J. Agric. Sci. Mansoura Univ., 34(2): 1347 - 1360, 2009

RELATIVE ABUNDANCE AND FLIGHT ACTIVITY OF THREE COTTON LEAF WORM MOTHS, *Spodoptera littoralis* BIOSD. , *Spodoptera exigua* HB. AND *Spodoptera latebrosa* LED. AND THEIR PREDATORS USING A LIGHT TRAP AT MANSOURA DISTRICT.

Mohamed, Nadia E.*; A. A.Ghanim ; A. H. Abdel-Salam** and A. A. A.Saleh***

*** Plant Protection Research Institute, Agricultural Research Center, Dokki Giza, Egypt.**

****Economic Entomology Department, Faculty of Agriculture, Mansoura University, Egypt.**

ABSTRACT

The population fluctuations and effect of certain weather factors on the flight activity of three leaf worms moths, *Spodoptera littoralis* Boisd. ; *Spodoptera exigua* Hb. and *Spodoptera latebrosa* Led. and their predators were studied by a light trap at Mansoura district. The obtained data showed that the peaks of *S. littoralis* according to biweekly catch occurred in the fourth week of April; the first week of June; the first week of July; the end of July; the second week of September; the end of October and the third week of November; represinting seven peaks of moths per year during the two years of study. The results showed that, *S. exigua* moths had five peaks per year during the two years of study. These peaks were occured in the first week of May; the first week of July; the end of August; the end of September and the fourth week of October, respectively. In addition, *S. latebrosa* moths had five peaks per year during the period of study. These peaks were occured in the first week of June; the first week of July; the end of July; the second week of September and fourth week of October, respectively. The statistical analysis showed that there was a highly significant positive correlation between the temperature parameters and the number of trapped moths of the three leaf worm species during the two years of study. The maximum relative humidity had a highly positive significant effect on populations of the three leaf worm moths in the first year and a slight negative effect in the second year of investigation. The other relative humidity parameters exerted a slight negative effect during the two years of investigation. The obtained results showed that there were four predators caught by a light trap during this study namely: *Coccinella undecimpunctata* L. ; *Cydonia vicina isis* Cr.; *Paederus alfierii* Koch. and *Labidura riparia* Pall.. The data cleared that *C. undecimpunctata* had four peaks and *C. vicina isis* had five peaks per year while that was two and three peaks for *P. alfierii* and *L. riparia*, respectively.

The statistical analysis showed that there was a highly significant positive correlation between the temperature parameters and the number of trapped predators during the two years of study. The maximum relative humidity had a highly positive significant correlation on the population density of *L. riparia* and *C. vicina isis* in the first year of study, while the minimum relative humidity had a negative significant effect on the population density of *L. riparia* in the first year, while minimum relaive humidity had a possitive significant effect on the population density of *P. alfierii* in the second year of investigation.

Keywords: *Spodoptera littoralis*; *Spodoptera exigua*; *Spodoptera latebrosa*; *Coccinella undecimpunctata*; *Cydonia vicina isis* ; *Paederus alfierii*; *Labidura riparia*; light trap.

INTRODUCTION

The ecological study on the environment preference of various insect species of cotton insect pests has gained in recent years a significant importance in the field of pest control research programs. These investigations were proved essential to the development of new concepts of control. However, entomologists suggested the use of light traps for recording new species and for determining the relative abundance and the number of annual broods of major insect pests throughout the year. Williams (1939) summarized some purposes of using light traps of which measuring the numbers of insects of a certain area and investigating the dates of their appearance the length and size of the broods. Information obtained also by light traps enables the entomologists to predict the possible outbreaks of certain insects. (El-Deeb *et al*., 1968). Several investigators used light traps for studying the seasonal abundance and flight activity of one or more species of the cotton leaf worms moths as Hassanein (1956); El-Minshawy (1963); Wafa and El-Borollosy (1970); Abul-Nasr *et al*. (1973) Shanab *et al*. (1978); Foda and Romeila (1999); Vajgand, *et al*. (2005) and Li, *et al*. (2006).

Many publications announced that light traps are a successful method for testing the relationship between weather factors and the activity of many insect pests (Hosny, 1958; Hafez *et al*., 1969; Hosny and Khattab 1969; Wafa and El-Borollosy 1970; Philipp and Watson 1971; Shanab *et al*., 1978; Blasubramanian *et al*., 1985; Matioli and Silva 1990; Rizk *et al*., 1990; El-Mezayyan *et al*., 1997 and Soliman, 2004). Therefore, the present investigation was conducted to study the relative abundance and flight activity of the three leaf worm moths: *S. littoralis*; *S. exigua* and *S. latebrosa* and their predators by using a light trap at Mansoura district and evaluate effect of some weather factors on the population fluctuations and their flight activity of these insect pests and their predators.

