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Original Research Article

Evaluation of Bt Cotton Hybrids for their Yield and Fiber Quality under Rainfed Situation of Vidarbha Region

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A B S T R A C T

A field experiment was carried out at experimental field of Cotton Research Unit, Dr. PDKV Akola, during *kharif* season 2015 to evaluate Bt cotton hybrids for their yield potential and fiber quality under rainfed situation of Vidarbha region. The field trial was laid out in randomized block design with total of twenty five cotton hybrids, all were Bt *G. hirsutum* cotton hybrids except PKV Hy 2 i.e non Bt. Among all hybrids there were three checks i.e, RCH 2 BG II, BUNNY BG II, and PKV Hy 2. Among the tested genotypes AHH 383 BG II recorded significantly higher yield (2244 kg/ha) followed by CCH-06 BG II (2160 kg/ha) and PDKV- JKAL-116 BG II (2145 kg/ha).The same entries were analyzed for fibre properties in High Volume Instrument (HVI) at Ginning and Training Center, CIRCOT, ICAR, Nagpur. Among all the entries, hybrid ANKUR APRATIM had maximum upper half mean length (UHML) (33.60 mm), fibre strength (32.30 g/tex) and uniformity ratio (88.00). Moderate fibre fineness was found in JKCH 121241 BG II (4.60 g/inch), and ginning percentage was maximum in AHH 383 BG II (36.2%).

Keywords

Bt cotton, Genotypes, Seed cotton yield, Fibre quality

Introduction

The development of Bt cotton containing a genetically introgressed endotoxin gene from the gram negative soil bacteria (*Bacillus thuringiensis* Hubner) represents a significant technological land mark in the global cotton research. India adopted this technology in 2002-03. Cotton is a major cash crop of India and accounts for 75 percent of the fiber used in the textile industry, which has 1063 spinning mills and accounts for 4 per cent gross domestic product. India is the only country to grow all four species of cultivated cotton *viz*, *Gossypium arborium*, *Gossypium harbaceum L.*, *Gossypium barbadense* L. and *Gossypium hirsutum L.* represents more than 90 per cent of the hybrid cotton production in India and all the current Bt cotton hybrids are *G. hirsutum* grown in an area of 87 per cent or 8.4 m. ha, a remarkably high proportion in a fairly short period of eight years equivalent to an unprecedented 168 fold increase from 2002 to 2009.

In 2009, the multiple gene Bt cotton hybrids were planted for the first time in more area (57%) than single gene Bt cotton hybrids occupied 4.82 m. ha as compared to 3.58 m. ha (43%) by single gene Bt cotton hybrids.

Transgenic cotton provided a handy tool to reduce the pest menace. The performance of Bt-cotton varied, from region to region with changing agroclimatic conditions, pest pressure and cropping systems thus, it is necessary to test the validity of Bt technology in prevailing field conditions. Bt cotton is becoming popular among the farming community because of its ability to ward-off bollworm menace.

This technology is highly beneficial to the growers and to the environment by reducing chemical insecticide treatments for target pests, increasing crop yields and preserving populations of beneficial arthropods. The introduction of transgenic cotton hybrids and their scope for extensive coverage in India in the coming years, there is a need for evaluating yield and yield components of transgenic cotton varieties. Several Bt cotton genotypes have entered the market with GEAC approval but the yield potential fiber quality of these genotypes were claimed different by different companies. Thus there is need to ascertain the on-farm yield potentials and fiber properties of these Bt cotton genotypes.

Materials and Methods

The field experiment was conducted at the experimental field of Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola located at 304.415 meter altitude, $20^{0}30'$ N latitude and $72^{o}02'$ longitude during *Kharif* season of 2015. The soil of experimental site was medium deep black soil

