

MONITORING OF COTTON PINK BOLLWORM POPULATION AT DIFFERENT COTTON GROWTH STAGES IN EGYPT

HUSSEIN NAGWA M. AND S.N. KOSTANDY

Plant protection Research Institute, Agricultural Research Centre, Dokki-Giza, Egypt.

(Manuscript received September 2001)

Abstract

Sexual pheromone traps were used in cotton fields to estimate the population of pink bollworm, *Pectinophora gossypiella* (Saunders) moths at Behira Governorate during 1999 and 2000 seasons. Relationship between early spring trapping of the pest and its population during the cotton season was studied. Moths emerged from diapaused larvae in spring could be used as a monitor of size and population of pink bollworm at the beginning of the season during cotton flowering. Number of pink bollworm moths caught in pheromone traps during cotton flowering was highly significant positively correlated with the number of moths caught during boll formation.

There was an insignificant negative correlation between number of *P. gossypiella* and *Earias insulana* larvae inside green bolls in cotton fields, 1999 and 2000 seasons. Accordingly, when the inside number of pink bollworm larvae increased, the number of spiny bollworm larvae decreased.

Also, an insignificant positive correlation between average number of pink bollworm in 100 green cotton bolls at the end of the two studied seasons and average number of moths emerged from diapaused larvae in the following spring.

INTRODUCTION

The changes in the infestation levels of the pink bollworm, *Pectinophora gossypiella* (Saunders) is considered of great value all over the world. Economic losses occur as a result of reduced yield quantity and cotton lint quality. Early infestation of the crop with *P. gossypiella* usually starts in the flowering parts of cotton (squares and flowers) in June and continue in boll during July, August and September until the end of the season. Sharma (1988) in India stated that control of pink bollworm in squares and blooms early in the season reduced infestation in bolls. In India, also, Siddiqui (1989) observed that the rate of pink bollworm moths catch increased at the cotton flowering period, reached its peak at boll bursting followed by a decline in trap catches. Chu and Henneberry (1990) reported that in U.S.A., the number of pink bollworm male moths

caught from March to June was correlated significantly with the number caught from July to August, indicating that early spring trapping may be used to identify potential field problem. Hossain (1990) and Romeila (1991) showed that in Egypt, pink bollworm moths started to appear in the traps in reasonable numbers by the end of March. Moth activity formed two conspicuous annual broods, the first extended, mainly from April to early July and the second from about mid-May to the end of November. El-Deeb *et al.* (1995) and Abd El-Hamid *et al.* (1999) found in Egypt that *P. gossypiella* showed four generations.

The present study was conducted to determine the relationship between number of pink bollworm moths emerged from diapause in spring and number of moths during flowering cotton season. The relationship between the occurrence of pink bollworm moths during flowering period and green boll formation was also studied. The competition value between pink and spiny bollworms larvae inhabiting the green bolls was estimated. The relationship between pink bollworm larvae inside infested green bolls on harvest date and yielded number of emerged moths from diapausing larvae in the next spring was also considered.

MATERIAL AND METHODS

A semi-large scale field experiment was carried out at Behira Governorate during 1999 and 2000 cotton growing seasons. Sex pheromone "Delta" traps were used to estimate the changes in the population of pink bollworm male moths. 365 traps were placed in 9950 feddans of winter crops and from March to June 4482 traps were distributed in cotton fields (134400 feddans). The traps were examined at three day intervals and the number of moths was counted and recorded. The relationships between number of pink bollworm moths emerged from diapausing larvae in spring season and flowering stage was studied. The relationship between pink bollworm moths population during cotton flowering and green boll formation was also clarified.

Pink and spiny bollworms numbers inside samples of green cotton bolls were counted. A total number of 33 and 24 samples of 100 green bolls were picked weekly during July, August, September 1999 and 2000, respectively. The sampled bolls were carefully dissected and examined for pink and spiny bollworm larvae.

