

OCCURRENCE AND SEASONAL ABUNDANCE OF THE PINK BOLLWORM *Pectinophora Gossypiella* (SAUNDERS) INFESTING COTTON IN THE NORTH DELTA

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ABSTRACT

The present investigation was directed to study the Occurance and seasonal abundance of the pink bollworm, *Pectinophora gossypiella* (sanders) in cotton fields during 2005 and 2006 at Kafr EL-Sheikh and Dakahlia Governorates. The effect of prevailing climatic factors on flight activity of using pheromone traps during two successive cotton season indicated that *P.gossypiella* had three generations with three sharp peaks on cotton during the period started early in June and extended till the end of September. The combined effect of the prevailing temperature and relative humidity were responsible for (40.5 ,38) and (13.7, 11.1) at Kafr EL-Sheikh governorate of the changes in amole moths population during 2005 and 2006, mean while, Dakahlia Governorate responsible for (8.3,23.2) and (36.7, 10) of the changes of the population and moths respectively. Larval population and boll infestation started during early July and increased progressively till the end of the season.

INTRODUCTION

In Egypt and worldwide as well as, there is a growing public concern about environmental pollution which is induced by excessive use of insecticides. Cotton is subjected to pests attacks which required excessive use of insecticides to protect the crop. In order to wise use pesticides timing the insecticidal application based on field population levels will minimize parmeros risk, reduce cost and save the environment. Sex pheromones are utilized in monitoring and estimating insect population and relating such level to field infestation and damage. This technique has many advantages: (1) to reduce insecticide treatment, by eliminating unnecessary application (Toscono *et al* 1994), (2) to conserve populations of beneficial arthropods in pheromone treated areas than those treated with broad spectrum insecticides (EL-Adle *at al* 1988) and (3) to provide and early warning of pest occurs sporadically from year to year or where long – range migration is suspected (El-Zanan and El-Hawary1999). The objectives of the present investigations are to relate field population of the male pink bollworm, PBW *Pectinophora gossypiella* with their field infestation percentages, and evaluating the effect of three prevailing weather factors, (average maximum temperature, minimum temperature and relative humidity) on the seasonal abundance of pink bollworm.

MATERIALS AND METHODS

The present study was based on determining the number of pink bollworm, *P. gossypiella* (PBW) male moths caught nightly by pheromone

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and Belkas and El -Mansoura districts, Dakahlia Governorates pink bollworm populations, as measured by numbers of male moths caught in sex – pheromone baited traps, varied dramatically from year- to year and from locality to other, (North Delta) during the two successive years 2005 and 2006 of cotton plantation.

1- Used pheromone traps:

Planting cotton occurred on late march and first half of April in both Governments in the two season's cotton plants received normal Agricultural practices cotton plants received normal Agricultural practices pheromone traps were placed in each field from 31st of may till the end of September in both seasons. Traps were fixed and distributed at rate of trap /15 feddans in both seasons. The baited sex pheromones (Delta) were fixed on metal bars just above cotton plants. The traps were baited with specific pheromone capsules and replaced every 2 weeks by fresh ones. The adhesive sheets were also changed every three days and the numbers of trapped males were counted. The sex pheromone traps were baited with synthetic pheromone formulation in polyethylene vials. Every vial contains 2 mg of active ingredient of the synthetic pheromone. The pheromone consists of a 1:1 mixture of (Z,Z) and (Z, E)- isomers of 7, 11 – hexadeca dieyl acetate, obtained from plant protection institute, Dokki, Giza, Egypt.

2-Used insecticides:

According to the national sprays program applied on cotton bollworm in Egypt , the experimental areas in the two seasons were sprayed by motor and four application were conducted in the current study using the recommended insecticides as in Table(1) . Samples of 100 green bolls were collected at random from diagonals of the inner square of each trap every six days in order to study the actual infestation. The cotton bolls were dissected and larvae in each boll were counted. Sampling started on July and contmued till Half September.

Table (1): Used insecticides against bollworms during 2005 and 2006 growing seasons and their rates of application.

