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Effect of date of sowing of parents, growth regulators and micronutrient spray on crossed seed germination and seedling vigour of NHH-44 Bt. cotton hybrid

BASAVARA J.S. LAKKUNDI, MOHAN R. DANDAGI, SANGAMESH S. HAKKALAPPANAVAR, M.R. ESHANNA AND SATISH ADIGER

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SUMMARY

The influence of three date of sowings *viz*., D_1, D_2 and D_3 and two growth regulators and four micronutrient sprays were studied for crossed seed quality parameters. The crossed seeds obtained from D_1 staggered sowing gave higher and crossed seed index, germination percentage, root length, shoot length, seedling vigour index and seedling dry weight as compared to those crossed seeds obtained from D_2 and D_3. The lihocin @ 100 ppm sprayed at 45 DAS recorded maximum crossed seed index, germination percentage, root length, shoot length, seedling vigour index, and seedling dry weight followed by NAA 10 ppm sprayed at 90 DAS. However, the germination percentage in all treatment combinations recorded above mean seed certification standards (75%). Hence, the crossed seeds obtained from all the eighteen treatment combination in NHH-44 Bt. Cotton hybrid seed production can be used as seed for commercial sowing. Among the interactions, the D_1 date of parents in the combination of lihocin recorded higher crossed seed index (9.02), germination (82.63%), seedling vigour index (2907) compare to other combinations.

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The major barrier in hybrid seed production is perfect synchronization of flowering between female and male in order to get higher crossed seed yield with better quality due to less insect damage, the square and flower dropping is less flower setting, locule damage are less and hence there is increase in number of retention of squares/flowers in Bt version of female parent (BN1) of NHH-44 hybrid cotton. Therefore, the already standardized staggered planting may also be expected to change. Due to less insect damage, retention of good opened bolls is also more. Hence, there is a need to supplement the plant proper micronutrients and growth regulators to retain the crossed bolls on the plant for final harvest so that crossed seed yield can be increased with high quality. So, in order to ascertain the quality of hybrid seed (NHH-44 Bt cotton) produced at different date of sowing of parent, micronutrient, growth regulator spray, the present experiment was planned.

Correspondence to:
BASAVARAJ S. LAKKUNDI, Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

Authors' affiliations:
MOHAN R. DANDAGI AND M.R. ESHANNA, Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

SANGAMESH S. HAKKALAPPANAVAR, Department of Entomology, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

SATISH ADIGER, Department of Genetics and Plant Breeding, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

MATERIALS AND METHODS

An experiment on inter hirsutum (BN1 x AC-738) Bt cotton hybrid (NHH-44) seed production was laid out at ARS, Dharwad during *Kharif* 2009 in factorial randomized complete block design. The 1st factor consists of three date of sowing of parents *viz*., D_1, D_2 and D3. The second factor consisted of two growth regulators *viz*., NAA (10 ppm), lihocin (100 ppm) and four micronutrients *viz*., $MgSO_4$ (1%), boron (1%), boron (2 ml/l), veagro (1 ml/l) were used for foliar application to the female parent.

The picked crossed kapas from each treatment combinations were separately cleaned, ginned and the crossed seeds were collected. The observation on crossed

seed index, germination percentage, root length, shoot length, seedling dry weight, seedling vigour index recorded for each treatment and statistical analysis of the data was done by analysis of variance technique.

RESULTS AND DISCUSSION

The seed quality parameters of crossed seeds obtained from different date of sowing of parents and micronutrients and growth regulator sprays varied significantly (Table 1 and 2).

Among the date of sowing of parents, D_1 recorded significantly higher crossed seed index (8.82 g) followed by D_2 (8.74 g) which are at par with each other this is due to the fact that in the D_1 date of sowing of parents, the boll load per plant in female parent was low, because of less number of bolls sufficient account of

Table 1 : Effect of staggered sowing of male parent and chemicals spray on Seed index (g) in NHH-44 Bt. cotton hybrid seed production

Treatments	Crossed seed index (g)						
	T_1 (NAA 10 ppm)	T_2 (Lihocin 100 ppm)	T_3 ($MgSO_4$ 0.1 %)	T_4 (Boron 1%)	T_5 (Boom 2 ml per litre)	T_6 (Viagro 1 ml per litre)	Mean
D_1 – Simultaneous sowing of both the parents	8.88	9.02	8.83	8.75	8.70	8.74	8.82
D_2 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sowing 7 days after first male sowing	8.90	8.88	8.75	8.83	8.50	8.57	8.74
D_3 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sown 10 days after first male sowing	8.74	8.70	8.67	8.61	8.48	8.44	8.61
Mean	8.84	8.87	8.75	8.73	8.56	8.58	8.72
For comparing means of		S.E.±				C.D. (P=0.05)	
Staggered sowing (D)		0.08				0.20	
Chemicals spray (T)		0.12				0.30	
DxT*		0.24				0.72	