RESULTS AND DISCUSSION

Table 1 shows the average number of pink bollworm moths during spring, flowering and green boll formation periods in cotton fields at Behira Governorate during 1999 and 2000 seasons. Data revealed that a highly significant positive correlation between pink bollworm moths emerged from diapausing larvae in the spring and number of moths captured during flowering period. Each pink bollworm moth captured in the trap per night in the spring corresponded three-four moths detected in the trap per night during cotton flowering period in the fields. The results suggest that night moth trap catches in the spring can be used for predicting the pink bollworm population during the flowering period. Taman (1990) stated that pheromone traps provided a useful ecological tool for monitoring cotton insect pests and early prediction of their successive generations. Kostandy (1991) found that early in the season, the only feeding sites for the pink bollworm larvae were the flower-buds and flowers. Control of early infestation in flowers is supposed to decrease the propagation of the pest in green bolls.

On the other hand, the number of captured pink bollworm moths caught/trap/night during the cotton flowering season was highly correlated with the number of moths caught during cotton boll formation. 10 moths of pink bollworm caught in a trap/night during cotton flowering period corresponded 3-7 moths would detected in a trap/night during cotton boll formation period. In other words, control programs on squares and flowers early in the seasons before cotton boll formation, is resulted in reducing percentages of infested bolls with pink bollworm. This result agrees with those of Chu and Henneberry (1990) in U.S.A., who mentioned that the average number of pink bollworm male moths/night/trap caught from March to June (flowering period) was correlated significantly with the the average number of moths caught from July to August (green boll formation), indicating that early spring trapping may be used to identify potential field problem. Kostandy (1994) observed a highly significant positive relationship between the pink bollworm moth and the corresponding larval infestation.

Table 2 shows the fluctuations in average number of pink and spiny bollworms inhabiting green bolls during July, August, September 1999 and 2000, respectively. An insignificant negative correlation between numbers of pink and spiny bollworm larvae inside green bolls was noticed during 1999 and 2000 cotton seasons. Percentages of

Table 1. The changes in the number of pink bollworm moths as indicated by pheromone traps (Behira Governorate) during spring, cotton flowering and boll formation periods, 1999 and 2000 seasons.

| Spring period | | | Flowering period | | | Boll formation period | | |
|-----------------|-------------------|------|------------------|-------------------|------|-----------------------|-------------------|------|
| Inspection date | No. of moths/trap | | Inspection date | No. of moths/trap | | Inspection date | No. of moths/trap | |
| | 1999 | 2000 | | 1999 | 2000 | | 1999 | 2000 |
| 25/3 | 0.31 | 0.20 | 5/6 | 1.74 | 3.44 | 22/7 | 5.69 | 4.15 |
| 1/4 | 0.25 | 0.27 | 12/6 | 1.73 | 3.97 | 29/7 | 6.14 | 5.11 |
| 8/4 | 0.38 | 0.29 | 19/6 | 1.37 | 4.38 | 5/8 | 5.97 | 5.29 |
| 15/4 | 0.47 | 0.42 | 26/6 | 1.78 | 4.69 | 12/8 | 5.91 | 4.95 |
| 22/4 | 0.47 | 0.62 | 3/7 | 2.70 | 4.78 | 19/8 | 6.11 | 5.29 |
| 29/4 | 0.65 | 0.58 | 10/7 | 3.36 | 4.05 | 26/8 | 6.63 | 5.54 |
| 6/5 | 0.94 | 0.82 | 17/7 | 5.54 | 5.93 | 2/9 | 6.90 | 6.40 |

- Correlation and regression coefficient between numbers of moths during spring and cotton flowering periods in (1999) and (2000) seasons were (+0.936, +4.576) and (+0.835, +2.943), respectively.
- Correlation and regression coefficient between number of moths during cotton flowering and boll formation periods in (1999) and (2000) seasons were (+0.916, +0.339) and (+0.842, +0.716), respectively.

