

Screening of Bt. Cotton Hybrids (*Gossypium hirsutum*) for Salt Tolerance in Vertisols of Andhra Pradesh

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Received: 8.08.2016 | Revised: 22.08.2016 | Accepted: 25.08.2016

ABSTRACT

A field experiment was conducted in black cotton soils with seven Bt.cotton hybrids viz., Santhi, Bhakthi BG II, Bunny BG II, Dr. Brent BG II, RCH 2BG II, First class BG II and Jadoo BG II and were replicated thrice in Randomised block design in farmer's field at Ammanabrolu village of Prakasam district during kharif, 2014. The experimental soil was moderately alkaline (pH: 8.6) and saline (ECe: 8.8 dSm⁻¹) in nature, available nitrogen 272 kg ha⁻¹, phosphorous 27 kg ha⁻¹ and potassium 341 kg ha⁻¹. Among the hybrids, First class Bt. cotton recorded significantly highest kapas yield (2244 kg ha⁻¹) followed by Dr.Brent Bt.cotton (2239 kg ha⁻¹) and Jadoo Bt.cotton (1992 kg ha⁻¹). Significantly highest boll weight was recorded in Bhakti Bt. cotton (5.36 g) followed by first class Bt. cotton (5.16 g) and Jaddu Bt. cotton (5.10 g). The highest lint index (6.37 g) and ginning out turn (41.62 %) was recorded in Dr. Brent Bt. Cotton followed by Bhakti Bt. The significantly highest span length (30.41 mm) and bundle strength (23.32 g tex⁻¹) of fibre were recorded in First class Bt. followed by Jadoo Bt. and Bunny Bt.

Keywords: Bt. cotton, salt tolerance, yield, fibre properties etc.

INTRODUCTION

India has unique place among the cotton growing countries of the world. India ranks 5th an area and third in production of cotton is 512 kg of lint ha⁻¹. Among the cotton growing states, Andhra Pradesh is having an area of 7.36 lakh ha, second in production, 21.10 lakh bales and an average productivity of 621 kg lint ha⁻¹. Bt. cotton crop is an exhaustive crop

and needs heavy fertilization to achieve higher yield compared to Desi, American cotton varieties and hybrids. It is known that nutrient removal is higher (25% extra) in Bt. cotton hybrids. In general a rainfed cotton crop removes about 6-7 kg N, 2-2.5 kg P, 7-8 kg K per 100 kg seed cotton. A nutrient recommendation varies with crop response, genotypes, soil and climate conditions.

Cite this article: Hema, K., Lakshmi, G.V., Rani, Y.S. and Kumari, S.R., Screening of Bt. Cotton Hybrids (*Gossypium hirsutum*) for Salt Tolerance in Vertisols of Andhra Pradesh, *Int. J. Pure App. Biosci.* 4(5): 48-51 (2016). doi: <http://dx.doi.org/10.18782/2320-7051.2348>

Salinity is the most serious problem that poses threat to productivity of field crops. Cotton (*Gossypium* spp) is an important crop grown for fibre fuel and edible oil. Cotton is salt tolerant crop, but it is sensitive during germination. Although cotton is classified as one of the most salt tolerant crop and considered as a pioneer crop in reclamation of saline soils, its growth, yield and fiber quality are negatively affected by excessive salts in the soil³. Major area of the cotton cultivation in Andhra Pradesh is occupied with Bt. Cotton hybrids and the information on salt tolerance of these hybrids is not available. Keeping this in view, evaluation of salt tolerance in Bt. cotton hybrids was carried out.

