

Seed Yield and its Attributing Characters as Influenced by Crossing Period in Hybrid Cotton DHB-290

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ABSTRACT The seed yield and its attributing characters, at five different crossing periods each with 15 days interval, in DHB-290 hybrid cotton showed increased number of flowers crossed, crossed bolls picked and seed yield from initial (C_1) crossing period and reached maximum at third (C_3) and fourth (C_4) fortnight crossing periods, respectively. Whereas, the seed yield attributing characters such as, boll setting percentage, boll weight, seed weight per boll and seed index decreased from the initial (C_1) crossing period to the last crossing period (C_5).

Key words: Crossing period, boll setting, seed index and hybrid seed yield.

Seed maturity is an important aspect of determining seed quality in seed production fields. The indeterminate nature of cotton and the extended blooming period, which expose different seeds to various environmental conditions, results in the different seed qualities within the same plants [1]. Seeds from late season bolls are smaller and less vigorous than those seeds from earlier bolls, due to reduced night temperature and other factors [2]. To ensure high seed yield per unit area, most flowers on the female plant are emasculated and pollinated by hand, and the late season squares and flowers are removed leaving only the hybridized bolls. This crossing period usually lasts for 15-16 weeks from the initiation of flowering in the female parent resulting in some variance in maturity and seed quality [3]. However, very little information is available on how hand crossing periods affect hybrid seed yield. The present study was conducted to determine the effect of hand crossing periods on hybrid seed yield.

MATERIALS AND METHODS

A field experiment on DHB-290 hybrid seed production was undertaken at Agricultural Research Station, Dharwad Farm, Dharwad during

2001-02 and 2002-03 in randomised block design with four replications. The spacing of 120 cm x 100 cm for female and 120 cm x 30 cm for male during 2001-02, and 120 cm x 60 cm for female and 120 cm x 30 cm for male during 2002-03 was followed. The crossing was carried out for 12 weeks starting from first flower. The entire duration was divided into five intervals (C_1 - C_5) each with 15 days gap. The first fortnight crossing period (C_1) included the flowers that were crossed from the very first flower on the female parent up to 15 days. The flowers that were crossed in next 15 days comprised second fortnight crossing periods (C_2). Likewise, C_3 , C_4 and C_5 crossing period treatments were made. For the purpose of identification of bolls of each crossing period, after emasculation, the buds were tied with different coloured woollen threads. The kapas from each crossing periods were kept separately and seeds were collected. The observations on number of flowers crossed, number of crossed bolls per plant, boll setting percentage, boll weight, seed weight per boll, seed index and hybrid seed yield per ha were recorded for each crossing period. Statistical analysis of the data was done following Fisher's Analysis of Variance Technique [4].

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RESULTS AND DISCUSSION

Significant differences in number of flowers and crossed bolls per plant were observed due to crossing period (Table 1). Significantly higher number of crossed flowers (37.8 and 43.8) and bolls (12.2 and 13.8) were recorded during fourth (C_4) and third (C_3) fortnight crossing periods, respectively during 2001-02 and 2002-03 compared to first (C_1) fortnight and second (C_2) crossing periods (5.0 and 6.8) for number of flowers crossed and (2.2 and 3.0) for number of crossed bolls per plant. Less number of flowers were crossed in first (C_1) and it reached maximum during fourth (C_4) in 2001-02 and third fortnight (C_3) in 2002-03, and then decreased thereafter. Thus, the flowering pattern in cotton as reported earlier was in the form of normal curve [5]. Few flowers were observed during the first two weeks from first flower initiation and subsequently number of flowers reached maximum during the month of January and decreased thereafter [6]. Higher number of crossed bolls per plant in third and fourth fortnight (C_3 and C_4) might be due to more number of available flowers crossed in those periods [6].

The boll setting was significantly higher (43.0 and 44.1%) in the beginning of crossing period (C_1) and decreased as the crossing period progressed and reached minimum (24.3 and 23.6%) during the last fortnight (C_5), indicating greater boll shedding and other floral parts due to either physiological or insect infestation [7]. In cotton, physiological losses accounts for 64 to 70 per cent of the total shedding of bolls and the rest is attributed to boll worm attack [8]. The presence of mature fruits on the plant effectively limited further fruit set [9]. The decrease in fruit set with time could be overcome by removal of the fruits which have already been set [10]. In cotton also, when early formed bolls are lost due to insect injury or other causes, the later formed flowers in the upper parts of the plants have greater survival [6]. Similar observations of decrease in boll setting with the advancement of blooming period was observed [11].

