Light Trap as Indicator of Weather Factors Affecting Flight Activity of Three Common Corn Borers Species in Alexandria Governorate

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ABSTRACT

In the last years, the degrees of temperature and relative humidity have been changed greatly, and over 20 years up till now no studies have been carried out in Alexandria region. For this reason it was found obliged to trace and study this change and its effect on the seasonal distribution of the following corn borers *Sesamia critica* Led. (Noctuidae), *Ostrinia nubilalis* (Hub.) (Pyraustidae) and *Chilo agamemnon* Bles. (Pyralidae). The present work was carried out at El-Sabaheia Agricultural Research Station, Alexandria, during two growing seasons, 2004 and 2005. A modified Robinson light trap was used to evaluate the multiple regression and to determine coefficient between maximum, minimum temperature, R.H and population of the evaluated insects were adjusted. The results showed that both May & September recorded high population for *S. cretica*, while for both *C. agamenon* and *O. nubilalis* it was during September and October. This work was attempt to gain more information about the effect of weather conditions on the flight activity of the three species of corn borers moths (or. Lepideptera).

INTRODUCTION

The effect of weather conditions on the activity of insects has been the subject of extensive studies in many parts in the world (William 1939; Roach, and Whisnant 1986; Elamin, 1988; Radin, 1990; and Baca, 1995).

In Egypt, trials were made to study the seasonal abundance of some maize insect pests, (Ahmed and kira 1960; El Sherif, 1965; Ismail 1968; Hanna and Atris, 1969, El Saadeny et al. 1978, Isa et al., 1978; Zanaty, et al. 1985; Attia et al., 1989, and Farag et al., 1991).

Sesamia cretica, *Ostrinia nubilalis*, and *Chilo agamemnon* are considered among the most economic important pests of maize. As far the integrated control of these insect pests is concerned their population dynamics are still far from being complete. Therefore, the present work was carried out to study the population densities of these insect pests catched by light trap with the aim of adding some contributions to the available knowledge on the effects of certain weather factors on their abundance in maize field.

MATERIALS AND METHODS

A light trap of the Robinson type fitted with (250 watt) mercury vapour bulb was operated daily from sunset to sunrise for two years from January 1st

2004, till December 31th, 2005, the trap was fixed at height of 3 m, located at the Experimental Farm of the Agricultural Research Center, Plant Protection Research Station, El Sabheia, Alexandria. This area mainly cultivated with Maiz. The trap was tested for about 12 hours per day during scotophase. Sodium cyanid was used for killing the collected moths which were kept in glass jar attached to the trap and transfered to the laboratory for insect counting and identification. As well daily moths catching were recorded.

The maximum and minimum daily mean temperature and relative humilities in Alexandria were obtained from the Meteorological Department.

Values of multiple regression and determination coefficient were calculated for each pest at different tested weather factors. El-Mezayyen, et al. (1996) stated that the method of partial regression is the best for dealing with weather factors in the field.

RESULTS AND DISCUSSION

A- Flight activities of the three species of corn borer moths:

1- The greater sugar-cane *Sesamia cretica*

The results in Figs (1 and 2) show that the first appearing of adults, which developed from over-wintering mature larvae trapped last week during March and the last one at the second half of October. The greater sugar-cane *S. cretica* had two generations, the first generation light extended from the first weak in April until the first week in June. Flight peaks occurred on the mid of May in both seasons of 2004 and 2005.

These results in accordance to the findings of Hanna and Atries (1969) who mentioned that this insect was caught in high numbers during spring season. This generation attacks the corn which was planted during end of March and April cause remarkable damages and economic losses to corn yield.

The second period of activity was starting from the beginning of August until the end of September with a light peak on Mid-September in both seasons of 2004 and 2005.

Abdel-Latif and Awadallah (1975) mentioned that eggs of these moths were laid at that time on older corn (up to 8 weeks old) which planted late in May up to July after which the number of moths declined gradually towards the end of October. Most larvae developing from eggs laid during these moths were diapaused.