MATERIALS AND METHODS

A field experiment was conducted in black cotton soils with seven Bt. cotton hybrids viz., Santhi, Bhakthi BG II, Bunny BG II, Dr. Brent BG II, RCH 2BG II, First class BG II and Jadoo BG II and were replicated thrice in Randomised block design in farmer's field at Ammanabrolu village of Prakasam district during *kharif*, 2014. The experimental soil was moderately alkaline (pH: 8.6) and saline (ECe: 8.8 dSm⁻¹) in nature, available nitrogen 272 kg ha⁻¹, phosphorous 27 kg ha⁻¹ and potassium 341 kg ha⁻¹. The recommended dose of fertiliser for Bt. cotton crop is 150- 60-60 kg NPK ha⁻¹. Entire phosphorous and half of nitrogen was as basal dose and remaining nitrogen and potassium were applied in three equal splits at flowering, square formation and boll development stages. At the time of maturation, seed cotton samples of each hybrid were collected at random from second picking in each replication. All the samples were ginned carefully in the laboratory and lint samples were tested for quality parameters by using standard method⁶. The fibre characteristics namely 2.5 percent span length, uniformity ratio, micronaire value, bundle strength and elongation were examined on HVT expert 1201(HVI). The seed cotton yield, boll weight and ginning percentage were also obtained as per standar methods. The statistical analysis of the data was done with

the methods suggested by Panse and Sukhatme⁷. The fibre quality index (FQI), counts(C) and count strength product (CSP) were calculated by using the formulae Anonymous¹. The same are defined as follows.

1. $FQI = LS / M^{1/2}$
2. $C = 0.196 FQI - 16$
3. $CSP = 1.74 FQI + 1600$

Where, L is 2.5 percent span length (mm); S is bundle strength (g/tex) at 3.2 mm guage length and

M is micronaire value i.e., fibre fineness.

The data on plant height (cm), no.of monopodia, no.of sympodia etc., were recorded at the time of harvest of the cotton crop. Final soil samples from each plot were collected at the time of harvesting, air – dried, ground to pass 2mm sieve and analysed for pH, Electrical Conductivity, available N, P and K⁴.

RESULTS AND DISCUSSION

Among the yiled attributes of Bt.cotton crop plant height, no.of monopodia and no.of sympodia are non significant, whereas no.of bolls, boll weight, lint index, seed index, ginnig out turn and kapas yield are significant in all the hybrids (Table 1). Freitas *et al.* reported that salt stress had significantly reduced the growth of cotton plants. The highest no.of bolls/ plant recorded in Bunny Bt.(42) followed by Jadoo Bt. (41) and Dr.Brent Bt.(40). Significantly the highest boll weight was recorded in Bhakti Bt. cotton (5.36 g) followed by first class Bt. cotton (5.16 g) and Jaddu Bt. cotton (5.10 g). First class Bt. cotton recorded significantly highest kapas yield (2244 kg ha⁻¹) followed by Dr.Brent Bt.cotton (2239 kg ha⁻¹) and Jadoo Bt.cotton (1992 kg ha⁻¹). Zhang *et al.*, (2012) reported that increased salinity from moderate to strong levels reduced sedd cotton yield by decreasing the number of bolls and boll weight. Significantly highest lint index was recorded in Dr. Brent Bt.cotton (6.37g) followed by Bhakti Bt. cotton (5.66g) and Jadoo Bt.cotton (5.61g). First class Bt.cotton recorded significantly highest seed index (9.65 g), which was on par with Jadoo Bt.cotton (9.25g) followed by Dr. Brent Bt.cotton (8.94g).

Fibre quality parameters span length and bundle strength are significant and uniformity ratio and micronaire are non significant. The significantly highest 2.5 % span length (30.41 mm) recorded in First class Bt followed by Jadoo Bt.(29.97 mm) and Bunny Bt. (29.93 mm).The highest bundle strength of fibre (23.32 g tex⁻¹) was recorded in First class Bt. followed by Jadoo Bt. (22.81 g tex⁻¹) and Bunny Bt. (22.45 g tex⁻¹). Santhi Bt. recorded highest micronaire value (4.51 10⁻⁶ g inch⁻¹) followed by Jadoo Bt. (4.32 10⁻⁶ g inch⁻¹) and RCH 2 Bt. (4.30 10⁻⁶ g inch⁻¹). Jyoti Nath reported that the micronaire value < 3.5 indicates fine lint, > 4.9 high micronaire indicates coarse lint and the desired range of micronaire value is 3.5 to 4.9. All the Bt. hybrids tested are having the micronaire value range from 4.09 to 4.51 10⁻⁶ g inch⁻¹, which comes under desired/ preferable range. The highest lint index (6.37 g) and ginning out turn (41.62 %) was recorded in Dr. Brent Bt. Cotton followed by Bhakti Bt.

