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Fiber quality parameters of different Bt cotton hybrids in Western zone of Tamil Nadu under irrigated condition

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Abstract

Twelve Bt cotton genotypes *viz.*, Jai, Akka, Tulasi 9, Viswanath, Mallika, Durga, Bunny, Tulasi 118, MRC 7347, MRC 7201, Chiruta and MRC 7351 were evaluated for fibre quality and its components character with the objective to identify superior Bt hybrids for irrigated condition at Tamil Nadu Agricultural University. Ginning outturn ranged from 31.6- 38.3 per cent, 2.5 per cent span length ranged from long to extra-long (31.8 mm – 35.6mm). Fibre strength ranged from low 21.0 -23.9g/tex⁻¹ strong. Whereas micronaire values ranged from fine 21.0 to 6.54 very coarse. Considering, ginning outturn and fibre quality parameters hybrids namely Akka Bt, Mallika Bt and Chiruta were found promising.

Keywords: Bt hybrids, seed index, fibre properties, micronaire value, ginning outturn.

Introduction

Cotton (*Gossypium sp*) is one of the important commercial fibre crops, which is also called “white Gold” and is a leading fibre crop and second most important oilseed crop in the world (Rajendran *et al.*, 2004) [12]. Indian cotton crop is the most diverse in the world, both in terms of botanical status and fibre quality range. The world today has suddenly turned its attention towards the natural fibres that are environment friendly and biodegradable. It is important to note here that the research and technology initiatives, safe cultivation practices and their on farm demonstration on a large scale have resulted in increase in cotton yield. Cotton production increased from 17.6 million bales in 1996-97 to 35.2 million bales during 2017-18. Average lint yield has jumped from a meager 168 kg ha⁻¹ (1980-81) to 526 kgha⁻¹ (2017-18). Which is approximately 70 per cent at world average (Anonymous, 2018). India has the largest area in the world under cotton at 11.7 M ha and is the second largest producer with 35.48 M bales (AICRP cotton, Annual Report, 2017-18). The cotton hybrids especially Bt cotton occupies as much as 75 per cent at the total area under cotton cultivation. Currently, out of 1042 Bt hybrids available in India 125 Bt hybrids are approved for commercial cultivation in Tamil Nadu. In south zone of Tamil Nadu, winter irrigated, winter rainfed, rice fallow and summer irrigated cotton are grown. Prior to the introduction of Bt cotton, it is reported that the average cotton yield in India which was 302 kg ha⁻¹ in 2002-2003, increased to 567 kg ha⁻¹ in 2007-2008. Similarly, the national cotton production increased from mere 13.6 million bales in 2002-2003 to 52.5 million bales in 2017-2018(Anonymous, 2018). During the recent years, a large number of Bt cotton hybrids have been developed and released for commercial cultivation. Hence, a study were undertaken to identify suitable region specific hybrids having good yield potential coupled with desirable fibre quality parameters under irrigated condition of Coimbatore region of Tamil Nadu.

Materials and methods

Genetic material: Breeding material comprised of twelve different *Gossypium hirsutum* genotypes having broad genetic base and varied by fiber yield as well as fiber quality traits. The cultivars were Jai, Akka, Tulasi 9, Viswanath, Mallika, Durga, Bunny, Tulasi 118, MRC7347, MRC7201, Chiruta and MRC 7351.

The experimental work comprised of to study the potential of genotypes, seed cotton yield with, fiber and cottonseed oil % in irrigated cotton was carried out under the prevailing environmental conditions of Tamil Nadu Agricultural University, Coimbatore. It were situated in the western zone of Tamil Nadu at 11° N latitude and 77° E longitude with an altitude of 426.74 m above mean sea level (MSL). The soils are sandy loam highly alkaline with pH of (8.3) and low in organic carbon (0.59 %). The soil was high, low and high in the available N (442 kg ha⁻¹), P₂O₅ (13.2 kg ha⁻¹) and K₂O (460.8 kg ha⁻¹). Each hybrids was grown in a five-

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row plot with 10 plants each row. The data on plant height (cm), number of monopodia and sympodia plant⁻¹, lint index (g), seed index (g), ginning outturn per cent, bolls plant⁻¹ and boll weight (g) were recorded on five randomly selected plants from each hybrids in each replication as per the standard procedure and mean data were calculated. Thinning were done in twice after 15 and 25 days of germination when the plant height was 10 and 20 cm, respectively to ensure single plant per hill. Cottonseed were harvest from the entire plot and the yield was calculated and expressed in kg ha⁻¹. The lint sample from each replication were pooled and the fibre quality parameters viz., 2.5 per cent span length (mm), lint index (g), ginning outturn per cent, Micronaire value (µg/inch) and bundle length (g/tex) were analysed in high volume instrument (HIV) at Department of Cotton lab, Coimbatore district, Tamil Nadu.

