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# Screening of Different Bt and Non Bt Cotton Hybrids against Aphids *Aphis gossypii*, and Whiteflies *Bemisia tabaci* on Bt Cotton

**J.B. Naveena* and Sharanabasappa**

*Department of Entomology, College of Agriculture, Shivamogga, India*

**Corresponding author*

## ABSTRACT

**Keywords**

Bt cotton, Aphids, Whiteflies, DCH-32

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The field experiment was carried out at Agricultural and Horticultural Research Station, Honnavile farm Shivamogga during *Kharif* 2016-17. Totally 15 *Bt* cotton hybrids and their counter non *Bt* cotton hybrids were screened against sucking pests of cotton like aphids and whiteflies under unprotected conditions. Lowest population of aphids were recorded in DCH-32 (13.04 aphids/ 3 leaves) followed by Ankur HB-2110 non *Bt*, MRC-7351 non *Bt*, SP904BG-II chamundi BG-II and chamundi BG-II non *Bt*, Minerva BG-I non *Bt*, MRC-7351, Minerva BG-I MRC-7918 non *Bt* and Ankur HB-2110 the highest population of aphids were recorded in double *Bt* (19.08 aphids/ 3 leaves) and MRC-7918 (18.54 aphids/ 3 leaves). However lowest population of whiteflies were recorded in DCH-32 (0.96 whiteflies/ 3 leaves) while the highest population of whiteflies were recorded in double *Bt* non *Bt* (4.54 whiteflies/ 3 leaves).

## Introduction

Cotton is the most important cash crop of monsoon season in India and popularly known as "white gold". India has a unique distinction of being the only country in the world to cultivate all four cultivable *Gossypium* species. *Gossypium hirsutum* represents 99.9 per cent of the hybrid cotton in India and all the current Bt cotton hybrids are either *G. hirsutum* or inter-specific hybrids with *G. barbadense*. In India, cotton is grown under 40 per cent irrigated and 60 per cent rainfed. American cotton is highly susceptible to sucking insect pests and of which jassid, *A. biguttula biguttula* also referred, as leafhopper is important sucking pest. Although introduction of *Bt* cotton could reduce the bollworm incidence, number of other pests *viz.*, leafhopper, mirid bugs, aphids and thrips are assuming potential threats (Kranthi *et al.*, 2011). At present many sucking pests of cotton have assumed potential threats and causing significant economic yield losses in cotton. The reduction of pyrethroid and other conventional insecticides on *Bt* cotton is presumed to have enhanced infestation of sucking pests (Kranthi *et al.*, 2009). Keeping in this point view the present investigation is conducted to study the reaction of Bt cotton hybrids against aphids and whiteflies of cotton.

## Materials and Methods

The field experiment was carried out at Agricultural and Horticultural Research Station (AHRS), Honnavile farm Shivamogga during *Kharif* 2016-17 for screening of *Bt* cotton hybrids for their reaction to sucking pest. Totally 15 *Bt* cotton hybrids and their counter non *Bt* cotton hybrids were screened against sucking pests under unprotected conditions. The hybrids were sown in two rows of 15 m length with a spacing of 90 cm x 60 cm with two replications. The crop was raised following all the recommended agronomic practice except the plant protection measures. Observations on sucking pests *viz.*, aphids and whiteflies were recorded at monthly intervals starting from 15 days after the sowing continued throughout the crop growth on ten randomly selected plants avoiding the border rows. Sucking pests were recorded on three leaves per plant by selecting top, middle and bottom leaves. The data collected on the population of sucking pests were subjected to ANOVA test by following with x + 0.5 transformations.

## Results and Discussion

The results on incidence of aphids on different *Bt* cotton hybrids were furnished in the Table 1. The mean population of aphids across the different *Bt* and non *Bt* cotton hybrids during the cropping period was ranged between 13.04 to 19.08 aphids per three leaves, which revealed that lowest population of whiteflies were recorded in DCH-32 (13.04 aphids/ 3 leaves) followed by Ankur HB-2110 non *Bt* (14.27 aphids/ 3 leaves), MRC-7351 non *Bt* (14.42 aphids/ 3 leaves), SP904BG-II (14.48 aphids/ 3 leaves) chamundi BG-II (15.01 aphids/ 3 leaves) and chamundi BG-II non *Bt* (15.52 aphids/ 3 leaves), where all these *Bt* cotton hybrids were statistically on par with each other.