MATERIALS AND METHODS

For studying the population density of three cotton leaf worm moths, *S. littoralis*; *S. exigua* and *S. latebrosa* and their predators by using a light trap at Mansoura district. Samples were taken daily during two years from 1st January 2006 till 31th December 2007.

A Robinson and Robinson (1950) light trap which proposed by Williams (1923) was used. The trap consists of an inverted metal cone, 24 inches in diameter, and contains six radial vanes projecting two inches above the upper aperture. These vanes obstruct the flight of insects circling or heading for the light and thus reduce their flight speed causing them to stall and fall into the sloping cone and then into the receptacle. At the lower aperture of the cone and in the center of the Vanes, a 250 watt clear mercury vapour lamp is fixed in a socket and so adjusted that its light is unobstructed above the upper structure of the trap. This upper structure is fitted tightly on a barrel-like 24 inches deep receptacle which forms the base of the apparatus. Sodium cyanide was put in a glass jar. It is 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 trap was placed in the Agricultural Experimental Station of Mansoura University at a height of 3.5 meters. The trap was emptied every morning and the catch was brought to laboratory for identification. The daily catch was separated, identified and counted at the same day. The daily catch was accumulated biweekly. Daily records of temperature and relative humidity of Mansoura district were obtained from the Meterological Organization, Ministry of Defence, Cario. These records have been calculated as biweekly means related to the date of accumulated biweekly catch.

Data analysis:

For the purpose of statistical analysis, data were analyzed to determine correlation coefficient (Costat, 2004).

RESULTS AND DISCUSSION

I. The cotton leaf worms moths

1. *Spodoptera littoralis*:

Table (1) and Figure (1) showed that the abundance of *S. littoralis* moths caught by a mercury light trap during the two years of study. It can seen from this table that the moths were trapped in all months of the year at Mansoura district. The total numbers of *S. littoralis* moths caught during the two years round were 14958 individuals in 2006 and 14433 in 2007, respectively. Peaks of *S. littoralis* moths according to the biweekly catch occurred in the fourth week of April; the first week of June; the first week of July; the end of July; the second week of September; the end of October and the third week of November, representing seven peaks of moths per year (Table 1 and Figure 1). As indicated by Hassanein (1956), the moths of *S. littoralis* were captured in all month of the year at Shebin El-Kom and the maximum abundance was during June and July, while Abul-Nasr *et al*. (1973) stated that peak numbers of *S. littoralis* moths were generally taken in about mid-June, late July and early September. They stated that the second and third peaks were higher than the fourth one. Shanab *et al*. (1978) at Mansoura district recorded seven peaks of *S. littoralis* moths per year occurred in the third week of February, the end of April; the first week of June; the end of June; the first week of August; the second week of September and second week of October. Foda and Romeila (1999) found that the number of *S. littoralis* moths caught by a light trap gradually increased from January to June, decreased in July and gradually increased thereafter, reaching its peak in October.

Table (2) shows the effect of the temperature and relative humidity on the biweekly catch of *S. littoralis* moths trapped by a light trap. Statistical analysis showed that there was a highly significant positive correlation between the temperature parameters and the number of trapped *S. littoralis* moths during the two years of study. The maximum relative humidity had a highly positive significant effect on the population density of *S. littoralis* moths in the first year and insignificant in the second year of study.

Table (1): Biweekly catch of three leafworm moths trapped by a light trap during the two successive years 2006 and 2007 at Mansoura district.

Species / Dates	*S. littoralis*		*S. exigua*		*S. latebrosa*	
	2006	**2007**	**2006**	**2007**	**2006**	**2007**
1 / 1	6	10	4	8	3	5
15 / 1	10	15	7	5	2	4
29 / 1	45	57	30	42	28	35
12 / 2	71	80	108	125	68	75
26 / 2	115	122	152	188	80	82
12 / 3	120	122	176	196	110	95
26 / 3	130	135	296	340	171	190
9 / 4	145	152	486	570	246	275
23 / 4	326	388	805	912	298	380
7 / 5	310	265	1015	1255	510	560
21 / 5	715	508	756	856	646	710
4 / 6	1511	1859	867	946	807	956
18 / 6	980	1076	996	1020	590	630
2 / 7	1640	1920	1088	1240	850	882
16 / 7	997	1045	975	1078	796	820
31 / 7	1580	1811	1078	1130	978	1042
15 / 8	1250	1026	1150	1250	810	750
29 / 8	810	636	1290	1352	601	630
12 / 9	1105	957	879	930	950	878
26 / 9	810	578	989	1041	616	575
10 / 10	573	405	756	844	720	638
24 / 10	732	560	886	910	856	780
7 / 11	315	210	647	536	526	350
21 / 11	456	370	426	245	316	223
5 / 12	104	58	216	170	108	115
19 / 12	62	47	156	162	91	108
31 / 12	40	21	77	90	71	85
Total	14958	14433	16311	17441	11848	11873

