

COMPARATIVE POPULATION DENSITIES OF CERTAIN PREDATORS IN COTTON FIELDS TREATED WITH SEX PHEROMONES AND INSECTICIDES IN MENOFIA GOVERNORATE; EGYPT.

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INTRODUCTION

The basic philosophy of cotton pests control should depend on the integration of all possible methods in an attempt to lead to an equilibrium of pest populations below the economic injury levels. It is to be noted that, in most cases, still most important among these methods is the pesticide applications.

The pink bollworm, *Pectinophora gossypiella* (Sound.) is considered the major injurious pest in cotton fields in Egypt. Among the new methods to control it with the aim of reducing number of insecticide applications, is the use of sex pheromones against its male moths.

Control of the pink bollworm, *P. gossypiella*, by the sole use of mating disruption technique was first successfully achieved in Egypt in 1981 by aerial application of a microencapsulated formulation of the sex pheromone (Critchley, 1983). Two alternative pheromone formulations are available commercially for the control of *P. gossypiella*; hollow plastic fibers (Brooks et al 1979) and plastic laminate flakes (Kydonieus & Beroza, 1981). Second attempt was undertaken in 1982 in Fayoum Governorate to evaluate the relative effectiveness of all three pheromone formulations in comparison with conventional insecticides (Critchley et al 1985).

In cotton season of 1986, a new trial to use the sex pheromones in a large scale in different locations in Delta was carried out. The experimental area was at Quesna District, Menofia Governorate, where all the cotton fields (9810 feddans) were treated with sex pheromones.

The aim of this study is to compare the seasonal population densities of certain groups of predators in cotton fields treated with sex pheromones and insecticides as two different control programs against bollworms.

MATERIAL and METHODS

Experimental locations were Quesna and Berket El-Sabh provinces, Menofia Governorate, where sex pheromone and insecticides treatments were applied, respectively during the cotton season of 1986.

Pheromone applications :

The hollow plastic fibre formulation was provided by Sandoz of Swiss. Each fibre is 1.5 cm long with an internal diameter of 0.2 mm. The pheromone is held in the fibers by capillary action and is released by evaporation from the open end (Brooks et al 1979). Pheromone formulations were sprayed by aircraft using conventional boom and nozzle equipment at a rate of 15g/feddans (3g. active ingredient), four times in the following dates, 18 June, 9 July, 29 July and 16 August.

Insecticide applications :

Insecticides treatments at Berket El-Sabh province were applied by aircrafts, five times throughout the season as follows :

- 1 — 7 July, 86 (D.C. Fl. Empire)
- 2 — 23 July, 86 (SHEER 10%)
- 3 — 12 August, 86 LARVIN + DURBAN)
- 4 — 28 August, 86 (DURBAN + DENET)
- 5 — 15 September, 86 (DENET + SHEER 10% + CETROLIN + CORACRON)

Later in the season a relatively high rate of infestation by *P. gossypiella* was recorded after completing of the pheromone applications (four times), the whole area of Quesna province was sprayed aerially two times (25/8 and 9/9) using CCN and DURBAN, respectively. Timing of pheromone and insecticides applications in the two areas are shown in Fig. I.

Predators counting :

Weekly counts for the main predators in cotton fields were carried out in the mentioned provinces in an area of about 10 feddans in each location. Counts were conducted throughout a period lasted from mid-June until late-

September (15 weeks). Each count comprised 100 randomized hills, of two cotton plants each. The direct counting method was used (Hafez, 1960).

Six groups of predators were considered, i.e. *Coccinella undecimpunctata* Reiche, *Scymnus* spp., *Paederus alfieri* Koch., *Orius* spp., *Chrysoperia carnea* Steph. and true spiders.

Boll infestation :

Samples were taken at 5-10 days intervals over ten weeks lasted from early July till mid-September. Boll infestation was assessed by collecting 100 bolls from randomly selected sites within each of the two areas. The 100-boll sample was examined at the same day of collection. Counts of boll infestation by *P. gossypiella* and *Earias insulana* Boisd. included bolls from which the larvae had departed but had left characteristic traces.