The experiment consisted of twenty four commercially available Bt cotton genotypes (hybrids) and one non-Bt cotton hybrids as treatments viz., 25 D 51BG II, SWCH 4749 BG II, ACH 1133-2 BG II, SP 7318 BG II, ACH 1199-2 BG II, JKCH 121241 BG II, AHH 383 BG II, MRC 7388 BG II, ANKUR DHANUSH BG II, CCH-06 BG II, ANKUR PUSHKAR BG II, CCH-03 BG II BG II, AHH 341 BG II, ANKUR APRATIM-BG II, GHH 029 BG II, PDKV-JKAL-116 BG II, NSC 1024 BG II, SCH 234 BG II, JKCH 8935 BG II, KCH-26-K-27 BG II, NCS 2311 BG II, KSCH-232 BG II, RCH 2 BG II, BUNNY BG II, PKV Hy 2. Out off twenty four Bt hybrids two hybrids *viz*, RCH 2 BG II and BUNNY BG II were used as check while PKV Hy 2 non Bt hybrid also used as a check.

The field experiment was laid out in a Randomized Block Design, with three replications. The land was ploughed once before commencement of experiment with mould board plough and later harrowed twice to bring the soil to fine tilth. The different cotton genotypes were dibbled at 90 cm apart with intra row spacing of 45 cm on 23rd June 2015. Two seeds per hill were dibbled to a depth of 4 cm on flat bed. Gap filling was done 10 days after sowing.

The 50 percent of recommended dose of nitrogen and full dose of Phosphorus and Potassium were applied (100:50:50 N: P: K kg/ha) at the time of sowing and the remaining 50 per cent of N was applied at 30 DAS. Biometric observations were recorded on five tagged plants selected randomly in each plot.

The data collected from the experiment at different growth stages were subjected to statistical analysis as described by Gomez and Gomez (1984). The level of significance used in 'F' and't' test was P=0.05. Critical difference (CD) values were calculated wherever the 'F' test was found significant.

Quality parameters of cotton fibre viz., span length, fibre strength, fibre fineness, ginning percentage and uniformity ratio were

assessed as per Sundaram (1979) using High Volume Instrument (HVI) at Ginning and Training Center, CIRCOT, ICAR, Nagpur.

Results and Discussion

In the present investigation among different genotypes studied, AHH 383 BG II (2244 kg/ha) produced significantly higher yield (2244 kg/ha) as compared with other Bt hybrids and checks, which was followed by CCH -06 BG II (2160 kg/ha) and PDKV-JKAL-116 BG II (2145 kg/ha).

Higher yield/ha is supported by higher per plant yield which ranged between 97.80 g/plant (AHH 383 BG II) to 51.46 g/plant (PKV Hy 2, Non Bt). Among Bt genotypes, AHH 383 BG II produced 50.35 per cent higher seed cotton yield and also 44.91 per cent higher per plant yield when compared with the lowest yielding Bt genotype.

The seed cotton yield of all treatments were related to higher fruiting co-efficient, medium leaf area, optimum amount of dry matter, low to medium photosynthetic rate and high to medium boll number and boll weight as per Bhardwaj *et al.* (1971). The increase in seed cotton yield per plant increases the seed cotton yield per ha in Bt cotton as per Singh (2007). Similar result was also found by Joshi *et al.* (2011).

The increase in yield alone could not benefit the cotton growers as quality of cotton fibre is the primary concern for fetching higher price (Sreenivasan, 2004). Among all the entries, hybrid ANKUR APRATIM had maximum upper half mean length (UHML) (33.60 mm).

The results obtained are similar to the findings of Mayee *et al.* (2004) reported in Bt genotypes exhibited slightly lesser 2.5% span length than their non Bt genotypes. This might be due to the earliness of Bt cotton genotypes which provide lesser period for fibre elongation. Regarding fibre strength, all the treatments differ significantly with each other. The fibre strength is indicator for spinning ability of yarn. The ANKUR APRATIM had significantly higher fibre strength i.e. 32.30 g/tex than the check BUNNY BG II (29.1 g/tex). The lowest fibre strength was found among check was PKV HY 2 (25.9 g/tex). Sudha *et al.* (2011) was found similar result.

The fibre fineness indicates the softness of the cotton fibre. All treatments differ significantly with each other for this trait. In JKCH 121241 BG II more fibre fineness i.e. 4.60 was found followed by ACH 1133-2 BG II (4.30). The lowest value obtained in the PKV HY 2 (3.20) for this trait. Similar result was also reported by Joshi *et al*. (2011.).

