before it moves to cotton. Mesbah *et al.*, (2003) and Nada *et al.*, (2009) found that the field larval infestation of *E. insulana* showed three peaks on cotton and but only in one peak on maize.

The present study aims to occurrence time of *E. insulana* on fruiting bodies of the some host plants.

MATERIALS AND METHODS

Field experiments were conducted at the farm of Horticulture Services Unit, Gemmiza, Agric. Res. station (Middle Delta), Santa, Gharbia Governorate during two successive seasons, 2008 and 2009 to study the occurrence of *Earias insulana* on some host plants. These hosts and its cultivation areas and dates were presented in Table (1) as well as receptor parts of each host plant, inspection period, sample size and the number of replicates.

All agricultural practices were corrected out in due time and no pesticide of treatments were applied. Weekly, all samples were randomly collected.

RESULTS AND DISCUSSION

Spiny bollworm (SBW) infest different receptors parts of their hosts as the following: in cotton terminal shoots, squares, flowers & green bolls; in okra squares, flowers & pods; in maize silk &ears; in *Hibiscus trionum* capsules and in Roselle flowers & capsules.

In cotton fields:

During cotton seasons 2008 and 2009 (Table 2), occurrence periods of SBW larvae that infest cotton terminal shoots were from 25th May to 6th July and from 17th May to 5th July, recorded a peak for each season at 8/6, respectively. In cotton squares, larvae occurred from 18th May to 10th August and from 17th May to 12th July, recorded a peak for each season at 8/6 and 15/6, respectively. In cotton flowers larvae occurred from 15th June to 31st August and from 21st June to 23rd August, recorded two peaks for each season at 29/6 & 3/8 and 29/6 & 3/8, respectively. In green cotton bolls the larvae fluctuated during the periods that extended from 13th July to 28th Sept. and from 19th July to 27th Sept., recorded two peaks for each season at 10/8 & 28/9 and 10/8 & 28/9, respectively. Subsequently, the Occurrence period of SBW infestation in the cotton terminal shoots and fruit structures extended from mid May to the end of September during 2008 and 2009 cotton seasons. Data in Table (2) show that, ranges of mean number of SBW larvae that infest 100 receptors were 0.3-2.7 , 0.3-3.7 & 0.5-5.3 , 0.5-6.3 & 0.3-1.0 , 0.3-1.7 and 0.3-13.5 , 1.0-19.0 for terminal shoots & squares & flowers and bolls during 2008 , 2009 cotton seasons; respectively.

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These results partially agree with Abul-Nasr *et al.* (1971a), they found that the cotton infestation by SBW occurred from mid-May through June in terminal shoots (and may extend to 1st half of July), late June through July in square & flowers and from mid June to late July through September in green bolls. Also Nada *et al.* (2009) recorded the larval infestation of SBW in cotton fields through the period from the 1st week of June to the 3rd week of October.

In general the population of SBW larval in cotton fields was higher earlier during season 2008 than 2009. However, the infestation of terminal shoots might be regarded as index for the future intensity of infestation on the fruiting parts of the cotton plants (Abul – Nasr *et al.*, 1971a and Ragab, 1999). The population of SBW larval in the cotton squares was higher than in both terminal shoots and flowers and lowest than cotton bolls. Moreover, the larval population reach its peak at the mid of June in terminal shoots and cotton squares. Also, the numbers of SBW larvae in cotton flowers are scarce through June to the end of August. On the other hand, the population of SBW larvae in the cotton boll increased gradually from mid June to the end of August then it increased sharply in September. These results agree with Abul-Nasr *et al.*, (1971a); Ragab, 1999; Hoda Salem *et al.*, (2004) and Nada *et al.*, (2009).

In maize fields:

AS shown in Table (2) and Figures (1-4), the occurrence of SBW larvae inside the silk and ears of maize began from 30th July to 24th September and from 25th July to 19th September during 2008 &2009 seasons, recorded a peak each at 24/8 and 31/8 for the two seasons, respectively. The mean number of SBW larval population ranged between 1.0-11.7 & 0.5-17.3 per 100 silks of maize ears and 0.7-13.0 & 1.0-18.7 per 100 ears of maize during seasons of 2008 and 2009, respectively. Also, it can be noticed that, the SBW larval population increased through August until reached its peak then it decreased in both seasons. In this regard, Abul-Nasr *et al.*, (1971b); Hoda Salem, *et al.* (2004) and Nada *et al.* (2009) they indicated that, the SBW larval infestation appeared on the maize from 3rd week of July to the end week of September and occurred in one peak during the appearance of maize flowers male (tassel) and female (silk) and growing ears.

