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**KM Vora**M.Sc. Scholars, Department of  
Agricultural Entomology, COA,  
JAU, Junagadh, Gujarat, India**Dr. YH Ghelani**Associate Professor & Assistant  
Registrar, Office of the  
Registrar, JAU, Junagadh,  
Gujarat, India**BV Patoliya**Assistant Professor & Assistant  
Registrar (Academic), Office of  
the Registrar, JAU, Junagadh**Dr. MK Ghelani**Assistant Professor, Department  
of Agricultural Entomology,  
COA, JAU, Junagadh, Gujarat,  
India**NM Kachhadiya**Subject Matter Specialist,  
Plant Protection, Krishi Vigyan  
Kendra, JAU, Amreli, Gujarat,  
India**Corresponding Author:****KM Vora**M.Sc. Scholars, Department of  
Agricultural Entomology, COA,  
JAU, Junagadh, Gujarat, India

## Estimation of yield losses due to pink bollworm, *Pectinophora gossypiella* (Saunders) on Bt cotton

**KM Vora, Dr. YH Ghelani, BV Patoliya, Dr. MK Ghelani and NM Kachhadiya**

### Abstract

The present research on “Estimate the yield losses due to pink bollworm, *Pectinophora gossypiella* (Saunders) infesting *Bt* cotton” was carried out at Village: Daliya, Ta. Gondal, Dist. Rajkot during *Kharif*, 2020-21. The results of experiment were revealed that the seed cotton yield of 2304.27 kg/ha were recorded from protected plots, while the seed cotton yield of 1478.73 kg/ha were recorded from unprotected plots. However, By providing protection with effective pesticides against pink bollworm 825.54 kg/ha yield loss can be saved and 35.83 per cent avoidable yield loss was recorded in protected plots over unprotected plots during *kharif*, 2020-21.

**Keywords:** *Bt* cotton, insecticides, pink bollworm, yield loss

### Introduction

Cotton (*Gossypium sp.*) is one of the principal commercial fiber crop grown under diverse agro-climatic conditions around the world which belongs to the family Malvaceae. The word “Cotton” derived from the Arabic word “ALQATAN”. Cotton is one of the oldest fiber known to mankind. The plant is a shrub native to tropical and subtropical regions around the world, including the America, Africa, Egypt and India. *Gossypium sp.* Comprising about 40 species of which four are commercially cultivated for cotton lint and seed. Cotton crop cultivated in more than seventy countries in the world. Cotton crop is playing an important role in economic, political and social affairs of the world. Cotton crop as commercial commodity plays an important role in industrial activity of nation, in terms of both employment generation and foreign exchange. India is an important cotton grower on a global scale. It is also known as white gold and king of appraisal fiber which is important raw material for textile industry.

India, United States, China, Brazil, Pakistan are the leading cotton producing countries in the world (Anon., 2019) [3]. India commands highest share (36%) in terms of area under cotton cultivation in the world. India is the largest producer of cotton in the world accounting for about 25 per cent of the world cotton production. In India, cotton was cultivated under 133.73 lakh hectare area with production of 365 lakh bales (1 bale=170 kg) and productivity of 464 kg per hectare during 2019-20 (Anon., 2018a) [2].

The cotton crop is attacked by 1326 species of insect pests throughout the world, of which about 130 different species of insects and mites found to devour cotton at different stages of crop growth in India. Spotted bollworm (*Earias vitelli* Fabricius), American bollworm (*Helicoverpa armigera* Hubner), pink bollworm (*Pectinophora gossypiella* Saunders), leaf eating caterpillar (*Spodoptera litura* Fabricius), aphid (*Aphis gossypii* Glover), jassid (*Amrasca biguttula biguttula* Ishida), thrips (*Thrips tabaci* Lindeman), whitefly (*Bemisia tabaci* Gennadius), mite (*Tetranychus telarius* Linnaeus), mealy bug (*Phenacoccus solenopsis* Tinsley) and dusky cotton bug (*Oxycarenus laetus* Kirby) are the major insect pests attacking the cotton crop (Davidson and Lyon, 1978) [5].

Among major insect pests attacking the cotton, pink bollworm, *P. gossypiella* [Lepidoptera: Gelechiidae] is the one of the most destructive and serious pest of cotton cultivation and has known to cause losses in seed cotton yield, oil content, loss in normal opening of bolls, damage of locales, and reduction in seed cotton yield.

The management of pink bollworm on cotton has become a tough task because the larval stages of this pest were spent in the cotton bolls. Therefore, conventional control methods including insecticidal application are difficult to control this pest.