Period of application	2005 and 2006 seasons		
	Common name	Trade name	Rate of application /fed
21/7-8/8 First spray	Chlorpyrifos 48%E.C individual or mixture with Atabron (chlorfluzaron 5%E.C)	Pestban Atabron	Liter 400 ml
2/8-21/8 second spray	esfenvalerates 5%E.C	Sumi- alpha	600 ml
16/8-31/8 Third spray	Chlorpyrifos 48% E.C individual or mixture with Cascade Flufenoxuron 10% D.C	Helban Cascade	Liter 300 ml
29/8-18/9 Forth spray	Spinosad 24% S.C or chorpyrifos 48% EC or chlorpyrifos 48% E.C	Spentor Pestban Helban	50 ml 1.0 Liter

3- Weather factors:

The average of maximum, minimum temperatures and R. H. % were obtained from the metrological department at both governorates. Data were statistical analyzed and the simple correlation values were calculated according to Steel and Torrie (1960).

RESULTS AND DISCUSSION

1- Seasonal abundance of the pink bollworm in kaf El Sheikh Governorate:

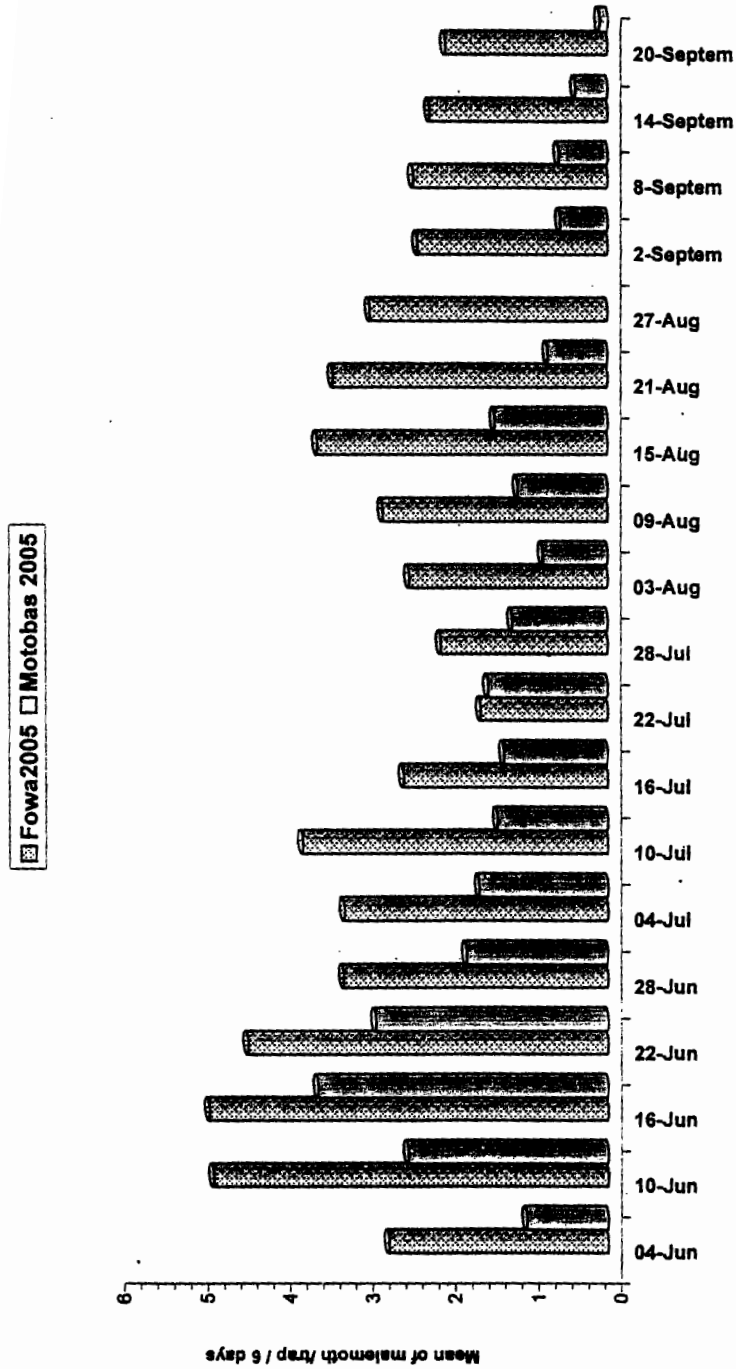
Data presented in table (2) and figures (1,2) show the fluctuation of the male moths of pink bollworm during the period extended from the first week of Jun till the end of September (2005- 2006 seasons) in fowa and Motobas districts.