The final soil sample recorded little change in pH and EC values, it may be due to upward movement of salts in the soil due to high evaporation demand at harvest stage of the crop. Whereas nutrient availability lower nitrogen, high phosphorous and potassium was recorded compared to initial soil values. Soil available nitrogen was significantly decreased compared to initial soil analysis, it may be due to losses of nitrogen thorough various methods and removal by crop. Yeresheemi *et al.*,⁸ reported that in salt affected soils nitrogen content was decreased due to high pH, Low Organic carbon favouring higher ammonia volatilisation losses and reduced nitrification and subsided activity of N- fixing microbes.

CONCLUSION

The present study revealed that First class Bt., Dr.Brent Bt. and Jadoo Bt. performed better than the other hybrids in salt affected soils under rainfed condition.

Table 1: Yield and yield parameters in Bt. cotton experiment during 2014-15

S.No.	Name of the Bt.Hybrid	Plant height (cm)	No.of mono podia/pt	No.of Symp odia /pt	No.of bolls/ pt	Lint index (g)	Seed index (g)	Ginning out turn (%)	Boll wt. (g)	Kapas yield (kg/ha)
1	Bhakti BG II Bt.	102	0.33	22.00	35.00	5.66	8.69	39.37	5.36	1926
2	Bunny BGII Bt.	114	1.00	23.33	42.00	4.98	8.17	37.88	4.92	1872
3	Dr.Brent BGII Bt.	110	0.66	23.67	40.00	6.37	8.94	41.62	4.77	2239
4	RCH 2 BG II Bt.	107	0.66	24.00	35.66	4.27	7.77	35.47	4.36	1844
5	First class BGII Bt.	90	0.66	21.33	38.00	5.35	9.65	35.65	5.16	2244
6	Jadoo BGII Bt.	94	0.33	19.66	41.00	5.61	9.25	37.92	5.10	1992
7	Santhi BGII Bt.	93	0.66	19.33	26.33	4.00	7.88	33.65	4.29	1749
	SEm±	6.7	0.4	1.8	2.94	0.17	0.31	1.34	0.2	102.8
	CD (P=0.05)	NS	NS	NS	9.06	0.52	0.94	4.14	0.6	316.7
	CV%	11.4	101.8	14.6	13.8	5.7	6.2	6.2	7.0	9.0

Table 2 : Final soil analysis data at Ammanabrolu village during 2014-15

S.No.	Name of the farmer	Village	pH	EC (dSm ⁻¹)	N	P ₂ O ₅	K ₂ O
					(kg ha ⁻¹)		
1	Sri K.Somaiah	Ammanabrolu Prakasam (Dist)	8.65	6.98	231	32.4	438

Table 3: Fibre quality parameters of Bt. cotton hybrids during 2014-15

S.No.	Name of the Bt.Hybrid	2.5% Span length (mm)	Uniformity Ratio (%)	Micronaire (10^{-6} g inch ⁻¹)	Bundle strength (g tex ⁻¹)	Fibre quality index	Counts	Count strength product
1	Bhakti BG II Bt.	28.42	47.01	4.09	21.59	303	43	2128
2	Bunny BGII Bt.	29.93	46.15	4.17	22.45	329	48	2173
3	Dr.Brent BGII Bt.	28.75	49.03	4.28	20.47	284	40	2095
4	RCH 2 BG II Bt.	27.94	48.69	4.30	22.06	297	42	2117
5	First class BGII Bt.	30.41	49.40	4.16	23.32	348	52	2205
6	Jadoo BGII Bt.	29.97	47.40	4.32	22.81	329	48	2172
7	Santhi BGII Bt.	25.96	44.71	4.51	21.78	266	36	2063
	General mean	28.77	47.48	4.26	22.07	308	44	2136
	SEm±	0.63	1.08	0.19	0.50	--	--	--
	CD (P=0.05)	1.96	NS	NS	1.55	--	--	--
	CV%	3.80	4.0	7.8	4.0	--	--	--

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