On other hand the next best *Bt* cotton hybrids in the order of superiority were Minerva BG-I non *Bt* (16.35 aphids/ 3 leaves) followed by MRC-7351 (16.94 aphids/ 3 leaves), Minerva BG-I (17.00 aphids/ 3 leaves) MRC-7918 non *Bt* (17.14 aphids/ 3 leaves) and Ankur HB-2110(17.18 aphids/ 3 leaves), where all this hybrids were statistically on par with each other, the highest population of aphids were recorded in double *Bt* (19.08 aphids/ 3 leaves) followed by double *Bt* non *Bt* (18.74 aphids/ 3 leaves) and MRC-7918 (18.54 aphids/ 3 leaves) respectively and were statistically on par with each other. However the results on incidence of whiteflies on different *Bt* cotton hybrids were furnished in the Table 1. revealed that lowest population of whiteflies were recorded in DCH-32 (0.96 whiteflies/ 3 leaves) and Ankur HB-2110 non *Bt* (0.96 whiteflies/ 3 leaves) followed by Chamundi BG-II non *Bt* Minerva BG-I (1.00 whiteflies/ 3 leaves), Ankur HB-2110 (1.11 whiteflies/ 3 leaves) MRC-7351 (1.15 whiteflies/ 3 leaves), MRC-7351 non *Bt* (1.23 whiteflies/ 3 leaves), double *Bt* (1.43 whiteflies/ 3 leaves) and MRC-7918 (1.85 whiteflies/ 3 leaves), where all these hybrids were on par with each other. However the highest population of whiteflies was recorded on Chamundi BG-II (2.57whiteflies/ 3 leaves) followed by Minerva BG-II non *Bt* (3.28 whiteflies /3 leaves) and double *Bt* non *Bt* (4.54 whiteflies/ 3 leaves) and were statistically on par with each other.

The results on incidence of aphids on different *Bt* cotton hybrids were furnished in the Table 1. which revealed that lowest population of whiteflies were recorded in DCH-32 (13.04 aphids/ 3 leaves) followed by Ankur HB-2110 non *Bt*, MRC-7351 non *Bt*, SP904BG-II chamundi BG-II and chamundi BG-II non *Bt*, where all these *Bt* cotton hybrids were statistically on par with each other.

**Table.1** . Screening of different Bt and non Bt cotton hybrids against aphids, *Aphis gossypii* and whiteflies, *Bemisia tabaci*