NS=Non-significant * Interaction effect Date of sowing of parents (D)

Table 2 : Effect of staggered sowing of male parent and chemicals spray on seed germination percentage in NHH-44 Bt. cotton hybrid seed production

Treatments	Seed germination (g)						
	T_1 (NAA 10 ppm)	T_2 (Lihocin 100 ppm)	T_3 ($MgSO_4$ 0.1 %)	T_4 (Boron 1%)	T_5 (Boom 2 ml per litre)	T_6 (Viagro 1 ml per litre)	Mean
D_1 – Simultaneous sowing of both the parents	81.13 (64.22)	82.63 (65.34)	80.67 (63.89)	80.40 (63.69)	80.39 (63.68)	80.34 (63.65)	80.93 (64.08)
D_2 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sowing 7 days after first male sowing	81.30 (64.35)	81.26 (64.32)	80.40 (63.70)	80.45 (63.73)	79.17 (62.82)	80.00 (63.41)	80.43 (63.72)
D_3 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sown 10 days after first male sowing	80.40 (63.70)	80.39 (63.69)	80.33 (63.65)	80.27 (63.60)	79.40 (62.99)	79.00 (62.70)	79.97 (63.39)
Mean	80.94 (64.09)	81.43 (64.45)	80.47 (63.75)	80.37 (63.68)	79.65 (63.16)	79.78 (63.25)	80.44 (63.73)
For comparing means of		S.E.±				C.D. (P=0.05)	
Staggered sowing (D)		0.58				1.74	
Chemicals spray (T)		0.82				2.46	
DxT*		1.42				4.26	

NS=Non-significant * Interaction effect Date of sowing of parents (D)

photosynthates may be translocated to individual seed development and thus resulting in increased crossed seed index. The seed index was significantly higher (8.87 g) in lihocin spray followed by NAA (8.84 g) (Table 1). This is due to the variation observed in the development of individual seed within the bolls, further at was recorded that whenever the number of bolls retained per plant was more, that has produced lesser seed index. This is due to the variation in translocation of limited source because of competation among the bolls within the plant and also competation among the seeds within the boll for the photosynthates and consequently caused the variation in seed index. These are in accordance with the findings obtained in other hybrids DHH-543 and DHB-290. In the interaction effect of date of sowing of parents and chemical sprays, D_1T_2 recorded significantly higher crossed seed index (9.02 g) and lowest crossed seed index was in D_3T_6 (8.44 g). The significantly highest germination

Table 3 : Effect of staggered sowing of male parent and chemicals spray on root length (cm) in NHH-44 Bt. cotton hybrid seed production

Treatments	Root length (cm)						
	T_1 (NAA 10 ppm)	T_2 (Lihocin 100 ppm)	T_3 ($MgSO_4$ 0.1 %)	T_4 (Boron 1%)	T_5 (Boom 2 ml per litre)	T_6 (Viagro 1 ml per litre)	Mean
D_1 – Simultaneous sowing of both the parents	19.15	19.64	18.87	18.57	17.5	18.44	18.69
D_2 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sowing 7 days after first male sowing	19.27	19.03	18.64	18.87	15.66	16.45	17.99
D_3 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sown 10 days after first male sowing	17.60	17.50	17.19	17.15	15.30	15.23	16.66
Mean	18.67	18.72	18.23	18.20	16.15	16.70	17.78
For comparing means of		S.E.±				C.D. (P=0.05)	
Staggered sowing (D)		0.23				0.72	
Chemicals spray (T)		0.33				0.18	
DxT*		0.57				1.71	

NS=Non-significant * Interaction effect Date of sowing of parents (D)

Table 4 : Effect of staggered sowing of male parent and chemicals spray on shoot length (cm) in NHH-44 Bt. cotton hybrid seed production

Treatments	Shoot length (cm)						
	T_1 (NAA 10 ppm)	T_2 (Lihocin 100 ppm)	T_3 ($MgSO_4$ 0.1 %)	T_4 (Boron 1%)	T_5 (Boom 2 ml per litre)	T_6 (Viagro 1 ml per litre)	Mean
D_1 – Simultaneous sowing of both the parents	14.34	15.54	14.25	14.15	13.85	13.90	14.33
D_2 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sowing 7 days after first male sowing	14.87	14.34	14.15	14.25	13.54	13.74	14.15
D_3 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sown 10 days after first male sowing	13.90	13.85	13.77	13.75	12.89	11.88	13.34
Mean	14.37	14.58	14.06	14.05	13.43	13.17	13.94
For comparing means of		S.E.±				C.D. (P=0.05)	
Staggered sowing (D)		0.01				0.28	
Chemicals spray (T)		0.14				0.4	
DxT*		0.24				0.72	

