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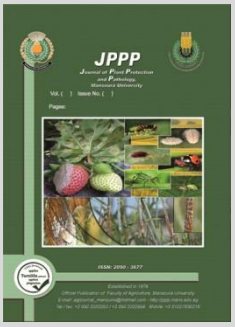
Ecological Studies on some Insect Pests Caught by Light Traps at Mansoura District, Egypt

Walaa A. Tawfik[1*]; Nadia E. Mohamed[1] and A. A. Ghanim[2]

[1] Plant Protection Research Institute, Agricultural Research Center, Dokki Giza, Egypt.
[2] Economic Entomology Department, Faculty of Agriculture, Mansoura University, Egypt.



ABSTRACT

Experiments were carried out to study the population fluctuations of some insects infesting vegetables and field crops trapped by using light traps and the effect of some temperature and relative humidity on these insects during the two years of investigation at Mansoura region. The obtained results revealed that *Agrotis spinifera* Hbn. recorded six peaks all the year a round. These peaks were found in the 3rd week of March, in the 4th week of April, in the 2nd week of June, in last week of July, in the first week of September, and in the end of October, during the two years of study. *Agrotis pronuba* Led. and *Syngrapha circumfelexa* L. had four peaks per a year during the period of study. The data showed that *Earias insoulana* Boised. had five peaks all the year a round and *Gryllotalpa africana* Pal. recorded three peaks per year. Results indicated that the values of correlation coefficient of the relationship between the average temperature, relative humidity and the population fluctuation of these five insect species during the two years of study, cleared that average temperature and relative humidity parameters exerted varied effect with a value ranged from slight to highly significant correlation during the period of study.

Keywords: Ecology, light traps, *Agrotis spinifera* , *Agrotis pronuba, Syngrapha circumfelexa, Earias insoulana, Gryllotalpa africana*

INTRODUCTION

Light traps are an important method for monitoring the number of insects that attacking vegetables and field crops throughout the year. The light traps were the most important method for survey moths, which exploit their attraction to artificial light (Fayle *et al.* 2007; Merckx *et al.*, 2009 and Groenendijk and Ellis, 2011). However, many workers evaluated the use of light traps for recording new species and for recorded the relative abundance of the main insect pests. Such information may enable them to predict the possible out- breaks of certain insect species ,meanwhile can identify migratory insects that leave the country , such as black rodent worm *Agrotis ipsilon* (Hunfnagal) (El- Deeb *et al.*, 1968; Fayle *et al.*, 2007 and Leraunt, 2009). This data predict the population density of insect species and used insecticides or other integrated control methods. Many investigators studied the population fluctuations of the important insect species (Wang *et al.* 1995; El- Mezayen *et al.*, 1997; El- Zanan and El- Hawary, 1999; Sharma *et al.*, 2010, Pehlevan and Kovanci, 2013 and Ghanim *et al*. 2019)

Many investigators reported light traps as successful method of testing the relationships of weather factors and the activity of vegetable crops insect species (Hendricks *et al.*, 1975; Ghanim, 1977). Therefore, this investigation carried out to study the relative abundance of some insects caught by light traps and the effects of certain weather factors on the seasonal abundance of these insects.

MATERIALS AND METHODS

The population density of insect species infesting field crops at Mansoura district. Daily catch was taken during the period of study from 26th December 2015 till 24th December 2017 by using two Robinson light traps (Robinson and Robinson 1950). The traps were placed in the farm of Faculty of Agriculture, Mansoura University at a height of seven meters. The two light traps were baited with mercury vapour lamps (250 Walt) as a source of light. Sodium cyanide was put in a glass jar and used as a killing agent inside the trap. The light trap was set off daily for a period of 12 hours from sunset to sunrise.

The daily procedure:

The traps were emptied every morning and the traps catches were singly placed in polyethylene sac, then the catch was brought to the laboratory. The daily catch was separated, identified, counted and recorded at the same day. The daily catch was accumulated biweekly for the two years of study.

Weather factors:

Daily records of temperature and relative humidity in Mansoura reagion were obtained from meteorological organization, Ministry of Defense, Cairo. These records have been calculated as mean of biweekly degrees related to the accumulated biweekly catch of the insect species.

Statistical analysis:

Correlation coefficient and multiple regression equation using computer advanced statistical program (Costat 2004).

