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RELATIONSHIP BETWEEN THE NUMBERS OF ADULT MALE CATCHES ON PHERMONE TRAPS AND PERCENTAGE OF BOLL INFESTATION FOR COTTON BOLLWORMS IN MIDDLE EGYPT.

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ABSTRACT

Under field conditions of Beni- Suef Governorate , field studies were carried out at the farm of Sids Agriculture Research Station during 2006, 2007 and 2008 cotton seasons to study the monitoring the first appearance and populations of adult males of both pink bollworm, *Pectinophora gossypiella* (Saunders) and spiny bollworm, *Earais insulana* (Boisd.) by using Delta pheromone baited traps.

The average number of male moths of *P. gossypiella* per trap / week during the period from April till September during the 2006, 2007 and 2008 cotton seasons, In the first season 2006, had five peaks of abundance in 5th May, 15th June, 14th July, 4th August and 8th September. In the second season 2007, also five peaks were observed. These peaks were occurred on 10th April, 24th April, 12th June, 24th July and 21st August. While in the third season 2008, four peaks were observed on 1st May, 29th May, 31st July and 4th September.

The average number of male moths of *E. insulana* per trap / week during the periods extending from March 17th till September 15th , March 27th till 4th September and April 3rd till September 18th during the 2006, 2007 and 2008 seasons, respectively. In the first season 2006, four peaks of spiny bollworm were observed in 21st April, 30th June, 11th August and 15th September. In the second season 2007, five peaks were observed in 24th April, 8th May, 12th June, 24th July and 28th August. While in the third season 2008, four peaks observed in 1st May, 31st July, 4th September and 18th September.

The combined effect of the two main weather factors on the changes in the population activity of the pink bollworm moths explained by the percentages of variance of the two tested weather factors were significant during 2006 and high significant during 2007 season , respectively but in 2008 season, was insignificant. The correlation between the spiny bollworm population and the weather factors Max. and Min. temperature and average relative humidity, it is obvious that a simple positive correlation coefficient between the average number of captured male moths in sex pheromone traps and max. temperature was found, but this correlation was insignificant during 2006 and 2007 seasons and significant 0.38 (P= 0.08) in 2008 growing season. The combined effect of the two main weather factors on the changes in the population activity of the spiny bollworm moths explained by the percentages of variance of the two tested weather factors which was significant during 2006, but in 2007 and 2008 planting seasons it was insignificant.

INTRODUCTION

Cotton is the most important fiber crop all over the world. In Egypt, cotton is a very important crop that is cultivated mainly for fibers to use in

industry and seeds for oil which is of great value. Cotton plants in Egypt have been attacked with numerous pests from planting till harvest, including sap sucking pests, cotton leaf worms and cotton bollworms, causing great damage to plants and crop yield. All the plant parts is attacked, but the most serious pests primarily attack the fruiting portions; buds, flowers and green bolls, reducing both quantity and quality of the harvested fibers and seeds, during the late season. Cotton plants greatly suffer from infestation with pink bollworm, *Pectinophora gossypiella* (Saunders) and spiny bollworm, *Earais insulana* (Boisd.). Pheromone trapping can be used to detect early infestations of an insect pest, monitor established populations and assist in the timing of pesticide applications in relation to the build-up of populations to dangerous levels (Jutsum and Gordon, 1989). Toscano *et al*. (1974) reported significant reductions in the number and cost of insecticide applications when treatments for bollworms control were based on male moth trap catches as compared to automatic five to seven day insecticide spray schedules. The use of pheromones in the management of *E. insulana* and *P. gossypiella* is studied and discussed by earlier workers (Mclaughlin and Mitchel, 1982 and Kumar and Devraj Urs, 1991). The seasonal variation of the insect is important information necessary for careful timing of applications of control measure. Hence the present study was undertaken to develop a pheromone based monitoring system for fluctuations of bollworms population build-up. This will facilitate proper timing of insecticidal spray and other control strategies for the management of bollworms. This study was conducted to determine the relationships between adult population in pheromone traps and infestation ratio by larvae in cotton bolls and their correlation with weather parameters.

MATERIALS AND METHODS

Experiments were carried out at Sids Research Station, Beni- Suef Governorate during 2006, 2007 and 2008 cotton growing seasons. The experimental area was cultivated with the Egyptian cotton variety Giza 80.