2-The lesser sugar-cane *Chilo agamemnon*

The data illustrated in Figs (1 and 2) indicated that up to late of April there were no moths in the trap. However, towards the beginning of May, the moths began to be trapped and increase gradually till the end of May with a light peak on the end of May only on season 2004. This generation attacks hosts other than corn such as sugar-cane rice, corn planted for forage and certain gramenious weeds because the humidity around such hosts in the field is higher than in corn fields. (Abdel Latif and Awadallah, 1975). After May 30, the number of moths decreased during June, July and Mid-August, but suddenly increased during September and Mid-October with a pronounced peak in October and September 2004, 2005, respectively. Similar studies have been conducted by Ahmed and Kira (1960), El Sherif (1965), Elsaadany (1969), and Draz et al. (1989).

3- The European corn borer *Ostrinia nubilalis*

Figures (1 and 2) show the number of moths of *O. nubilalis* during 2004, 2005. it is obvious that there were two peaks in 2004, lowest peak in May and highest peak in October, while in 2005 one peak occurred in September. Similar results were obtained by El-Sherief (1965).

The first generation resulting from hibernated larvae (lowest peak) at the end of May 30 and extend between the end of April until the first weak of June. Abdel-Latif and Awadallah (1975) demonstrated that this generation laid their eggs on corn which planted early (March and April).

The highest peak occurred during October 2004 and September 2005, respectively. This generation females of moths laid high numbers of eggs on corn plant as late as July and caused high losses in yield Abdel Latif and Awadallah, 1975).

B. Effect of three main weather factors on population fluctuations of the corn borers

1- Maximum day temperature

The results in Table (1) indicate a positive and insignificant effect of the maximum day temperature on the population of the three corn borers during 2004 and 2005 (B= 0.274 and 0.592, 0.527 and 0.382, and 1.211 and 1.80, for *S. cretica*, *C. agamemnon* and *O. nubilalis*), respectively. Where (r = 0.223 and 0.437, 0.259 and 0.163, and 0.373 and 0.627 for the same pests), respectively.

2- Minimum night temperature

A negative and insignificant relationship took place between the population of the three corn borers and minimum temperature in both years (B = -0.157 and -0.372, -0.393 and -.0.340, and -0.872 and -1.51 for *S. cretica*, *C. agamemnon* and *O. nubilalis*), successively. Where (r = -0.199 and -0.326, 0.301 and -0.173, and -0.714 and -0.622 for the same pests), respectively.

3- Relative humidity (R.H.)

Positive and insignificant effects of the R.H. were found for the three corn borers during the two years of experiments (B = 0.117 and 0.722, 0.118 and 0.202, and 0.193 and 0.143). Where (r = 0.136 and 0.538, 0.463 and 0.19, and 0.085 and 0.150 for the same pests), respectively.

4- Combined effect of weather factors on the trapping populations of the tested pests:

The combined effect of the three weather factors, maximum and minimum temp. and R.H. on the flight activity of the tested pests is shown in table one and was calculated by determination coefficient values (R2).

The R2 values for the three weather factors were 0.54, 0.334 and 0.625 for *S. cretica*, *C. agamemnon* and *O. nubilalis* in 2004, while in 2005 it was 0.597, 0.218 and 0.353, respectively.

On the other hand the population densities expressed as mean daily catch were 1.03, 1.45, and 1.98 Individual in 2004 while in 2005 it reached 1.47, 1.75 and 2.61, respectively (Figs 1 and 2). The data reflects the important role of the three factors which influenced the activity and abundance of these pests during 2004 and 2005, respectively.

However the present results agree with the results obtained by Draz et al. (1989) who found that the multiple regression values were positive for the effects of maximum temperature and relative humidity on the population of *S. cretica*, *C. agamemnon* and *O. nubilalis*, while it was negative for the minimum temperature in the first year. The values were not the same during the second year, taken in our consideration that the trapping moth values differ from season to another.

Table (1): Multiple regressions and simple correlation determination coefficient between three weather factors; maximum, minimum temp. and relative humidity and population fluctuations of three insect-pests during 2004 and 2005 at Alexandria.