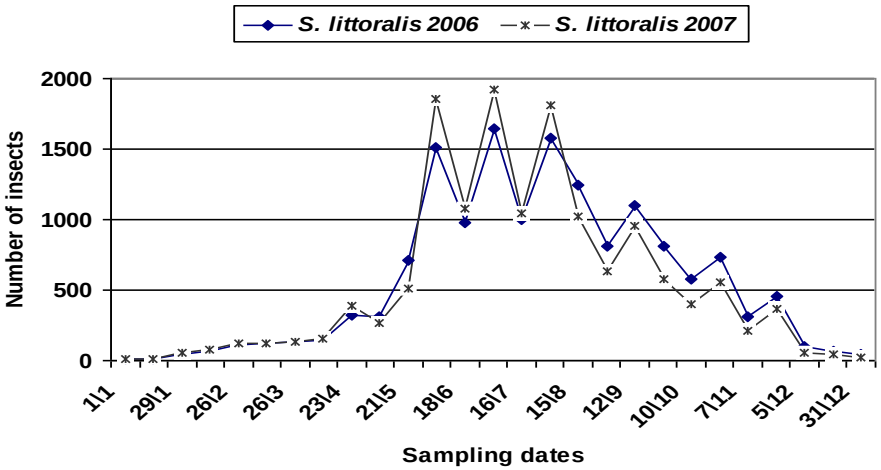

Figure (1): Biweekly catch of *S. littoralis* caught by a light trap during the two years 2006 and 2007 at Mansoura district.

Table (2): Simple correlation coefficient between the population density of *S. littoralis* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.8736	2.6898	***	0.7481	7.2315	***
Minimum Temp.	0.8878	6.5962	***	0.8008	5.2559	***
Average Temp.	0.8153	2.2232	***	0.7806	1.5561	***
Maximum R. H.	0.6159	6.2544	***	- 0.1580	0.4309	Ns
Minimum R. H.	- 0.1339	0.5053	Ns	- 0.2066	0.3010	Ns
Average R. H.	- 0.0154	0.9390	Ns	- 0.0182	0.9279	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

The other relative humidity exerted effect which varied from a slight negative during the two years of investigation. Hsssanein (1956) indicated that temperature was the factor contributing most largely to annual fluctuation in insects population. Hanna and Atries (1969) stated that the moths were most active and abundant at moderate temperature and moderate relative humidity and low barometric pressure, while Wafa *et al*. (1970) suggested that the percentage and activity of females were lower at colder weather and higher relative humidity the opposite was true with males.

2. *Spodoptera exigua*:

Table (1) and Figure (2) showed that the abundance of *S. exigua* moths caught by a mercury light trap during the two years of study. It can seen from this table that the moths were trapped in all moths of the year at Mansoura district. The total numbers of *S. exigua* moths caught during the two years

round were 16311 individuals in 2006 and 17441 in 2007 respectively. Peaks of *S. exigua* moths according to biweekly catch occurred in the first week of May; the first week of July; the end of August; the end of September and the fourth week of October, representing five peaks of moths per year (Table 1and Figure 2). This finding agrees with that of Shanab *et al*. (1978).

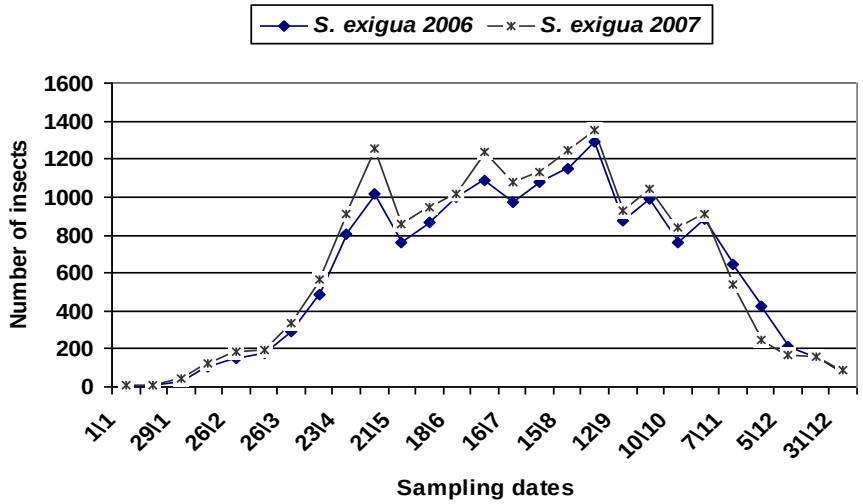

Figure (2): Biweekly catch of *S. exigua* caught by a light trap during the two years 2006 and 2007 at Mansoura district.