1. Monitoring the adult males of both pink and spiny bollworm populations by pheromone traps.

The changes in the activity of the pink and spiny bollworm moths were studied during three successive cotton growing seasons. Two-delta sticky pheromone traps baited with two capsules containing 1 mg of gossyplure were placed in the experimental field to observe the population of the pink bollworm. In addition, one delta sticky trap and one funnel trap baited with two capsules for spiny bollworm males. The traps were fixed at different positions in the experimental field and changed each weak. The trap catch was checked each weak and the number of trapped males was recorded during the period of March till 15th September in the three seasons. Pheromone capsules were replaced by new ones every two weeks according to Othman *et al*. (2000), who found that the degradation of both gossyplure pheromone isomers (ZZ - and ZE – 7,11 – hexadecadienyl acetate) was fast

after 14 days of hanging; the residue half- life ($RL_{1/2}$) of the pheromone was 40 days after application under field conditions.

Simple correlations between the trapped male moths of *P. gossypiella* and *E. insulana* and the infestation percent and larval content was calculated in the same week according to Al- Beltagy *et al*. (1995). Linear equation regressions: ($Y= x^2 + b x + a$) were calculated for each density of traps at each season.

Where:

Y= Number of young larvae,

b = regression factor

x = No. of moths / trap/ week.

a= constant

2. Determination of cotton bolls infestation by both bollworms larvae.

For assessing the infestation of cotton bolls by pink and spiny larvae, 100 green bolls were collected weekly till the end of each season at random from both diagonals of the inner square area of each treatment according to the method of Shaaban and Radwan (1974). Samples were kept in tightly closed cloth tissue bags and transferred to the laboratory for examination. The bolls were inspected and dissected to count the number of larvae population density of both bollworms as well as infestation percent of bolls at the same day of sampling.

3. Weather parameters.

The records of the atmospheric daily maximum, minimum temperature and relative humidity for the years 2006, 2007 and 2008 were obtained from the Central Laboratory for Agriculture and Land Reclamation, Dokki, Egypt.

RESULTS AND DISCUSSION

1. Population dynamics of cotton bollworms.

To be able to suggest the appropriate times to spray for bollworms, it was essential to study of their population dynamics under the field conditions of Beni- Suef Governorate. Field studies were carried out at the farm of Sids Agriculture Research Station during 2006, 2007 and 2008 cotton seasons to monitor the first appearance and populations of adult males of both pink and spiny bollworms using Delta pheromone baited traps.

1.1 Pink bollworm (PBW):

Data presented in Tables (1, 2 and 3) and illustrated in Fig.(1, 2 and 3) show the average number of *P. gossypiella* male moths per trap / week during the period from March17th to September15th, March27th to September 4th and April 3rd to September18th during 2006, 2007 and 2008 cotton seasons, respectively. In the first season, 2006 five peaks were recorded number of males / trap / week, the first peak occurred on 5th May and reached 41.33 males / trap per week. The second peak occurred at the mid of June and reached 45.00 males / trap / week. The third peak occurred on the 14th July and reached 59.5 males / trap/ week. While the fourth and fifth peaks were found on the 4th August and 8th September and reached to 44.5 and 75.5 males/ trap/ week, respectively. In the second season 2007, also

five peaks were observed. These peaks were occurred on 10th April , 24th April, 12th June, 24th July and 21st August and reached 16.00, 33.60, 51.50, 59.00 and 79.5 males / trap/week, respectively. While in the third season 2008, four peaks were observed. These peaks occurred on 1st May, 29th May, 31st July and 4th September and reached 34.5, 59.0, 53.5 and 108.5 males / trap / week, respectively. This data agreed to a great extent with the previous findings of many investigators. Hamid and Al-Beltagy (1995) showed the presence of 4 peaks each allowed to a PBW generation. The first peak (the highest one) appeared on May 9th indicating the emergence of the suicide generation. The second peak (the lowest one) appeared on 10th June, indicating PBW flower generation (the small generation which infested flower buds). The third and fourth peaks (the intermediate peaks) appeared by July 28 and August 29, pointed out to the two boll infesting generation of PBW. In addition, Abdel – Hamid *et al*. (1999) mentioned that the *P. gossypiella* had 5 generations during the whole season, but three generations occurred during the cotton season. Ismail *et al.* (2002) used the delta pheromone traps to estimate the flight activity of *P. gossypiella* moths in cotton fields through three successive cotton seasons 1993, 1994 and 1995 in Menoufia Governorate, Egypt. Results indicated that five peaks were detected in 1993 and 1994, but in 1995, the number of male moths caught by the sex pheromone trap peaked 6 times. Mohamed (2004) mentioned that the *P. gossypiella* had 4- 5 peaks of male moths / trap / week during the cotton season.