Table (2): Average number of trapped male moths of the PBW in fowa and Motobas Districts In Kafr El-shikh Governorate during Cotton seasons 2005 and 2006 .

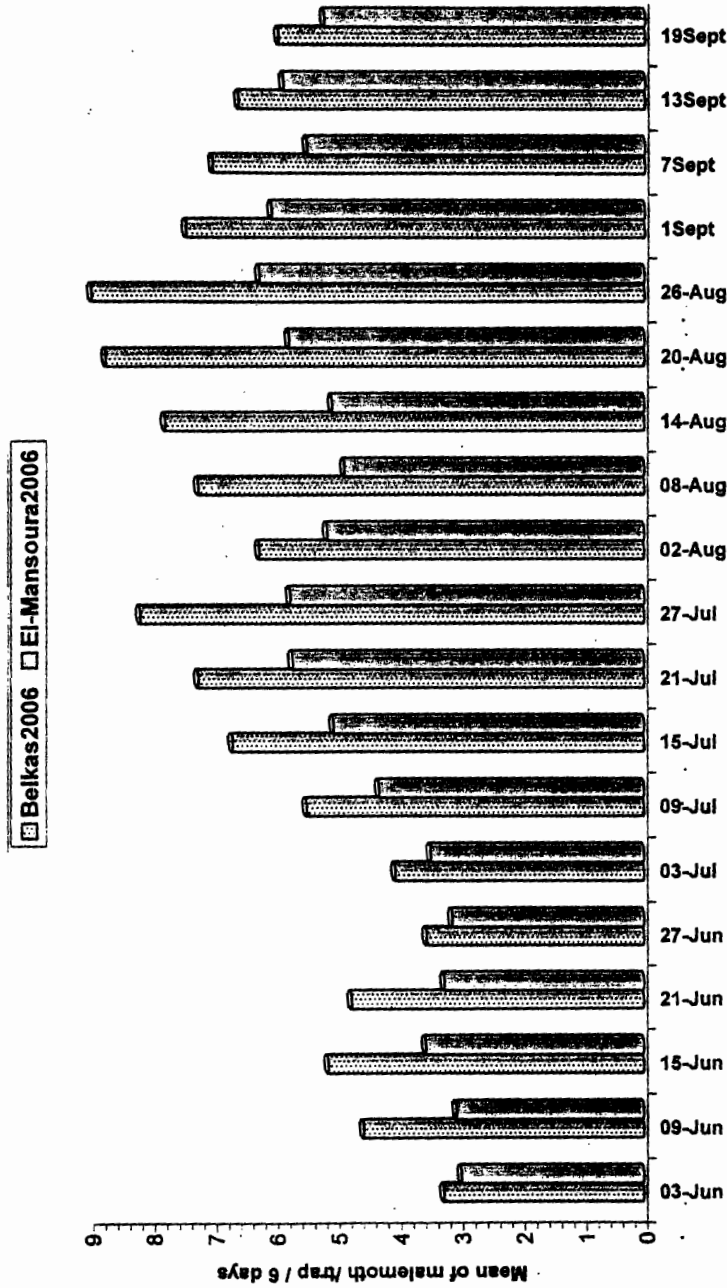
Period of application		2005 seasons		2006 seasons	
		Mean No. of male moths/ trap/6 days		Mean No. of male moths/ trap/6 days	
		Fowa*	Motobas**	Fowa***	Motobas****
June	4/6-9/6	2.64	0.98	2.39	0.92
	10/6-15/6	4.77	2.41	5.19	1.73
	16/6-21/6	4.82	3.50	4.08	2.10
	22/6-27/6	4.35	2.80	4.01	1.58
	28/6-3/7	3.19	1.70	2.74	1.56
July	4/7-9/7	3.18	1.55	2.57	1.24
	10/7-15/7	3.68	1.33	3.00	1.39
	16/7-21/7	2.46	1.25	3.61	1.34
	22/7-27/7	1.53	1.44	1.93	1.56
	28/7-2/8	2.01	1.15	2.29	0.95
August	3/8-8/8	2.39	0.78	3.83	0.81
	9/8-14/8	2.71	1.08	3.25	0.83
	15/8-20/8	3.50	1.36	3.69	1.50
	21/8-26/8	3.31	0.98	4.06	1.01
	27/8-1/9	2.86	0.72	1.93	0.71
September	2/9-7/9	2.29	0.57	2.59	0.86
	8/9-13/9	2.34	0.59	2.06	0.66
	14/9-19/9	2.14	0.39	2.13	0.59
	20/9-25/9	1.95	0.10	2.06	1.18