RESULTS

Obtained results of the number of predators in Quesna and Berket El-Sabh provinces are summerized in Tables I and II, respectively and in Fig. I. Rate of infestation by the two bollworms in the two locations of work is shown in Fig. 2.

These results seem to indicate the following :

Counting of Predators :

— *Coccinella undecimpunctata* Reiche :

At Quesna, larvae and adults of *C. undecimpunctata* reached their peak of 32 and 30 insects/100 hills on 5/7 and 19/7, respectively. The population was relatively steady till 9/8, then began to occur in low numbers until the end of the season due to the use of insecticides later. (As a matter of fact, *C. undecimpunctata* has a natural drop mostly during August). At Berket El-Sabh, the population was moderate in numbers during the first four weeks, then dropped drastically to reach Nil on 12/7 next to the first use of insecticides and followed by low numbers with a maximum of 6 beetles/100 hills till the end of the season.

— *Scymnus* spp. :

Populations of *Scymnus* spp. were relatively high at Quesna, the highest counts were recorded during the period from 19/7 till 9/8 with a maximum of 64 beetles/100 hills by 26/7. A gradual decrease was observed next to the

insecticides applications later in the season. At Berket El-Sabh, after a moderate occurrence of *Scymnus* for four weeks, a sharp decline was found next to the first use of insecticides by 12/7, but with certain fluctuations until the last count on 20/9.

TABLE I

Weekly numbers of predators per 100 hills in cotton fields sprayed with sex pheromone against *P. gossypiella*, Quesna pronice, Menofia Governorate, 1986.

Date	<i>C. undecim- punctata</i>	<i>Scymnus</i> spp.	<i>P.</i> <i>alfieri</i>	<i>C.</i> <i>carnea</i>	<i>Orius</i> spp.	Spiders	Total
19/6/86	14	10	16	22	42	26	130
25/6	14	16	12	36	36	22	146
30/6	12	14	8	12	34	28	108
5/7	32	32	32	28	58	36	206
12/7	10	26	16	22	60	30	164
19/7	30	60	24	24	80	44	262
26/7	22	64	42	16	84	40	268
2/8	18	28	32	10	70	36	194
9/8	22	58	18	28	78	36	240
16/8	6	18	10	10	38	28	110
23/8	8	14	10	10	24	26	92
30/8	6	20	12	4	26	24	92
6/9	4	18	8	8	18	24	80
13/9	6	14	8	2	18	24	72
20/9	0	10	0	2	6	18	36
Total	204	402	248	234	672	442	2202

TABLE II

Weekly number of predators per 100 hills in cotton fields sprayed with insecticides, Berket El-Sabh province, Menofia Governorate, 1986.

Date	<i>C. undecim-punctata</i>	<i>Scymnus</i> spp.	<i>P. alfieri</i>	<i>C. carnea</i>	<i>Orius</i> spp.	Spiders	Total
19/6/86	14	18	22	26	54	44	178
25/6	18	16	16	38	68	34	190
30/6	10	24	10	12	40	32	128
5/7	24	26	36	16	92	34	228
12/7	0	6	2	2	8	12	30
19/7	6	10	2	4	6	18	46
26/7	2	2	4	2	10	14	34
2/8	0	10	0	4	16	18	48
9/8	6	16	4	4	18	18	66
16/8	0	10	0	2	14	14	40
23/8	0	2	2	2	10	14	30
30/8	0	12	0	4	10	14	40
6/9	0	6	2	2	10	16	36
13/9	6	10	2	4	10	14	26
20/9	0	6	0	0	2	10	18
total	86	174	102	122	368	306	1158

— *Paederus alfieri* Koch. :

Occurrence of the beetles of *P. alfieri* at Quesna seemed to be moderate throughout the whole period of counting except the last few weeks due to the use of insecticides. They reached their peak of 42 beetles/100 hills by 26/7. At Berket El-Sabh, the population was relatively higher than at Quesna in the first four weeks, but after insecticides applications the population decreased and was represented by very low numbers till the end of the season.

— *Chrysoperla carnea* Steph. :

Larvae and adults of *Chrysoperla* were counted at Quesna in relatively

steady numbers ranged between 10-36 individuals/100 hills. The peak of 36 insects was recorded on 25/6. Low numbers were observed after insecticides treatments later in the season. At Berket El-Sabh, a sharp decline occurred next to the first use of insecticides by 6/7, followed by low numbers with a maximum of 4 insects/100 hills till the last count.