1.2. Spiny bollworm (SBW).

Data presented in Tables (1, 2 and 3) and illustrated in Figures (1, 2 and 3) showed the average number of male moths of *E. insulana* per trap / week during the periods extending from March 17th till September 15th , March 27th till 4th September and April 3rd till September 18 st during the 2006, 2007 and 2008 seasons, respectively. The average number of males / trap / week of the 2006 cotton season presented in Table 1 and illustrated in Fig. 1, four peaks of spiny bollworm were observed. The first peak occurred on the 21st of April (7.20 males / trap / week) and marked to the first generation which attacked cotton plants during the first week of May and lasted up to late May. The second peak occurred on the 30th of June and reached 24.50 males / trap/ week. While the third and fourth peaks were found on the 11th of August and 15th of September and reached to 53.5 and 96.31 males/ trap/ week, respectively. In the second season 2007, five peaks were observed. These peaks occurred in 24th April, 8th of May, 12th of June , 24th of July and 28th August and reached 24.0, 26.5, 32.0, 33.0 and 80.5 males / trap/week, respectively. While in the third season 2008, four peaks observed. These peaks were occurred on 1st May, 31st of July, 4th of September and 18th September. It reached 23.0, 64.5, 72.5 and 94.5, respectively.

Moawad (1974) and Barania (1979) found that late-planted cotton was the most infested with spiny bollworm. Moreover, El- Zanan (1987) found that the highest average number of larvae / 100 cotton green bolls and the highest percentage of bollworm infestation were recorded when cotton was sown in late April as compared with that sown in late March or mid- April.

Hossain *et al.* (1999) studied the number and duration of spiny bollworm, *E. insulana* field generations during three seasons 1993, 1994 and 1995 in Gharbia & Kafr El- Sheikh Governorates. Their results revealed the presence of six overlapping generations during the investigation period in each of the three tested localities. Also, Tawfik (2002), reported that 5 clearly interval periods of *E. insulana* activity from the 2nd week of May to the 2nd week of September during the 2000 and 2001 cotton seasons.

Table (1): The average number of males caught / trap / week, percent of infestation and the number of larvae in 100 cotton bolls for *P. gossypiella* and *E. insulana* in cotton fields during season,2006.

Inspection dates	Av. No. of males /trap/week		2006 season					
			% infestation		No. of larvae /100 bolls			
					1st instar		All instars	
	PBW	SBW	PBW	SBW	PBW	SBW	PBW	SBW
17-Mar	9.51	0.50	0	0	0	0	0	0
24-Mar	17.60	1.60	0	0	0	0	0	0
31-Mar	10.17	1.75	0	0	0	0	0	0
07-Apr	12.90	1.10	0	0	0	0	0	0
14-Apr	22.31	2.18	0	0	0	0	0	0
21-Apr	27.00	7.20	0	0	0	0	0	0
28-Apr	34.00	2.14	0	0	0	0	0	0
05-May	41.33	1.30	0	0	0	0	0	0
12-May	30.51	1.40	0	0	0	0	0	0
19-May	21.09	1.50	0	0	0	0	0	0
26-May	18.33	3.50	0	0	0	0	0	0
02-Jun	27.56	2.00	0	0	0	0	0	0
09-Jun	37.50	8.00	0	0	0	0	0	0
16-Jun	45.00	5.00	1	1	1	1	1	1
23-Jun	43.00	9.50	3	2	3	2	3	2
30-Jun	45.50	24.50	2	1	2	1	3	1
07-Jul	35.50	14.00	3	2	3	1	3	2
14-Jul	59.50	3.10	4	1	4	0	4	1
21-Jul	22.50	3.50	5	1	5	1	5	1
28-Jul	32.50	11.88	7	0	4	0	7	0
04-Aug	44.50	25.50	11	4	4	4	11	4
11-Aug	38.50	53.50	8	3	6	1	8	3
18-Aug	31.50	21.50	17	4	11	4	17	4
25-Aug	29.50	46.60	20	9	8	5	27	12
01-Sep	46.50	35.50	40	11	17	6	53	8
08-Sep	75.50	74.50	53	24	20	5	79	24
15-Sep	65.50	96.31	59	18	28	13	60	18
r			0.64*	0.86**	0.58*	0.81**	0.65*	0.87**
b			0.50	3.29	1.15	6.44	0.40	3.31

r = Simple correlation coefficient value **b = Regression coefficient value**
*** = Significant at 5 % level** **** = Significant at 1% level**
PBW= *P. gossypiella* **SBW= *E. insulana***

Table (2) : The average number of males caught / trap / week, percent of infestation and the number of larvae in 100 cotton bolls for *P. gossypiella* and *E. insulana* in cotton fields during season,2007.