*Average number of 232 Traps ,** Average number of 265 Traps, *** Average number of 196 Traps, **** Average number of 215 Traps

During the season of 2005, three generations with three sharp peaks occurred in fowa and Motobas districts (fig.1) these peaks were found in the third week of Jun, second and third week of Jun (first generation in both seasons).



Figur (1) : Average number of *Pectinophora gossypiella* adult male moths caught using pheromone traps in the two districts Fowa and Motobas Kafr El-sheikh governorate during 2005 cotton season .



Figur (4) : Average number of *Pectinophora gossypiella* adult male moths caught using pheromone traps in the two districts Belkas and El-Mansoura Dakahlia governorate during 2006 cotton season.

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The corresponding numbers of caught males were 4.82 and 3.5 in 2005 cotton season and 5.19 male/ trap/ 6 days and 2.10 in 2006 cotton season the second peak was occurred in the second week of July (3.88) and third week (3.01) in fowa and Motobas districts during 2005 cotton season while in 2006 cotton season this peak appeared in July in fowa and third week in Motobas.

Half of August (3.56 and 1.36) male / trap 6 days. In 2006 cotton season this peak appeared on third week and half of August which counted (4.06 and 1.5 male / trap/ 6 days).

The obtained data demonstrate that, peaks of *P.gossypiella* males occurred during June, July and August during the two seasons.

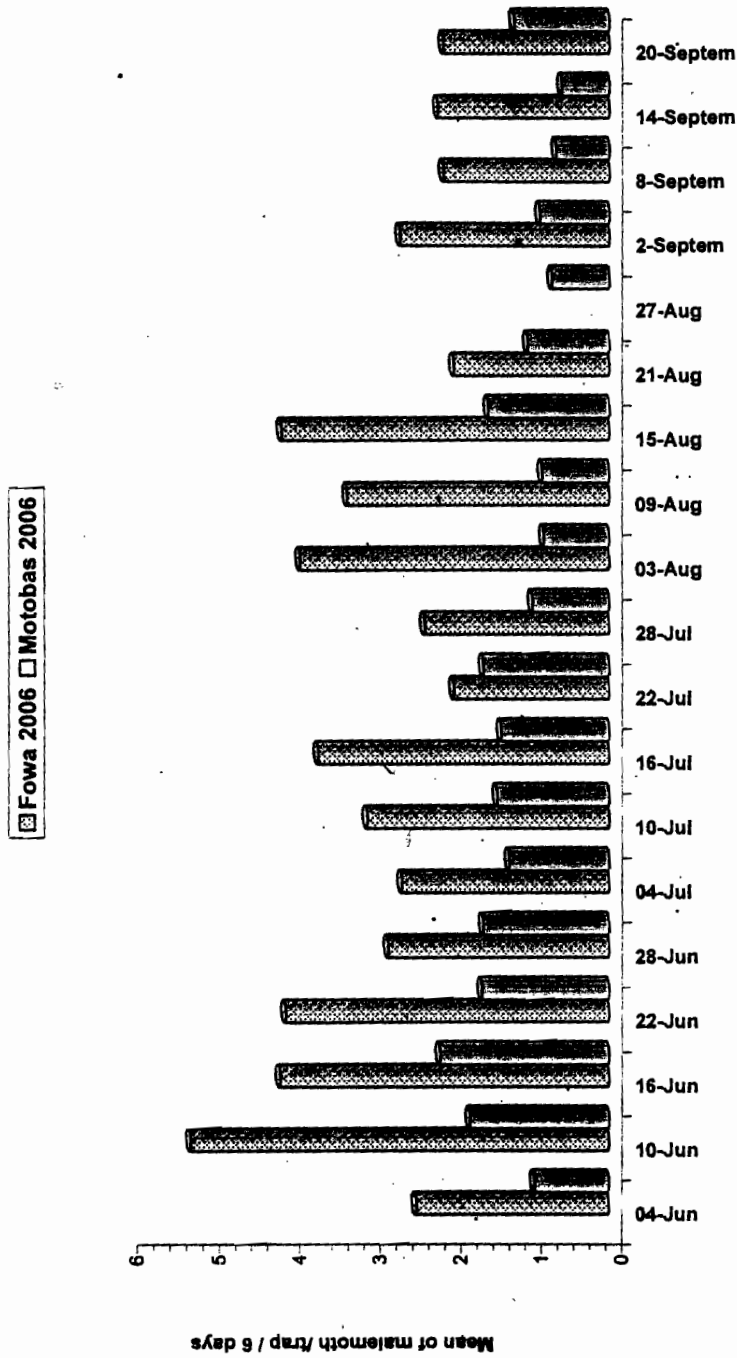
During the two seasons, maximum numbers of moths caught were recorded during June and July in both season in both districts. The obtained results are parallel with those obtained by many authors; Metwally *et al.* (1996) reported that the population dynamic of pink bollworm recorded three generations in sharkia governorate. Guirguis *et al.* (1991) studied the occurrence and seasonal abundance of the pink bollworm in cotton fields and found three generations with three sharp peaks of this insect. Ragab (1999) showed that in all three cotton seasons (1992- 1994) peak catches occurred in late May, late Jun, July, August and September representing five peaks during the cotton growing season. Pink bollworm population, as measured by number of male moths caught in the sex-pheromone baited traps, varied dramatically from year to year and from locality to other. The PBW remained active throughout March- late November with intensity during the warmest months; however pink bollworm could develop into five generations throughout May- November showing 5 distinct peaks at Zefta (Middle Delta). While, at sids (South Egypt). He evident that *P. gossypiella* had three generations and males flight peaks occurred at June, late July and late Septmber during three consecutive cotton seasons. Aref *et al.* (2006) founded that there are three or four generations of pink bollworm within season on cotton fields.