Hence, Estimate the yield losses due to pink bollworm, *P. gossypiella* for better understanding of the pest to formulate control strategies for effective management of pink bollworm.

**Materials and Methods**

An experiment was conducted to estimate yield losses due to pink bollworm in *Bt* cotton under field condition at Village: Daliya, Ta. Gondal, Dist. Rajkot during *Kharif*, 2020-21 with Large Plot Technique with 2 treatments and 15 repetitions. The crop was sown in a plot size of 18.0 m x 12.0 m at spacing of 90 cm x 60 cm. The crop was divided into two plots.

- **Untreated / unprotected (plot):** The crop was kept free from the insecticides and subjected to the natural occurrence of the pink bollworm in *Bt* cotton.
- **Treated / Protected (Plot):** The crop was protected against the pink bollworm through application of recommended insecticides *viz.*, spinosad 45 SC @ 3 ml/10 lit., chlorotraniiprole 18.5 SC @ 3.25 ml/10 lit and azadirachtin 10000 ppm @ 6 ml/10 lit of water was applied alternately at fifteen day interval.

**Method of recording observations**

Two strips each of 9.0 m x 9.0 m were prepared and were divided into 15 quadrates of size 1.8 m x 3.0 m. The observations were recorded from each quadrate and the data was subjected to statistical analysis. Seed cotton yield from protected and unprotected plots were recorded at harvest. The yield increased in protected plots over the unprotected (control) and avoidable loss were worked out from final yield of cotton using the formula mentioned below given by Pradhan (1969) [8].

$$\text{Yield increased (\%)} = 100 \times \frac{T - C}{C}$$

$$\text{Avoidable yield loss (\%)} = 100 \times \frac{T - C}{T}$$

Where,

T= Yield from treated (protected) plots (Kg/ha)

C= Yield from control (untreated) plots (Kg/ha)

**Results and Discussion**

An experiment was conducted to estimate yield losses due to pink bollworm in *Bt* cotton under field condition at Village: Daliya, Ta. Gondal, Dist. Rajkot during *Kharif*, 2020-21 with Large Plot Technique with 2 treatments and 15 repetitions. The plot was divided into two *i.e.*, unprotected and protected plots. In case of unprotected plot, the crop was kept free from insecticides and subjected to the natural occurrence of the pink bollworm on *Bt* cotton, while in protected plot the application of recommended insecticides were applied against pink bollworm population.

The data on yield losses in *Bt* cotton due to pink bollworm are presented in (Table 1) revealed significant difference in seed cotton yield of *Bt* cotton between protected and unprotected plots. The seed cotton yield of 2304.27 kg/ha were recorded from protected plots, while the seed cotton yield of 1478.73 kg/ha were recorded from unprotected plots. The yield increased in protected plots over unprotected plots was 825.54 kg/ha. In case of yield increased over unprotected plots was 55.83 per cent in protected plots over unprotected plots. However, 35.83 per cent avoidable yield loss was recorded in protected plots over unprotected plots during *kharif* 2020-21. Kaushik *et al.* (1987) [6] revealed that the avoidable yield losses in cotton yield due to bollworm complex was 33 per cent in Madhya Pradesh.

**Table 1:** Yield losses in *Bt* cotton crop due to pink bollworm, *P. Gossypiella* during *Kharif*, 2020-21

Treatment	Seed cotton yield (Kg/ha)	Yield loss (Kg/ha)	Avoidable yield loss (%)	Yield increased over control (%)
Untreated (unprotected)	1478.73	825.54	-	-
Treated (Protected)	2304.27	-	35.83	55.83
S.E.M. ±	62.30	-	-	-
C.D at 5%	180.44	-	-	-
C.V %	12.76	-	-	-

Patil (1987) [7] reported that bollworm complex alone caused 24.64 per cent losses. Bollworm complex caused 21.43 per cent avoidable yield loss (Banerjee, 2002) [4]. Amin and Gergis (2006) [1] reported that *P. Gossypiella* is responsible for 20-40 per cent loss in cotton seed yield worldwide. Hence, the present observations are more or less in confirmation with the results of the earlier workers.

**Conclusion**

From the overall results of the present investigation, it can be concluded that the seed cotton yield of 2304.27 kg/ha were recorded from protected plots, while the seed cotton yield of 1478.73 kg/ha were recorded from unprotected plots. However, 35.83 per cent avoidable yield loss was recorded in protected plots over unprotected plots during *kharif*, 2020-21.

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