Hassanein (1956) at Shebin El-Kom, Egypt stated that moth of *S. exigua* were captured from March to December, and it had six generations throught the year. Meanwhile, our results showed that the moths were trapped all the year round and this insects had five peaks per year. El-Minshawy (1963) at Alexandria, Egypt and Wafa and El-Borollossy (1970) at Dokki (Giza) Egypt found that the moths of *S. exigua* reached its peak during two periods, May-June and Agust-September. The latter authors stated that the population declines during July (probably owing to high temperature). Vajgand *et al*. (2004) in Serbian recorded five peaks for *S. exigua* by using a light trap. These peaks occurred in the second week of July; the end of July; the fourth week of August; the first week of September and the first week of October.

Statistical analysis showed that in Table (3) there was a highly significant positive correlation between the temperature parameters and the number of trapped *S. exigua* moths during the two years of study. The maximum relative humidity had a positive correlation in the first year and a slight negative correlation in the second year of study. Meanwhile, the minimum relative humidity had a negative significant effect on the population density of *S. exigua* moths in the second year and the average relative humidity exerted effect which varied from a slight negative during the two years of investigation.

Table (3): Simple correlation coefficient between the population density of *S. exigua* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.9544	1.2132	***	0.9247	5.5344	***
Minimum Temp.	0.9431	1.8115	***	0.9125	3.3455	***
Average Temp.	0.8520	1.7129	***	0.9282	3.1155	***
Maximum R. H.	0.4611	0.0154	*	- 0.0680	0.7357	Ns
Minimum R. H.	- 0.3269	0.0960	Ns	- 0.4115	0.0329	*
Average R. H.	- 0.2296	0.2491	Ns	- 0.3778	0.0519	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

3. *Spodoptera latebrosa*:

Table (1) and Figure (3) showed that the abundance of *S. latebrosa* moths caught by a mercury light trap during the two years of study. It can seen from this table that the moths were trapped in all monthes of the year at Mansoura district. The total numbers of *S. latebrosa* moths caught during the two years were 11848 individuals in 2006 and 11873 in 2007, respectively. Peaks of *S. latebrosa* moths according to biweekly catch occurred in the first week of June; the first week of July; the end of July; second week of September; and the fourth week of October, representing five peaks of moths per year (Table 1and Figure 3). This finding agrees with that of Soliman (2004).

El-Minshawy (1963) at Alexandria, Egypt recorded the appearance of *S. latebrosa* moths in the end of March. He said that the moths occurred in greater numbers during two periods from late July to mid-August and from late September to the end of November. Shanab *et al*. (1978) in Mansoura recorded four broods of moths throughout the year reaching and the peak numbers during June while our results recorded five peaks for this insect.

Statistical analysis showed that in Table (4) there was a highly significant positive correlation between the temperature parameters and the number of trapped of *S. latebrosa* moths during the two years of study. The maximum relative humidity had a highly positive correlation in the first year and a slight negative correlation in the second year of study. Minimum and average relative humidity exerted effect which varied from a slight negative during the two years of investigation.

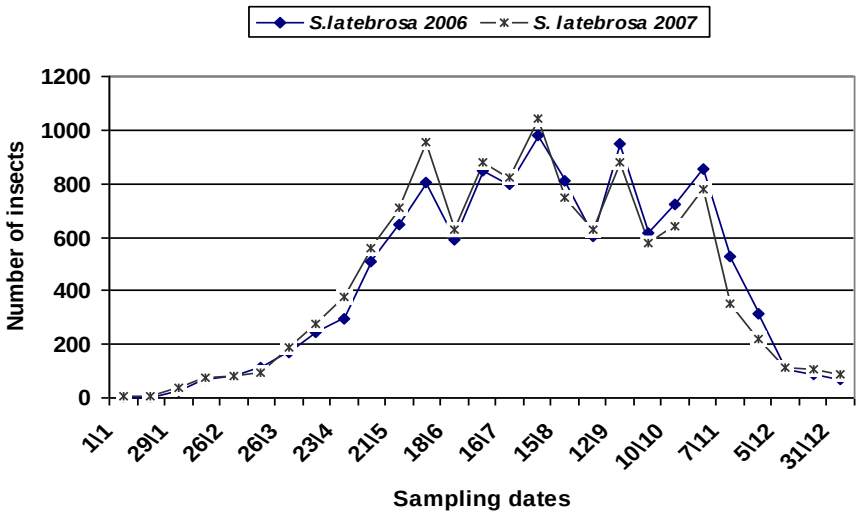

Figure (3): Biweekly catch of *S. latebrosa* caught by a light trap during the two years 2006 and 2007 at Mansoura district.