Results and discussion

Quality parameters

Fibre quality of Bt cotton is the foremost requirement to decide the market value of the produce. India is emerging as a major yarn exporter and has utilized the cotton stocks for this purpose. The current quality of the cotton is able to meet the existing demands of the processors (AICCIP, 2002) [1]. The increase in productivity alone could not benefit it the cotton growers as quality of cotton fibre is the primary concern for fetching higher price (Sreenivasan, 2004) [16].

Ginning percentage

Ginning percent was calculated treatment wise for second picking (as the yield of seed cotton was more in the second picking) using the following formula:

$$\text{Ginning percentage} = \frac{\text{Weight of lint (g)}}{\text{Weight of seed cotton (g)}} \times 100$$

Fibre quality of GOT was significant difference were registered by twelve different genotypes. Wide variation for ginning outturn registered among the hybrids at it ranged from 31.6 to 38.3 per cent. The hybrid Akka (38.3 per cent) recorded highest ginning outturn followed by Chiruta (37.2 per cent). Bunny and MRC 7351 recorded significantly lower ginning percentage (31.6) than rest of the germplasm. Table.1

Lint index and Seed index

Length of staple fibre is one of the most important characteristics. In general, a longer average fibre length is to be preferred because it confers a number of advantages. Firstly, longer fibres are easier to process. Secondly, more even yarns are produced from them because there are less fiber ends in a given length of yarn. Thirdly, a higher strength yarn they produced from them for the same level of twist.

The results indicated that there is a notable difference among cotton genotypes. MRC-7351 Bt genotype recorded significantly higher seed index (12.5 g) and it was on par with the Mallika Bt (12.40 g), Bunny Bt (12.1 g), Tulasi-9 Bt (12.0 g). The lowest seed index was recorded with Durga Bt (9.50 g). The different treatments registered lint index values between 4.9 to 5.9 g (Table 1 & Fig 1). Taohua & Haipeng (2006) [17] and Meena *et al.*, (2007) [19] studied the performance of *G. hirsutum* and perceived varied values for lint index.

Staple length 2.5 %

The fibre quality of 2.5 % staple length of Bt cotton did show characteristic changes due to different genotypes. However, it varied from 31.8 (Durga) to 35.6 (Akka) with a mean of 30.5 (Table 1). This is in similar findings of Venugopal *et al.* (2004) [18] that 80 per cent of the variation on fibre length is governed by genetic factors.

Uniformity ratio

Significantly higher uniformity ratio of Bt cotton was recorded with MRC 7201 (50.9) was on par with Vishwanath (50.4), Durga (50.1), Mallika (49.9) and Akka (49.7) Table 1. Significantly lower uniformity ratio of 46.70 (MRC 7201) was recorded than rest of treatments of the Bt cotton hybrids. It was corroborated with the findings of Gurumurthy (1993) [6, 7]

Fibre strength

Among the twelve Bt hybrids studied, Akka Bt registered maximum with a fibre strength of 23.9 g tex⁻¹ recorded significantly higher fibre strength of Bt cotton over rest of the treatments except MRC 7347 (23.3) which were on par with latter treatment. Tulasi 118 recorded fibre strength of 21.0 which was on par with Tulasi 9 (21.6), Mallika (21.7), Durga Bt (21.7) and significantly lower than rest of the treatments. The Akka Bt hybrid had recorded higher fibre quality over MRC 7351 corroborated with the findings of (AICCIP, 2004b) [2] Table 1.

Micronaire

The micronaire data of Bt cotton ranged from 3.9 (Chiruta Bt) to 4.8 (Jai and Mallika Bt). However, the fibre quality data pertaining to micronaire did not show any significant difference due to genetical character of Bt cotton hybrids. But fibre qualities were more genetical and also in consonance with the report of Halemani *et al.* (2004) [8] Fig 1.