| Treatment detail | | No. of *Bemisia tabaci* / 3 leaves | | | | Mean | No. of *Aphis gossypii* / 3 leaves | | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **September** | **October** | **November** | **December** | | **August** | **September** | **October** | **November** | **December** | |
| **$T_1$** | **MRC-7918** | 3.00 (1.87)$^{def}$ | 3.00 (1.87)$^{bcde}$ | 1.01 (1.21)$^{ab}$ | 0.37 (0.93)$^{b}$ | 1.85 (1.48)$^{ab}$ | 10.30 (3.28)$^{ab}$ | 7.90 (2.88)$^{abcde}$ | 16.00 (4.04)$^{de}$ | 27.1 (5.23)$^{a}$ | 29.00 (5.42)$^{a}$ | 18.54 (4.26)$^{a}$ |
| **$T_2$** | **MRC-7918, non Bt** | 5.15 (2.36)$^{cd}$ | 0.15 (0.80)$^{bc}$ | 0.35 (0.92)$^{de}$ | 0.82 (1.1)$^{ab}$ | 1.62 (1.31)$^{abc}$ | 5.80 (2.51)$^{bcde}$ | 5.55 (2.46)$^{de}$ | 21.05 (4.64)$^{a}$ | 25.65 (5.02)$^{ab}$ | 27.40 (5.27)$^{ab}$ | 17.14 (4.01)$^{ab}$ |
| **$T_3$** | **MRC-7351** | 1.75 (1.5)$^{f}$ | 2.35 (1.67)$^{de}$ | 0.25 (0.86)$^{de}$ | 0.24 (0.86)$^{b}$ | 1.15 (1.23)$^{b}$ | 8.64 (3.02)$^{abcd}$ | 12.5 (3.59)$^{ab}$ | 17.00 (4.17)$^{cde}$ | 24.00 (4.93)$^{a}$ | 26.4 (5.16)$^{ab}$ | 16.94 (4.07)$^{bc}$ |
| **$T_4$** | **MRC-7351,non B t** | 1.90 (1.54)$^{f}$ | 2.15 (1.62)$^{e}$ | 0.28 (0.88)$^{de}$ | 0.58 (1.01)$^{bc}$ | 1.23 (1.27)$^{bc}$ | 4.90 (2.32)$^{de}$ | 4.00 (2.11)$^{e}$ | 20.60 (4.58)$^{a}$ | 17.80 (4.26)$^{bcd}$ | 23.90 (4.87)$^{bcd}$ | 14.42 (3.69)$^{bc}$ |
| **$T_5$** | **Ankur-HB 2110** | 2.00 (1.56)$^{f}$ | 2.00 (1.56)$^{e}$ | 0.28 (0.88)$^{de}$ | 0.15 (0.8)$^{c}$ | 1.11 (1.21)$^{bc}$ | 10.05 (3.23)$^{abc}$ | 10.75 (3.33)$^{abcd}$ | 16.25 (4.08)$^{cd}$ | 21.70 (4.71)$^{cde}$ | 27.85 (5.3)$^{ab}$ | 17.18 (4.12)$^{a}$ |
| **$T_6$** | **Ankur-HB 2110,non Bt** | 1.70 (1.48)$^{f}$ | 1.70 (1.48)$^{e}$ | 0.38 (0.94)$^{de}$ | 0.07 (0.75)$^{ef}$ | 0.96 (1.16)$^{bc}$ | 5.00 (2.33)$^{de}$ | 5.75 (2.44)$^{cde}$ | 13.10 (3.68)$^{bcd}$ | 22.50 (4.79)$^{de}$ | 25.85 (5.12)$^{abc}$ | 14.29 (3.66)$^{cd}$ |
| **$T_7$** | **Minerva BG-1** | 1.65 (1.46)$^{f}$ | 1.65 (1.46)$^{e}$ | 0.47 (0.98)$^{bc}$ | 0.29 (0.88)$^{cd}$ | 1.00 (1.19)$^{fg}$ | 9.65 (3.16)$^{abcd}$ | 11.30 (3.4)$^{abc}$ | 18.15 (4.32)$^{a}$ | 16.75 (4.15)$^{def}$ | 30.80 (5.59)$^{a}$ | 17.00 (4.09)$^{a}$ |
| **$T_8$** | **Minerva BG-1,non Bt** | 7.55 (2.83)$^{ab}$ | 5.25 (2.37)$^{bc}$ | 0.33 (0.9)$^{de}$ | 0.00 (0.71)$^{ef}$ | 3.28 (1.71)$^{bcde}$ | 8.75 (3.04)$^{abcd}$ | 8.15 (2.94)$^{abcde}$ | 19.95 (4.51)$^{a}$ | 19.20 (4.42)$^{bc}$ | 25.10 (4.96)$^{a}$ | 16.35 (4.02)$^{abc}$ |
| **$T_9$** | **Double Bt** | 2.50 (1.72)$^{ef}$ | 2.50 (1.72)$^{de}$ | 0.41 (0.95)$^{de}$ | 0.29 (0.88)$^{d}$ | 1.43 (1.33)$^{ef}$ | 12.30 (3.56)$^{a}$ | 13.35 (3.69)$^{a}$ | 15.75 (4.02)$^{de}$ | 25.25 (5.03)$^{a}$ | 29.80 (5.45)$^{a}$ | 19.08 (4.35)$^{a}$ |
| **$T_{10}$** | **Double Bt,nonBt** | 8.80 (3.05)$^{a}$ | 8.80 (3.05)$^{a}$ | 0.26 (0.87)$^{ef}$ | 0.00 (0.71)$^{ef}$ | 4.54 (1.96)$^{cde}$ | 8.75 (3.04)$^{abcd}$ | 8.15 (2.94)$^{abcde}$ | 22.00 (4.74)$^{a}$ | 28.50 (5.38)$^{a}$ | 25.70 (5.08)$^{ab}$ | 18.74 (4.27)$^{a}$ |
| **$T_{11}$** | **SP 904BG-II** | 5.40 (2.41)$^{bc}$ | 5.40 (2.41)$^{bc}$ | 1.12 (1.24)$^{a}$ | 0.24 (0.86)$^{bc}$ | 3.05 (1.75)$^{cde}$ | 6.55 (2.65)$^{bcde}$ | 5.95 (2.54)$^{cde}$ | 17.25 (4.21)$^{cde}$ | 14.85 (3.91)$^{def}$ | 27.20 (5.24)$^{ab}$ | 14.48 (3.74)$^{cd}$ |
| **$T_{12}$** | **SP 904BG-II, non Bt** | 3.25 (1.94)$^{cdef}$ | 3.25 (1.94)$^{bcde}$ | 0.20 (0.83)$^{ef}$ | 0.00 (0.71)$^{ef}$ | 2.50 (1.66)$^{ef}$ | 5.50 (2.4)$^{cde}$ | 5.15 (2.38)$^{de}$ | 18.25 (4.32)$^{a}$ | 20.50 (4.56)$^{abc}$ | 23.00 (4.76)$^{abc}$ | 14.55 (3.73)$^{cd}$ |
| **$T_{13}$** | **Chamundi BG-II** | 4.75 (2.28)$^{cde}$ | 4.85 (2.3)$^{bcd}$ | 0.51 (1.00)$^{bcd}$ | 0.15 (0.81)$^{cf}$ | 2.57 (1.6)$^{de}$ | 3.35 (1.94)$^{e}$ | 7.00 (2.72)$^{bcde}$ | 16.25 (4.07)$^{cde}$ | 24.35 (4.95)$^{a}$ | 27.75 (5.3)$^{a}$ | 15.01 (3.66)$^{cd}$ |
| **$T_{14}$** | **Chamundi BG-II,nonBt** | 2.65 (1.77)$^{cdef}$ | 2.65 (1.77)$^{cde}$ | 0.20 (0.83)$^{de}$ | 0.00 (0.71)$^{e}$ | 1.38 (1.27)$^{fg}$ | 5.50 (2.42)$^{cde}$ | 3.70 (2.01)$^{e}$ | 19.75 (4.5)$^{a}$ | 23.35 (4.88)$^{ab}$ | 23.5 (4.79)$^{ab}$ | 15.52 (3.84)$^{bc}$ |
| **$T_{15}$** | **DCH-32** | 1.70 (1.48)$^{ef}$ | 1.70 (1.48)$^{e}$ | 0.45 (0.97)$^{bcd}$ | 0.00 (0.71)$^{ef}$ | 0.96 (1.16)$^{g}$ | 7.75 (2.84)$^{abcd}$ | 5.40 (2.4)$^{de}$ | 18.70 (4.34)$^{a}$ | 18.30 (4.28)$^{bcd}$ | 12.7 (3.63)$^{de}$ | 13.04 (3.62)$^{cd}$ |
| **SEM±** | | **0.49** | **0.17** | **0.15** | **0.15** | **0.17** | **0.11** | **0.14** | **0.14** | **0.21** | **0.17** | **0.12** |
| **CD@ P= 0.05** | | **1.40** | **0.50** | **0.44** | **0.44** | **0.54** | **0.33** | **0.43** | **0.42** | **0.63** | **0.54** | **0.38** |
| **CV %** | | **13.26** | **9.07** | **9.20** | **9.94** | **13.48** | **11.19** | **12.23** | **12.34** | **16.86** | **14.19** | **13.34** |