Table (4): Simple correlation coefficient between the population density of *S. latebrosa* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.9414	2.6017	***	0.9174	1.6763	***
Minimum Temp.	0.9431	1.8283	***	0.9321	1.5757	***
Average Temp.	0.8549	1.3655	***	0.9336	1.1889	***
Maximum R. H.	0.4875	0.0098	**	-0.0767	0.7034	Ns
Minimum R. H.	- 0.2718	0.1701	Ns	- 0.3148	0.1097	Ns
Average R. H.	- 0.1756	0.3807	Ns	- 0.1871	0.3500	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

II. Predators associated with cotton leaf worms:

1. *Coccinella undecimpunctata*:

Table (5) shows that the abundance of *C. undecimpunctata* caught by a mercury light trap during the two years of study. The total numbers of this predator caught during the two years round were 344 individuals in 2006 and 302 in 2007, respectively. Peaks of *C. undecimpunctata* according to biweekly catch occurred in the third week of May; the end of July; second week of September and fourth week of October, representing four peaks of this predator per year (Table 5).

Statistical analysis showed that in Table (6), there was a highly significant positive correlation between the temperature parameters and the number of trapped insect of *C. undecimpunctata* during the two years of study. The

maximum relative humidity had a positive correlation in the two years. The minimum and average relative humidity had a slight negative correlation in the two years of study.

Table (5): Biweekly catch of certain predatory insects associated with cotton leaf worms caught by a light trap during the two years 2006 and 2007 at Mansoura district.

Species / Dates	*C. undecimpunctata*		*C. vicina isis*		*P. alfierii*		*L. riparia*	
	2006	**2007**	**2006**	**2007**	**2006**	**2007**	**2006**	**2007**
1 / 1	1	1	2	2	0	0	0	0
15 / 1	1	1	3	2	0	0	0	0
29 / 1	2	1	3	3	1	1	0	0
12 / 2	2	3	7	5	2	1	0	0
26 / 2	3	3	9	7	4	3	1	0
12 / 3	5	4	11	7	6	5	2	1
26 / 3	7	4	13	9	8	7	2	2
9 / 4	9	7	16	14	12	10	4	2
23 / 4	14	12	10	8	15	12	6	3
7 / 5	18	16	12	10	19	16	8	5
21 / 5	22	19	29	25	10	10	16	8
4 / 6	17	12	18	17	11	10	20	14
18 / 6	12	10	16	14	13	12	22	17
2 / 7	17	15	35	30	15	13	15	20
16 / 7	21	18	22	18	19	15	16	8
31 / 7	26	22	25	21	21	16	10	7
15 / 8	21	20	29	25	20	16	12	7
29 / 8	22	24	41	45	21	17	12	9
12 / 9	33	30	32	33	21	17	12	9
26 / 9	29	26	29	25	21	18	10	8
10 / 10	17	15	35	30	20	14	9	5
24 /10	21	18	29	22	15	7	5	3
7 / 11	9	7	15	10	8	3	5	3
21 / 11	8	5	12	9	7	2	4	3
5 / 12	4	4	9	7	5	2	3	3
19 / 12	2	3	8	4	4	2	3	2
31 / 12	1	2	4	3	2	2	0	0
Total	344	302	474	405	300	231	197	139

2. *Cydonia vicina isis*:

Table (5) showed that the abundance of *C. vicina isis* caught by a mercury light trap during the two years of study. The total numbers of this predator caught during the two years round were 474 individuals in 2006 and 405 in 2007 respectively. Peaks of *C. vicina isis* according to biweekly catch occurred in the second week of April; the third week of May; the first week of July; the end of August and the second week of October, representing five peaks of this predator per year (Table 5).

Statistical analysis showed that in Table (7), there was a highly significant positive correlation between the temperature parameters and the number of

trapped insect of *C. vicina isis* during the two years of study. The maximum relative humidity had a significant positive correlation in the first year and a slight positive correlation in the second year of study. The minimum relative humidity had a slight negative correlation during the two years of investigation. The average relative humidity had a negative correlation in the first year and a slight positive correlation in the second year**.**

Table (6): Simple correlation coefficient between the population density of *C. undecimpunctata* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.9140	2.7411	***	0.8363	5.5395	***
Minimum Temp.	0.8820	1.1995	***	0.8600	8.9943	***
Average Temp.	0.8147	2.2983	***	0.8560	1.2508	***
Maximum R. H.	0.3422	0.0805	Ns	0.0977	0.6278	Ns
Minimum R. H.	- 0.3352	0.0873	Ns	- 0.2235	0.2622	Ns
Average R. H.	- 0.2661	0.1796	Ns	- 0.1730	0.3880	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

