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Monitoring Pink Bollworm Seasonal Population Through the Use of Gossyplure

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Abstract: Pink bollworm (*Pectinophora gossypiella*) is a major pest of cotton, remained active throughout the year with minimal population during June, when temperature crossed 40°C. For monitoring its population, delta traps baited with gossyplure (sex pheromone) were used. First smaller peak appeared in April and second peak the larger one in October. The moth population pattern was observed similar during the whole year for both the years of study i.e., 1995 and 1996.

The results revealed that gossyplure is an effective attractant for male moths of pink bollworm and can be used successively for monitoring seasonal emergence and population development in future period, as a tool in pest management programme. The use of sex pheromone such as gossyplure result in a substantial reduction in the number of pesticide application required for the control of bollworms during the cotton growing season.

Key words: Cotton, Pest population, Pink bollworm and gossyplure

Introduction

Pakistan is basically an agro-based country; therefore the importance of its agricultural development and achievement can hardly be over emphasized. Moreover Pakistan's agriculture economy is highly dependent upon the cotton crop, both as source of cash for the rural masses and as a foreign exchange earner and contributes 60 percent of export earnings to the national exchequer. Efforts, therefore, are needed to rise per hectare yield through the adoption of modern production technology. Cotton crop is liable to insect pest attack from seedling to picking stage. important pests in all cotton growing areas mostly include bollworms, which feed on the buds and bolls (Attique, 1992). The losses caused by the bollworms ranges from 30 to 40 percent (Ahmad, 1980). In adequate and untimely plant protection cover coupled with the indiscriminate spraying of insecticides has many times proved hazardous to the cotton crop, while an adequate timely and judicious plant protection measures will certainly boost up the production of the crop, which would eventually help in many ways such as an improvement of farmer's economy on one hand and national economy on the other by improving raw materials for running mills and banaspati ghee factories for public consumption. The potential production of the crop is reduced by 21 percent due to ravages of insect infestation (Ali *et al*., 1982), only bollworm attack loss estimates ranged between 6 to 38 percent (Bishara and Shakeel, 1982). Losses in yield of cotton due to insect when controlled and uncontrolled were calculated as 8 to 19% (Schwartz, 1985) pink bollworm was found major pest of cotton, which damages the fruiting parts and destroy the quality of seed cotton. Once the eggs have hatched and the larvae have entered into the bolls, it becomes difficult to control this pest through the use of conventional insecticides (Chamberlain *et al.,* 1994). It is imperative to have information on its incidence and seasonal population fluctuation to achieve an effective control of this pest. For this sex pheromone has gained importance. Sex pheromones combined with traps have been observed of great value in the detection and monitoring of insect population before an infestation is enlarged and sprayed. Gossyplure is commercially available formulation containing the synthetic female sex pheromone of *Pectinophora gossypiella* (Hummel *et al*., 1973) and is widely used to control the pink bollworm in the developed countries (Shorey *et al.,* 1974; Staten *et al*., 1987) and in developing countries such as Egypt (El-Adl *et al*., 1988) and Pakistan (Qureshi *et al.,* 1988; Critchley *et al*., 1991). Chamberlain *et al*. (1994) have advocated that pink bollworm which currently is controlled by regular spray of conventional pesticides, may contribute to the increasing problem of pesticide resistance in other cotton pests in the region. Thus season-long control of this insect through the application of their pheromone results in substantial reduction in the number of regular pesticide application. Keeping in view the gravity of pesticide hazards and need of alternative methods to reduce the dependence on insecticides without reducing the cotton yields, present studies were carried out to see the effectiveness of gossyplure as a sex pheromone, to monitor and control pink bollworm male moths population.

Materials and Methods

The studies were carried out at Central Cotton Research Institute, Sakrand farm and two and half hectare block was selected for these studies. Cotton variety CRIS-9 was sown during second week of May in both the year of study. For monitoring seasonal population fluctuation of pink bollworm male moths, delta type traps baited with gossyplure (a 1:1 mixture of Cis, Cis and Cis, trans isomers of 7.11 hexadecadienyl acetate) were used. The traps were suspended at the top of cotton canopy and adjusted at that level with crop growth and about 0.9 m above the ground level during the off season. The traps were rebaited after three weeks interval to maintain them at full catching efficiency. The sticky surface of the traps was renewed

periodically. The traps were replaced with new ones when they were either deshaped or soiled with moth scales. Moth catches recorded at weekly intervals through out the year and then captured moths were removed. Maximum, minimum temperature was also recorded to correlate with the moth catches.