2-Seasonal abundance of the pink bollworm in Dakahlia governorate:

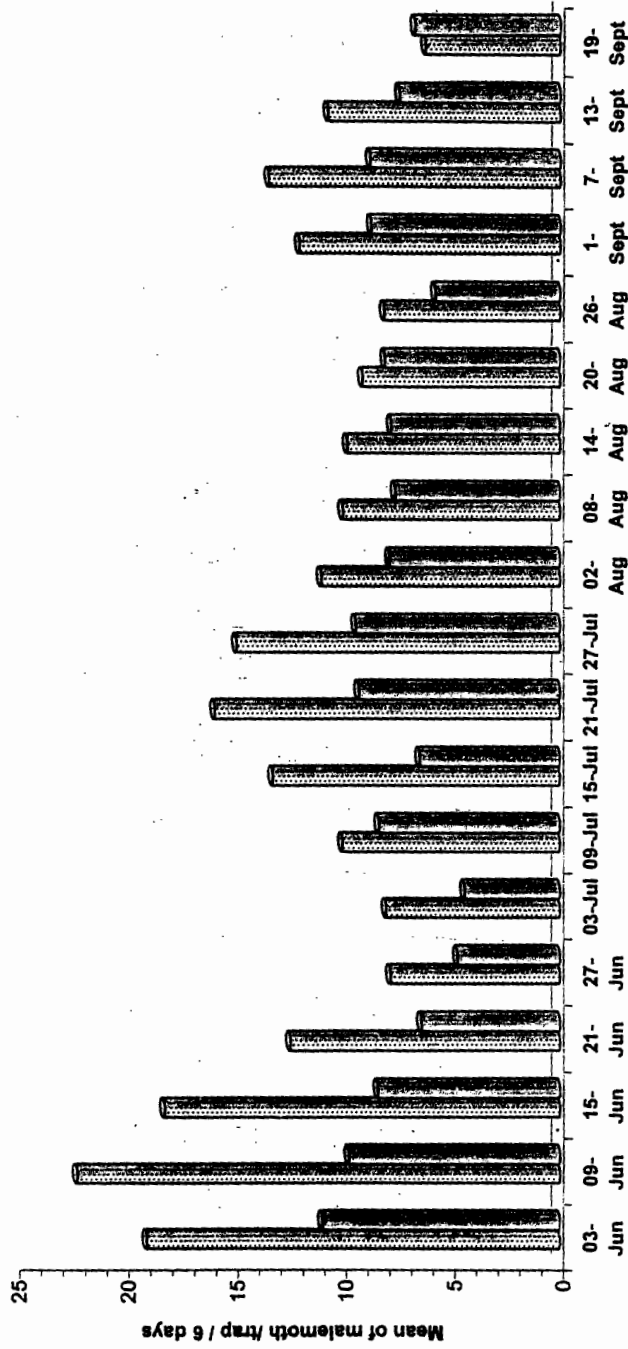
Data presented in table (3) and Figures (3 & 4) show the fluctuation of the male moths of PBW during the period extended from the 1 st week of June till the end of September in 2005 and 2006 seasons on two districts in Dakahlia governorate.