Table (7): Simple correlation coefficient between the population density of *C. vicina isis* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.8763	2.0961	***	0.8013	5.0865	***
Minimum Temp.	0.8710	3.4324	***	0.8400	4.2511	***
Average Temp.	0.7747	2.1006	***	0.8278	4.9245	***
Maximum R. H.	0.4148	0.0314	*	0.1689	0.3994	Ns
Minimum R. H.	- 0.2300	0.2484	Ns	- 0.1699	0.3966	Ns
Average R. H.	- 0.1529	0.4464	Ns	0.0107	0.9575	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

3. *Pedearus alfierii* :

Table (5) showed that the abundance of *P. alfierii* caught by a mercury light trap during the two years of study. The total numbers of this predator caught during the two years were 300 individuals in 2006 and 231 in 2007, respectively. Peaks of *P. alfierii* according to biweekly catch occurred in the first week of May; the end of July and the end of September in the first year and in the first week of May and the end of September in the second year (Table 5).

Statistical analysis showed that in Table (8), there was a highly significant positive correlation between the temperature parameters and the number of trapped insect of *P. alfierii* during the two years of study. The maximum

relative humidity had a slight positive correlation in the two years of study. The minimum relative humidity exerted effect which varied from a slight negative during the first year of investigation and a negative significant correlation in the second year of study. The average relative humidity had a slight negative correlation in the in the two years of study.

Table (8): Simple correlation coefficient between the population density of *P. alfierii* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.9154	2.2449	***	0.8478	2.3703	***
Minimum Temp.	0.9086	5.6738	***	0.8447	2.9967	***
Average Temp.	0.8057	3.9576	***	0.8548	1.3684	***
Maximum R. H.	0.3307	0.0919	Ns	0.0498	0.8050	Ns
Minimum R. H.	- 0.2864	0.1475	Ns	- 0.3997	0.0388	*
Average R. H.	- 0.2201	0.2698	Ns	- 0.3465	0.0765	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

4. *Lapidura riparia* :

Table (5) showed that the abundance of *L. riparia* caught by a mercury light trap during the two years of study. The total numbers of this predator caught during the two years were 197 individuals in 2006 and 139 in 2007, respectively. Peaks of *L. riparia* according to biweekly catch occurred in the third week of June; third week of July and second week of September in the first year and in the first week of July and the second week of September in the second year (Table 5).

Statistical analysis showed that in Table (9), there was a highly significant positive correlation between the temperature parameters and the number of trapped insect of *L. riparia* during the two years of study. The maximum relative humidity had a highly positive correlation in the first year and a slight negative correlation in the second year of study. The minimum relative humidity had a significant negative correlation in the first year and a slight negative correlation in the second year. Average relative humidity had a slight negative correlation in the two years of study.

Table (9): Simple correlation coefficient between the population density of *L. riparia* and the temperature and relative humidity components during the two years 2006 and 2007 at Mansoura district.

Weather variables	Season 2006			Season 2007		
	r	P	S	r	P	S
Maximum Temp.	0.8257	1.1410	***	0.7724	2.3518	***
Minimum Temp.	0.7920	8.5717	***	0.7803	1.5851	***
Average Temp.	0.7392	1.0605	***	0.7839	1.3172	***
Maximum R. H.	0.6320	4.0535	***	- 0.1698	0.3970	Ns
Minimum R. H.	- 0.4006	0.0383	*	- 0.3389	0.0837	Ns
Average R. H.	- 0.2700	0.1730	Ns	- 0.1410	0.4827	Ns

Ns = insignificant * = significant with varied degree where R = Correlation coefficient P = Probability S = significant sign.

REFERENCES

Abul-Nasr, S. I. ; El-Sherif, S. I. and Naguib, M. A. 1973. Seasonal fluctuations of moths of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) during the cotton season (Lepidoptera: Noctuidae). Bull. Soc. Ent. Egypt, 57: 415 - 418.

Balasubramanian, G. ; Chelliah, S. ; Balasubramanian, M. ;Regupathy, A. and Jayaraj, A. 1985. Studies on light trap and phermone trap catches of *Spodoptera littoralis* (Boisd.) Tamil Nadu Agric University, Behavioural. Physiological. Approaches. Pest. Management., 78 – 84 .

CoHort Software, 2004. CoStat. www. CoHort com. Monterey, California, U. S. A.

El-Deeb, A. A. , Hammad, S. M. and Amer, A. I. 1968. Studies on the spiny bollworm *Earias insulana* Boisd. in Alexandria area. Alex. J. Agric. Res. 16 : 7 - 12 .

El-Mezayyen, G. R. ; El-Dinah, A. A. ; Moawad, G. M. and Tadros, M. S. 1997. A modified light trap as a tool for insects survey in relation to the main weather factors. Egypt. J. Agric. Res. 75 : (4) 995 – 1006.

El-Minshawy, A. M. 1963. Studies on the morphology and biology of *Spodoptera exigua* Hb. and *Spodoptera latebrosa* Led. in Alexandria. M. Sc. Thesis, Fac. Agric. Univ. Alex.