— *Orius* spp. :

: Nymph and adult population of *Orius* spp. was the highest in the two localities among the considered groups of predators. At Quesna, they reached their peak of 84 insects/100 hills by 26/7 and then decreased gradually till the end of the season. At Berket El-Sabh, the population was high in the first four weeks with a peak of 92 insects/100 hills by 5/7 just one day before the first use of insecticides which followed by low numbers of *Orius* until the last count.

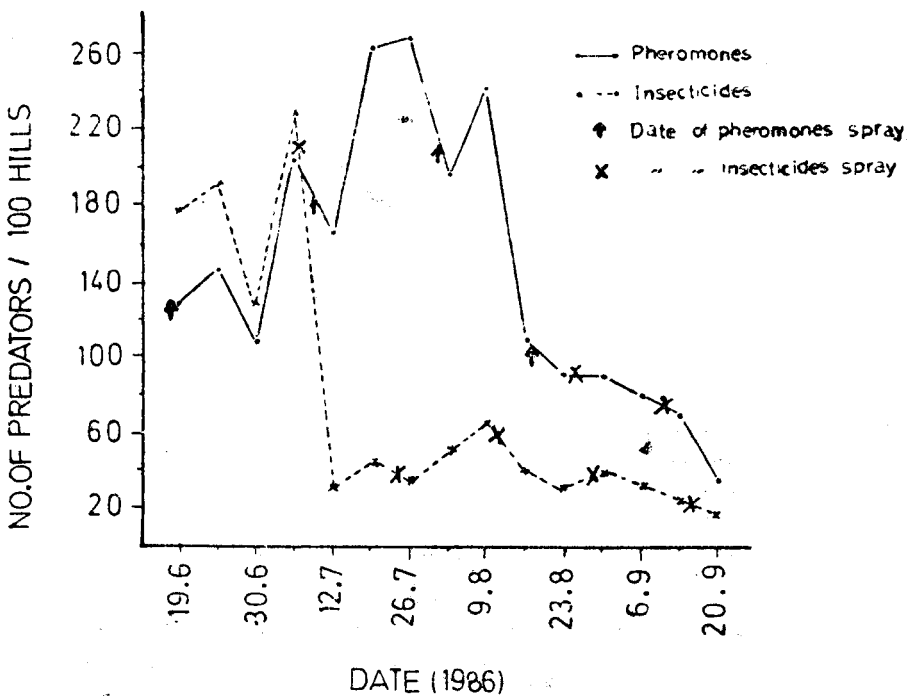


Fig.1. Population densities of certain predators in cotton fields treated with sex pheromones and insecticides

— Spiders :

Spiders seemed to be the least group of predators affected with insecticide applications. Their population was steadily moderate all over the season ranged between 18-44 individuals with a peak of 44 individuals by 19/7 at Quesna and between 10-44 individuals with the same peak (44 individuals) but a month earlier (19/6) at Berket El-Sabh.

2 — Boll infestation :

Comparisons of the percentage of infestations of cotton bolls by bollworms in the pheromone — and insecticide — treated areas for the ten sampling occasions during the season are shown in Fig. 2.

Statistical analysis using T-test indicated that no significant differences in the percentage of infestations by bollworms in pheromone treated area when compared with their corresponding in insecticide treated area during

