

Effect of Crossing Period on Seed Germination and Seedling Vigour of Cotton Hybrid DHH-543

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ABSTRACT The influence of five crossing period *viz.*, first crossing period to last crossing period (C_1 - C_5) each with fifteen days interval were studied for seed quality parameters. The seeds obtained from the bolls set at first three crossing periods (C_1 , C_2 , C_3) gave higher seed index, germination percentage, shoot length, seedling dry weight and seedling vigour index as compared to those seeds obtained from the later crossed bolls (C_4 and C_5). However, the germination percentage even in fourth and fifth crossing periods recorded above minimum seed certification standards (75%). Hence, the seeds obtained from all the five fortnight crossings periods in DHH-543 intra-hirsutum hybrid seed production can be used as seed for commercial sowing.

Key words: Crossing period, seed index, germination, vigour index

Low quality of lint from later pickings [1] and seeds from bolls set at later crossing periods [2] is well documented in cotton hybrids. Because of high prices of hybrid seed and vast area under cotton cultivation, it is necessary to ensure supply of good quality seed to the cotton growers. Cotton plant is known for its complex fruiting behaviour and indeterminate type of growth which involves production of vegetative branches (monopodia) in the beginning which do not bear flowers, followed by reproductive branches (sympodia) which produce fruiting bodies. As the plant grows in height, it continues to produce new branches, thus bearing more and more fruiting bodies (squares) till maturity. As a result, the reproductive period which normally starts from 50 to 75 days [3] after sowing in most of the cotton varieties extends over a period of two to four months. However, for economic hybrid seed production in DDH-2 desi cotton hybrid, crossing should be restricted to eight to ten weeks [4]. Further, the seeds from bolls set at early (8 to 10 weeks) crossing periods were bold and recorded high germination and seedling vigour

[2] in cotton. So, in order to ascertain the quality of hybrid seed (DHH-543) produced during different periods of crossing, the present experiment was planned.

MATERIALS AND METHODS

An experiment on intra-hirsutum (CPD-621 x CPD-427) cotton hybrid (DHH-543) seed production was laid out at Agricultural Research Station, Dharwad during *kharif*, 2001-02 and 2002-03 in replicated block design. The crossing was carried out for five fortnights after first flowering. The first fortnight crossing period (C_1) included crossing the very first flower of female parent up to 15 days. The flowers that were crossed in next 15 days comprised second fortnight crossing periods (C_2), followed by C_3 , C_4 and C_5 crossing period treatments [1]. For identification of bolls of each crossing period, the buds after pollination were tied with different coloured woollen threads. The picked *kapas* from each crossing periods were separately cleaned, ginned and the seeds were collected. The observations on seed index, germination

percentage, shoot and root length, seedling dry weight and seedling vigour (germination % x root length (cm)+shoot length(cm)) were recorded for each crossing period and Statistical analysis of the data was done by Analysis of Variance Technique [5].

RESULTS AND DISCUSSION

The seed quality parameters of different crossing periods varied significantly in both the years (Table 1). Significantly higher seed index was recorded in the earlier crossing periods (C_1 , C_2 , C_3) than in those bolls set at later stages of crop growth (C_4 and C_5). Maximum seed index recorded in C_2 fortnight crossing period (9.48 and 11.10 g) as compared to C_4 (8.73 and 10.60 g) and C_5 crossing period (8.65 and 10.10 g) respectively for year 2001-02 and 2002-03. The early crossed bolls were generally borne at lower portion of the plant canopy and remained on the plant for longer period of time. The early set bolls reaches

physiological maturity early and food supply will be cut off for the later set bolls resulting in higher seed index in early set bolls [6]. Such reports of higher seed index in early set bolls were reported in DHH-2 [2] and NHH-44 [7]. The germination percentage observed in seeds of C_1 , C_2 and C_3 were better with maximum in C_2 (85.0 and 91.0%) respectively in year 2001-02 and 2002-03 [1]. The C_5 recorded the lowest value (76.0 and 75.0% in year 2001-02 and 2002-3, respectively) but remained above MSCS. These are in accordance with the findings obtained in other hybrid DDH-2 [2], wherein the seeds obtained up to 11th week of crossing, recorded MSCS for germination (>65%). Higher germination and seed weight for early set bolls in hybrid cotton was reported earlier [8]. The quality of seed obtained from the bolls set at the basal position of the plant in cotton was found to be superior [9, 10].