Table 2. Average number of pink and spiny bollworms in 100 green cotton bolls at Rashied district, Behira Governorate, during 1999 and 2000 seasons

| Inspection date | Pink bollworm | | Spiny bollworm | |
|-----------------|---------------|------|----------------|------|
| | 1999 | 2000 | 1999 | 2000 |
| 18/7 to 22/7 | 0.58 | - | 0.68 | - |
| 23/7 to 29/7 | 0.39 | 0.38 | 0.39 | 0.37 |
| 30/7 to 4/8 | 0.45 | 0.25 | 0.82 | 0.42 |
| 5/8 to 10/8 | 0.58 | 0.92 | 0.84 | 0.12 |
| 11/8 to 16/8 | 1.21 | 0.50 | 0.45 | 0.29 |
| 17/8 to 22/8 | 1.42 | 0.83 | 0.24 | 0.08 |
| 23/8 to 28/8 | 0.88 | 0.96 | 0.21 | 0.17 |
| 29/8 to 3/9 | 1.21 | 0.92 | 0.73 | 0.37 |
| 4/9 to 9/9 | 0.85 | 0.67 | 0.76 | 0.29 |
| 10/9 to 15/9 | 0.76 | 0.79 | 0.51 | 1.08 |
| 16/9 to 21/9 | 1.30 | 0.63 | 0.36 | 0.33 |
| 22/9 to 27/9 | 1.09 | 0.75 | 0.06 | 0.25 |

- Correlation coefficient (r) & regression coefficient (b) between pink and spiny bollworms in green cotton bolls in (1999) and (2000) seasons were (-0.479, -0.358) and (-0.541, -0.621), respectively.
- Percentage of variation ($r^2 \times 100$) in 1999 and 2000 seasons were 22.9 and 29 %, respectively.

variation ($r^2 \times 100$) were 23 % and 29 % in 1999 and 2000 seasons, respectively when the spiny bollworm was considered as dependent variable. In general, it means that when the number of pink bollworm increases, the number of spiny bollworm decreases. 71 to 77 % of variation in the number of spiny bollworm was due to other factors such as its different host plants (except cotton). Abul-Nasr *et al.* (1979) and Abdel-Rahim *et al.* (1980) mentioned that cotton plants that bloomed and matured early became less infested by *P. gossypiella*. The majority of damaged bolls throughout the whole season were infested with pink bollworm larvae rather than with spiny bollworms.

Table 3 shows the average number of pink bollworm/100 green bolls collected from cotton fields at the end of 1999 and 2000 seasons and the corresponding average number of moths/trap/night emerged from diapausing larvae in the following spring 2000 and 2001. An insignificant positive correlation between number of pink bollworm inside green bolls were inspected during September and number of pink bollworm moths emerged from diapausing larvae of the second season. It could be concluded that the increase of the pink bollworm infestation in green bolls at late season is following by increase in number of moths emerged from diapausing larvae in the spring of the next year. Although small number of the pink bollworm larvae (inside the last samples of green bolls) entered diapause, the emerged moths in the following spring is considered parameter or predicting the population density of the pest.

Table 3. Average number of pink bollworm/100 green cotton bolls in September of 1999 & 2000 and average number of moths in trap/night emerged from diapaused larvae in spring of 2000 & 2001 (Rashied/Behira Governorate)

| Av. no. of pink bollworm/100 green boll | | | Av. no. of moths/trap | | |
|-----------------------------------------|---------|------|-----------------------|---------|------|
| Inspection date | Av. no. | | Inspection date | Av. no. | |
| | 1999 | 2000 | | 1999 | 2000 |
| 4-9th Sep. | 0.85 | 0.67 | 21-27th Mar. | 0.2 | 0.37 |
| 10-15th Sep. | 0.76 | 0.79 | 28th Mar-3rd Apr. | 0.27 | 0.44 |
| 16-21th Sep. | 1.3 | 0.63 | 4-10th Apr. | 0.29 | 0.76 |
| 22-27th Sep. | 1.09 | 0.75 | 11-17th Apr. | 0.42 | 1.02 |

- Correlation and regression coefficient between pink bollworm in green cotton bolls in last month of (1999) and (2000) seasons and moths emerged from diapausing larvae in spring of the following season were (+0.447, +0.168) and (+0.0008, +0.0004), respectively.