Inspection dates	Av. No. of males /trap/week		2007 season					
			% infestation		No. of larvae /100 bolls			
					1st instar		All instars	
	PBW	SBW	PBW	SBW	PBW	SBW	PBW	SBW
27-Mar	3.50	0.50	0	0	0	0	0	0
03-Apr	9.80	2.80	0	0	0	0	0	0
10-Apr	16.00	7.50	0	0	0	0	0	0
17-Apr	12.50	9.50	0	0	0	0	0	0
24-Apr	33.60	24.00	0	0	0	0	0	0
01-May	15.50	18.00	0	0	0	0	0	0
08-May	19.50	26.50	0	0	0	0	0	0
15-May	14.50	17.00	0	0	0	0	0	0
22-May	10.30	15.50	0	0	0	0	0	0
29-May	17.00	19.50	0	0	0	0	0	0
05-Jun	39.50	25.00	0	0	0	0	0	0
12-Jun	51.50	32.00	0	0	0	0	0	0
19-Jun	42.00	27.50	0	0	0	0	0	0
26-Jun	49.50	42.50	2	0	2	0	2	0
03-Jul	33.00	32.00	3	0	1	0	3	0
10-Jul	41.00	30.50	5	1	3	1	6	1
17-Jul	42.00	25.00	7	2	3	2	10	2
24-Jul	59.00	33.00	5	1	2	1	7	1
31-Jul	33.00	24.50	17	2	7	2	21	2
07-Aug	41.50	24.00	11	3	5	2	19	3
14-Aug	51.00	40.50	19	4	10	4	23	4
21-Aug	79.50	66.50	23	3	14	3	29	3
28-Aug	67.50	80.50	31	11	9	5	39	11
04-Sep	42.00	70.50	24	6	7	4	25	6
r			0.48 *	0.79**	0.59*	0.72**	0.50*	0.79**
b			0.59	4.79	1.79	7.84	0.51	4.79

r = Simple correlation coefficient value **b = Regression coefficient value**
*** = Significant at 5 % level** **** = Significant at 1% level**
PBW= *P. gossypiella* **SBW= *E. insulana***

Table (3) : The average number of males caught / trap / week, percent of infestation and the number of larvae in 100 cotton bolls for *P. gossypiella* and *E. insulana* in cotton fields during season,2008.

Inspection dates	Av. No. of males /trap/week		2008 season					
			% infestation		No. of larvae /100 bolls			
					1st instar		All instars	
	PBW	SBW	PBW	SBW	PBW	SBW	PBW	SBW
03-Apr	2.50	1.00	0	0	0	0	0	0
10-Apr	9.90	1.80	0	0	0	0	0	0
17-Apr	15.00	6.50	0	0	0	0	0	0
24-Apr	12.50	8.50	0	0	0	0	0	0
01-May	34.50	23.00	0	0	0	0	0	0
08-May	16.00	5.00	0	0	0	0	0	0
15-May	27.00	14.50	0	0	0	0	0	0
22-May	21.50	10.00	0	0	0	0	0	0
29-May	59.00	10.00	0	0	0	0	0	0
05-Jun	38.00	10.50	0	0	0	0	0	0
12-Jun	19.00	6.50	0	0	0	0	0	0
19-Jun	22.90	7.50	0	0	0	0	0	0
26-Jun	22.00	8.50	0	0	0	0	0	0
03-Jul	25.50	16.00	0	0	0	0	0	0
10-Jul	26.50	17.50	1	3	1	2	1	3
17-Jul	33.50	10.00	2	1	2	1	2	1
24-Jul	41.20	47.00	3	0	3	0	3	0
31-Jul	53.50	64.50	6	0	4	0	6	0
07-Aug	49.50	38.50	5	0	5	0	5	0
14-Aug	47.00	55.50	7	2	5	1	7	2
21-Aug	46.00	52.00	5	2	2	2	6	2
28-Aug	68.00	54.50	9	2	4	1	9	2
04-Sep	108.50	72.50	8	4	5	3	11	4
11-Sep	95.00	68.50	14	5	11	5	19	5
18-Sep	91.50	94.50	18	6	9	6	27	6
R			0.87**	0.68*	0.84**	0.68*	0.85**	0.68*
B			4.50	8.51	7.19	8.87	3.02	8.51

r = Simple correlation coefficient value **b = Regression coefficient value**
*** = Significant at 5 % level** **** = Significant at 1% level**
PBW= *P. gossypiella* **SBW= *E. insulana***