The present investigation pertaining to ginning %, fibre strength, fibre fineness and micronaire were also reported. The desirable hybrids in respect of quality parameter Akka BGII, Jai BGII, Tulasi 9 BGII, Mallika BGII and MRC 7351 BGII was identified in the present findings for this location (Table 1). However, it needs further confirmation on multilocation basis. Similar research findings on Bt cotton hybrids were also reported by (Siva Reddy *et al.* 2015) [14, 15], (Deshmukh *et al.* 2015) [5], (Satish *et al.* 2015) [14, 15], (Bhongle *et al.* 2013) [5], (Sangwan *et al.* 2013) [13] and (Patil *et al.* 2013) [4, 11].

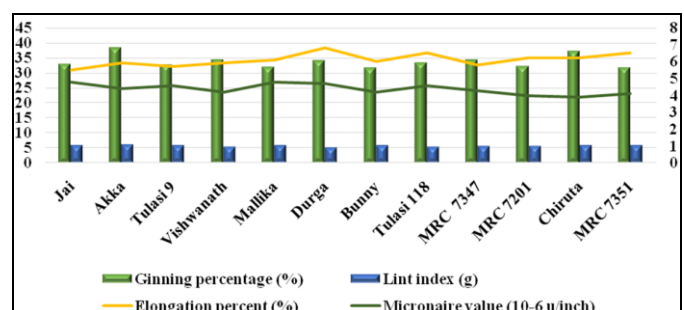


Fig 1: Effect of agronomic practices on quality parameters of different Bt hybrids

Conclusions

Our study concludes that irrigated Bt Cotton hybrids fibre quality parameters viz., ginning percentage was higher in Akka Bt genotypes. Seed index value was higher in MRC

7351 Bt. Lint index value was more in Akka Bt followed by Jai, Tulasi 9, Mallika and MRC 7351 Bt genotypes. The other quality characters like staple length, uniformity ratio, micronaire and elongation percent were significant difference in the different genotypes. There was a significant difference observed in the tenacity of Bt cotton. The higher value of 23.9 g tex⁻¹ was recorded in the Akka Bt genotypes.

Recommendation

It is evident from the present investigation that Akka Bt cotton hybrid has increased the fibre quality. Akka Bt, Mallika and Chiruta are found to be better Bt genotypes for winter irrigated condition in Coimbatore. It can be adopt for higher fibre quality and profitability under irrigated condition to reap the full genetic potential.

It was now i.e., a decade back Bt cotton hybrids were introduced and as a result the snub of boll worms was overcome and relatively good retention of bolls was witnessed. Retention of maximum number of bolls also sometimes made the plants to change their growth habit (determinate/indeterminate) according to the prevailing seasonal conditions. Therefore, due to these frequent changes in macro and micro weather conditions, the performance of Bt hybrids becomes unpredictable and the farmers suffered huge losses or benefits. It is in this context that the results of the present experimentation have immense practical utility. Thus, it is suggested to adopt the particular promising hybrids it provides better opportunity for Bt hybrids to express their potential under irrigated conditions in Coimbatore district.

Table 1: Effect of agronomic practices on quality parameters of different Bt hybrids

Genotypes	Ginning percentage	Lint index (g)	2.5 per cent Staple length (mm)	Tenacity (g tex ⁻¹)	Elongation per cent	Uniformity ratio	Micronaire value (10 ⁻⁶ u/inch)	Seed index (g)
Jai	32.9	5.8	34.4	22.3	5.5	48.7	4.8	11.8
Akka	38.3	5.9	35.6	23.9	5.9	49.7	4.4	9.5
Tulasi 9	32.5	5.8	32.0	21.4	5.7	48.8	4.6	12.0
Vishwanath	34.2	5.2	33.5	22.7	5.9	50.4	4.2	10.0
Mallika	32.0	5.8	33.3	21.7	6.1	49.9	4.8	12.4
Durga	34.0	4.9	31.8	21.7	6.8	50.1	4.7	9.5
Bunny	31.6	5.6	33.5	22.9	6.0	46.9	4.2	12.1
Tulasi 118	33.3	5.3	33.5	21.0	6.5	48.4	4.6	10.6
MRC 7347	34.3	5.5	32.2	23.3	5.8	50.9	4.3	10.5
MRC 7201	32.1	5.4	34.0	21.9	6.2	46.7	4.0	11.4
Chiruta	37.2	5.7	35.2	22.7	6.2	47.5	3.9	9.6
MRC 7351	31.6	5.8	33.3	22.8	6.5	49.1	4.1	12.5
SEd	0.76	0.10	0.65	0.62	0.25	1.82	0.18	0.20
CD (P = 0.05)	1.58	0.22	1.35	1.30	0.52	3.77	0.39	0.43

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