RESULTS AND DISCUSSION

1) Population fluctuations of *Agrotis spinifera* moths

Data illustrated in Figure (1) cleared that the population density of *A. spinifera* during 2016 and 2017 investigation. The catch size revealed that this insect had six peaks all the year per years. These peaks were recorded in the 3rd week of March, in the 4th of April, in the 2nd week of June, the end of July, in the begging week of September, and

* **Corresponding author.**
E-mail address:walaa**abdelmoaty81@gmail.com**
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in the last week of October, during the period of study. Moreover, the highest average number (122 moths / light trap) of *A. spinifera* trapped by light trap was found in the first week of September in 2016. While in the second year of investigation, the highest number (107 moths) was recorded per light trap in the 1st week of September. However, the monthly numbers of trapped moths were relatively low in the cold months of December, January and February, also during the very warm month of August.

The obtained results agree with those of Hassanein (1956) who stated that the moths of *A. spinifera* were caught during summer months at Shebin-Elkkom, Moreover, there were a big catch of moths in spring and autumn. Ghanim, 1977 recorded that *A. spinifera* had four generations per year. He found that the moderate numbers that were found during May and the highest numbers during June. The strongest generation was in the last week of June. Soliman (2004) stated that the weekly catch of *A. spinifera* moths had four peaks in cotton field at Aga district. These peaks were found in 3rd week of June, in the 2nd week of July, in the first week of August and in the 2nd week of September, respectively during the two years of investigation.

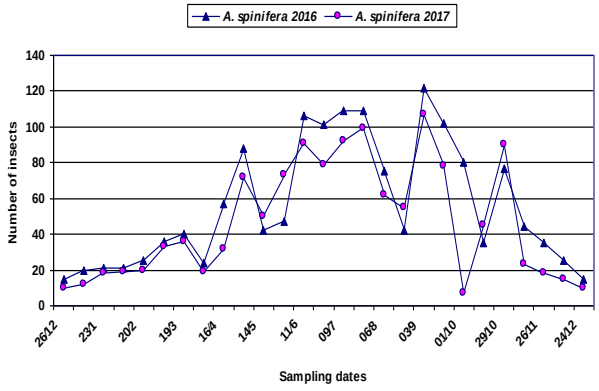

Figure 1. Population fluctuations of *A. spinifera* catched by using light traps during the two years of study at Mansoura reagion.

1 B: Effect of some weather factors on the population fluctuations of *A. spinifera*

Results tabulated in Table (1) A assured that the values of correlation coefficient and regression between the average temperature, relative humidity and the population density of *A. spinifera* during investigation (2016 and 2017). These values of correlation coefficient which describe the relation between temperature parameters and the population size of this insect cleared highly significant positive correlation during 2016 and 2017 years. Meanwhile, the effect of R.H different varied values ranged from slight to insignificant correlation during the period of study. The (explained variance) of temperature ranged between 61% to 73% and the relative humidity ranged 42 % to 52% (Table 1). These results are in agreement with those of Soliman (2004) who found that the temperature parameters had highly significant positive correlation on the population size of this insect. Meanwhile, the relative humidity had slight to insignificant effect on the relative abundance of this insect.

Table 1. Correlation coefficient and regression between the population density of *A. spinifera* and the weather factor during 2016 and 2017 season at Mansoura district.

Year	Simple correlation coefficient (r)		Regression R^2	
	Average Temperature	Average R.H.	Average Temperature	Average R.H.
2016	0.58*	0.27ns	0.61	0.42
2017	0.63**	0.41ns	0.73	0.52

r = correlation coefficient R^2= Regression ns= insignificant
*** = significant with varied degree**

2) A. Population fluctuations of *Triphaena (=Agrotis pronuba)* moths

Data represented in Figure (2) revealed that the population density of *A. pronuba* during the two years of study. This insect had four peaks per a year. These peaks were occurred in the last week of April, in the last week of May, in the 3rd week of September, in last week of November, during the first years. While in the second year this peaks were occurred in the third week of April, in the last week of May, in the first week of September, and in the 2nd week of November. Moreover, the highest average number (255 moths /light trap) of *A. pronuba* was coughed in the last week of April, in 2016 while in the second year of investigation, the highest number (220 moths) was recorded per light trap in 2nd week of April,. However the numbers of the monthly trapped moths were relatively low in the cold months of December, January and February, also during the very warm month on August. Ghanim, (1977) found that *A. pronuba* moths disappeared completely during the hot months of June, July and August and also during the cold month of February. The sudden increase of trapped moths of *A. pronuba* during April, give an impression of migratory habit of this insect. Soliman (2004), recorded that *A. pronuba* had six peaks per year in cotton fields he found that the strongest peak was occurred during May and se September at Aga district.