During the season on 2005 as shown in fig (3), there were three generations with three sharp peaks in Belkas and EL Mansoura districts in both seasons these peaks occurred on the 2nd and first week of June 3rd third and 4th four the week of July and 2nd second week of September in 2005 season on both districts.

Corresponding numbers of caught males were 22-2, 15.90 and 13.40 in case of Belkas and 10.94,9.40 and 8.75 in case of EL Mansoura at the same season, respectively .



Figur (2) : Average number of *Pectinophora gossypiella* adult male moths caught using pheromone traps in the two districts Fowa and Motobas Kafr-El-sheikh governorate during 2006 cotton season .



Figur (3) : Average number of *Pectinophora gossypiella* adult male moths caught using pheromone traps in the two districts Belkas and El-Mansoura Dakahlia governorate during 2005 cotton season.

Regarding 2006 growing season (Fig 4), three generations were found Belkas district, with their peaks during half June, the end of July and the end of August in Belkas and EL Mansoura districts.

The trapped male moth recorded (5.13, 3.55), (8.19, 5.75) and (8.98, 6.25) male / trap/6 days in Belkas and EL-Mansoura districts.

Table (3): Average number of P.B.W adult male moths Caught by pheromone traps in the two districts (Belkas and El-Mansoura) of Dakahlia governorat during seasons 2005 and 2006 .

Period of application		2005 seasons		2006 seasons	
		Mean No. of male moths/ trap/6 days		Mean No. of male moths/ trap/6 days	
		Belkas	El-Mansoura	Belkas	El-Mansoura
June	3/6-8/6	19.0	10.94	3.25	2.97
	9/6-14/6	22.2	9.72	4.55	3.05
	15/6-20/6	18.2	8.38	5.13	3.55
	21/6-26/6	12.4	6.38	4.75	3.25
	27/6-2/7	7.8	4.72	3.54	3.12
July	3/7-8/7	8.0	4.38	4.04	3.47
	9/7-14/7	10.01	8.33	5.48	4.30
	15/7-20/7	13.2	6.45	6.69	5.05
	21/7-26/7	15.90	9.26	7.25	5.71
	27/7-1/8	14.90	9.4	8.19	5.75
August	2/8-7/8	11.0	7.85	6.25	5.15
	8/8-13/8	10.0	7.58	7.25	4.87
	14/8-19/8	9.80	7.77	7.78	5.07
	20/8-25/8	9.10	8.07	8.75	5.77
	26/8-31/8	8.10	5.75	8.98	6.25
September	1/9-6/9	12.0	8.70	7.45	6.05
	7/9-12/9	13.40	8.75	7.02	5.48
	13/9-18/9	10.70	7.40	6.59	5.86
	19/9-24/9	6.20	6.70	5.94	5.20

*Average number of 120 Traps, ** Average number of 155 Traps, *** Average number of 119 Traps, **** Average number of 160 Traps

3-Infestation rates by PBW larvae:

To evaluate the correlation between the number of caught males and the actual infestation with PBW larvae, bolls were examined periodically for infestation and the percentage of infestation were calculated. As matter of fact the rate of infestation levels of PBW larvae were recorded from cotton plantation treated with insecticides for controlling cotton bollworms.