Similarly, the boll weight, seed weight per boll and seed index decreased from the early set bolls as compared to those set at later stages of crossing periods. Significantly higher boll weight (3.48 and 4.28 g) and seed weight (2.20 and 2.68 g) per boll

Table 1. Effects of crossing period on hybrid seed yield and its attributing characters in cotton hybrid DHB-290

Crossing period	No. of flowers crossed per plant		No. of crossed bolls per plant		Boll setting (%)		Boll weight (g)		Seed weight (g) per boll		Seed index (g)		Hybrid seed yield (kg/ha)	
	2001-02	02-03	2001-02	02-03	2001-02	02-03	2001-02	02-03	2001-02	02-03	2001-02	02-03	2001-02	02-03
C_1	5.0 (4.5)	6.8 (5.4)	2.2 (6.1)	3.0 (7.6)	43.0	44.1	3.48	4.28	2.20	2.68	9.28	10.95	39.1 (7.0)	107.6 (8.1)
C_2	15.8 (14.4)	21.0 (16.6)	5.8 (16.2)	7.7 (90.5)	36.4	36.8	3.35	4.05	2.10	2.65	9.30	10.98	98.3 (17.5)	276.1 (20.8)
C_3	26.3 (23.9)	43.8 (34.7)	9.6 (26.8)	13.8 (34.9)	36.4	31.5	3.10	3.93	2.00	2.53	8.93	10.48	155.0 (27.6)	465.5 (35.1)
C_4	37.8 (34.4)	35.0 (27.7)	12.2 (34.1)	10.4 (26.3)	32.3	29.8	2.83	3.65	1.83	2.35	8.43	10.15	180.3 (32.1)	333.3 (25.2)
C_5	25.3 (23.0)	19.8 (15.7)	6.2 (17.3)	4.7 (11.9)	24.3	23.6	2.68	3.55	1.78	2.33	8.33	10.13	88.3 (15.7)	145.1 (11.0)
Total/mean	110.0	126.3	35.8	39.5	34.5	33.2	3.10	3.90	2.00	2.50	8.85	10.54	561	1325.1
S.Em. \pm	1.6	1.8	0.5	0.6	2.2	2.1	0.14	0.13	0.08	0.08	0.24	0.19	9.7	24.9
C.D. at 5%	5.1	5.5	1.7	1.9	6.9	6.3	0.43	0.40	0.23	0.25	0.75	0.58	30.0	76.9

Figures in parentheses indicate percentage of total value

recorded by first (C_1) fortnight crossing period compared to the last (C_5) fortnight crossing period which recorded 2.68 and 3.55 g boll weight and 1.78 and 2.33 g seed weight per boll during 2001-02 and 2002-03, respectively. Whereas, the C_2 crossing period recorded significantly higher (9.30 and 10.98 g) seed index followed by C_1 (9.28 and 10.95 g) during 2001-02 and 2002-03, respectively. The earlier crossed bolls (C_1) are generally present at the lower portion of plant canopy, slowly, absorb more nutrients and minerals and develop seeds with higher test weights [12], thereby the seed index will be higher. The first fruiting produced the largest bolls [13] with higher seed weight [14] and smaller bolls were produced on secondary and tertiary branches. The seed index was significantly higher in the early weeks of crossing period [15] and decreased in the boll set at later stages of crop growth.

The hybrid seed yield varied significantly due to crossing period. Significantly higher seed yield per ha (180.3 and 465.6 kg) was recorded by fourth (C_4) and third (C_3) fortnight crossing periods, respectively compared to the first (C_1) fortnight crossing period (39.1 and 107.6 kg). This was attributed to more number of bolls picked at those particular crossing periods. Similarly, higher seed yield was obtained from the flower that were crossed from the middle of the crossing period [15].

From the above, it can be concluded that for hybrid seed production in cotton DHB-290 crossing work can be taken up for a total period of 60-65 days and the intensity of crossing be increased in the 3rd and 4th fortnight in order to get higher seed yield.

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