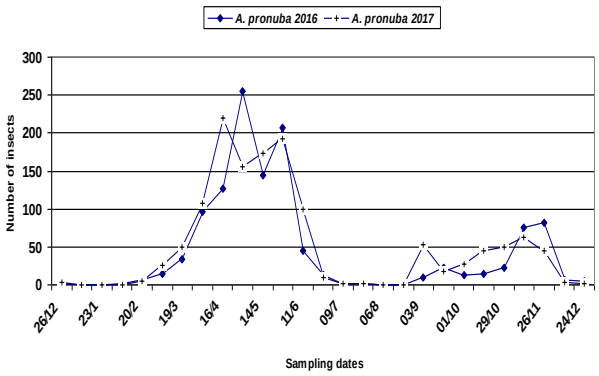

Figure 2. Population fluctuations of *A. pronuba* counted by using light traps during 2016 and 2017 season at Mansoura district.

2) B: Effect of some weather factors on the population fluctuations *of A. pronuba*:

Results arranged in Table (2) show the values of correlation coefficient and regression between the average temperature, relative humidity and the population density of *A. pronuba* during (2016 and 2017). These values between temperature parameters and the population size of this insect

cleared insignificant highly significant positive correlation during the first and second year respectively, meanwhile, the effect of relative humidity exerted varied values ranged from slight to insignificant correlation during the period of study. The (explained variance) of temperature ranged between 51% to 82% and the relative humidity ranged 25 % to 45%. Soliman 2004, indicated that the average temperature and relative humidity parameters affected highly significant correlation during the period of study.

3) A: Population fluctuations of *Syngrapha (Plusia) circumflexa L.* moths

The obtained results in Figure (3) referred that the population density of *S. circumfelexa* during the period of study. This insect had four peaks all the year a round. These peaks were occurred in the 3rd week of March, in the 4th week of April, in the 2nd week of June and in the 3rd week of September, during 2016 season. While during the second season it had four peaks in the 1st week of March, in the 2nd week of April, in the 2nd week of June, and in the 3rd week of September. Moreover, the highest average number (153 moths/light trap) of *S. circumfelexa* trapped by light trap was found in the 2nd week of June, in 2016 while in the second year of investigation, the highest number (135 moths) was recorded per light trap in the 2nd week of June. However, the numbers of the monthly trapped moths were relatively low in the cold months of December, January and February, also during the very warm month on August.

Table 2. Correlation coefficient and regression between *A. pronuba* moths and weather components by light traps during 2016 and 2017 seasons at Mansoura district.

Year	Simple correlation coefficient (r)		Regression R^2	
	Average Temperature	Average R.H.	Average Temperature	Average R.H.
2016	0.49ns	0.19ns	0.51	0.25
2017	0.71**	0.34ns	0.82	0.45

r = correlation coefficient R^2= Regression ns= insignificant
*** = significant with varied degree**

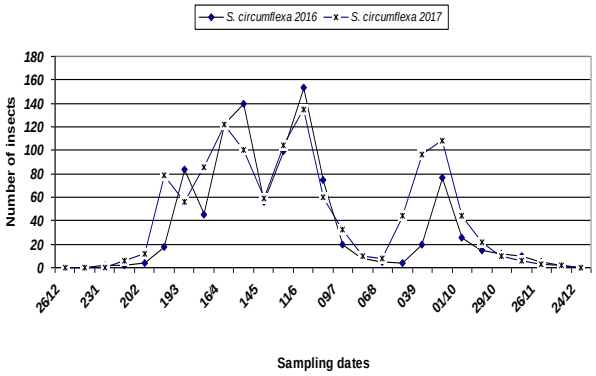

Figure 3. Population fluctuations of *S. circumfelexa* counted by using light traps during 2016 and 2017 season at Mansoura district.

3) B: Effect of some weather factors on the population fluctuations of *S. circumfelexa*:

Data arranged in Table (3) showed the values of correlation coefficient which describe the relationship between temperature parameters and the population size of this insect cleared highly significant positive correlation during the seasons of study. Meanwhile, the effect of relative humidity exerted varied values ranged from slight to insignificant correlation during the period of study. The (explained variance) of temperature ranged between 52% to 64% and the relative humidity ranged 20 % to 42%.

Table 3. Correlation coefficient and regression between the population density of *S. circumflexa* moths and certain weathercomponents during 2016 and 2017 at Mansoura district.

