Asian J. of Bio Sci. (2007) Vol. 2 No. 2 : (196-198)

Research Note :

Heterosis studies in sorghum

R.B.GHORADE AND DIPALI V. GHIVE*
Dr. Panjabrao Deshmukh, Krishi Vidyapeeth, AKOLA (M.S.) INDIA

(Accepted : August, 2007)

The present investigation entitled "Studies on new male sterile lines and restorers in rabi sorghum" was undertaken to assess the *per se* performance of parents, to estimate the amount of heterosis for yield and yield components, to estimate the combining ability and fertility restoration and to identify heterotic combinations for further study. Significant heterosis has been recorded for yield and yield components in most of the crosses. The hybrid ms-104A x AKR-354 recorded highest heterosis and heterobeltiosis for grain yield and also exhibited significant heterosis except leaf area. For grain yield, the hybrid 104A x AKR-354 was followed by ms-104A x AKR-388-1, ms-104A x AKR-368 and AKRMS-69 x AKR-388-1.

Key words : Sorghum, Hetrosis, Heteroeltiosis, Grain Yield.

To achieve these objectives, five cytoplasmic genetic male sterile lines (females) and 10 testers (males) and their 50 possible crosses were sown during rabi 2004-2005 in randomized block design with three replications. Observations were recorded on five randomly selected plants per genotype per replication for days to 50 per cent flowering, plant height, number of leaves per plant, leaf area, panicle length, panicle breadth, number of whorls per panicle, number of primaries per panicle, panicle weight, number of grains per panicle, grain yield per plant, 1000 seed weight and per cent seed setting.

The statistical analysis was based on genetic model suggested by Kempthorne (1957).

Heterosis :

Heterosis is observed in almost every crop species studied. Often the degree of heterosis is considerably high to permit its commercial exploitation. Heterosis is commercially used in the form of hybrid or synthetic varieties. Therefore, exploitation of hybrid vigour has become the important aspect in crop improvement programme in sorghum. The presence of heterosis in rabi sorghum has been studied and pointed out by many scientists; Shivanna and Patil (1988), Biradar *et al*. (2000), Ghorade *et al*. (1997) .

In the present study, moderate to appreciable amount of heterosis is observed. Crosses exhibiting good amount of heterosis over mid parent and better parent are identified. Some promising hybrids are selected on the basis of *per se* performance for grain yield and presented in Table 1 alongwith heterosis and heterobeltiosis for yield and other component characters.

From the Table 1, it can be depicted that ms-104A x AKR-354 recorded maximum and appreciable amount of significant heterosis for yield and also for the characters plant height days to 50 per cent flowering, number of leaves per plant, panicle length, panicle breadth, number of whorls per panicle, panicle weight, number of grain per panicle, 1000 seed weight and per cent seed setting (fertility restoration). Hence, ms-104A x AKR-354 (CSH-19R) was identified as best heterotic cross combination. The tester (Restorer) involved in this cross showed the highest *per se* performance for yield among all the male parents.

The hybrid ms-104A x AKR-388-1 was ranked at second position. It recorded significant heterosis and heterobeltiosis for grain yield. It also showed significant heterosis for plant height, number of leaves, panicle length, number of whorls, number of primaries, panicle weight, number of grains per panicle and 1000 seed weight.

The cross 'ms-104A x AKR-368 which ranked fifth in *per se* performance for yield was found to be on third position in respect of heterosis and heterobeltiosis for grain yield. It showed the significant heterosis in desirable direction for the traits like plant height, number of leaves per plant, panicle weight, number of grains per panicle and 1000 seed weight. It also recorded desirable heterobeltiosis for panicle weight, number of grains per panicle and 1000 seed weight.

The remaining crosses AKRMS-69 x AKR-388-1, AKRMS-80 x AKR-354, ms-104A x AKR-413, AKRMS-66 x AKR-388-1 and AKRMS-47 x AKR-388-1 ranked third, fourth, eighth, ninth and tenth, positions

* Author for Correspondence

Table : 1 : Significant heterosis (H_1) and heterbeltiosis (H_2) in desirable direction for yield and yield components of selected promising hybrids

