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Short Communication

Heterosis studies for yield and its components in *rabi* sorghum [*Sorghum bicolor* (L.) Moench.]

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Thirty two hybrids of *rabi* sorghum [*Sorghum bicolor* (L.) Moench.] resulting from 8 lines (local germplasm and derived lines) and 4 testers (three released varieties and a promising variety) along with their 12 parents were evaluated in a randomized block design with two replications during rabi 2001-02 at the National Research Centre for Sorghum, Rajendranagar, Hyderabad. Each entry was grown in two rows of 4m in length. The spacing was 60 cm between rows and 15 cm between plants. Observations were recorded on five randomly selected plants for plant height, head weight, number of primaries per panicle, 100 seed weight and grain yield per plant. Heterosis was estimated over the mid-parent and better parent as per the standard procedures. The analysis of variance revealed significant differences among parents and F_1 hybrids for all the characters. The estimates of heterosis of F1s over the mid-parent and better-parent for all the characters studied are presented in Table 1.

For plant height the heterosis ranged from –43.1 to 37.19 per cent over mid-parent and –47.47 to 26.85 per cent over better parent. Significant heterosis over mid-parent was observed in one hybrid i.e. E36-1 × SPV1155 (37.19%), whereas none of the hybrids exhibited significant heterosis over better-parent. E36-1 × SPVII55 showed highest positive non-significant heterosis over better parent (26.85%). Positive heterosis for plant height in sorghum has been reported earlier (1-3).

Six hybrids showed significant positive heterosis for head weight over mid-parent while 4 hybrids over better-parent. The cross E36-1 × CSV 14R recorded highest significant positive heterosis over both the better-parent (67.44%) and mid-parent (49.11%). These results are in agreement with the earlier findings (1, 4, 5, and 6).

The number of primaries per panicle exhibited heterosis in the range of –18.15 to 42.51 per cent over mid-parent and –29.76 to 33.33 per cent over better-parent. The cross (IS23399 × NRI349)-2-2-4-1 × SPV 1155 exhibited highest heterosis both over midparent (42.51%) and better-parent (33.33%). Out of 32 crosses, 11 crosses showed significant positive heterosis over mid-parent and 4 crosses over better-parent. These observations are supported by results of earlier studies (4-5).

For 100 seed weight heterosis ranged from –16.54 to 37.80 per cent over mid-parent and –18.23 to 33.43 per cent over better-parent. Significant heterosis over midparent was observed in 25 hybrids where as 20 hybrids exhibited significant heterosis over the better parent. The cross RSLG 241 × SPV1155 showed maximum heterosis of 37.80% and 33.33% over mid-parent and better parent respectively. These results were in accordance with the earlier findings (3, 4, and 7) for seed weight.

The heterosis over mid-parent and better-parent for grain yield ranged from –16.10 to 118.95 per cent and –21.1 to 98.17 per cent respectively. Significant heterosis over mid-parent and better-parent was observed for 24 and 14 hybrids respectively. The cross E36-1 × CSV14R exhibited highest heterosis of 118.95% over mid-parent and high heterosis of 85.71 % over better-parent while the cross RSLG227 × CSV8R showed highest heterosis over better-parent (98.17%) and also recorded high heterosis over mid-parent (100%). The results are in conformity with the earlier reports (5, 6, and 8) for grain yield. Grain yield being a complex character depends on large number of yield contributing characters. It was observed that ear head weight is one of the most important components of yield with significantly desirable response for heterosis and was exhibiting significant positive heterosis for four crosses among five best crosses along with high heterosis for grain yield per plant.

From the results, an appreciable amount of heterosis and heterobeltiosis was evident for certain characters. This indicates the amount of genetic diversity of the parents involved in the crosses in determining the heterotic effect. The very low and

Table 1. Per cent heterosis in rabi sorghum over mid parent (MP) and over better parent (BP)

