

Original Research Article

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Estimation of Yield Losses Due to Major Sucking Insect Pests of *Bt* Cotton

D. K. Makwana, K.A. Chudasama and T.K. Balas *

Department of Entomology, College of Agriculture, Junagadh Agricultural University,
Junagadh-362 001, Gujarat, India

*Corresponding author

ABSTRACT

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Present investigation on estimation of yield losses due to major sucking pests of the *Bt* cotton was carried out on the College Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* season of the year 2011-12. The *Bt* hybrid cotton cultivar KDCHH-441 was grown with the plot size of 24 m X 20 m at spacing of 120 cm x 45 cm. The data revealed that significantly higher seed cotton yield 2038.82 kg/ha was recorded from protected plots, while the yield of 1312.70 kg/ha was recorded from unprotected plots. The yield increased in protected plots over unprotected plots was 726.12 kg/ha. This showed 55.31 per cent increase in yield and 35.61 per cent avoidable loss. The result clearly indicated that by providing protection with effective pesticides against cotton sucking pests, 726.12 kg/ha yield loss can be saved. Total avoidable yield loss could be worked out as 35.61 per cent.

Introduction

Cotton crop is known as “White gold” and is a premier commercial crop in India, which occupies only 5 per cent of the arable land and supports 60 million people having direct bearing on the country’s economy. India is a unique among the cotton growing countries of the world in which four species of cotton viz., *Gossypium hirsutum*, *G. barbadense*, *G. arboreum* and *G. herbaceum* are grown commercially under diversified ecosystem. In India, it is cultivated in 110.00 million hectares with 325.00 lakh bale production and an average productivity was 503 kg/ha during 2010-11 (Anon., 2011). India accounts for approximately 23 per cent of the world cotton area but the average productivity of cotton is

markedly low at about 521 kg/ha as compared to world average of 765 kg/ha. The major cotton growing states in India are Maharashtra, Gujarat, Andhra Pradesh, Madhya Pradesh, Punjab, Haryana, Karnataka, Rajasthan, Tamil Nadu and Orissa.

Gujarat stands the second in respect of area 26.20 million ha and the first in respect of production 106.82 lakh bale with the productivity of 693 kg/ha during 2010-11 (Anon., 2011). The average productivity of cotton in India is lower than Brazil, China, USA and Pakistan in the world. In addition to cultivation on marginal lands and the complexities of pest management are also important. Among the different constraints

that limit the production and productivity of cotton crop in India, the insect pests are considered to be the most serious. In India, 160 species of insect pests have been reported to attack the cotton crop right from time of germination till the final harvesting of cotton (Agarwal, 1978). The total loss due to cotton pests (jassid and bollworm complex) in north, central and south zone was estimated as 52.80, 46.53 and 47.56 per cent, respectively (Basu *et al.*, 1990). Among the various insect pests listed above, aphid, whitefly, thrips, cotton leaf hopper or jassid and mealy bugs are the major sucking pests of cotton and limiting the profitable cultivation. Due to introduction and adoption of *Bt* hybrid cotton, the yield losses caused by bollworms become minimized. According to Butani and Jotwani (1984), *A. gossypii* is a polyphagous pest and cotton, tomato, brinjal, beans, potato and okra are its main hosts. Both nymphs and adults suck the cell sap and secrete honey dew, which not only attract the black ants but also favours the growth of sooty mould giving the plants a sticky and blackish appearance.

Whitefly is also a polyphagous pest found in most of the countries in tropics and sub tropics. Its main hosts are cotton, tobacco and some winter vegetables including brinjal and tomato. The infestation on these crops is sporadically severe. This pest also sucks the cell sap from the various plant parts and secretes honey dew (Butani and Jotwani, 1984). Dhawan *et al.*, (1988) reported that *A. biguttula biguttula* is one of the most serious sucking pests of cotton in India causing reduction in yield to an extent of 20 per cent. The information on yield losses due to major sucking pests of the *Bt* cotton particularly under Junagadh condition is very scanty hence in view of the importance of sucking pests, it is necessary to have comprehensive information on these aspects. The present investigation was, therefore, carried out on the following aspect.

Materials and Methods

With a view to estimate the losses caused by major sucking pest in the *Bt* cotton, an experiment was carried out at College Farm, JAU, Junagadh during *Kharif*- 2011-12. The *Bt* hybrid cotton cultivar KDCHH-441 was grown with the plot size of 24 m X 20 m at spacing of 120 cm x 45 cm. All the recommended agronomical practices were followed to raise the crop.

For this purpose, two strip each of 12m x 20m was prepared and from each strip fifteen quadrates of size 2.5m x 1.5m was selected randomly for the observations. From two plots one plot is unprotected which was kept free from insecticides and subjected to the natural occurrence of the sucking pests of cotton and another protected plot was protected against the major sucking insect pests damage through application of recommended insecticides *viz.*, imidacloprid @ 0.01% and quinalphos @ 0.05 % alternately at ten day interval.

Observations to be recorded

The observations on yield of treated plot kg/quadrate and yield of untreated plot kg/quadrate were recorded from each quadrate and the data was subjected to statistical analysis using CRD design.

Yield and economics

The grain yield obtained from each quadrate was converted on hectare basis and subjected to statistical analysis. The per cent increase in yield over control was calculated by using following formula:

$$\text{Yield increase over control} = \frac{T - C}{C} \times 100$$

Where,

T = Yield of protected plot (kg/ha)
 C = Yield of unprotected plot (kg/ha)

The percentage avoidable loss in yield due to sucking pests was calculated as per the formula given by (Khosla, 1977).

$$\text{Percentage avoidable loss} = \frac{T - C}{T} \times 100$$

Where,

T = Yield in the protected plot (kg/ha)
 C = Yield in the unprotected plot (kg/ha)

Results and Discussion

The data on yield losses in *Bt* cotton due to sucking pests are presented in Table 1 revealed that 26.21 per cent damage was

recorded in unprotected crop (untreated plots). While in protected crop (treated plots) only 7.29 per cent damage was recorded due to the sucking pests.

The data presented in Table 1 further revealed that significantly higher cotton yield 2038.82 kg/ha was recorded from protected plots, while the yield of 1312.70 kg/ha was recorded from unprotected plots. The yield increased in protected plots over unprotected plots was 726.12 kg/ha. This showed 55.31 per cent yield increased over control and 35.61 per cent avoidable loss.

The result clearly indicated that by providing protection with effective pesticides against cotton sucking pests, 726.12 kg/ha yield loss can be saved. Total avoidable yield loss could be worked out as 35.61 per cent.

Table.1 Yield losses in *Bt* cotton crop due to sucking pests during *Kharif* 2011-12

Treatment	Damage (%)	Cotton Yield Kg/ha	Yield Loss Kg/ha	Avoidable Yield loss (%)	Yield increased Over Control (%)
Untreated (unprotected)	32.37 (26.21)	1312.70	726.12	–	–
Treated (Protected)	9.68 (7.29)	2038.82	–	35.61	55.31
S.E _m ±	1.67	45.57			
C.D	4.91	131.99			
C.V %	10.71	11.57			

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