NS=Non-significant * Interaction effect Date of sowing of parents (D)

percentage observed in the seeds of D_1 (80.93) and the lowest was in D_3 (79.97%). The lihocin spray recorded significantly highest germination (81.43%) and the lowest was observed in boron spray. The significantly highest seed germination was observed in the treatment combination D_1T_2 (82.63%) followed by D_2T_1 (81.30%) (Table 2). The significant variation in germination is because of variation in the crossed seed index. Increase in crossed seed index has supplied adequate metabolic activity at the time of germination to resume embryo growth. The seed quality parameters like root length (18.69cm), shoot length (14.33 cm), seedling vigour index (2674) were significantly higher in D_1 followed by D_2 (17.99 cm, 14.15 cm, 2586 and 65.93 mg, respectively). The lihocin spray recorded significantly highest root length (18.72 cm), shoot length (14.58 cm) and seedling vigour index (2713) followed by NAA spray (18.67 cm, 14.37 cm and 2675, respectively) (Table 3-5). The higher

Table 5 : Effect of staggered sowing of male parent and chemicals spray on seedling vigour index in NHH-44 Bt. Cotton hybrid seed production

Treatments	Seedling vigour index						
	T_1 (NAA 10 ppm)	T_2 (Lihocin 100 ppm)	T_3 ($MgSO_4$ 0.1 %)	T_4 (Boron 1%)	T_5 (Boom 2 ml per litre)	T_6 (Viagro 1 ml per litre)	Mean
D_1 – Simultaneous sowing of both the parents	2717	2907	2672	2631	2520	2598	2674
D_2 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sowing 7 days after first male sowing	2776	2712	2636	2665	2312	2415	2586
D_3 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sown 10 days after first male sowing	2533	2520	2487	2481	2239	2142	2400
Mean	2675	2713	2598	2592	2358	2385	2553
For comparing means of		S.E.±				C.D. (P=0.05)	
Staggered sowing (D)		15.19				43.88	
Chemicals spray (T)		21.48				62.05	
DxT*		37.22				107.5	

NS=Non-significant * Interaction effect Date of sowing of parents (D)

Table 6 : Effect of staggered sowing of male parent and chemicals spray on seedling dry weight (mg) in NHH-44 Bt. cotton hybrid seed production

Treatments	Seedling dry weight (mg)						
	T_1 (NAA 10 ppm)	T_2 (Lihocin 100 ppm)	T_3 ($MgSO_4$ 0.1 %)	T_4 (Boron 1%)	T_5 (Boom 2 ml per litre)	T_6 (Viagro 1 ml per litre)	Mean
D_1 – Simultaneous sowing of both the parents	67.02	67.57	66.55	65.94	65.35	65.55	66.33
D_2 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sowing 7 days after first male sowing	67.40	66.69	65.94	66.45	64.35	64.72	65.93
D_3 – 100% female sowing + 50 per cent first male sowing, 50% male seeds were sown 10 days after first male sowing	65.43	65.31	65.24	65.20	63.47	62.42	64.51
Mean	66.62	66.52	65.91	65.86	64.39	64.23	65.59
For comparing means of		S.E.±				C.D. (P=0.05)	
Staggered sowing (D)		0.29				0.88	
Chemicals spray (T)		0.41				1.24	
DxT*		0.72				2.16	

NS=Non-significant * Interaction effect Date of sowing of parents (D)

seedling dry weight (66.62 mg) was recorded in NAA spray followed by lihocin spray (66.52 mg). Among the interactions, D_1T_2 (19.64 cm) recorded highest root length followed by D_1T_1 (Table 6). The shoot length was highest in D_1T_2 (15.54 cm) followed by D_2T_1 (14.87 cm). The D_1T_2 (2907) recorded the highest seedling vigour index followed by D_2T_1 (2776). The seedling dry weight was highest in D_1T_2 (67.57 mg) followed by D_2T_1 (67.40 mg). The significant increase in root and shoot length is due to higher seed index which have supplied adequate food reserves to resume embryo growth. The SVI and seedling dry weight were also more due to higher crossed seed weight. A positive correlation between seed weight and seedling dry weight was observed in cotton (Kasul *et al*., 2003). Similar results were also observed in DHH-543 and DHB-290 cotton hybrids (Doddagoudar *et al*., 2006 a and b). From the present study, it is in combination with lihocin concluded that, out of three date of sowing of parents, D_1 is better to produce quality seeds in NHH-44 bt cotton hybrid seed production but all treatments have better vigour index which can be used as seed for commercial sowing.

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