Results and Discussion

The population of adult pink bollworm male moths captured by means of traps baited with gossyplure indicated that it varied with the months of the year (Table 1). It is evident from the results that with the exception of June, pink bollworm remained active through out the year during both the years. Minimal population in June could be attributed to the climatic conditions and temperature reached at 44.42 and 43.31°C (Table 2) in during 1995 and 1996 or may be due to emergence of moths from the dispensing larvae pink bollvvonn. Then slowly and gradually the population starts rebuild up and reaches its peak a larger one of moth catches 25.5 and 43.4 in the month of October of 1995 and 1996 respectively at the start of seedcotton picking.

Table 1: Average number of *Pectinophora gossypiella* moths traped during different months from January to December 1995 and 1996

Month	1995	1996
January	8.3	17.8
February	4.2	7.4
March	14.3	12.4
April	17.1	24.2
May	8.5	7.2
June	2.8	3.7
July	5.1	6.3
August	9.4	9.7
September	16.6	17.1
October	25.5	43.4
November	20.4	28.2
December	24.2	21.8

The data reveal that the population of male pink bollworm moths was minimum during the months of June and July in both the years under study. The moth emergence during March and April proved to be suicidal due to the non-availability of preferred host plant i.e., cotton crop in the field. Thus moth emergence from May onwards was drastically reduced and again started increasing during August till it reached its peak in October. The moth population started decreasing from November to the month of February. The population pattern was found almost similar during both the years. However, population recorded during 1996 was on higher side for all the 12 months of the year.

The results manifest that two peaks of moth population were recorded one in April 17.1 and 24.2 and second in October 25.5 and 43.4 during 1995 and 1996 respectively. More or less similar population fluctuation of male pink bollworm moths have been reported by other researchers (Rice and Reynolds, 1971; Kaae *et al*., 1977; Qureshi *et al*., 1984; Attique, 1992). However, the results presented, differ from that of Ahmad (1979) who recorded the maximum population in February-March and minimum population in April. He further reported a low population during May to December. This trend of moth population is contradictory to the present findings that could be due to climatic conditions under which the experiment has been conducted. The higher population from August onwards may be due to the presence of more fruiting bodies in the cotton field.

Kaae *et al*. (1977) reported that during the later part of the cotton-growing season (July to early September) more males were captured during July-September and large number of infested fruiting bodies were found during above months in the cotton field.

The results of the present studies show interesting pattern of male population of pink bollworm moth that may have important consequences in future attempts to control this pest. Since, gossyplure attracted considerable number of male moths of pink bollworm, therefore, it has wider scope in the control of this insect pest of cotton and can be successively used for monitoring the population. Thus the

Table 2: Average maximum and minimum temperature recorded during 1995 and 1996 at Central Cotton Research Institute, Sakrand

Month	1995		1996	
	Max. temp (°C)	Min. temp (°C)	Max. temp (°C)	Min. temp (°C)
January	22.97	9.02	23.48	8.74
February	26.55	11.12	27.85	9.23
March	30.24	13.66	33.17	16.40
April	37.14	19.73	40.42	20.04
May	43.80	24.55	43.37	24.96
June	44.42	22.95	43.31	27.98
July	37.48	17.42	40.27	27.46
August	37.82	15.40	37.98	28.45
September	31.30	12.94	37.72	24.19
October	31.23	9.68	36.02	18.87
November	32.12	5.20	30.57	11.79
December	25.02	10.82	25.01	8.26

use of this sex pheromone formulation to control the cotton pink bollworm will also provide an opportunity to reduce current level of pesticide application to control the cotton pest complex in cotton growing areas of Pakistan. If the use of gossyplure is integrated into the cotton pest management recommendations, this may form an important element of a future Insecticide Resistance Management (IRM) strategy. This may also result in considerable benefit in an area where pesticide resistance in cotton pests is an increasing threat to sustainable cotton production.

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