Figures in parenthesis are □ x + 0.5 transformed value Means in the columns followed by the same alphabet do not differ significantly by DMRT (P=0.05)

On other hand the next best *Bt* cotton hybrids in the order of superiority were Minerva BG-I non *Bt* followed by MRC-7351, Minerva BG-I, MRC-7918 non *Bt* and Ankur HB-2110, where all this hybrids were statistically on par with each other, the highest population of aphids were recorded in double *Bt* followed by double *Bt* non *Bt* and MRC-7918 respectively and were statistically on par with each other.

The results are in line with many findings, Udikeri *et al.,* (2012) who observed that the impact of *Bt* transgenic cotton on dynamics of aphid in RCH 2 *Bt* and non-*Bt* cotton hybrids. In RCH 2 *Bt* the population of aphid ranged between 8.58/ leaf (34th SMW) and 42.15/ leaf (50th SMW) with a mean incidence of aphid (23.82/ leaf) whereas in RCH 2 non-*Bt* cotton, the aphid population ranged from 6.22 to 37.08/ leaf (46th SMW) with a mean incidence of 21.37/ leaf. However the results on incidence of whiteflies on different *Bt* cotton hybrids were furnished in the Table 1. revealed that lowest population of whiteflies were recorded in DCH-32 and Ankur HB-2110 non *Bt* followed by Chamundi BG-II non *Bt* Minerva BG-I, Ankur HB-2110 MRC-7351, MRC-7351 non *Bt*, double *Bt* and MRC-7918, where all these hybrids were on par with each other. However the highest population of whiteflies were recorded on Chamundi BG-II followed by Minerva BG-II non *Bt* and double *Bt* non *Bt* (4.54 whiteflies/ 3 leaves) and were statistically on par with each other. The present findings are in agreement with Rohith *et al.,* (2014) recorded the *Bt* genotypes MRC-7918 and cheeranjivi show resistant and moderately resistant respectively to aphid, thrips and white flies. No genotype show resistant to mirid bug but cheeranjivi and MRC-7351 show moderately resistant DCH-32 is highly susceptible to all the sucking pest.

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