Year	Simple correlation coefficient (r)		Regression R^2	
	Average Temperature	Average R.H.	Average Temperature	Average R.H.
2016	0.70**	0.19ns	0.52	0.20
2017	0.82**	0.24ns	0.64	0.42

r = correlation coefficient R^2= Regression ns= in significant
*** = significant with varied degree**

4) A: Population fluctuations of *Earias insoulana* moths

Data illustrated in Figure (4) cleared that the population density of *E. insoulana* during the two years of investigation. *Earias insoulana* had five peaks all the year a round. These peaks were in the 3rd week of March, in the 2nd week of June, in the 3rd week of September, in the 3rd week of October and in the 2nd week of November, during the first years of study. While in the second year these peaks were occurred in the 3rd week of March, in the last week of June, in the first week of September, in the 3rd week of October and in the 2nd week of November. Moreover, the highest average number (240 moth /light trap) of *E. insoulana* caught by light trap was counted in the 3rd week of October, in 2016 while in the second year of investigation, the highest number (275 moths) was recorded per light trap in the 3rd week of October at Mansoura district. However the numbers of the monthly trapped moths were relatively low in the cold months of December, January and February, also during the very warm month on August.

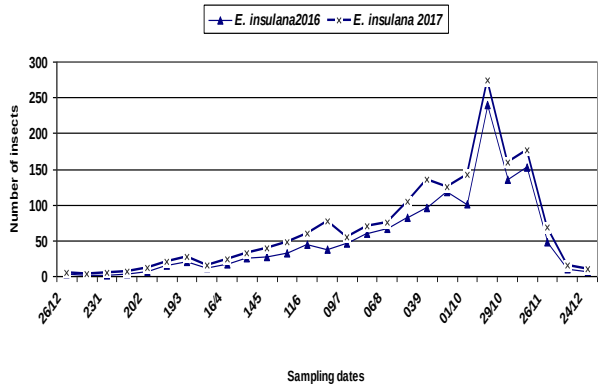

Figure 3. Population fluctuations of *E. insoulana* caught by using light traps during 2016 and 2017 at Mansoura district.

The present results agree with those of Hassannein (1956), at Shebin ElKom, Egypt. Who stated that *E. insulana* reached its peak of activity during September and October. Similar results were found by El-Deeb *et al.* (1968), at Alexandria who found that during September the total number of the monthly trapped moth ranked a higher situation and that the greatest catch was found during October and November. Ghanim, (1977) reported that this insect had four overlapping generations per year. These generations were observed during July (1st and weakest

generation, August 2nd , September (3rd) and October (4th and strangest generations). Soliman (2004) recorded five peaks for *E. insulana* at Aga district. The strongest peak was occurred during August and September.

4) B: Effect of some weather factors on the population fluctuations of *E. insoulana*

Results tabulated in Table (4) described the values of correlation coefficient and regression between the average temperature, relative humidity and the population density of *E. insoulana* during 2016 and 2017 seasons. These values of correlation coefficient cleared highly significant positive correlation during the two years of study. Meanwhile, the effect of R.H. exerted varied values ranged from slight to insignificant correlation during the period of study. The values of proportional effect (explained variance) of temperature ranged between 16% to 61% and the relative humidity ranged 13% to 21% (Table 4).

Soliman (2004), indicated that the average temperature and relative humidity parameters exerted highly significant positive correlation during the period of study.

Table 4. Correlation coefficient and regression between the population density of *Earias insulana* moths, the temperature and relative humidity components during 2016 and 2017 at Mansoura district.

Year	Simple correlation coefficient (r)		Regression R^2	
	Average Temperature	Average R.H.	Average Temperature	Average R.H.
2016	0.27**	0.17ns	0.16	0.13
2017	0.59*	0.25ns	0.61	0.21

r = correlation coefficient R^2= Regression ns= in significant
*** = significant with varied degree**

5) Population fluctuations of *Gryllotalpa africana* adults

The population fluctuations of *G. africana* revealed that this insect had three peaks in the 3rd week of August, in the 3rd week of September and in the 3rd week of October, during the 1st years of study. While in the 2nd year theses peaks were occurred in the 1st week of August, in the 3rd week of September and in the last week of October. Moreover, the highest average number (132 adults /light trap) of *G. africana* caught by light trap was found in the last week of October, in 2016. While in season 2017, the highest number (102 adults) was recorded per light trap in the last week of October. However, the numbers of the monthly trapped adults were relatively low in the cold months of December, January and February, also during the very warm month on August. Moreover, the highest average number (132 adults/ light trap) and (102 adults/ light trap) of *G. africana* caught by light trap was found in the last week of October in 2016 and 2017, respectively (Figure 5).