Bladder Khatmia

Data in table (2) and figures (1-4) show that, the infestation of bladder capsules was started in the first week of June and extend to the third week of September. Also, mean number of SBW larval population ranged between 2.0-17.7 & 4.0-17.7 /100 capsules and recorded three peaks each at 6/7, 10/8 & 31/8 during the two seasons of 2008 & 2009; respectively. In this respects ABUL-NSR *et al.*, (1972) and Mesbah *et al.*, (2003) reported that in cotton field the attack of the bladder capsules may start as early as the 1st half of July in EL-GIZA and reached its maximum level in the 1st half of November

SBW infestation was recorded in the capsules of bladder (a weed, *H. trionum*) which grows naturally in both cotton and maize fields. The squares of bladder Khatmia are rarely injured with SBW because their mucilage content is deleterious to SBW larvae. Rate of attack in flowers is also very

low but in capsules is rather high (ABUL-NSR *et al.*, (1972). So, the present results were restricted to record the SBW larval number in bladder capsules.

In okra fields

Occurrence of SBW larvae in okra squares were recorded on 6th week of August and it extended to 1st week of October and 2nd week of September during seasons of 2008 and 2009, respectively. The respective mean number of larval infestation ranged between 0.3-4.7 & 0.3-4.0 per 100 squares. On the other hand, the initial occurrences of SBW larvae in okra flower was recorded in mid August and extend to the first week of October and last week of September with mean numbers ranged between 0.7-4 and 0.7-5.0 during season of 2008 and 2009; respectively Table (2). Also, the initial occurrence of SBW larvae was recorded in okra pods in mid August and extended to the last week of October with mean number ranged between 0.3-31.5 and 0.3-34.0 larvae per 100 pods during season of 2008 and 2009; respectively. However, peak occurrence of SBW larvae in okra squares, flowers and pods were (17/8 & 21/8) , (17/8 & 21/8) and (17/8 , 26/10 & 21/9, 24/10) during the two seasons of 2008 and 2009 ; respectively Table (2) & Figures (1-4).

However, the rate of mucilage contents of squares and flowers seems to be deleterious to SBW larvae. Consequently, the numbers of SBW larvae in okra pods was the highest (ABUL-NSR *et al.* 1972).

Roselle fields

Data in Table(2) and Figures(1-4) indicated that , occurrence of the SBW larvae in Roselle flowers was recorded from 10th & 19th September to (22nd & 24th) October ; and the obtained mean number ranged between 0.3-2.0 & 0.3-1.7 and the peak occurred on 5th October during seasons of 2008 & 2009, respectively. Regarding to the SBW infestation against the Roselle capsules , it was recoded in the period from (17th & 26th) September to (11th & 15th) November , with range of mean numbers 2.0-19 & 2.7-16 larvae per 100 capsule and the peaks occurred on 5th October, 9th November during the two seasons of 2008 & 2009, respectively. In this regards, Ahamed (1990), Afsah(2005) and Abdel-Moniem and EL-Wahab (2006) recorded *E. insulana* as one of the most dominant pest on Roselle plants *Hibiscus sabdarifa*.

Occurrence of SBW in different periods

During May and June, SBW larvae were found in scarce numbers in the cotton terminal shoots (C.T) and in low number in cotton square (C.S). Also, during June, it was found in low numbers in both of C.T & C.S and in scarce numbers in the cotton flowers (C.F). While it has relatively high numbers in the Bladder Khatmia capsules (B.KH.Cap) that grown in cotton fields as a weed Table (2) and Figures (1-4). These results agree with Mesbah *et al.*, (2003) revealed that Bladder hibiscus a weed grows in cotton fields. It acts as a source of infestation with some economic serious pests. The pests usually occur in considerable high number on the weed plants about few weeks earlier than on cotton plants because the weed plants grow faster than the cotton plants. On the other hand, the weed species did not show up to harbor considered number of predatory species. These low numbers of SBW larvae through May and June in cotton receptors (C.T , C.S and C.F) may be due to the occurrences of the common insect predators (8, insects and true