Crosses	Plant height (cm)		Head weight (g)		No. of primaries panicle-1		100 seed wt. (g)		Grain yield (g)	
	MP	BP	MP	BP	MP	BP	MP	BP	MP	BP
RSLG 227 × CSV 8R	4.71	0.24	13.21	−3.23	13.81*	8.80	7.06**	−4.05**	100.00**	98.17**
× CSV 14R	−2.90	−5.00	22.73	22.73	2.46	−3.85	21.26**	9.54**	41.18**	21.10
× CSV 216R	−1.19	−9.49	10.23	−11.82	−16.31*	−29.76**	3.07**	−0.88*	69.23**	58.40**
× SPV 1155	10.69	3.33	−1.40	−8.44	20.33**	12.12	26.33**	24.00**	−16.10	−21.10
RSLG 241 × CSV 8R	1.93	−4.94	25.53	12.37	4.44	−2.76	35.85**	27.59**	82.05**	67.72**
× CSV 14R	−0.34	−0.90	2.51	−2.72	−12.73*	−17.24*	4.22**	−1.29**	55.12**	25.20*
× CSV 216R	−4.10	−9.88	−30.25*	−41.82**	−17.57**	−23.21**	17.20**	15.85**	15.08	14.17
× SPV 1155	−10.12	−18.20	43.52**	40.26**	3.25	−1.38	37.80**	33.43**	92.83**	69.29**
RSLG 262 × CSV 8R	−4.12	−10.20	−20.51	−24.02	0.00	−8.05	6.81**	1.27**	23.69*	8.45
× CSV 14R	−1.48	−1.59	13.10	−6.86	0.36	−6.04	18.60**	13.40**	57.27**	21.83
× CSV 216R	−4.33	−10.47	41.51**	36.36*	−14.20*	−19.05*	29.87**	27.12**	24.34*	16.90
× SPV 1155	0.99	−7.71	12.85	−0.98	−18.15**	−22.82**	25.18**	20.06**	37.82**	15.49
RSLG 383 × CSV 8R	−43.10**	−47.47**	8.84	−13.98	10.04	9.60	−10.03**	−11.39**	24.35*	12.15
× CSV 14R	−8.38	−9.89	27.50*	15.91	1.57	−0.77	−2.20**	−2.84**	70.73**	62.79**
× CSV 216R	−8.43	−13.04	−8.54	−31.82*	−11.64	−23.21**	8.03**	1.83**	9.95	−7.20
× SPV 1155	3.17	−7.03	22.90	4.55	2.34	−0.76	8.47**	0.26	38.46**	31.25**
RSP-1 × CSV 8R	0.98	−4.62	20.99	5.38	18.75**	16.03*	15.76**	7.85**	18.92	14.78
× CSV 14R	1.49	0.68	−8.15	−10.14	−11.11	−11.45	5.08**	−1.29**	6.74	−10.43
× CSV 216R	−3.30	−10.28	19.55	−2.73	31.10**	16.67*	5.88**	5.57**	29.17**	24.00*
× SPV 1155	−6.77	−14.09	18.49	12.34	2.66	2.27	29.13**	26.10**	28.91**	18.26
RSP-3 × CSV 8R	−5.12	−10.57	37.13**	23.12	19.55**	12.77	18.60**	17.00**	92.34**	87.85**
× CSV 14R	−9.49	−10.00	10.71	4.73	16.61*	12.06	6.30**	3.94**	38.89**	22.55
× CSV 216R	−6.70	−13.24	−3.26	−19.09	−2.91	−10.71	−10.60**	−17.98**	16.30	5.60*
× SPV 1155	6.00	−2.53	13.91	11.69	−15.75*	−18.44*	23.94**	11.58**	30.30**	26.47**
(IS 23399 x NR 1349) -2-2-4-1 × CSV 8R	12.73	12.73	24.93	14.52	16.67*	12.00	−8.16**	−8.86**	53.78**	34.03**
× CSV 14R	−8.85	−14.55	11.50	3.23	32.24**	24.62**	1.16**	1.03*	31.53**	1.39
× CSV 216R	−3.48	−15.02	9.33	−6.82	14.49*	−3.57	10.16**	3.08**	19.70*	11.81
× SPV 1155	17.60	14.55	37.86**	37.42*	42.51**	33.33**	21.01**	11.05**	38.33**	15.28
E 36-1 × CSV 8R	−27.77	−34.81*	18.31	12.90	9.92	6.40	−16.54**	−18.23**	47.03**	43.75**
× CSV 14R	−26.40	−37.27*	67.44**	49.11**	13.36*	7.69	0.39	−0.77	118.95**	85.71**
× CSV 216R	12.25	−9.49	−16.71	−26.36	12.98*	−4.17	−2.23**	−7.39**	11.39	5.60
× SPV 1155	37.19*	26.85	−15.17	−18.93	−7.63	−12.88	−13.64**	5.54**	6.73	−0.89

*, **Significant at 5% and 1% levels respectively

mostly negative heterosis for some characters may be due to the presence of large epistatic gene effects or due to the incomplete dominant gene effects. The desirable cross combinations RSLG227 × CSV8R, RSP-3 × CSV8R, E36-1 × CSV14R, RSLG241 × SPVII55 and RSLG 214 × CSV8R showed high magnitude of heterosis over better parent for grain yield along with other yield contributing characters and offers a better scope of commercial exploitation using CGMS system provided the B or R reaction of these lines is understood before initiating conversion of these lines. The heterosis over better parent for grain yield to the extent of 98.2 % offers a good scope for heterosis breeding in this crop. These crosses could be used to produce biparental progenies to get superior segregants, which may be handled through pedigree method of breeding for varietal improvement.

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