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CONTROL OF PINK BOLLWORM, *PECTINOPHORA GOSSYPIELLA* (SAUNDERS) BY MATING DISRUPTION TECHNIQUE*

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Three commercial formulations of gossyplure viz; NoMate PBW, PB-ROPE and pectone were evaluated for their efficacy in controlling the pink bollworm, *Pectinophora gossypiella* (Saunders) by mating disruption technique on a private farm. An area of 8.1 hectare of cotton was sub-divided into 4 blocks of 2 ha: for each treatment. The samples of flowers and green bolls were observed weekly from five plots (0.4 ha each) in each treated block. PB-ROPE treated plots showed the least infestation in flowers (0.90%) and green bolls (1.67%) followed by NoMate PBW (1.81%, 2.52%) and pectone (2.32%, 3.06%) treated plots respectively. The infestation differences between the three pheromone treatments however, were found to be statistically non-significant. The percent larval infestation in bolls was significantly lower in plots treated with PB-ROPE (1.67%) and NoMate PBW (2.52%) than conventional insecticide plots 4.52%). Similarly the moth population was also lower in pheromone treatments than in plots treated with insecticide.

Key words: Pink bollworm, Cotton, Mating disruption.

INTRODUCTION

Insecticides are generally applied for the control of insect pests but their use often create the problems of environmental pollution and development of resistance by insects. Van Steenwyk *et al.* [10] reported that season long application of insecticides in cotton fields resulted in destruction of beneficial insects which are useful for the control of secondary pests. It is therefore, imperative to consider alternate methods of insect pest control to reduce sole reliance on insecticides. Mating disruption by synthetic sex pheromones seems to have great potential in controlling pink bollworm without causing environmental pollution. Gaston *et al.* [5] observed that synthetic sex pheromone released from hollow thermoplastic fibers was equally effective in comparison with the insecticidal treatment for the control of pink bollworm. Similar results have also been reported by other workers [1-3, 6-8]. Many kinds of dispensers have been investigated which provide a slow release of gossyplure formulation. These commercial gossyplure dispensers required special equipment and adhesive material for application. A new PB-ROPE (polyethylene tubes) formulation containing relatively large amount of gossyplure have recently become available and need evaluation.

The present investigations were, therefore, carried out to determine the relative efficacy of three commercially available pheromone formulation in comparison with conventional insecticide for the control of pink bollworm.

MATERIALS AND METHODS

The studies to evaluate the relative efficacy of three commercial formulations of gossyplure in controlling pink bollworm viz; NoMate PBW (plastic hollow fibers), PB-ROPE (polyethylene tubes) and pectone (microencapsules), were conducted on a private farm near Tandojam. For this purpose NIAB-78, a high yielding short staple variety of cotton was sown on an area of 8.1 hectre which was subdivided into 4 blocks of 2 ha each. In one block PB-ROPE (20cm long) were tied by hand to the cotton plant by twisting them on twigs, when the height of plants were approximately 50cm (1st appearence of flowers). The PB-ROPE were applied once only for whole cotton season in a 2.5 x 2.5 m grid. Thus a total of 55g A. I per hectare of pheromone was applied.

The second block was treated with NoMate PBW. Four to five fibers were applied by mixing them in an adhesive (biotac 15) on top leaf of cotton plant in a 2.5 x 2.5 m grid. The NoMate PBW treatments were applied at 3 week intervals. A total of 4 applications were applied and 12 g A.I per hectare was used.

In the third block pectone was sprayed as a water based suspension by means of motorized knapsack sprayer. The spray was done on every 3rd. row at the rate of 494

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ml (9.9 g A.I.) per hectare. The pectone was applied at 2 week intervals in 5 applications.

The fourth block was sprayed with insecticide at 2 week intervals by the farmer according to his own choice. Apart from early season applications of advantage ED, the other insecticide used by the farmer was cymbush ED. Cymbush (10%) was applied at the rate of 618 ml per hectare and a total of 5 applications were made.

Solvirex 10G @ 12.3 kg/ha was applied with first irrigation in all the treatments to control the sucking pests. The pheromone treatments for pink bollworm were started from 3rd. week of July, the time of first appearance of flowers.

Incidence of pink bollworm attack was recorded on flowers and green bolls at weekly intervals starting from the last week of July to the 2nd week of October. For this purpose flowers of 10 m row length was observed at 4 different places in 0.4 ha. Thus flowers of 200 m of row length were observed weekly in each treatment. The green boll infestation was recorded from randomly picked 500 bolls of 2-3 weeks old from each treatments. The bolls were dissected to determine the pink bollworm infestation after 3-4 days. In the 3rd week of October loculi infestation was recorded from 200 randomly picked bolls from each treated block. The effectiveness of communication disruption was also measured by maintaining one delta trap baited with 1 mg gossyplure strip (Albany International, USA) in each treatment. The number of moths captured in delta traps were recorded twice a week and computed on weekly basis. The PBW infestation data was analyzed using an analysis of variance ($P \geqslant 0.01$) followed by a LSD test.

