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HETEROSIS STUDIES INVOLVING DIVERSE CYTOSTERILES OF SORGHUM

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ABSTRACT

Sixty hybrid combinations were secured by crossing ten females belonging to diverse cytoplasmic sources with a set of six males in a line x tester mating design. heterosis over better parent was studied for days to 50 per cent flowering, plant height, 100 grain weight and grain yield per plant. The crosses ISIII2C A x AKR150 for days to 50 per cent flowering, A2 A x TNS30 for plant height, 111 A x CO26 for more 100 grain weight and ISIII2C A x CS3541 for grain yield were recorded highest heterobeltiosis. The Utilization of A3 cytoplasmic male sterile line ISIII2C A for the production of early maturing and high yielding hybrids in suggested.

Key Words : *Sorghum, Cytosteriles, Heterobeltiosis*

INTRODUCTION

The practical exploitation of hybrid vigour in sorghum was made possible with the help of cytoplasmic genitic male sterile lines. The first commercial hybrid was produced in 1956. Since then number of hybrids were released based on milo cytoplasm only. In recent years cytoplasmic uniformity has been recognised as a potential danger to the stability of crop production. Work on non-milo cytoplasmic genetic male steriles was reported by Borikar et al. (1987). But heterosis studies involving non-milo cytoplasm were rare. The present heterotic study involve both milo and non-milo source of cytoplasmic male sterile lines.

MATERIALS AND METHODS

In the present investigation the cytoplasmic male steriles lines 401 A, 101 A, DMSI A, 111 A, 3660 A and ICSA 26 belonging to A1 cytoplasmic group, A2 A and TAM428 A of A2, IS1112C A of A3 and CSV4 A of G1 source of cytoplasm and 6 pollinators (CO26, CO21, TNS30, CS3541, AKR150, ICSV239) have been crossed in line x tester mating design. A trial consisting of 60 hybrids along with their 16 parents was conducted in RBD with 3 replications during summer 1991, under irrigated condition and the recommended package of practices was followed. The biometrical observations on days to 50 per cent flowering, plant height,, 100 grain weight and grain yield per plant were recorded on five randomly selected

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Table - Expression of Heterobeltiosis (Per Cent)

S.No.	Crosses	Days to 50 per cent flowering	Plant Height	100 grain weight	Grain yield per plant
1.	401 A X CO26	-9.09	2.20	-1.30*	-20.55
2.	401 A X CO21	-8.04	17.46	7.54**	-11.49
3.	401 A X TNS30	-11.17	6.97	-8.06**	53.62
4.	401 A X AKR150	-20.56	24.55	-12.74**	47.22
5.	401 A X CS3541	-6.45	30.50	-14.82**	7.89
6.	401 A X ICSV239	-11.52	21.86	4.81**	14.62
7.	101 A X CO26	-0.47	-22.72	3.13**	-12.59
8.	101 A X CO21	0.47	-3.99	15.15**	-1.52
9.	101 A X TNS30	-2.82	-3.88	0.88	114.30**
10.	101 A X AKR150	-3.23	14.84	18.25**	92.35**
11.	101 A X CS3541	29.58	23.09	9.83**	143.20**
12.	101 A X ICSV239	1.38	12.50	-0.94	77.03*
13.	DMS1 A X CO26	-8.61	2.28	-5.96**	-19.95
14.	DMS1 A X CO21	-6.03	15.72	3.79**	35.09
15.	DM21 A X TNS30	-10.15	7.82	7.05**	71.12
16.	DMS1 A X AKR150	-20.97	12.04	19.38**	47.60
17.	DMS1 A X CS3541	-8.06	10.74	-0.95	122.11**
18.	DMS1 A X ICSV239	-11.52	18.63	-15.18**	87.22**
19.	111 A X CO26	-13.79	30.37	31.91**	-44.49
20.	111 A X C021	-15.71	44.15	23.14**	-13.90
21.	111 A X TNS30	-16.09	35.76	2.34**	87.17*
22.	111 A X AKR150	-6.13	31.88	25.17**	57.82
23.	111 A X CS3541	-18.77	43.66	14.33**	108.67**
24.	111 A X ICSV239	-14.56	46.52	29.54**	80.36*
25.	3660 A X CO26	-7.17	4.54	5.48**	-6.06
26.	3660 A X CO21	-1.00	26.82	6.76**	8.60
27.	3660 A X TNS30	-0.51	9.05	-20.15**	29.62
28.	3660 A X AKR150	-19.25	24.22	2.04**	34.76
29.	3660 A X CS3541	-7.49	34.77	-9.95**	169.48**
30.	3660 A X ICSV239	-14.38	37.53	-1.15*	74.95*
31.	ICS A26 X CO26	-1.91	11.75	31.77**	-3.25
32.	ICS A26 X CO21	2.01	27.63	0.41	-9.03
33.	ICS A26 X TNS30	1.02	19.70	-11.53**	1.28
34.	ICS A26 X AKR150	-16.13	19.75	10.73**	-20.80
35.	ICS A26 X CS3541	-6.19	23.27	25.55**	71.64