Foda, E. M. and Romeila, M. A. 1999. Population abundance and certain reproductive potential aspects of *Spodoptera littoralis* (Boisd.) moths caught by light traps. Annals of Agricultural-Science, Moshtohor. 37(1): 691-699.

Hafez, M. ; Hassanein, M. H. and Risk, G. A. M. 1969. The simulataneous effect of certain weather factors on the activity and population density of bollworms in upper Egypt, Bull. Soc. Ent. Egypt. 53 : 557 – 566.

Hanna, H. M. And Atries, I. A. 1969. On the time of flight of certian nocturnal Lepidoptera as measured by a light trap. Bull. Soc. Ent. Egypt. Vol. 52: 535 – 545.

Hassanein, M. H. 1956. Nocturnal activity of insects as indicated by light traps. Bul. Soc. Ent. Egypt, 40 : 463 – 479.

Hosny, M. M. 1958. Ecological studies on the environment preference and sex-ratio in catches of Macrolepidoptera in ultraviolet light traps. Bull. Soc. Ent. Egypt, 24 : 421 – 347.

Hosny, M. M. and Khattab, A. A. S. 1969. Average flight level and type of distribution in some nocturnal insects species as indicated by catches in three light-traps. Bull. Soc. Ent. Egypt,. 53 :109 – 116 .

Li., H. ; Guo,Y. and Wu, X. W. 2006. Evaluation of different sex phermone lure and light traps for trapping and monitoring the adults of *Spodoptera exigua* and *S. litura* . China-vegetables. (4): 17-19.

Matioli, J. C. and Silva, R. A. 1990. Effects of climatic factors on the capture of *Alabama argillacea* (Hueb.) (Lepidoptera: Noctuidae) with light traps equipped with BLB and GL lights, in Janauba-MG. Brazil. Anais da Sociedade Entomologica. 19 : (1) 101 – 110.

Philipp, J. S. and Watson, T. F. 1971. Influence of temperature on population growth of the pink bollwarm, *Pectinophora gossypiella* (Lepidoptera: Gelechiidae). Ann. Ent. Soc. America. 64: 344.

Rizk, G. A. ; Soliman M. A. and Ismael H. M. 1990. Efficiency of sex phermone and UV light traps attractimg male moths of the cotton leafworm, *Spodoptera littoralis* (Boisd.). Assiut J. Of Agric. Sci. Assiut. Univ., 21 (3) : 58 – 70.

Robinson, H. S. and Robinson, P. J. M. 1950. Some notes on the observed behaviour of Lepidoptera in flight in the vicinity of light sources, together with a description of a light trap designed to entomological samples, Entom. Gaz. I: 2 – 20 .

Shanab, L. M. ;Hammad, S.M. and Ghanim, A. A. 1978. Population of the cotton leafworms moths *Spodoptera littoralis* Boisd., *Spodoptera exigua* Hb. and *Spodoptera latebrosa* Led. As recorded in light trap. J. Agric. Sc. Mansoura Univ. 3(1) 322 – 329.

Soliman, S. E. S. 2004. Insect pest management in cotton crop at Dakahlia Goverenorate. M. Sc. Thesis . Fac. of Agric. Mansoura Univ. pp. 263.

Vajgand, D. ; Forgic, G. and Tosev, M. 2004. Beet armyworm, *Spodoptera exigua* (Hubner) (Lepidoptera: Noctuidae) and flight dynamics data in the Sombor Region. Biljni Lekar Plant Doctor. 32(1): 27 – 31.

Vajgand, D. ; Forgic, G. ; Tosev, M. and Radian, Z. 2005. Flight dynamics of economically important lepidoptera in the Sombor area during 2004 and a forecast for 2005. Biljni Lekar Plant Doctor. 33(4): 412 – 418.

Wafa, A. K. and El-Borollosy, F. M. 1970. Fluctuations of population densities of *Laphygama exigua* Hb. and analysis of the influence of the main weather factors on its activity. Agric. Res. Rev. Cairo, 48 : 22 – 30.

Wafa, A. K. ; El-Borollosy, F. M. and Khattb, A. A. 1970. Moth activity of *Laphygma exigua* Hb. During the differnt night hours. Agric. Res. Rev. Cairo University Egypt. 48 (1): 31 – 37.

Williams, C. B. 1923. A new type of light trap for insects. Minist. Agric. Egypt, Tech. and Sci. Serv., Bull. 28, Cairo.

Williams, C. B. 1939. An analysis of four years captures of insects in light trap. Part I. General survey, sex proportion, phenology and time of flight Trans. Roy. Ent. Soc. Lond., 89: 79 – 132 .