REFERENCES

1. Abul-Nasr, S.E., E.D. Ammar and S.M. Farrag. 1979. Rates of infestation by *Pectinophora gossypiella* (Saund.) and *Earias insulana* (Boisd.) on flowering sites of cotton plant. Deutsche Entomologische Zeitschrift, 26 : 165-172.
2. Abdel-Rahim, W.A., S.M.I. Metwally and F. El-Dakroury. 1980. Effect of certain physical and chemical characters of cotton varieties on susceptibility to infestation by pink and spiny bollworms. Rijksuniversiteit Gent. International Symposium on Crop Protection, : 727-731.
3. Abd-El-Hamid, Z.H., S.M. El-Fateh Radwan, G.B. El-Saadany and M.A. Romeilah. 1999. Approximate number of annual field generations of pink bollworm, *Pectinophora gossypiella* (Saund.). Egypt. J. Agric. Res., 77 (2) : 575-589.
4. Chu, C.C. and T.J. Henneberry. 1990. Pink bollworm seasonal distribution, yearly variation, and male moth trap catch relationships to population increases in cotton. Southwest Entomol., 15 (3) : 273-280.
5. El-Deeb, M.A., M.M. El-Zohairy, Kamilia A. Abd El-Salam and E.A. Sherief. 1995. Population dynamics and testis development of male pink bollworm moths captured in sex pheromone traps sited in cotton fields at Sharkia Governorate. Zagazig J. Agric. Res., 22 (2) : 533-544.
6. Hossain, A.M. 1990. Ecological studies on bollworms in relation to the cropping system and host plants in Fayoum region. Ph.D. Thesis., Fac. of Agric., Ain Shams Univ., Egypt.
7. Kostandy, S.N. 1991. Effect of deflowering on cotton boll infestation with the pink bollworm, *Pectinophora gossypiella* (Saunders). Bull. Ent. Soc. Egypt, 70 : 45-49.
8. Kostandy, S.N. 1994. Capture of pink bollworm male moths in pheromone traps and the relative incidence of larvae in cotton bolls. Bull. Ent. Soc. Egypt, 72 : 173-178.
9. Romiela, M.A.H. 1991. The development of bollworm infestation in the cotton crop and its relationship to damage and yield. M.Sc. Thesis, Fac. of Agric., Ain Shams Univ., Egypt.

10. Sharma, J.P. 1988. Evaluation of some synthetic pyrethroids and carbaryl for the control of bollworms and their effect on yield parameters of cotton. *Entom.*, 13 (3) : 215-221.
11. Siddiqui, Iqbal. 1989. Trapping of pink bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera : Gelechiidae) with its synthetic sex pheromone. *India J. Entomol.*, 50 (2) : 238-248.
12. Taman, F.A. 1990. Pheromone trapping of cotton insects in relation to some climatic factors. *Alex. Sci. Exch.*, 11 (3) : 37-53.

تواجد دودة اللوز القرنفلية فى مراحل النمو المختلفة لنبات القطن فى مصر

نجوى محمود حسين سمير نصيف قسطندى

معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الدقى، الجيزة، مصر

وضعت مصائد الجاذبات الجنسية فى محافظة البحيرة خلال موسمى ١٩٩٩، ٢٠٠٠ لتقدير تعداد دودة اللوز القرنفلية فى مراحل مختلفة من نمو نبات القطن. أستخدم تعداد الفراشات الخارجة فى الربيع (من اليرقات الساكنة) كمرشد للتنبؤ بحجم الفراشات التى تتواجد فى أول الموسم خلال فترة تزهير القطن. أوضحت النتائج إرتباط عدد الفراشات القرنفلية فى مصائد الفرمون خلال فترة تزهير القطن معنوباً مع عدد الفراشات خلال فترة تكون اللوز الأخضر مما يستدعى مكافحة الحشرة وقت تزهير القطن. كذلك وجد إرتباط سالب بين عدد أفراد دودة اللوز القرنفلية ودودة اللوز الشوكية داخل لوز القطن. عندما ازدادت أعداد دودة اللوز القرنفلية إنخفضت أعداد دودة اللوز الشوكية.

وجد أيضاً ارتباط موجب بين أعداد دودة اللوز القرنفلية داخل عينات لوز القطن فى نهاية موسمى القطن ١٩٩٩، ٢٠٠٠ وعدد الفراشات الخارجة من السكون فى الربيع التالى. وهذا يعطى مؤشراً بأن زيادة الإصابة بدودة اللوز القرنفلية فى اللوز الأخضر فى نهاية الموسم يتبعه زيادة خروج الفراشات فى الربيع التالى.