Species	Weather factors	2004			2005		
		B	S. E of r	R^2	B	r	R^2
S. cretica	Max. Temp.°C	0.274	0.223		0.592	0.437	
Led.	Mini Temp.°C	- 0.157	- 0.199	0.54	- 0.372	0.326	0.597
	RH%				0.722	0.538	
C. agamemnon	Max. Temp.°C	0.527	0.259		0.382	0.163	
Bles.	Mini Temp.°C	- 0.393	- 0.301	0.334	- 0.340	- 0.173	0.218
	RH%	0.118	0.463		0.202	0.19	
O. nubilalis	Max. Temp.°C	1.211	0.373		1.80	0.627	
(Hub.)	Mini Temp.°C	- 0.872	- 0.417	0.625	- 1.51	- 0.622	0.353
	RH%	0.193	0.085		0.143	0.150	

B = Regression Coefficient Value.
r = Simple Correlation.
R^2 = Determination Coefficient Value.

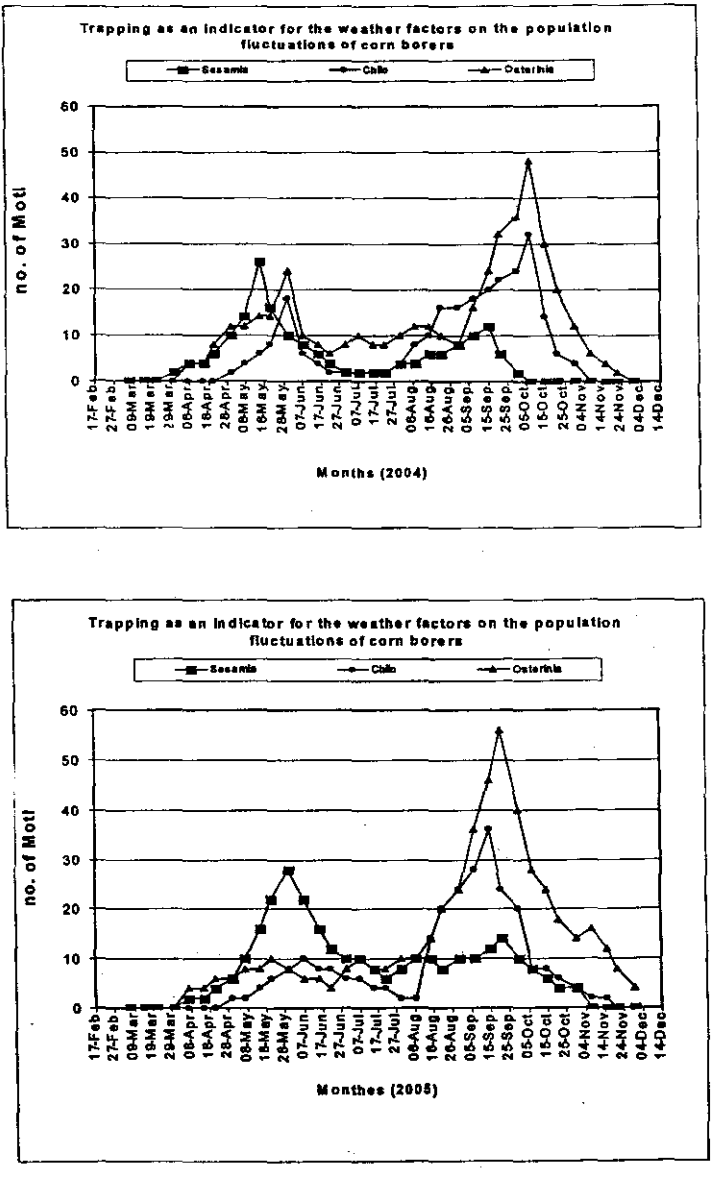

Figure (1): Monthly catch of *Sesamia cretica* Led. , *Chilo agamemnon* Bles. and *Osterinia nubilalis* (Hub.) by the light trap through twelve months (2004) and (2005) at Alexandria

