Role of Reciprocal Crosses in Sugarcane Breeding

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ABSTRACT

Various leaf and stalk characters were compared in seven sets of reciprocal crosses of sugarcane. Cane length (CL), length of five internode (LI) were found much variable and differed in five sets of crosses, whereas stalk volume (SV), stalk density (SD) differed in three sets of crosses. Stalk diameter and number of millable cane were also differed in two sets of crosses. The significant differences in number of millable cane, cane length and diameter also affected cane volume significantly. Difference between reciprocal crosses was common indicating the contribution of maternal effect. This result suggested that to obtain maximum variability and better combination of characters, reciprocal crosses should be included in the breeding programme as an extra source of variability.

Key words : Reciprocal cross , maximum variability, sugarcane.

INTRODUCTION

In sugarcane breeding it is always desirable to know how a cross would be predictable, which facilitates the process of selection. Though it is very difficult to predict which cross will give the most productive result, this dose not imply that all crosses have the same probability of producing a new variety. The important yield contributing characters like, number of cane, cane diameter and length have been reported as the direct cane yield determing attributes, while cane volume has been find out using all these attributes (Sharma and Singh, 1984; Sundarson *et al.* 1979; Sharma and Katyar, 1988). The present study was undertaken with a view to establish the relationship of cane volume with cane weight in seedling population of sugarcane to screen out the superior genotype.

MATERIALS AND METHODS

Materials used in this study as parent for 14 intervarietal crosses were obtained from the Germplasm Bank of BSRI, Ishurdi, Pabna. The crosses were as follows :

Number	Identity	Cross
1	CP 44-154 x I 95-78	4 x 5
2	I 95-78 x CP 44-154	5 x 4
3	CP 44-154 x CI 85-80	4 x 10
4	CI 85-80 x CP 44-154	10 x 4
5	CP 44 - 154 x I 327 - 86	4 x 11
6	I 327 - 86 x CP 44-154	11 x 4
7	I 95-78 x CI 85-80	5 x 10
8	CI 85 -80 x I 95-78	10 x 5
9	I 95-78 x I 327 - 86	5 x 11
10	I 327 - 86 x I 95-78	11 x 5
11	CI 85 - 80 x I 327 - 86	10 x 11
12	I 327 - 86 x CI 85 - 80	11 x 10
13	MY 54 - 29 x Isd 16	8 x 12
14	Isd 16 x MY 54 - 29	12 x 8

In the text the crosses will be referred as 4 x 10, 10 x 4 ..... 12 x 8 . The experiment was laid out in a randomized complete block design, in the experimental farm of BSRI. Necessary intercultural operations were done as and when necessary. Thirty seedlings were randomly selected for the observations of tillers / clump (TC), number of millable cane (NMC), single stalk weight (SSW), cane length (CL), cane diameter (CD), number of internode (NI), length of five internode (LI), stalk volume (SV), stalk density (SD), leaf number (LN), leaf area (LA) and yield per clump (YPC). Cane volume was calculated as $SV = \pi (D/2) L$ (James, 1971).

RESULTS AND DISCUSSION

The components of variation like standard deviation (SD), coefficient of variation (CV) and "t" values were estimated in 7 sets of crosses (Table 1). In first set (4 x 5) and reciprocal crosses differed significantly for the characters viz., cane length, cane diameter, tiller per clump and length of five internodes.

In 2nd set (4 x 10) and reciprocal, the "t" value was significant for the characters viz. length of five internodes, leaf area, number of internode and cane length.

For 3rd set (4 x 11) and reciprocal, the crosses differed significantly for the characters viz. tiller per clump, cane diameter, length of five internode, number of millable cane per clump and leaf area.

In 4th set (5 x 10) and reciprocal, crosses differed significantly for the characters viz. stalk density, stalk volume, cane length, cane diameter and length of five internodes.

For 5th set (5 x 11) and the reciprocal, crosses significantly differed for the characters viz. stalk density, stalk volume, cane length, yield per clump and single stalk weight.

In case of 6th set (10 x 11) and reciprocal crosses only leaf area was significantly different. In 7th (8 x 12) and reciprocal crosses differences were significant for stalk density, stalk volume, leaf number, length of five internodes, cane length, tiller per clump, number of millable cane per clump, yield per clump and number of internode.

Seven pairs of reciprocal crosses were compared for12 different characters, five sets differed for four/five characters, whereas for one cross as many as nine characters differed significantly. Thus, difference between reciprocal crosses was common indicating the contribution of maternal effect or complex genetic background of parents were involved. Since the modern noble cane varieties are complex hybrids, the F_1 progeny are likely to be very variable. Reciprocal differences in crosses of sugarcane was reported (Brown, 1967; Natarajan *et al.* 967; Hogarth, 1980; Reddy and Reddi, 1986). Selection of seedling from different crosses should be made on the basis of number of millable cane, cane length, cane diameter, whereas cane volume is a better criteria for selection at early stage of selection (Sharma and Katyar,1988).