Fig1

Fig2

Fig3

1.1.3. Relationship between the number of pink bollworm (PBW) male moths caught and the percentage of boll infestation.

Field trails were carried out to evaluate the relationship between the number of pink bollworm, *P. gossypiella* male caught in the pheromone traps / week and percentages of infested green bolls in cotton fields sown on different dates in three successive cotton seasons, 2006, 2007 and 2008.

In 2006 season.

Data presented in Table (1) and illustrated in Fig. (4) indicated a positive and significant relationship between the average numbers of male moths of PBW caught in the pheromone traps and the rate of infested green bolls, the number of all larvae /100 bolls and the number of young larvae (first and second instar). The simple correlation coefficient values were 0.64 (P= 0.02), 0.65 (P= 0.001) and 0.58 (P= 0.02), respectively. The regression equation of average male moths and young larvae of PBW in cotton fields was $Y= 0.011X^2 - 0.8414X+20.082$. (Fig. 4).

In 2007 season.

Data presented in Table (2) and illustrated in Fig. (4) indicated a positive and significant relationship between the average numbers of male moths of PBW caught in the pheromone traps and the rate of infested green bolls, the number of all larvae /100 bolls and the number of young larvae (first and second instar). The simple correlation coefficient values were 0.48 (P= 0.02), 0.50 (P= 0.001) and 0.59 (P= 0.02), respectively. The regression equation of average male moths and young larvae of PBW in cotton fields was $Y= 0.007X^2 - 0.5792X+15.69$. (Fig. 4).

In 2008 season.

Data presented in Table (3) and illustrated in Fig. (4) indicated a positive and significant relationship between the average numbers of male moths of PBW caught in the pheromone traps and the rate of infested green bolls, the number of all larvae /100 bolls and the number of young larvae (first and second instar).The simple correlation coefficient values were 0.87 (P= 0.002), 0.85 (P= 0.001) and 0.84 (P= 0.002), respectively. The regression equation of average male moths and young larvae of PBW in cotton fields was $Y= -0.0013X^2 - 0.256X-5.355$.(Fig. 4).

The foregoing results is fully agree with the findings of Al- Beltagy *et al*. (1995), who studied the relationships between PBW trap catches and boll infestation under different conditions. Their results indicated that the correlation between PBW trap catches and PBW infestation in open bolls was of great importance in predicting the population of this insect. Moreover, Qureshi *et al.* (1993) used male adult catches in gossyplure-baited traps to predict infestation of pink bollworm. They suggested that the catches were positively correlated with the percentage of larval infestation. Also, Buchelos *et al.* (1999) mentioned that there was a significant positive linear correlation between the number of moths caught and the infestation percentage with first and second larval stage on the first (r = 0.69) and second (r = 0.7399) boll feeding generations. Ismail *et al.* (2002) showed that an obvious correlation between the number of *P. gossypiella* males caught during May and the size of the population during the following months.

Fig4

Thus, it could be fairly concluded that positive and significant relationship exists between the average number of males caught in pheromone traps and the rate of infested green bolls, number of larvae /100 bolls and the young larvae (first and second instar) for cotton of different sowing dates. There are different models of the relationship between PBW trap catches and young larvae for different sowing dates.

1.1.4. Relationship between the number of caught males of spiny bollworm (SBW) moths and the percentage of boll infestation

Field trails were carried out to evaluate the relationship between the spiny bollworm, *E. insulana* male catches in pheromone traps / week and percentages of infested green bolls in cotton fields sown on different dates in successive cotton seasons, 2006, 2007 and 2008.

In 2006 season.