Ghanim, (1977) reported that *G. africana* recorded during the whole year of study but in very low numbers from December till March.,and highest numbers occurred during August. Soliman (2004), stated that *G. africana* had three peaks in cotton fight at Aga district, and the strongest peak was found during August month.

5) B: Effect of some weather factors on the population fluctuations of *G. africana*

Results arranged in Table (5) present the simple correlation coefficient values and regression between the population density of *G. Africana* and certain weather components by light traps during 2016 and 2017 seasons. The correlation coefficient values which describe the relation between temperature parameters and the population size of this insect cleared highly significant positive correlation during 2016 and 2017 seasons. Meanwhile, the effect of relative humidity exerted varied values ranged from slight to insignificant correlation during the period of study. The (explained variance) of temperature ranged between 63% to 79% and the relative humidity ranged 26 % to 47%. Soliman (2004) indicated that the average temperature and relative humidity parameters exited varied effect with a value ranged from significant to highly significant correlation during the period of study.

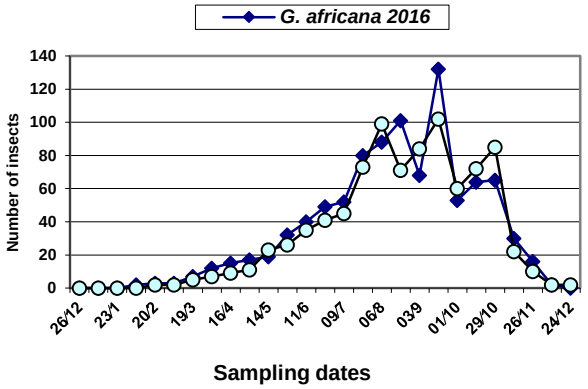

Figure 5. Population fluctuations of *G . africana* caught by using light traps during 2016 and 2017 at Mansoura district.

Table 5. Correlation coefficient and regression between the population density of *G. africana* adult, the temperature and relative humidity components during 2016 and 2017 at Mansoura district.

Year	Simple correlation coefficient (r)		Regression R^2	
	Average Temperature	Average R.H	Average Temperature	Average R.H.
2016	0.64**	0.207ns	0.63	0.26
2017	0.78*	0.19ns	0.79	0.47

r = correlation coefficient R^2= Regression ns= insignificant
*** = significant with varied degree**

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دراسات ايكولوجية على بعض الآفات الحشرية التى تم اصطيادها بواسطة المصيدة الضوئية فى منطقة المنصورة

ولاء عبد المعطى توفيق[1*]، نادية الحسينى محمد[1] وعبد البديع عبد الحميد غانم[2]

[1] معهد بحوث وقاية النباتات - مركز البحوث الزراعية – الدقي - الجيزة - مصر

[2] قسم الحشرات الاقتصادية - كلية الزراعة - جامعة المنصورة - مصر

أجريت الدراسة فى منطقة المنصورة لمعرفة التذبذبات العددية لبعض الحشرات التى تصيب محاصيل الخضر و المحاصيل الحقلية و التى يتم اصطيادها بواسطة المصيدة الضوئية خلال عامى 2016 و 2017 أظهرت النتائج المتحصل عليها أن الدودة القارضة البنية *Agrotis spinifera* لها ستة ذروات على مدار العام و هذه الذروات كانت موجودة فى الأسبوع الثالث من مارس و فى الأسبوع الأخير من أبريل و فى الأسبوع الثانى من يونيو و فى الأسبوع الأخير من يوليو و فى الأسبوع الاول من سبتمبر و أخيرا فى الأسبوع الأخير من أكتوبر خلال عامى الدراسة أما بالنسبة لحشرة *Agrotis pronuba* و فراشة الدودة النصف قياسة ذات الخصر المتعرج *Syngrapha circumfelica* فكان لكل منهما أربعة أجيال فى العام , كما أظهرت النتائج المتحصل عليها أن دودة اللوز الشوكية *Earias insulana* لها خمسة أجيال فى العام . أما بالنسبة للحفار الافريقى *Gryllotalpa africana* فلقد تم تسجيل ثلاثة ذروات له فى العام أوضحت النتائج أن قيمة الارتباط بين متوسط درجات الحرارة و الرطوبة النسبية و التذبذبات العددية للحشرات الخمسة خلال موسمى الدراسة تراوحت تأثيرها بين المعنوية البسيطة إلى المعنوية الموجبة العالية.