Results presented in Table (4) revealed that the percentage of infestation ranged between (0.66 and 3.39) and (0.90 and 2.75) in fowa district during 2005 and 2006 cotton seasons, respectively. The corresponding values ranged between (0.69 and 3.35) and (1.14 and 3.16) for Motobas district in the same and seasons.

Data obtained during 2005 cotton season, the percentage of infestation, ranged between (0.88 and 2.23) and (0.55 and 3.21) in Belkas and EL Mansoura districts, and ranged between (1.09 and 3.21) and (0.33 and 2.44) during 2006 season, respectively.

Table (4): Percentages of infestations recorded from cotton fields treated with insecticides in two governorates during 2005 and 2006 seasons.

2005 seasons					
Sampling dates		Fowa	Motobas	Belkas	El-Mansoura
July	8/7-13/7	-	-	1.40	1.57
	14/7-19/7	0.91	1.13	0.88	1.85
	20/7-25/7	0.66	0.69	1.49	2.27
August	26/7-31/7	0.91	1.25	1.35	1.84
	1/8-6/8	1.44	1.56	1.78	1.85
	7/8-12/8	1.38	1.42	1.79	1.66
	13/8-18/8	2.42	2.03	2.44	1.78
	19/8-24/8	3.39	3.35	2.00	1.78
	25/8-30/8	2.58	3.08	1.77	2.21
	31/8-5/9	2.61	3.08	2.23	2.05
September	6/9-11/9	2.73	2.27	1.85	1.97
	12/9-17/9	3.0	2.18	1.66	1.90
	2006 seasons				
Sampling dates		Fowa	Motobas	Belkas	El-Mansoura
July	9/7-14/7	-	-	1.93	0.70
	15/7-20/7	1.36	-	1.09	0.33
	21/7-26/7	1.09	1.16	1.15	1.00
August	27/7-1/8	0.90	1.14	1.89	2.45
	2/8-7/8	1.02	1.58	1.83	2.94
	8/8-13/8	1.60	1.80	2.28	3.10
	14/8-19/8	2.09	2.13	3.21	2.65
	20/8-25/8	2.75	3.00	2.70	1.98
	26/8-31/8	1.60	2.64	2.85	2.44
September	1/9-6/9	1.87	3.16	2.55	2.20
	7/9-12/9	1.63	1.77	2.15	1.80
	13/9-18/9	1.42	1.52	1.66	1.40

4-Effect of weather factors on *P. gossypiella* :

Results in Tables (5 &6) indicated that the multiple regression values for maximum temperature were positive and significant ($b = 0.560, 0.399, 0.741$ and 0.695) at kafr EL-Sheikh governorate while $b = 0.192, 0.020$, 1.561 and 0.664 at Dakahlia governorate during 2005 and 2006 respectively. The minimum temperature was effected positive and negative significant($b = 0.14, 0.137, - 0.508$ and $- 0.182$) at Kafr Elsheikh governorate while, in Dakahlia governorate ($b = -0.185, 0.310, -1.630$ and $- 0.887$) during 2005 and 2006, in respect to relative humduty, multiple regression indicated a positive and negative relation ship between relative humidity and number of moths in both seasons ($b = 0.070, 0.15 - 0.3080$ and -0.039) at kafr El sheikh governorate where is ($b = 0.019, -0.122, 0.260$ and 0.131 at Dakahlia

governorate. It means that the relative humidity may low effect on population density during 2005 and 2006 seasons.

r^2 values for the three weather factors were 0.405, 0.380, 0.137 and 0.111 at kafr EL- Sheikh government while, at Dakahlia governorate were 0.083, 0.232, 0.367 and 1.00 respectively table (5+6). It revealed that the three weather factors were responsible for obvious ratio of variability in population of moths this means that there are unknown or a biotic unconsidered factors that may be responsible of variability in population density.

Table (5): Effect of weather factors on *P. gossypiella* male population during 2005 and 2006 cotton seasons in Kafr-EL-Sheikh governorate.