الوفرة الموسمية و نشاط الطيران لثلاثة أنواع من ديدان ورق القطن : دودة ورق القطن *Spodoptera littoralis* ، دودة ورق القطن الصغرى *Spodoptera exigua* ، ودودة ورق القطن المتشابهة *Spodoptera latebrosa* و مفترساتهم باستخدام المصيدة الضوئية في منطقة المنصورة

نادية الحسيني محمد*، عبد البديع عبد الحميد غانم ، عادل حسن عبد السلام** و أحمد أمين أحمد صالح***

*** معهد بحوث وقاية النباتات ـ مركز البحوث الزراعية ـ الدقى ـ جيزة ـ مصر .**

**** قسم الحشرات الإقتصادية ـ كلية الزراعة ـ جامعة المنصورة ـ مصر.**

تم دراسة التذبذبات الموسمية و تأثير بعض العوامل الجوية علي نشاط الطيران لثلاثة أنواع من ديدان ورق القطن وهم : دودة ورق القطن *Spodoptera littoralis* ، دودة ورق القطن الصغرى *Spodoptera exigua* ، دودة ورق القطن المتشابهة *Spodoptera latebrosa* و مفترساتهم بإستخدام المصيدة الضوئية خلال عامين متتالين هما ٢٠٠٦و٢٠٠٧م في منطقة المنصورة.

وأوضحت النتائج المتحصل عليها أن لدودة ورق القطن سبعة ذروات في العام في الإسبوع الرابع من أبريل ـ الإسبوع الأول من يونيو ـ الإسبوع الأول من يوليو ـ الإسبوع الأخير من يوليو ـ الإسبوع الثاني من سبتمبر ـ و الإسبوع الأخيرمن اكتوبر – بينما كانت الذروة الأخيرة في الإسبوع الثالث من نوفمبر خلال سنتى الدراسة. أما بالنسبة لدودة ورق القطن الصغرى فكان لها خمسة ذروات في العام و كانت هذه الذروات موجودة في الإسبوع الأول من مايو ـ الإسبوع الأول من يوليو ـ الإسبوع الأخيرمن أغسطس و نهاية سبتمبر و الإسبوع الرابع من اكتوبر علي التوالى . كذلك بالنسبة لدودة ورق القطن المتشابهة كان لها خمسة ذروات في السنة وهذه الذروات كانت موجودة في الإسبوع الأول من يونيو- الإسبوع الأول من يوليو ـ نهاية يوليو ـ الإسبوع الثاني من سبتمبر ـ الإسبوع الرابع من اكتوبر علي التوالى.

وأشار التحليل الإحصائى وجود ارتباط معنوى موجب قوى بين مقاييس درجة الحرارة (درجة الحرارة القصوى ـ درجة الحرارة الصغرى ـ ومتوسط درجة الحرارة) و تعداد فراشات الثلاثة أنواع من ديدان ورق القطن خلال سنتى الدراسة . أما بالنسبة للرطوبة النسبية القصوى فكان تأثيرها معنوى موجب عال علي الثلاثة أنواع من فراشات ديدان ورق القطن خلال العام الأول و لم يكن معنويا في خلال العام الثانى. أما بالنسبة للرطوبة النسبية الصغرى و متوسط الرطوبة النسبية فكان تأثيرهما غير معنوى خلال عامى الدراسة.

كما أظهرت النتائج انجذاب أربعة أنواع من المفترسات الحشرية بواسطة المصيدة الضوئية مرتبطة بديدان ورق القطن الثلاثة و هم أبوالعيد ١١ نقطة *Coccinella undecimpunctata* ـ أبو العيد الاسود *Cydonia vicina isis* – حشرة الرواغة *Paederus alfierii* و أيضا مفترس ابرة العجوز الكبيرة *Labidura riparia* وأظهرت النتائج أن لأبو العيد ١١ نقطة أربعة ذروات وابو العيد الإسود له خمسة ذروات تواجد خلال السنة أما بالنسبة لحشرة الرواغة و ابرة العجوز الكبيرة فكان لكل منهما ٢ ـ ٣ ذروات في السنة خلال سنتى الدراسة كما أوضح التحليل الإحصائى وجود علاقة ارتباط قوية موجبة بين مقاييس درجة الحرارة (الحرارة العظمى – الصغرى – و متوسط درجة الحرارة) و تعداد الأربعة مفترسات الحشرية خلال فترة الدراسة أما بالنسبة للرطوبة النسبية فإن الرطوبة النسبية القصوى كان لها تأثير معنوى موجب قوي علي تعداد مفترسى إبرة العجوز الكبيرة و تأثير موجب علي أبو العيد الإسود خلال العام الأول أما الرطوبة النسبية الصغرى كان لها تأثير معنوى سالب على كل من حشرة إبرة العجوز الكبيرة في العام الأول و حشرة الرواغة في العام الثانى.