



Research Article

MANAGEMENT OF PINK BOLLWORM WITH MATING DISRUPTION TECHNIQUE IN SMALLAR PLOTS OF COTTON

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ABSTRACT

Pink bollworm, *Pectinophora gossypiella* is the most damaging pest of cotton irrespective of Bt and non Bt. The damage of the Pink bollworm has increased in Pakistan since 2015 to till now. The main purpose to conduct this study was the evaluation of mating Disruptor's efficiency against Pink bollworm in smaller plots of cotton. This experiment was conducted at farmer's field at Bomb more Jalalpur pirwala district Multan on cotton season 2018. The PB-ropes were installed in 1st treatment at the rate of 150 ropes/acre while the PB-ropes were applied in the 2nd treatment at the rate of 200 ropes/acre and the third treatment was kept as control. The gossyplure baited traps were installed in the cotton at flowering stage in 1st week of August. The gossyplure baited traps were installed in the cotton field to monitor the activity of Pink bollworm moth catches in both treatments and control block. It was also observed that the mating disruption efficacy of PB-Ropes remained up to three months. The significant decrease of % damage in green bolls was observed in the plot treated with PB-Ropes @ 200 ropes/ acre ($4.73 \pm 0.57b$) following 150 ropes treated plot ($4.73 \pm 0.57 b$) as compared to control block ($31.04 \pm 2.42a$). The number of moth catches was reduced in the plot treated with PB-Ropes @ 200 ropes /acre ($3.40 \pm 0.34b$) following 150 ropes treated plot ($4.64 \pm 0.37b$) as compared to control block ($40.47 \pm 1.67a$). The results were further confirmed by % infestation in leftover bolls of the plot treated with PB-Ropes @ 200 ropes / acre

($14.00 \pm 0.57 b$) following plot treated with PB-Ropes @ 150 ropes / acre ($20.33 \pm 0.88 b$) as compared to control plot ($63.00 \pm 2.08 a$)

Keywords: Cotton, gossyplure, Pheromone, PB-Rope,

1. INTRODUCTION

Cotton *Gossypium hirsutum* L. (Malvaceae) is important economic and cash crop in all countries of the world. Pakistan ranked fourth position among cotton producing countries all over the world (Abro, 2004). The major cotton cultivation areas in Pakistan are Punjab and Sindh (Anwar et al., 2009). The use of insecticides including organophosphate, Carbamates, synthetic pyrethroids to control the pink bollworm has developed resistance in insect pests all over the world including Pakistan (Ahmad et al, 2006). It is difficult to control the population of Pink bollworm because the larvae of Pink bollworm just after hatching enter into the square and cotton bolls therefore, the proper time of insecticide application for the control of Pink bollworm could not be approached by the farmers (Jothi et al, 2016).

The sex pheromone for the pink bollworm which is called as gossyplure is a mixture of ZZ and ZE isomers of 7-11 Hexadecadienyl acetate (Hummel et al, 1973). The population of the *Pectinophora gossypiella* can be controlled on large scale by use of pheromones (Tamankhar et al 2001). The use of gossyplure baited pheromone traps reduced the Pink

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bollworm population in China (Gao et al, 1992).

The best technique for the management of Pink bollworm is use of mating disruption technique. The sex pheromone based mating disruption technique is the effective tool for the management of Pink bollworm which has no bad effect on the environment and population of natural enemies (Critchley et al., 1991). The infestation of Pink bollworm (*Pectinophora gossypiella*) has been recorded to cause heavy losses in cotton crop (Amin and Gergis, 2006). The status of Pink bollworm as the major insect pest was confirmed in recent past (Ghosh, 2001)

This study was conducted to evaluate the effectiveness of PB-ropes @ 150 and 200 ropes / acre on smaller plots of cotton. PB-ropes were applied at the flowering stage of cotton because there is no economic damage of Pink bollworm at the pin head square stage of cotton.

2. MATERIAL AND METHODS

1.1. Experimental details

The present study of PB-rope research was done at the private farmer field which was located at Bomb more Jalal pur road in cotton season 2018. Total area under experiment was 15 acres .The randomized complete block design (RCBD) was used in this research which was comprised with three treatments Each treatment contained three replications. The area under experiment was divided into 3 equal blocks. The treated blocks were named as T1 and T2. The area of each treatment was 5 acres. The PB-ropes were applied at the rate of 150 ropes / acre in 1st treatment block. The PB-ropes were applied @ 200 ropes/acre in 2nd treatment block. The 3rd block was kept untreated and named as control. Imidachloprid was used as seed treatment of cotton seed (70% WP) 5g/1kg of cotton seed. The sucking pest complex was controlled by the use of pesticides such as Ulala, Buprofezin and Legend. The installation of PB-ropes was done at the rate of 150 ropes per acre in the first treatment block of 5 acres in the 1st week of August while in the

2nd treatment block the application of PB-ropes was done at the rate of 200 PB-Ropes/ acre. The 3rd block which was consisted of 5 acres considered as control block.