Season and district	Weather factors	Mean No. of Male/ trap	b	S.E	R ²	E.V(%)	F
2005 Fowa	Max. temp	4.37	0.560	0.346	0.405	40.5%	3.634**
	Mini. temp		0.140	0.331			
	R.H%		0.070	0.069			
2005 Motobas	Max. temp	2.72	0.399	0.291	0.380	38%	3.275**
	Mini. temp		0.137	0.211			
	R.H%		0.015	0.044			
2006 Fowa	Max. temp	9.96	0.741	1.177	0.137	13.7%	0.845*
	Mini. temp		-0.508	0.877			
	R.H%		-0.308	0.278			
2006 Motobas	Max. temp	5.52	0.695	0.493	0.111	11.1%	0.665*
	Mini. temp		-0.182	0.367			
	R.H%		-0.039	0.166			

Karaman *et al.* (1982) reported that the daily minimum daily mean relative humidity seemed to influence significantly *P. gossypiella* population fluctuation in middle Egypt. In relation to weather factors effect Hossain (1990) indicated that the three main weather of factors maximum, minimum temperature and relative humidity were significantly effective on the changes in population of *p. gossypie/ila* moths captured by pheromone traps in Fayom governorate, Metwally *et al.* (1996) found that there were positive correlation between the number of pink bollworm moths and the thermal heat units expressed as daily degree till July during 1989 to 1991, while El-Zanan *et al.* (1998) reported that the combined effect of the three weather factors on changes of pink bollworm was responsible for 71,30.66 and 56 % during 1994 to 1997 Nassef and Aref(2004) reported that the population fluctuation of pink bollworm was affected significantly by the changes in weather factors during 2002 and 2003 cotton season at Kafr Elsheitkh governorate.

Table (6): Effect of weather factors on *P. gossypiella* male population during 2005 and 2006 cotton seasons in Dakahlia governorate.

Season and district	Weather factors	Mean No. of weather factor	Mean No. of Male/ trap	b	S.E	R ²	E.V(%)	F
2005 Belkas	Max. temp	30.71	3.05	0.192	0.213	0.83	8.3 %	0.425
	Mini. temp	18.81		-0.185	0.225			
	R.H%	63.71		0.019	0.085			
2005 El-Mansoura	Max. temp	30.71	4.14	0.020	0.196	0.232	23.2 %	1.513**
	Mini. temp	18.81		0.310	0.207			
	R.H%	63.71		-0.122	0.087			
2006 Belkas	Max. temp	33.87	4.69	1.561	0.850	0.367	36.7 %	3.091**
	Mini. temp	19.54		-1.630	0.656			
	R.H%	71.00		0.260	0.105			
2006 El-Mansoura	Max. temp	33.87	6.25	0.664	0.989	0.100	10 %	0.594
	Mini. temp	19.54		-0.887	0.763			
	R.H%	71.00		0.131	0.122			

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التواجد والوفرة الموسمية لدودة اللوز القرنفلية التي تصيب القطن في شمال الدلتا
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أجريت هذه التجربة لداسة الوفرة الموسمية لتعداد دودة اللوز القرنفلية فى حقول القطن خلال موسمى ٢٠٠٥ ، ٢٠٠٦ كذلك تمت دراسة تأثير العوامل الجوية لنشاط طيران ذكور فراشاتها. تمت دراسة نشاط الذكور باستخدام المصائد الفرمونية خلال الموسمين السابقين وأوضحت النتائج ان دودة اللوز القرنفلية لها ٣ اجيال على القطن مع وجود ثلاث قمم واضحة بداية من اول يونيو حتى نهاية سبتمبر- وكان التأثير المشترك للعاملين الجوىين (الحرارة والرطوبة) على الفراشات كانت بنسبة (٤٠,٥ % ، ٣٨ %) و(١٣,٧% و ١١,١ %) فى كل من فوة ومطوبس من محافظة كفرالشيخ خلال موسمى ٢٠٠٥ ، ٢٠٠٦ . بينما كان تأثير العاملين الجوىين فى محافظة الدقهلية هو (٨,٣ % ، ٢٣,٢ %) و (٣٦,٧ % ، ١٠ %) فى كل مركز بلفاس والمنصورة خلال نفس الموسمين على التوالي لما تعداد اليرقات واصابة اللوز فقد كانا ثابتين خلال بداية يوليو وازداد تدريجيا حتى نهاية الموسم .

قام بتحكيم البحث

كلية الزراعة - جامعة المنصورة
مركز البحوث الزراعية

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