Table 1. Mean, standard deviation and 't' values for different characters between the reciprocal crosses of sugarcane.

Crosses	Components	TC	NMC	SSW	YPC	CL	CD	NI	LI	SV	SD	LN	LA
4 x 5	x	6.37	4.63	0.70	2.85	207.60	1.99	18.37	51.27	646.20	1.09	8.13	201.11
5 x 4		9.03	4.70	0.65	3.00	232.18	1.87	18.27	58.43	648.60	1.04	8.03	230.70
	Pooled SD	3.31	1.84	0.18	1.10	21.06	0.17	0.22	6.73	124.20	0.36	1.44	64.11
	t	3.12**	0.14	0.91	0.53	4.51**	2.80**	0.17	4.13**	0.08	0.46	0.27	1.79
4 x 10	x	6.70	4.03	0.69	2.64	214.53	2.02	19.17	48.37	692.86	1.03	8.00	197.34
10 x 4		6.97	4.23	0.63	2.60	225.03	1.97	17.9	63.93	684.73	0.94	7.57	247.09
	Pooled SD	2.25	1.43	0.16	0.96	19.34	0.20	2.38	6.28	140.61	0.30	1.20	58.57
	t	0.46	0.54	1.39	0.17	2.04*	1.01	2.06*	9.60**	0.22	1.12	1.40	3.29**
4 x 11	x	5.40	4.03	0.67	2.68	199.30	2.10	16.90	51.07	701.03	1.03	7.50	242.57
11 x 4		8.83	5.17	0.65	3.15	213.50	1.92	16.87	54.47	621.80	1.07	8.17	282.23
	Pooled SD	2.43	1.53	0.20	1.19	27.54	0.19	2.36	7.06	160.90	0.43	1.44	73.15
	t	5.47**	2.88**	0.28	1.52	2.00	3.70**	0.50	3.51**	1.91	0.39	1.80	2.10*
5 x 10	x	8.50	4.90	0.75	3.63	186.13	1.85	16.07	55.99	517.20	1.51	7.97	310.80
10 x 5		9.23	4.47	0.75	3.28	213.20	1.96	17.23	55.23	644.80	1.18	7.83	303.60
	Pooled SD	3.31	1.73	0.16	1.31	28.05	0.17	1.81	7.67	118.60	0.38	1.38	77.80
	t	0.86	0.97	0.02	1.04	3.74**	2.55*	2.50*	0.35	4.20**	3.43**	0.37	0.36
5 x 11	x	8.43	4.37	0.56	2.42	242.19	1.94	16.43	55.80	710.54	0.80	8.07	239.80
11 x 5		9.60	4.63	0.71	3.26	213.63	1.87	17.10	58.40	596.90	1.27	8.53	243.40
	Pooled SD	4.38	1.76	0.13	1.22	22.11	0.19	1.77	5.28	144.01	0.28	1.23	41.31
	t	1.03	0.59	4.70**	2.67**	4.95**	1.51	1.46	1.88	3.30**	6.39**	1.47	0.34
10 x 11	x	7.97	4.77	0.66	3.05	209.53	1.87	16.53	58.00	588.90	1.21	8.17	240.90
11 x 10		8.13	5.00	0.70	3.37	206.40	1.84	16.10	60.30	550.30	1.32	8.63	216.90
	Pooled SD	3.05	1.90	0.17	1.25	20.92	0.19	2.18	5.60	126.70	0.43	1.31	40.70
	t	0.21	0.48	0.96	0.98	0.58	0.63	0.77	1.54	1.18	0.98	1.38	2.30*
8 x 12	x	9.03	5.17	0.70	3.50	251.80	1.89	17.73	55.27	712.90	1.01	7.57	242.80
12 x 8		5.23	4.03	0.75	2.82	207.30	1.96	19.03	51.07	625.60	1.19	8.73	271.10
	Poolped SD	2.59	1.67	0.22	1.09	17.41	0.18	1.93	4.94	128.0	0.29	1.01	55.80
	t	5.68**	2.65**	0.88	2.42**	9.90**	1.50	2.60**	3.29**	2.64**	2.40**	3.43**	1.96

*,** = Significant at 5% & 1% levels respectively, x = Mean, Pooled SD = Pooled standard deviation and t = test.

Thus, to obtain maximum variability and better combination of characters, reciprocal crosses should be included in the breeding programe as an extra source of variability.

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