Ginning percentage was maximum in AHH 383 BG II (36.2%) which was at par with CCH - 06 BG II and PDKV- JKAL-116 BG II (35.8 and 35.00%) respectively. Mayee *et al*. (2004), noted that Bt genotypes exhibit higher ginning percentage. Khadi *et al*. (2008), recorded increase in ginning out turn in Bt genotypes.

The Bt genotype significant with each other for this character check PKV Hy 2 had lowest value 82.0. The highest value found in ANKUR APRATIM i.e. 88.0, which was at par with ANKUR DHANUSH and RCH BG II , (87.0 and 87.0) respectively. Asha *et al*. (2015) showed that uniformity ratio showed significant positive association with fibre elongation whereas fibre elongation showed significant positive association with seed cotton yield/ plant.

Table.1 Evaluation of different Bt (BG II) cotton hybrids for seed cotton yield and fibre quality under rainfed situation

Sr. No	Name of genotye/Hybrid	Seed cotton yield per plant (g)	Seed cotton yield per hector (kg)	Upper half mean length (mm)	Fibre strength (g/tex)	Fibre fineness (micronaire)	Ginning percentage (%)	Uniformity ratio (%)
1	25 D 51 BG II	80.27	1899	30.4	30.3	3.40	33.8	86.0
2	SWCH 4749 BG II	83.20	2018	30.9	28.8	3.70	34.3	86.5
3	ACH 1133-2 BG II	79.27	1934	29.6	29.3	4.30	34.3	85.5
4	SP 7318 BG II	58.60	1224	28.9	28.5	3.80	31.7	85.5
5	ACH 1199-2 BG II	62.33	1462	29.6	29.9	3.55	32.1	85.5
6	JKCH 121241 BG II	80.40	1914	27.2	27.1	4.60	34.0	85.0
7	AHH 383 BG II	97.80	2244	29.8	30.5	3.75	36.2	86.5
8	MRC 7388 BG II	77.53	1886	30.2	28.7	3.45	33.4	84.5
9	ANKUR DHANUSH BG II	66.67	1595	30.7	27.8	3.30	32.4	87.0
10	CCH-06 BG II	96.73	2160	29.8	28.1	3.90	35.8	85.0
11	ANKUR PUSHKAR BG II	76.60	1879	29.9	28.7	3.30	33.4	86.0
12	CCH-03 BG II	76.13	1849	27.3	27.4	3.50	33.3	84.5
13	AHH 341 BG II	90.80	2046	30.0	28.2	3.85	34.8	85.5
14	ANKUR APRATIM BG II	65.27	1564	33.6	32.3	3.40	32.1	88.0
15	GHH 029 BG II	75.13	1750	29.5	28.9	3.25	33.2	86.0
16	PDKV-JKAL-116 BG II	95.80	2145	30.9	31.0	3.70	35.0	86.5
17	NSC 1024 BG II	74.87	1730	32.0	32.2	4.20	33.0	86.0
18	SCH 234 BG II	62.33	1258	31.4	29.2	3.60	31.9	85.0
19	JKCH 8935 BG II	73.07	1652	28.5	29.3	4.40	32.6	85.5
20	KCH-26-K-27 BG II	83.93	2022	29.6	29.5	4.05	34.7	85.5
21	NCS 2311 BG II	91.53	2137	31.5	29.2	4.10	34.9	86.5
22	KSCH-232 BG II	75.80	1823	29.5	31.0	3.60	33.2	84.5
23	RCH 2 BG II (check)	56.00	1136	32.0	28.7	3.45	31.7	87.0
24	BUNNY BG II (check)	53.87	1114	32.5	29.1	3.25	30.8	85.5
25	PKV Hy2 (NB) (check)	51.46	1084	26.9	25.9	3.20	30.2	82.0
	SE(m)±	7.39	169	0.61	0.67	0.07	0.59	0.37
	CD at 5 %	21.04	482	1.74	1.93	0.20	1.70	1.40
	CV at 5 %	16.97	16.83	3.52	4.02	3.36	3.11	0.74

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