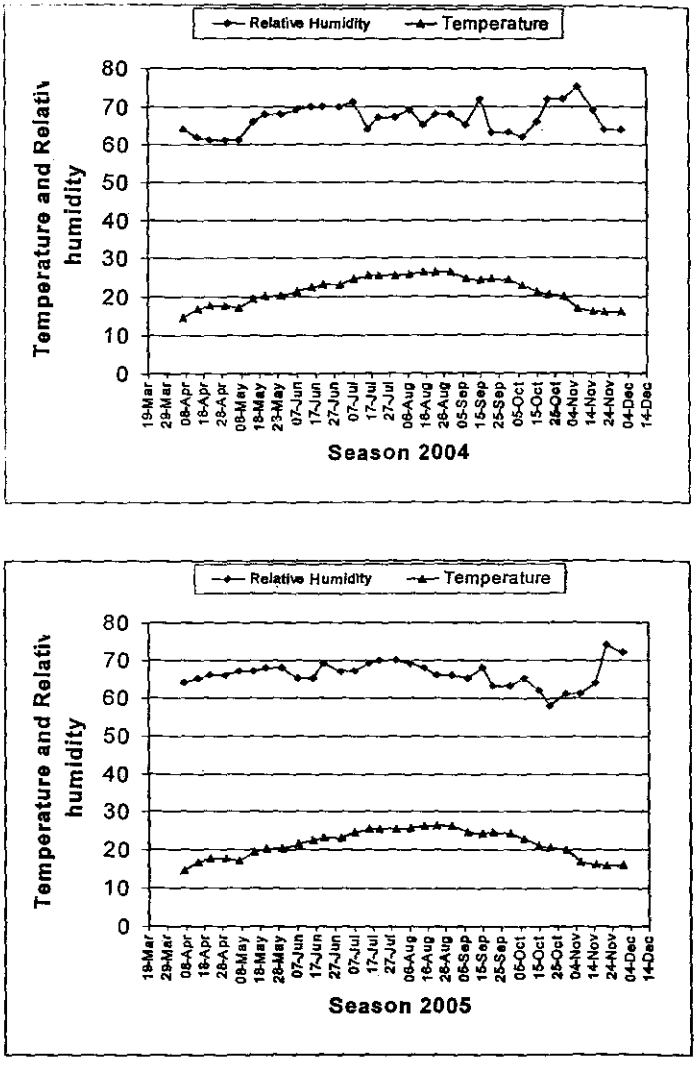

Figure (2): Temperature and Relative Humidity in the field during 2004 and 2005 seasons.

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الملخص العربى

استخدام المصيدة الضوئية كمؤشر لتأثير العوامل الجوية على نشاط الطيران لفراشات ثاقبات الذرة الثلاث فى منطقة الإسكندرية

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نظراً لحدوث تغير كبير فى درجات الحرارة والرطوبة النسبية فى السنوات الأخيرة ومع الأخذ بنظر الاعتبار أنه لأكثر من ٢٠ عام لم تجرى دراسات عن تأثير تلك العوامل الجوية على التوزيع الموسمي لفراشات ثاقبات الذرة الثلاث بمنطقة محافظة الإسكندرية (دودة القصب الكبرى *S. critica* و دودة القصب الصغرى *C. agamemnon* وحفار ساق الذرة الأوربى , *O. nubilalis*) .لذلك كان من الضرورى دراسة تأثير هذه العوامل الجوية على التوزيع الموسمى لفراشات هذه الآفات. وقد أجريت هذه الدراسة بمزرعة كلية الزراعة ــ جامعة الإسكندرية ــ بمنطقة الصبحية بالإسكندرية وذلك لمدة عامين فى الفترة من بداية يناير ٢٠٠٤ حتى نهاية ديسمبر ٢٠٠٥ حيث وضعت المصيدة الضوئية على ارتفاع

ثلاثة أمتار من سطح الأرض أعلى مبنى إنتاج عسل النحل. أوضحت الدراسة أن أعلى تعداد لفراشة دودة القصب الكبرى كان خلال شهر مايو وكان أعلى تعداد لفراشتى دودة القصب الصغرى وفراشة دودة الذرة الأوربية خلال شهرى سبتمبر وأكتوبر. كما بينت النتائج وجود تأثير غير معنوى للعوامل الجوية الثلاث كل على حدة (درجات الحرارة العظمى، والصغرى، والرطوبة النسبية) ولكن كان هناك تأثير عالى المعنوية لتأثير العوامل الجوية الثلاث معاً، وكان هناك تأثير لهذه العوامل على تعداد هذه الحشرات التى تم اصطيادها بالمصائد من خلال معرفة معامل التقدير Determination coefficient.