

Screening *Bt* cotton entries for salinity tolerance under laboratory conditions

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ABSTRACT : A pot culture study was conducted at Regional Agricultural Research Station, Guntur with eight genotypes *viz.*, Bunny BGII, NCS 138 BGII, Ranjit BGII, Srinidhi BGII, Rasi BGII, Takat BGII and Dyna BGII under four salinity levels (0, 4, 6, and 8 EC) in a factorial completely randomized design to study the effect of salinity on cotton at seedling stage and yield. Based on the seedling characters, the mean performance of Ranjit is good followed by Dyna and Srinidhi. Of all the salinity levels tried, 4 and 6 EC levels are equally good after normal irrigated water. The mean germination per cent was significantly high in control conditions and it was *on par* with 4 EC. Highest mean seed cotton yield was observed in Bunny (22.0 g/plant) followed by Srinidhi, Takat and NCS 138.

Key words : Cotton, germination, salinity, yield

The six major soil groups present in the state are red soils (Alfi sols 65%), black soils (verti sols 25%), alluvial soils (Entisols and verti sols 5%) Coastal sands (Enti sols 3%), laterite and latic soils (Oxisols) and problem soils (Alfi sols and Incepti sols 1%) including saline, saline alkali and non saline alkali soils. The yield of the crop is dependent upon the environment and the management practices of the cropping system. Although, cotton is cultivated in all soil types and reported as salt tolerant (Uma *et al.*, 2004), it is reported to be relatively sensitive during germination (Ratna Kumari *et al.*, 2004). Salinity affects large areas of Andhra Pradesh and the salinity ranged from 12 to 60 per cent in different districts of Andhra Pradesh. Even though, the cotton crop is a bit tolerant to salinity, excess salinity causes poor and spotty stand, uneven and stunted growth and poor yields depending upon the extent and degree of salinity. So the present study is focussed on the effects of salinity on per cent germination, seedling characteristics and cotton yield of different cotton entries grown in Andhra Pradesh.

A pot culture study was conducted during 2011-2012 crop season at Regional Agricultural Research Station, Guntur with 8 genotypes under 4 salinity levels (0, 4, 6 and 8EC) in a completely randomized block design with 3 replications. The soils of different EC were collected from cotton growing areas of Guntur and Prakasam districts of Andhra Pradesh. Eight promising *Bt* cultivars *viz.*; Bunny, NCS 138, Ranjit, Srinidhi, Rasi,

Takat, Dyna, Rudra were taken to study the salinity tolerance and also the adaptability of these entries to saline areas. Seeds of each cultivar were put into different pots with three replications for recording germination percentage, seedling length, shoot length, root length, seedling vigour and the seed cotton yield. The data were analyzed statistically.

Significant differences were noticed in per cent germination, shoot length and root length and seedling vigour among the BGII entries due to different salinity levels and also with the interaction of entries with the salinity levels. There is significant reduction in per cent germination at higher EC levels *i.e.*, 6 and 8 EC and the results are in conformity with the findings of Ratna Kumari *et al.*, (2004). Among the entries, Ranjit recorded significantly higher mean per cent germination (86.4) followed by NCS 138 (77.6) and Dyna (74.5). The mean germination per cent was significantly high in control conditions. The interaction of varieties and salinity levels is also significant due to per cent germination. The mean shoot length was significantly more in Dyna (16.00) followed by Ranjit (15.77) and the mean shoot length for the salinity levels was high at 0 EC (18.4) followed by 4 EC(17.0). The mean root length was maximum in Dyna (12.87) followed by Srinidhi (12.10). Among the different *Bt* entries, significantly higher mean seed vigour index was recorded in Ranjit (2209) followed by Dyna (2168) and seed vigour index was recorded under 0 EC(2444)