1.2. PB-Ropes dispenser's installation

The pink bollworm sex pheromone baited ropes were twisted smoothly on the main stem of the cotton plant 2-3 leaves below the terminal portion of cotton plant. The concentration of the gossyplure was (1:1 ZZ and ZE isomers of Hexadecadienyl Acetate) The Ropes were twisted in the first treatment in which the 150 PB-ropes were applied on 1st plant in 1st row then was twisted on every 7th row after every 5 steps while the PB-Ropes were twisted in the second treatment in which 200 PB-ropes were applied on every 6th row and at every 4 steps. The boundary of cotton field was covered with PB-ropes to stop the penetration of pink bollworm in the respective field.

1.3. Data recording

1.3.1. Pheromone traps

The data of the pink bollworm moth catches was recorded by the sex pheromone baited traps four times in a week (Mohamed et al, 2016) till harvest from each replication. Pheromone traps were just installed for the monitoring of PB-ropes either working or not.

1.3.2. Pink boll worm % damage estimation

The damage %age of the pink bollworm was estimated by collecting the 100 bolls from each replication from all treatments till harvest. Bolls were collected in the polythene bags and then take these bags in the laboratory of the MNS University of agriculture multan and place these bolls in the plastic basket to prevent the damage of fungus. The bolls dissection was done after 4 days to check the larval population of pink bollworm in the bolls.

$\% \text{ Infestation} = (\text{Infested bolls} \times 100) / \text{Total bolls}$

1.3.3. Statistical Analysis

The effect of PB-ropes was observed by the comparison of pink bollworm moth population and % infestation in green bolls among the control and PB-rope treated

blocks. Data of pink bollworm % infestation was analyzed with analysis of variance (ANOVA) in RCBD and Tukey HSD test was used for pairwise comparison. Significant treatment means separated by the least significant difference at $P < 0.05$. Data of pink bollworm moth catches was analyzed with analysis of variance (ANOVA) in RCBD and Tukey HSD test was used for pairwise comparison. Significant treatment means

Treatments	Yield in Kg/acre
PB-rope @ 200	1200
PB-rope @ 150	1000
Control	680

separated by the least significant difference at $P < 0.05$.

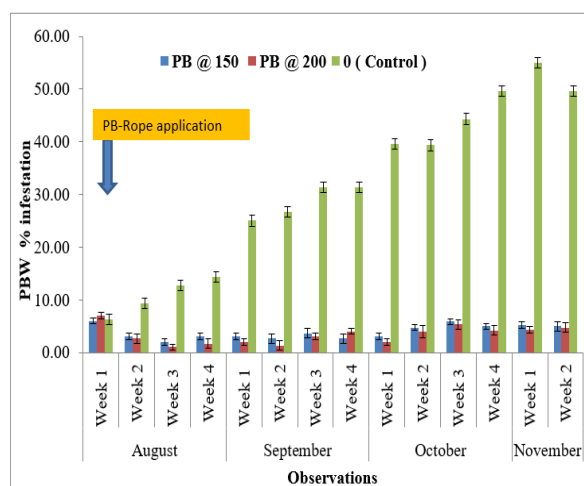
3. RESULT AND DISCUSSION

1.4. Pink bollworm % infestation in green bolls

Analysis of data showed that there was a significant difference in pink bollworm % infestation rate in green bolls between the PB-rope treated and control (untreated) blocks as ($P < 0.05$). Mean comparison (at 5% probability level) for *P.gossypiella* infestation showed that the maximum damage of pink bollworm as recorded (31.04 ± 2.42 %) in control block. Minimum damage of pink bollworm was recorded (4.73 ± 0.57 %) in PB-Ropes @ 200 treated block followed by (6.19 ± 0.75) in PB-Ropes @ 150 treated block.