Data presented in Table (1) and illustrated in Fig.(5) indicated a positive and significant relationship between the average numbers of male moths of SBW caught in the pheromone traps and the rate of infested green bolls, the number of all larvae /100 bolls and the number of young larvae (first and second instar),The simple correlation coefficient values were 0.86 (P= 0.002) 0.87 (P= 0.001) and 0.81 (P= 0.002),respectively. The regression equation of average male moths and young larvae of SBW in cotton fields was $Y= 0.0004X^2 +0.1843X-0.5462$.Fig.(5).

In 2007 season.

Data presented in Table (2) and illustrated in Fig.(5) indicated a positive and significant relationship between the average numbers of male moths of SBW caught in the pheromone traps and the rate of infested green bolls, the number of all larvae /100 bolls and the number of young larvae (first and second instar).The simple correlation coefficient values were 0.79 (P= 0.002),0.79 (P= 0.001) and 0.72 (P= 0.002),respectively. The regression equation of average male moths and young larvae of SBW in cotton fields was $Y= 0.0018X^2 - 0.125X+3.3728$.Fig.(5).

In 2008 season.

Data presented in Table(3) and illustrated in Fig.(5) indicated a positive and significant relationship between the average numbers of male moths of SBW caught in the pheromone traps and the rate of infested green bolls, the number of all larvae /100 bolls and the number of young larvae (first and second instar).The simple correlation coefficient values were 0.68 (P= 0.002),0.68 (P= 0.001) and 0.68 (P= 0.002),respectively. The regression equation of average male moths and young larvae of SBW in cotton fields was $Y= -0.0004X^2 - 0.0019X+0.1069$.Fig.(5).

Tawfik (2002) studied the relationship between the population density of spiny bollworm and the infestation level in cotton green bolls.Results indicated that there is a significant positive relationship between the population of SBW moths and the percentage of infestation in cotton green bolls.

Fig5

1.1.5. Effect of prevailing weather factors (temperature and relative humidity) on the population dynamics of both bollworms.

The effect of the prevailing weather factors on the seasonal abundance of cotton bollworms was studied under field conditions at Beni-Suef Governorate during three successive seasons, 2006, 2007 and 2008.

1.1.5.1. The Pink bollworm (PBW).

The data presented in Table (4) showed the correlation between the pink bollworm population and weather factors (maximum and minimum temperature and average relative humidity). It was obvious that the simple correlation coefficient between the average number of captured male moths in sex pheromone traps and max. temperature was significantly positive with values of 0.42 (P= 0.03), 0.48 (P= 0.02) in 2006 and 2007, respectively, while in 2008 season, the simple correlation was positive and highly significant 0.72 (P= 0.001). Moreover, the multiple regression analysis revealed that the max. temperature was responsible of 17.6, 23.04 and 51.8% of the population changes of pink bollworm moths during the above mentioned seasons, respectively. The simple correlation coefficient between the night min. temperature and the population dynamics of pink bollworm was positive and highly significant 0.53 (P= 0.005) and 0.33 (P=0.138) during the 2006 and 2007 seasons, however in the 2008 season, this relationship was positive and insignificant 0.70 (P= 0.001). The min. temperature was responsible for 28.1, 10.89 and 49.0 % of the population fluctuations in the three seasons 2006, 2007 and 2008, respectively. The simple correlation coefficient values for the daily mean relative humidity (R.H. %) with the population density of pink bollworm was positive and insignificant in the three mentioned seasons. The R.H. % was responsible of 4.84, 0.26 and 10.43% of the population's changes of pink bollworm during the three seasons, respectively.

The combined effect of the three main weather factors on the changes in the population activity of the pink bollworm moths explained by the percentages of variance of the three tested weather factors were significant during 2006 and highly significant during 2007, respectively, but in 2008 insignificant.

1.1.5.2. The spiny bollworm (SBW):

The data presented in Table (4) showed the correlation between the spiny bollworm population and the weather factors (maximum and minimum temperature and average relative humidity). It was obvious that the simple correlation coefficient between the average numbers of captured male moths in sex pheromone traps and max temperature was insignificant with values of 0.22 (P=0.28), 0.25 (P=0.25) in 2006 and 2008 seasons, while in 2007 seasons, the simple correlation was significant 0.38 (P= 0.08).The multiple regression analysis revealed that the max. temperature was responsible of 4.8, 14.4 and 6.25 % of the population changes of spiny bollworm moths during the above mentioned seasons, respectively. The simple correlation coefficient between the min. temperature and the population dynamics of spiny bollworm was insignificantly positive during the three mentioned seasons. The min. temperature was responsible for 6.3, 1.0 and 1.44 % of the population fluctuations in the three seasons, respectively. The simple correlation coefficient values of the daily mean relative humidity (R.H. %) with

the population density of spiny bollworm was positive and insignificant in the three seasons. The R.H. % was responsible of o.49, 16.89 and 4.84 of the population changes of spiny bollworm during the three seasons, respectively.