spider) from the 1st week of May and it's gradually increasing until reach its peaks at mid or end of June (Nada et al., 2009). While, the increasing of SBW larval numbers in B.KH.Cap is more favorable for SBW and/or there were only two predators (*Scymnus interrupts* (Boezei) and *Orius albidipens*) that were recorded in low numbers on the bladder hibiscus. Several malvaceous plants included okra (*H. esculents*) till (*H. cannabinus*), Hollyhock (*Althea rosea*), the ornamental red Hibiscus (*H. rosa sinensis*), Karcadieh (*H. sabdarifa*) and khobbeza (*Marla parviflora*) were recorded as host plants for SBW by Willcocks and Bahgat (1937).

During July, the occurrence of SBW was recorded in the cotton bolls (C.b.) and the maize silk (M.S) in low numbers as well as in C.S and C.F. Hoda Salem et al., (2004) they found that the highest infestation by SBW attacking maize that recorded during August, while the lowest was recorded during July in cotton field. On the other hand, there was a sharply increasing in SBW larvae was recorded in the B.KH.Cap. However, these results may be due to the scarce of natural enemies on the B.KH as well as the occurrence of the natural enemies peaks (1st peak on 28th June) and (or 2nd peak on 20th July) on cotton plants and (1st peak on 20th July) on the maize (Nada et al., 2009). Moreover, Fasell (1977) found that, the SBW individual developed on the *H. trionum* Cap laid more eggs than did those developing on cotton bolls. And he adds that, removal of hibiscus from the vicinity of cotton factor in the control of *E. insulana*.

During August, as shown in Figures (1-4) there were three indications; 1- the 1st occurrence of SBW in the okra squares (O.S), flowers (O. F) pods (O.P) in low numbers. 2- The number of SBW larvae increased in the green bolls, while it was scarce in the cotton squares (C.S); however, as the green cotton bolls increase in numbers ,the infestation of squares recedes that green bolls are preferable to *E. insulana* than squares (ABUL-NASR et al., 1971a; Kostandy et al., 1988 And Ragab, 1999). The numbers of SBW larvae in Green bolls (G.b) was lower than it in both maize silk (M.S) and ears (M.E). This may a result of the lower population of natural enemies in the maize fields than it in the cotton fields (Nada et al. 2009).

During September, the SBW infestation appeared in both of the Roselle flowers (R.F) and capsules (R.Cap) in very low and relatively high numbers; respectively. In addition, the SBW larvae found in very high in B.KH then in Okra pods (O.P), green bolls (G.b) and Maize ears (M.E.). While, it was relatively high in maize silk Figures(1-4). However, *Earias insulana* multiplying on its alternative host plants at the same time as on cotton. In all circumstances when cotton and other native host plants are fruiting simultaneously the question of host preferences become important. Fitt (1989) Suggested that temperature, host plants sequence and host suitability play an important role in population dynamic of SBW male moths. Good evidence is scanty, but on the whole it suggests that cotton is not the first choice of *Earias* (Reed 1994).

During October , the larvae of SBW was recorded in very high numbers in okra pods (O.P) and high numbers in the Roselle capsules (R.Cap) ; while it was very low in the Roselle flower (R.F)

During November, the SBW larvae were recorded only in the Roselle capsules in very high numbers. Ahmed (1990) and Afsah (2005) revealed that SBW commenced its infestation for Roselle plants on the third week of September till the end of the growing seasons. Infestation with SBW larval in capsules gave their highest level during November in the two examined seasons.