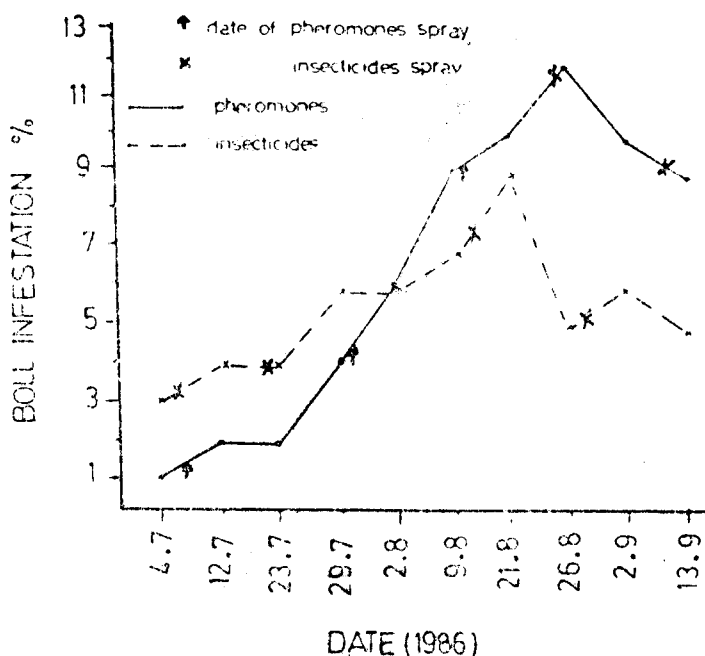


Fig. 2. Rates of boll infestation in cotton fields treated with sex pheromones and insecticides

the critical period of boll formation up to the end of July. However, on the last three sampling occasions, by the end of August and next to the four pheromone treatments, the level of infestation was relatively higher than in the insecticide-treated area (Fig. 2). Therefore, two insecticide applications were practiced by 25/8 and 9/9 in the pheromone-treated area.

Seasonal average of the percentages of infestation in the ten sampling occasions was 6.5 and 5.5% in pheromone- and insecticide-treated areas, respectively.

DISCUSSION

Obtained results indicate that, in general, the population densities of *C. undecimpunctata*, *P. alfieri* and *C. carnea* were less in number in the two localities than the other three groups, *Scymnus* spp. *Orius* spp. and spiders.

In the two areas, *Orius* spp. were the dominant predators in cotton fields, followed by spiders and then *Scymnus* spp.

Sharp decline in the number of considered predators was observed after the application of insecticides especially the first treatment by 6/7 at Berket El-Sabh.

Populations of the certain predators were about two-fold in sex pheromone treated area (Quesna) comparing with insecticide treated area (Berket El-Sabh).

Orius spp., Spiders and *Scymnus* spp. seemed to be much tolerant to insecticide applications.

Field observations showed that aphid infestation was relatively high in the cotton fields all over the season of 1986 in the two locations of study, that may interpret the high populations of the most of the considered predators, comparing with the recorded data of El-Heneidy et al 1978 and Hamed et al 1983. It is well known that the six groups of considered predators are mainly aphid feeders and partly eggs and newly hatched larvae predators for most of the cotton pests.

As a matter of fact, it is possible in areas treated with *P. gossypiella* pheromone that unacceptable late season increases in *E. insulana* infestations might occur, compared with areas where insecticide applications would be expected to control both pest species. Therefore, a relative much occurrence of *E. insulana* was observed in the pheromone-treated area.

In general, statistical analysis indicated that highly significant differences between the population densities of the considered groups of predators in the two different areas of work were obtained, whereas, no significant differences between the boll percentages of infestation in both areas of treatments were observed.

Results obtained in the present work are generally in agreement with those obtained by Hafez, 1960, El-Heneidy et al 1978 and Hamed et al 1983.

It is worthy to be supported that :

1. Using sex pheromones before insecticides especially during June and July in cotton fields might decrease number of insecticide treatments and not only maintain the high population of predators for long time, but also increase their role at least till August without great differences in boll infestation.
2. The recommended 10% level (reported by Metwally, 1961) as economic injury level for bollworm infestation in cotton fields has to be taken in consideration before any insecticide applications in cotton fields.

SUMMARY

The present work was undertaken over 15 weeks in the cotton season, 1986 in Menofia Governorate to compare between the seasonal population densities of certain groups of predators in cotton fields treated with sex pheromones (Quesna province) and insecticides (Berket El-Sabh province) as two different control programs against bollworms.

Population densities of the predators were about two-fold in sex pheromone-treated area compared with insecticide-treated area. Among the considered groups of predators, *Orius* sp., were the dominant, in both areas of cotton fields, followed by Spiders.

Boll infestation was estimated in both locations of work over ten weeks, where no significant differences were found in the infestations by bollworms between the two areas.

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