Table (4): Simultaneous effects of weather factors on the population density of *P. gossypiella* ,(PBW) and*E. Insulana*,(SBW) at Sids Agric. Research Station, Beni-Suef Governorate during cotton seasons 2006, 2007and 2008.

Seasons	Weather factors	Simple correlation			Multiple regression				Analysis of variance		
		r	p	E.V.%	b	S.E.	t	p	F	p	E.V.%
		P . gossypiella									
2006	Max., tem.	0.42	0.034	17.6	0.718	1.08	0.67	0.513	3.08	0.049	29.6
	Min., tem.	0.53	0.005	28.1	1.706	1.275	1.34	0.195			
	R.H.%	0.22	0.274	4.84	0.381	1.049	0.36	0.720			
	Total			50.54							
2007	Max., tem.	0.48	0.024	23.04	8.57	4.21	2.04	0.057	2.29	0.113	27.6
	Min., tem.	0.33	0.138	10.89	3.81	4.90	0.78	0.447			
	R.H.%	0.051	0.822	0.26	2.60	2.42	1.07	0.297			
	Total			34.19							
2008	Max., tem.	0.72	0.001	51.8	1.73	1.58	1.09	0.29	8.51	0.001	58.7
	Min., tem.	0.70	0.001	49.0	0.98	1.73	0.57	0.58			
	R.H.%	0.323	0.142	10.43	1.66	1.04	1.60	0.13			
	Total			111.2							
E. insulana											
2006	Max., tem.	0.22	0.280	4.80	0.732	2.23	0.33	0.75	0.55	0.65	7.0
	Min., tem.	0.25	0.212	6.3	1.49	2.63	0.57	0.58			
	R.H.%	0.07	0.729	0.49	0.024	2.16	0.01	0.99			
	Total			11.58							
2007	Max., tem.	0.38	0.081	14.4	-5.12	2.97	1.72	0.102	2.61	0.083	30.3
	Min., tem.	0. 1	0.996	1.0	3.58	3.46	1.04	0.314			
	R.H.%	0.411	0.057	16.89	1.07	1.71	0.62	0.540			
	Total			32.39							
2008	Max., tem.	0.25	0.257	6.25	4.26	2.44	1.74	0.09	1.45	0.261	19.5
	Min., tem.	0.12	0.582	1.44	-3.88	2.68	1.45	0.164			
	R.H.%	0.22	0.324	4.84	1.36	1.60	0.85	0.405			
	Total			12.53							

r = Simple correlation coefficient value b = Regression coefficient value
S. E. = Stander error p= probability

The combined effect of the three main weather factors on the changes in the population activity of the pink bollworm moths explained by the percentages of variance of the three tested weather factors was significant during 2007, but in 2006 and 2008 insignificant.

Reviewing the aforementioned results, it could be stated, that our findings agree with those obtained by Hussien (1990) who mentioned that the effect of the daily relative humidity was insignificant on both pink and spiny bollworms. Nassef (1989) concluded that the combined effect of the prevailing relative humidity had a slight effect on the flight activity of male moths of pink bollworm. Gupta *et al.* (1996) used sex pheromone traps to study the population dynamics of cotton pests in Madhya Pradesh, India, in 1989-90 and 1990-91. The maximum temperature showed a significant

negative correlation with trap catches and relative humidity showed a significant positive correlation with trap catches. Also, Dhawan and Simwat (1996) mentioned that the relationship of pink bollworm catch with weather parameters was positive and insignificant.

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العلاقة بين تعداد فراشات الذكور في المصائد الفرمونية ونسبة الاصابة في اللوز بيرقات ديدان اللوز في مصر الوسطي

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تمت هذه الدراسة تحت الظروف الحقلية بمحطة سدس للبحوث الزراعية بمحافظة بني سويف خلال مواسم زراعة القطن المتعاقبة ٢٠٠٦, ٢٠٠٧, ٢٠٠٨ بغرض دراسة ومتابعة أول ظهور وكذلك الكثافة العددية لذكور فراشات كل من دودة اللوز القرنفلية ودودة اللوز الشوكية من خلال المصائد الفرمونية.