S. No.	Hybrids	Per se Performance g/plant	Heterosis (H_1) and Heterobeltiosis (H_2) for yield	Significant Heterosis (H_1) and Heterobeltiosis (H_2) for other characters
1	ms 104 x AKR 354	67.87	H_1 – 49.78**	Days to 50 % flowering (-2.35), Plant height (23.27), Number of leaves (26.32), Panicle length (14.32), Panicle breadth (12.17), Number of whorls per panicle (11.37), Number of primaries per panicle (16.89), Panicle weight (42.44), Number of grains per panicle (13.54), 1000 seed weight (33.11) per cent seed setting (11.44).
			H_2 – 38.43**	Panicle length (12.05), Number of primaries per panicle (1.30), panicle weight (39.18), number of grains per panicle (8.58), 1000 seed weight (29.38), Percent seed setting (11.08).
2	ms 104 A x AKR 388-1	57.91	H_1 – 31.19 **	Plant height (24.63), Number of leaves (28.65), Panicle length (14.56), number of whorls (23.72), number of primaries (17.57), panicle weight (47.23), number of grains (16.89), 1000 seed weight (13.89).
			H_2 – 24.03**	Number of leaves (13.29), panicle length (10.92), number of primaries (3.29), panicle weight (40.61), number of grains (16.20), 1000 seed weight (7.78).
3	AKRMS 69 x AKR 388-1	55.00	H_1 – 16.10 **	Plant height (23.71), number of leaves (10.38), panicle breadth (32.12), number of whorls (33.56), number of primaries (15.67), panicle weight (32.31), 1000 seed weight (14.67).
			H_2 – 14.44**	Panicle breadth (24.70), number of whorls (15.78), number of primaries (11.82), panicle weight (32.30), 1000 seed weight (14.11).
4	AKRMS 80 x AKR 354	51.32	H_1 – 10.20 **	Plant height (16.42), Panicle length (8.19), Panicle weight (11.68), number of grains per panicle (8.16), 1000 seed weight (16.45).
			H_2 – 5.07	1000 seed weight (12.43).
5	ms 104 A x AKR 368	50.73	H_1 – 22.27**	Plant height (22.31), number of leaves (14.81), panicle weight (10.79), number of grains for panicle (7.57), 1000 seed weight (14.45).
			H_2 – 21.95**	Panicle weight (10.67), number of grains (7.06), 1000 seed weight (11.26).
6	AKRMS 69 x AKR 354	50.15	H_1 – 3.31	Plant height (14.79), panicle weight (11.27), 1000 seed weight (15.80).
			H_2 – 2.28	1000 seed weight (13.19).
7	AKRMS 69 x AKR 413	49.25	H_1 – 6.61 **	Plant height (14.41), number of leaves (16.28), number of primaries (15.58), panicle weight (9.95), 1000 seed weight (12.51).
			H_2 – 2.47	Number of leaves (8.60), 1000 seed weight (12.22).
8	ms 104 x AKR 413	49.21	H_1 – 14.53 **	Plant height (19.41), number of leaves (40.23), number of primaries (9.99), panicle weight (11.50), number of grains (13.76), 1000 seed weight (16.01).
			H_2 – 10.98**	Number of leaves (21.88), panicle weight (9.18), number of grains (13.02), 1000 seed weight (12.22).

Contd....

Contd....

S. No.	Hybrids	Per se Performance g/plant	Heterosis (H_1) and Heterobeltiosis (H_2) for yield	Significant Heterosis (H_1) and Heterobeltiosis (H_2) for other characters
9	AKRMS 66 x AKR 388-1	49.18	H_1 – 6.19 **	Number of whorls (27.26), 1000 seed weight (13.21)
			H_2 – 5.33	1000 seed weight (10.32)
10	AKRMS 47 x AKR 388-1	48.67	H_1 – 13.52 **	Plant height (19.80), number of leaves (52.38), leaf area (35.03), panicle length (9.57), panicle breadth (16.39), number of whorls (32.71), number of primaries (13.95), panicle weight (17.84), 1000 seed weight (13.33).
			H_2 – 4.24	Number of leaves (48.37), panicle length (9.30), number of whorls (13.89), number of primaries (9.38), panicle weight (15.45).

***,** ** Significant at 5 % and 1 % level, respectively.

respectively with significant heterosis in desirable direction for various characters including yield. For the fertility restoration (per cent seed setting) the hybrid AKRMS-47 x AKR-356 exhibited hihgest heterosis and heterobeltiosis followed by the hybrids. AKRMS-47 x AKR-402, AKRMS-47 x AKR-364 and AKRMS-66 x AKR-356.

Shivanna and Patil (1988), Nandanwar (1990), Shinde and Borikar (1991) Biradar *et al*. (2000), Ghorade *et al*. (1997), have found significant positive heterosis in the desirable direction for grain yield over mid parental value, in rabi sorghum which ranged between 0.24 per cent to 49.78 per cent. Several other workers recorded significant heterosis towards desirable direction for different traits Ghorade *et al*. 1997 for panicle weight, Biradar *et al*., 2000, which support the present findings.

In present study, the highest heterobeltiosis was found to be 38.43% in respect of grain yield and similar results were recorded by the same scientists mentioned above. Standard heterosis in desirable direction was found in the traits, days to 50 per cent flowering, plant height and number of leaves per plant.

REFERENCES

Biradar, B.D., Vastrad, S.M., Borikar, R.A. and Niglagundi, J.M. (2000). Combining ability studies in rabi sorghum, *Karnataka J. Agri. Sci.,* **9(4) :** 627-634.

Ghorade, R.B., Gite, B. D., Sakhare, B.A. and Thorat, Archana (1997). Analysis of heterosis and heterobeltiosis for commercial exploitation of sorghum (sorghum bicolour (L.) Moench) hybrids. *J.Soils and Crops.,* **7 (2):** 185-189.

Nandanwar , K.G. (1990). Heterosis studies for grain yield character in rabi sorghum . *Indian J.Genet .*, **50(1) :** 83-85.

Shinde, V. K. and Borikar, S.T. (1991). Heterosis studies involving maldandi cytoplasm in sorghum.*J Maharashtra agric. Univ.,* **16(1):**121-122.

Shivanna, H. and Patil, S.S. (1988). Role of combiners, combinations and their combinations of Ambekar, S.S and K.C. Nandanwar (1985). Scaling tests, heterosis and inbreeding depression studies in rabi sorghum. *Sorghum Newsletter.,* **28 :** 11.