F1

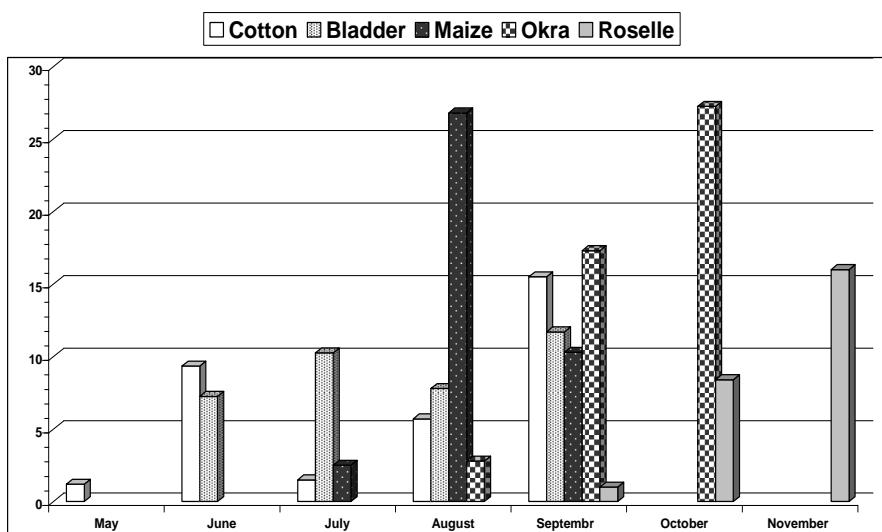


Fig. (2) : Monthly population of *Earias insulana* larvae on five host plants at the Farm Horticulture Services Unit, Gemmiza , Santa , Gharbia Governorate, during 2009 season

Fig. (3) :Population fluctuation of *Earias insulana* larvae on different receptors of five host plants at the Farm Horticulture Services Unit, Gemmeiza, Santa , Gharbia Governorate, during 2008 season.

Fig. (4) :Population fluctuation of *Earias insulana* larvae on different receptors of five host plants at the Farm Horticulture Services Unit, Gemmeiza , Santa , Gharbia Governorate, during 2009 season

Concluded that SBW occurred only in the cotton fields during May and June and we do not need any efforts for its control. It is naturally controlled by its nature enemies. The *H. trionum* must get rid from the cotton and maize fields before the last week of July. SBW larvae were in okra pod and Roselle capsules. In absence of cotton, okra and Roselle, *E.insulana* can be survive on a number of alternative hosts including *hibiscus rosasinensis* L.; Abut, *Lion indicum*(L); sweet , *Althea roseal* , *Sida cordifolia* and *Malva sylvestrisl* (Reed 1994). The bladder weed acted as a source of infestation with SBW followed by cotton, Maize and okra were the most important hosts in summer for the occurrence of the SBW population, while some other hosts as Roselle acted as source of infestation with SBW followed by Hollyhock, Khobbeza, pea , mallow, various legumes. The ornamental Red *hibiscus* was the most important hosts in winter. The wintry different crops which were grown in Egypt had the sustain SBW infestation during a critical period of its seasonal history that extended from December to April. Thus, the early infestation of the bladder weed is usually the main source of infestation with SBW population to the target crops in summer. While, Roselle acted as a source of infestation with SBW to the target crops in winter (Mesbah et al., 2003).

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تواجد وتحركات دودة اللوز الشوكية داخل بعض عوائدها النباتية
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أجريت التجارب الحقلية في مزرعة وحدة الخدمات البيئية بالجيزة مركز السنطة محافظة الغربية (وسط الدلتا) ، خلال موسم 2008 و 2009 على التوالي. لدراسة تواجد دودة اللوز الشوكية على بعض عوائدها النباتية. وكانت العوائل موضع الدراسة هي القطن (جيزة 86) ، الذرة (بايونير 3062) ، حشيشة التيل البرى ، البامية ، الكركديه. حيث امتدت فترة الإصابة اليرقية في القطن من منتصف شهر مايو وحتى نهاية سبتمبر حيث سجلت ثلاثة قمم. أما في الحريره وكوز الذرة، فقد تواجدت الإصابة اليرقية خلال الفترة من أواخر يوليو إلى آخر سبتمبر في قمة واحدة. وفي كبسولات التيل البرى، فقد بدأت الإصابة من الأسبوع الأول من يونيو وامتدت إلى الأسبوع الثالث من سبتمبر في 2-3 قمم. أما في البامية، فقد تواجدت إعتباراً من الأسبوع الأول من أغسطس وامتدت إلى الأسبوع الأخير من أكتوبر في قمتين. وفي الكركديه تم تسجيل نسب الإصابة من منتصف سبتمبر إلى منتصف نوفمبر في قمتين. ويعتبر التيل البرى مصدراً للإصابة بدوادة اللوز الشوكية يليه القطن والذرة ثم البامية. وتعتبر التيل البرى من أهم العوائل في فترة الصيف لهذه الأفة. بينما نبات الكركديه بمثابة مصدر الإصابة بدوادة اللوز الشوكية للعوازل الشتوية (خاصة الحشاش منها) حيث يحافظ على تواجد الأفة خلال فترة حرجة من تاريخها الذي يمتد من ديسمبر إلى أبريل.