أظهرت النتائج أن متوسط تعداد ذكور فراشات دودة اللوز القرنفلية التي تم اصطيادها اسبوعيا لكل مصيدة خلال الفترة من أبريل حتي سبتمبر خلال المواسم الثلاث ٢٠٠٦, ٢٠٠٧, ٢٠٠٨ كانت كالتالي: في الموسم الأول ٢٠٠٦, تم ملاحظة خمسة ذروات عددية في ٥ مايو, ١٥ يونيو, ١٤ يوليو, ٤ أغسطس, ٨ سبتمبر. في الموسم الثاني ٢٠٠٧, أيضا لوحظ خمسة ذروات عددية في ١٠ أبريل, ٢٤ أبريل, ١٢ يونيو, ٢٤ يوليو, ٢١ أغسطس. بينما في الموسم الثالث لوحظ أربع ذروات عددية في ١ مايو, ٢٩ مايو, ٣١ يوليو, ٤ سبتمبر.

متوسط تعداد ذكور فراشات دودة اللوز الشوكية تم حسابه خلال الفترة من ١٧ مارس حتي ١٥ سبتمبر ومن ٢٧ مارس حتي ٤ سبتمبر ومن ٣ أبريل حتي ١٨ سبتمبر خلال مواسم ٢٠٠٦, ٢٠٠٧, ٢٠٠٨ علي التوالي. في الموسم الأول ٢٠٠٦, تم ملاحظة أربع ذروات عددية في ٢١ أبريل, ٣٠ يونيو, ١١ أغسطس, ١٥ سبتمبر. في الموسم الثاني ٢٠٠٧, لوحظ خمس ذروات عددية في ٢٤ أبريل, ٨ مايو, ١٢ يونيو, ٢٤ يوليو, ٢٨ أغسطس. بينما في الموسم الثالث لوحظ أربعة ذروات عددية في ١ مايو, ٣١ يوليو, ٤ سبتمبر, ١٨ سبتمبر.

أوضحت النتائج أن تأثير درجة الحرارة العظمى على متوسط تعداد ديدان اللوز القرنفلية معنوي في موسمي٢٠٠٦ و ٢٠٠٧ وعالي المعنوية في موسم ٢٠٠٨. حيث كان معامل الارتباط البسيط ٠.٤٢ و ٠.٤٨ و ٠.٧٢ على التوالي. بينما كان تأثير متوسط درجة الحرارة الصغرى وعالي المعنوية في موسمي ٢٠٠٦ و ٢٠٠٧ وغير معنوي في موسم ٢٠٠٨ م وكان معامل الارتباط البسيط ٠.٥٣ و ٠.٧٠ و ٠.٣٣ على التوالي. بينما كان تأثير متوسط الرطوبة النسبية على تعداد فراشات دودة اللوز القرنفلية غير معنوي في المواسم الثلاثة.ومن ناحية أخرى كان التأثير المشترك للثلاث عوامل مجتمعة على نشاط فراشات دودة اللوز القرنفلية معنويا في موسم ٢٠٠٦ وعالي المعنوية في موسم ٢٠٠٧ وغير معنوي في موسم ٢٠٠٨ حيث كانت النسبة المئوية للتباين ٢٩.٦ و ٢٧.٦ و ٥٨.٧ % على التوالي. أما بالنسبة لتأثير درجة الحرارة العظمى على تعداد دودة اللوز الشوكية كان معنوي في موسم ٢٠٠٦ فقط وغير معنوي في موسمي ٢٠٠٧ و ٢٠٠٨.بينما كان تأثير درجة الحرارة الصغرى ومتوسط نسبة الرطوبة النسبية غير معنوي خلال المواسم الثلاثة. ومن ناحية أخرى كان التأثير المشترك للثلاث عوامل مجتمعة على نشاط فراشات دودة اللوز الشوكية تأثيرا معنويا في موسم ٢٠٠٦ وغير معنوي في موسمي ٢٠٠٧ و ٢٠٠٨ حيث كانت النسبة المئوية للتباين ٧.٠ و ٣٠.٣ و ١٩.٥ % على التوالي.

يتضح من خلال النتائج المتحصل عليها في سنوات الدراسة الثلاثة وجود ارتباط موجب معنوي بين نسبة ذكور القرنفلية والشوكية المصطادة في المصائد الفرمونية ونسبة الإصابة في اللوز الأخضر .

قام بتحكيم البحث

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