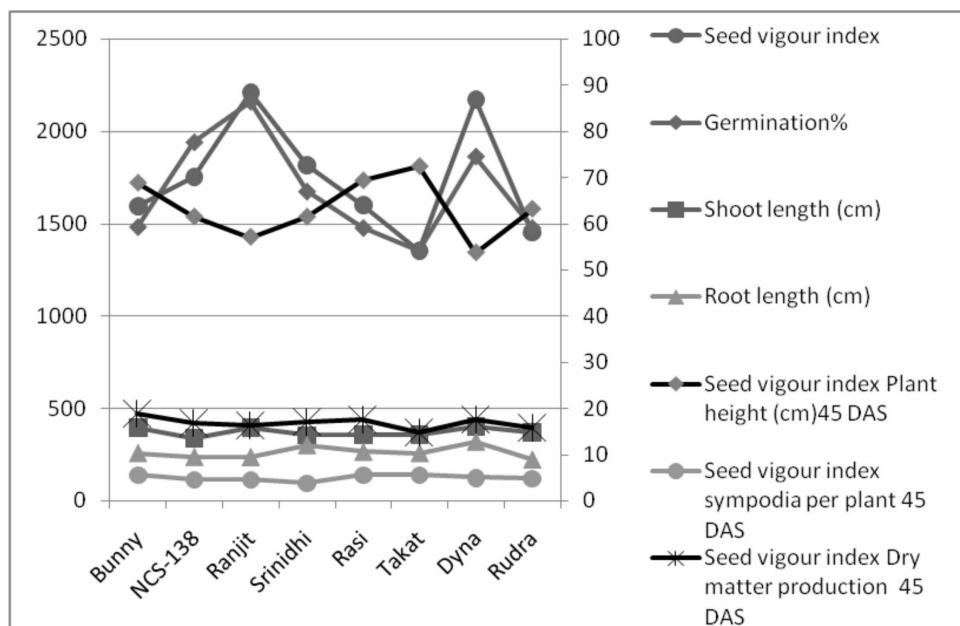


Fig. 1 Effects of salinity on germination at 45 DAS of *Bt* cotton

followed by 4 EC(1733), 6 EC(1614) and 8 EC (1313) indicating their high tolerance to salinity at seedling stage (Fig. 1) and these results substantiate the findings of Ratna Kumari *et al.*, (2004). Based on the seedling characters, the mean performance of Ranjit is good followed by Dyna and Srinidhi and of all the salinity levels

tried, 4 and 6 EC levels are also equally good after normal irrigated water.

At 45 DAS, significantly higher mean plant height was recorded by Takat (72.5cm) followed by Rasi (69.4cm) and Bunny (68.9cm). The mean seedling height was significantly low at 4 EC compared to control, but it was *on par* with 6

Table 1. Effects of salinity on yield and yield attributing characters of *Bt* cotton

<i>Bt</i> cotton hybrids	Dry weight (g)		Bolls/plant	Boll weight (g)	Harvest index	Seed cotton yield(g/pl)
	Flowering	Harvest				
Bunny	23.9	70.9	5.32	3.89	30.5	22.0
NCS 138	20.9	60.6	5.27	3.90	28.6	17.6
Renjit	19.8	72.0	4.03	3.78	23.2	16.5
Srinidhi	20.1	68.7	5.40	3.77	27.9	14.8
Rasi	21.8	46.0	4.90	3.75	32.1	19.4
Takat	18.5	55.8	4.00	4.14	32.1	18.4
Dyna	20.6	56.9	4.50	4.09	31.0	17.7
Rudra	17.5	54.0	4.70	3.49	30.4	16.4
SEm +	0.56	1.04	0.19	0.52	1.01	0.58
P=0.05	1.82	3.38	0.63	1.67	3.28	1.89
Salinity levels (EC)						
EC (0)	26.2	65.3	5.33	4.0	33.7	22.0
EC (4)	21.7	65.2	5.22	4.0	32.1	20.9
EC (6)	18.0	57.8	4.55	3.8	31.4	17.7
EC (8)	15.7	54.1	4.04	3.5	20.7	10.8
SEm +	0.39	0.736	0.14	0.04	1.01	0.41
P=0.05	1.29	2.39	0.45	0.12	2.32	1.33
Interaction (Hybrids x EC levels)						
SEm +	1.12	2.08	0.39	0.10	0.72	1.16
P=0.05	3.64	6.76	1.26	0.33	6.56	3.77
CV(%)	9.53	5.95	14.13	4.63	11.87	11.28

EC. The mean sympodia/plant were significantly high in Bunny (5.55) followed by Takat (5.52). Significantly higher mean sympodia were produced under controlled conditions followed by 4 EC level. From 6 EC level, significant reduction was noticed in sympodia produced/plant. This can be attributed to the less photosynthetic activity of plants in saline soils (Desingh and Kanagaraj, 2007). Except Takat and Rudra, all the entries recorded higher mean dry matter production per plant at 45 DAS. Significant reduction in mean dry weight was noticed at 4 EC level and it was on par with 6 EC level. From 6EC onwards there was drastic reduction in mean dry weight/plant (Table 1).

Highest mean seed cotton yield and boll / plant was observed in Bunny (22.0 g/plant and 5.32) followed by Rasi and Takat. Boll weight was more in Takat and harvest index was more both in Takat and Rasi. Of the salinity levels, drastic reduction in yield was noticed in 8 EC level only. The higher yield was associated with higher bolls/plant, boll weight and harvest index. The present study indicated that by improving the per cent

germination in the entries *viz*; Bunny, Rasi and Takat, higher yields can be obtained under saline conditions.

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