قام بتحكيم البحث

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Table (1): Inspection of *E. insulana* infestation in its host plant fields during 2008 and 2009 seasons at Gharbia Governorate.

Host Plant	Cultivations		Receptor part(s)	Inspection Period (s)				Sample		
	Area	date		Season 2008		Season 2009		size	Replicate	
				from	to	from	to			
Cotton <i>Gossypium barbadense</i> . (Giza 86)	One Feddan	Last week of March	Terminal shoots	4 th May	6 th July	3 rd May	5 th July	25	4	
			Squares	11 th May	8 th Aug	17 th May	12 th July			
			Flowers	8 th June	31 st Aug	14 th June	23 rd Aug			
			Bolls	6 th July	28 th Sep	5 th July	27 th Sep			
Maize <i>Zea maize</i> (Pioneer 3062)	One Feddan	First week of June 2008	Silks	23 rd July	24 th Sep	18 th July	19 th Sep	5	20	
		Last week of May 2009	Ears							
The bladder Khtmia weed <i>Hibiscus trionum L.</i> grown naturally in cotton and maize fields				Capsules	4 th June	24 th Sep	6 th June		10	10
Okra <i>Hibiscus esculentus L.</i>	1/4 Feddan	Mid April	Squares					24 th Oct	25	4
			Flowers	16 th July	22 nd Oct	25 th July				
			Pods							
Roselle <i>Hibiscus Sabdarifa L.</i>	1/4 Feddan	Last week Of April	Flowers	3 rd Sep	29 th Oct.	5 th Sep.	15 th Nov	11 th Nov	19 th Sep	10/8 & 26/10
			Capsules							

Table (2): The infestation periods and running mean of *E.insulana* numbers on different host plant receptors in Santa Gharbia Governorate during 2008 and 2009 seasons

host planet	Receptor part(s)	infestation period				Running mean of SBW larval number /100 respecters					
		2008		2009		2008		2009		Range	
		from	to	from	to	from	to	range	from	to	peak occurred date
Cotton	terminal shoot	25 th May	6 th Jul	17 th May	5 th July	0.3	2.7	8/6	0.3	3.7	8/6
	squares	18 th May	10 th August		12 th July	0.5	5.3	8/6 & 20/7	0.5	6.3	15/6
	flowers	15 th June	31 th August	21 th June	23 th August	0.3	1.0	29/6 & 3/8	0.3	1.7	29/6 & 3/8
	bolls	13 th July	28 th Sept	19 th July	27 th Sept	0.3	13.5	10/8 & 28/9	1.0	19	10/8 & 28/9
Maize	Silk	30 th July	24 th Sep	19 th Sep	1.0	11.7	24/8	0.5	17.3	31/8	
	Ears				0.7	13	31/8	1.0	18.7	31/8	
Bladder Khtmia	capsules	4 th June	24 th Sep	6 th Jun	19 th Sep	2	17.7	6/7,10/8 & 31/8	4.0	17.7	20/7,10/8 &31/8
Okra	square	6 th Aug	15 th Oct	15 th August	12 th Sep	0.3	4.7	17/8	0.3	4.0	21/8
	flower	16 th August		26 th Sep	0.7	4.0	17/8	0.7	5.0	21/9	
	pod	13 th Aug	22 th Oct	17 th August	24 th Oct	0.3	31.5	17/8 & 26/10	0.3	34.0	21/9 & 26/10
Roselle	flower	10 th Sep	22 th Oct	19 th Sep	24 th Oct	0.3	2.0	5/10	0.3	1.7	5/10
	capsules	17 th Sep	11 th Nov	26 th Sep	15 th Nov	2.0	19.7	5/10 & 9/11	2.7	16.0	5/10 & 9/11