RESULTS AND DISCUSSION

The data (Table 1) showed that the percent infestation by pink bollworm in flowers was significantly lower in the PB-ROPE and NoMate PBW treated blocks as compared to insecticide treated block (3.56%). The flowers infestation percentage by pink bollworm was 0.90, 1.81 and 2.32 in blocks treated with PB-ROPE, NoMate PBW and pectone respectively but the differences in infestation were statistically non-significant. The pink bollworm infestation in green bolls were lowest in plots treated with PB-ROPE (1.67%) followed by NoMate PBW and pectone (non-significant differences). However, maximum boll infestation was observed in conventional insecticides treated block (4.52%). Similar trend of infestation was observed in loculi (range 3.44 to 9.44%).

The male moth population remained low up to the end of September in all pheromone treatments. The moth population increased abruptly in the 2nd. week of October and total of 21, 31 and 244 moths per trap per week were captured from PB-ROPE, NoMate PBW and Pectone treated blocks respectively. The moth population in the insecticide treated block remained high from the 2nd week of August to the end of the cotton season. The maximum number (422) of moths per trap per week was recorded in the 2nd week of October in insecticide treated block (Fig. 1). During the whole season an average of 3 moths per trap per week in PB-ROPE treated block were captured as compared to 12.21 and 30.86 moths per trap per week in NoMate PBW and pectone treated blocks respectively. In conventional insecticides treated block an average of 86.00 moths per trap per week were captured (Table 2). The calculated percent reduction of male moths compared to insecticide was 96, 85 and 64 in treated blocks of PB-ROPE, NoMate PBW and pectone, respectively. This may be attributed to mating disruption of pink bollworm which caused the suppression of moth population in the field and subsequently resulted in lower larval infestations in flowers, green bolls and loculi.

From the results it follows that PB-ROPE and NoMate PBW disrupted communication effectively. PB-ROPE and NoMate PBW significantly reduced the larval infestation

Table 1. Percent infestation of pink bollworm in cotton crop treated with different formulations of gossyplure.

Treatments	Percent infestation in		
	Flowers	Green bolls	Loculi
PB-ROPE	0.90 a	1.67 a	3.44 a
NoMate PBW	1.81 a	2.52 a	6.46 ab
Pectone	2.32 ab	3.06 ab	7.67 ab
Insecticides	3.56 b	4.52 b	9.41 b

Means followed by the same letters are non-significant ($P \geqslant 0.01$).

Analysis of variance table

Source of variance	DF	MS with significance		
		Flowers	Green bolls	Loculi
Replications	4	2.494183	0.589455	14.1975
Treatments(T)	3	6.157365**	7.177313**	31.9110*
Error	12	0.739053	0.712488	5.4286
LSD (0.05)		–	–	–
LSD (0.01)		1.66	1.63	4.49

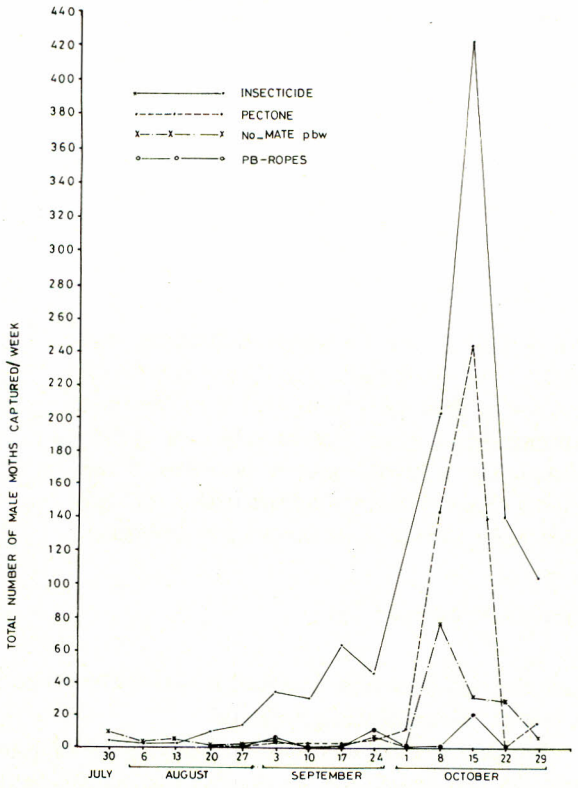

Fig. 1. Monitoring pink bollworm population in block treated with different pheromone formulations and insecticide.

Table 2. Mean number of pink bollworm male moths captured in different treatments during the cotton season.

Treatments	Total moths captured in a treatment	Mean no. of moths captured per trap per week	Reduction percentage over insecticide
PB-ROPE	42	3.00	96.51
NoMate PBW	171	12.21	85.79
Pectone	432	30.85	64.78
Insecticides	1204	86.00	–

in flowers and green bolls compared to insecticides whereas Pectone was at par with insecticide. The present findings are in close conformity with Flint *et al.* [4] and Staten *et al.* [9]. They also observed significant reduction in boll infestation and male moth catches of pink bollworm in PB-ROPE treated field as compared with conventional insecticides treatment.

The results indicated that pheromone formulations effectively controlled the pink bollworm population as compared to insecticides. Though the PB-ROPE and NoMate PBW formulations were equally effective in controlling the pink bollworm, yet the PB-ROPE are preferred over NoMate PBW formulation because they are applied only once and they provide season long protection to the crop. On the other hand, NoMate PBW needs to be applied 5 times during the season at 3 weeks interval to achieve the desired control of the pest.

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