S.No.	Crosses	Days to 50 per cent flowering	Plant Height	100 grain weight	Grain yield per plant
36.	ICS A26 X ICSV239	-6.91	27.96	3.30**	-2.03
37.	A2 A X CO26	-9.09	23.69	4.99**	-32.91
38.	A2 A X CO21	-8.54	50.12	-18.60**	7.22
39.	A2 A X TNS30	-5.08	50.36	1.02*	100.89**
40.	A2 A X AKR150	-18.95	46.29	11.63**	38.93
41.	A2 A X CS3541	-1.61	36.77	-8.53**	7.86
42.	A2 A X ICSV239	-11.06	50.98	-5.28**	-29.74
43.	TAM428 A X CO26	-4.21	12.78	7.69**	9.98
44.	TAM428 A X C021	-0.50	7.59	16.39**	33.30
45.	TAM428 A X TNS30	-7.61	9.08	8.61**	106.64**
46.	TAM428 A X AKR150	-16.94	35.67	-0.15	31.04
47.	TAM428 A X CS3541	-4.74	26.23	9.21**	170.75**
48.	TAM428 A X ICSV239	-11.06	30.05	9.06**	136.88**
49.	IS1112C A X CO26	-8.61	-3.94	23.58**	38.46
50.	IS1112C A X CO21	-12.06	5.95	10.98**	58.42
51.	IS1112C A X TNS30	-16.75	-2.14	12.47**	148.65**
52.	IS1112C A X AKR150	-24.60	14.62	18.83**	71.76
53.	IS1112C A X CS3541	-9.14	12.40	8.81**	224.87**
54.	IS1112C A X ICSV239	-12.90	27.60	14.09**	157.46**
55.	CSV4 A X CO26	-8.61	-3.75	6.13**	29.23
56.	CSV4 A X CO21	-4.52	4.07	6.06**	60.69
57.	CSV4 A X TNS30	-7.11	-0.57	6.86**	115.76**
58.	CSV4 A X AKR150	-15.72	15.45	17.88**	52.00
59.	CSV4 A X CS3541	-7.11	8.01	11.77**	130.97**
60.	CSV4 A X ICSV239	-9.22	14.99	17.17**	107.93**
	S.E.	0.41	1.53	0.00	0.26
	C.D. (P=0.05)	0.41	1.53	0.00	0.26
	C.D. (P=0.01)	1.51	5.66	0.02	0.95

plants from each variant per replication. In the case of A2, A3 and Gl cytoplasmic hybrids estimated yield (g) was taken as grain yield per plant except A2 A x CO21 and TAM428 A x CO21. The estimated yield was necessitated since seed set on these hybrids were not 100 per cent. Heterosis over better parent (Heterobeltiosis) was calculated following the formula of Fonesca and Patterson (1968). Significance of heterosis was ascertained by the critical different at one per cent and five per cent levels.

RESULTS AND DISCUSSION

The expression of heterobeltiosis are presented in Table-1. Most of the hybrids exhibited negative heterobeltiosis for days to 50 per cent flowering (55 crosses) and positive heterobeltiosis for plant height (53 crosses), 100 grain weight (44 crosses) and grain yield per plant (46 crosses). This shows the possibilities of exploitation of earliness, plant height, more grain weight and higher grain yield because most of the crosses exhibited high level of heterobeltiosis.

The maximum negative heterobeltiosis was recorded by the cross IS1112C A x AKR 150 (-24.60 per cent) for days to 50 per cent flowering. It also exhibited positive heterobeltiosis for plant height, 100 grain weight and grain yield. So it can be considered as a best early maturing hybrid. The cross A2 A x TNS30 showed significant positive heterobeltionsis (50.36 per cent) for plant height, negative heterobeltiosis for days to 50 per cent flowering and positive heterobeltiosis for 100 grain weight and grain yield. The cross 111 A x CO26 exhibited highest significant positive heterobeltiosis (31.91 per cent) for 100 grain weight, positive heterobeltiosis for plant height and negative heterobeltiosis for days to 50 per cent flowering. Similarly the cross IS1112C A x CS3541 recorded highest significant positive heterobeltiosis (224.87 per cent) for grain yield and also this hybrid has desirable characters like plant height, 100 grain weight (positive heterobeltiosis) and early maturing nature (negative heterobeltiosis for days to 50 per cent flowering)

Kishan and Borkar (1988) have also observed heterosis for grain yield in A2 cytoplasmic hybrids. It is interesting to note that the female parent IS1112C A showed positive heterobeltiosis for grain yield with the male parent CS3541 and also it showed negative heterobeltiosis for days to 50 per cent flowering with the male parent AKR150. So the female parent IS111SC A can be further utilized in the hybrid programme for developing early maturing and high yielding hybrids, if suitable restorers were identified.

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