1.5. Pink bollworm % infestation in leftover bolls

Analysis of data shows that there was a maximum difference between the Pink bollworm % infestation in leftover bolls in PB-

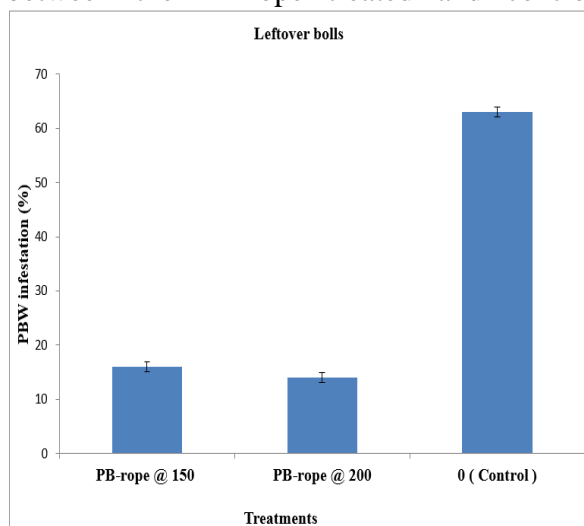


Pink bollworm % infestation in green bolls in different application rates of PB-ropes /acre verses control.

rope treated and control (untreated) blocks as ($P < 0.05$). Mean comparison (at 5% probability level) for pink bollworm % infestation revealed that the maximum damage of pink bollworm was recorded (63.00 ± 2.08 %) in control. Minimum pink bollworm % infestation was recorded (14.00 ± 0.57 %) in PB-Ropes @ 200 treated block followed by (20.33 ± 0.88) in PB-Ropes @ 150 treated block.

1.6. Pink bollworm moth catches in sex pheromone traps

Pink bollworm moth catches were recorded in gossypure baited sex pheromone traps as ($P < 0.05$). Analysis of data revealed that there was a significant difference in moth catches between the PB-rope treated and control

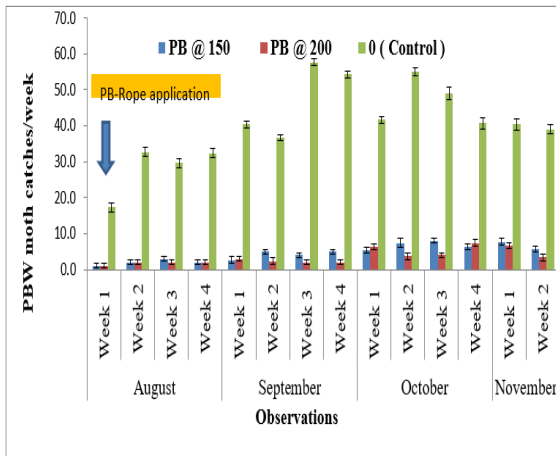


Pink bollworm % infestation in leftover bolls in different application rates of PB-ropes /acre verses control

(untreated) blocks. Mean comparison (at 5% probability level) of pink bollworm moth catches showed that maximum moth catches

(40.47 ± 1.67a) were recorded in control block. Minimum moth catches were observed (3.40 ± 0.34b) in PB-Ropes @ 200 treated block followed by (4.64 ± 0.37 b) in PB-Ropes @ 150 treated block.

The results of this research concluded that the % infestation in green bolls remained lower in the plot treated with PB-Ropes @ 200 ropes / acre following plot treated with PB-Ropes



Pink bollworm moth catches in sex pheromone traps in different application rates of PB-ropes /acre versus control.

@ 150 ropes / acre. Parmer obtained that the effective results against Pink bollworm by using the PB-Ropes at the rate of 150 ropes / acre. The main findings of this study concluded that the PB-rope dispensers were applied on smaller plots of cotton at the flowering stage. There was no significant difference by the application of PB-ropes on the larger and smaller plots of cotton.

1.7. Yield data

Yield data showed that minimum yield was observed in control block. Maximum yield was observed in PB-rope @ 200 followed by PB-rope @ 150 treated block. Bunchy fruiting was observed in PB-rope @ 200 and PB-rope @ 150 treated blocks.

4. CONCLUSION

This study is the complete package for small land holders to manage and control the population of Pink bollworm. The results of this study concluded that the use of PB-Rope @ 150 ropes / acre is the best strategy to control the Pink bollworm population and conserve the population of the natural enemies because there is no significant difference between the PB-rope 150 and PB-

rope 200 treated blocks. The pheromone keeps the population of Pink bollworm below ETL and favors the population of beneficial insects and suppress the population of whitefly. The importance of PB-ropes at the rate of 200 and 150 ropes / acre is clearly evident from the obtained results on the smaller plots of cotton. The sex pheromone based mating disruption technique is used as an important tool of the integrated pest management. This study was conducted at the flowering stage of cotton instead of pin head square stage because there is no economic damage at the pin head square stage. This study was carried out on small land holder farmer field BOMB MORE PIRWALA DISTRICT MULTAN.

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