Table 1. Effect of crossing period on seed quality parameters of an intra-hirsutum cotton hybrid DHH-543

Crossing period	Seed index (g)		Germination (%)		Shoot length (cm)		Root length (cm)		Seedling dry weight (mg)		Seedling vigour index	
	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03
C_1	9.43	11.08	84.8 (67.0)	90.5 (72.7)	15.3	15.8	17.3	18.4	69.3	71.5	2740	3075
C_2	9.48	11.10	85.0 (67.4)	91.0 (73.0)	14.9	15.2	17.0	18.3	68.5	71.3	2688	3046
C_3	9.20	10.75	84.3 (66.7)	89.5 (71.3)	14.6	15.2	16.9	18.1	66.3	68.3	2659	2978
C_4	8.73	10.60	79.8 (63.4)	83.0 (65.7)	14.1	14.7	16.8	17.8	64.0	64.0	2459	2695
C_5	8.65	10.10	76.0 (60.7)	75.0 (61.0)	13.0	13.6	16.7	17.8	62.0	62.0	2257	2400
Mean	9.10	10.73	82.0 (65.0)	86.1 (68.7)	14.4	14.9	16.9	18.1	66.0	67.4	2561	2839
S.Em+	0.21	0.18	1.3	2.0	0.3	0.2	0.3	0.4	1.3	1.3	58	68
CD at 5%	0.64	0.56	4.1	6.0	0.9	0.7	NS	NS	4.0	4.0	180	210

Figures in the parentheses indicate angular transformed values.

Significant differences were noticed in shoot length and seedling dry weight but not for root length due to the crossing periods (Table 1). Shoot length of the seedlings raised from the seeds up to third (C_3) fortnight crossing period was significantly higher and were on par with each other (15.3 cm in C_1 to 14.6 cm in C_3 during 2001-02 and 15.8 cm in C_1 to 15.2 cm in C_3 during 2002-03). Later on, there was a significant decline in shoot length and reached to minimum (13.0 and 13.6 cm in 2001-02 and 2002-03, respectively) at fifth (C_5) fortnight crossing period. Though, the root length was not significantly influenced by crossing periods, it decreased numerically from first (C_1) crossing period to the fifth (C_5). Higher shoot and root length in earlier crossed bolls would be attributed to increased seed index. Similar observations were made in other hybrids such as Varalaxmi [11] and DDH-2 [2]. The seedling dry weight also decreased significantly from initial (C_1) to the last (C_5) crossing period. The seeds collected from first (C_1) fortnight crossing period recorded significantly higher (69.3 and 71.5 mg) seedling dry weight compared to the fourth (C_4) (64.0 and 64.0 mg) and fifth (C_5) (62.0 and 62.0 mg) fortnight crossing periods during 2001-02 and 2002-03, respectively. This could be attributed to higher shoot and root length of seedling from the seeds obtained from the early crossed bolls, which has resulted in higher seedling dry weight compared to the later crossed ones, as the later crossed bolls did not get adequate photosynthates [12], thereby developed the seeds with smaller size with less weight [11].

Evaluation of vigour based on germination alone may be incomplete assessment, since the root and shoot length is a measure of synthesis, mobilization and quality. In general, the seedling vigour index decreased from initial C_1 crossing period to the last C_5 in both the years. Significantly higher seedling vigour index was recorded for C_1 crossing period (2740 and 3075) as compared to C_4 (2459 and 2659) and C_5 (2257 and 2400) crossing periods, respectively in year 2001-02 and 2002-03. However, higher seedling vigour index in the seeds obtained from the early crossed bolls

might be due to higher germination percentage and higher shoot and root length. The seeds collected from early period of crossing had higher seedling vigour index than the later period of crossing [13, 2].

The above results conclude that, out of five crossing periods first three are better to produce quality seeds in DHH-543 cotton hybrid seed production but all treatments have better vigour index which can be used as seed for commercial sowing.

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