

A. COMPARATIVE STUDY OF HETEROSIS IN HYBRIDS OF MALE STERILE LINES WITH INDIGENOUS SORGHUM CULTIVARS

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The extent of heterosis for yield and yield attributes in a set of 30 cross combinations consisting of six male sterile and five indigenous restorer lines of sorghum were studied. Heterosis was observed in all the hybrids in respect of plant height. The maximum relative heterosis was recorded in the cross CK 60 A x DSV 23 followed by 1036 A x Usilampatti 2. Twenty three hybrids manifested highly significant positive heterosis for panicle length. For single plant yield, five crosses 2758 A x K6, CK 60A x K6 10570A x Usilampatti 2, 10570A x DSV 23 and 2758A x Dindigul-1 recorded highly significant relative heterosis.

The discovery of the phenomenon of heterosis in sorghum and the occurrence of cytoplasmic genic male sterility led to the development of hybrids in sorghum. The fact that the part played by restorer lines is not in any way inferior to that of male sterile lines, necessitated the search for new restorer lines. In view of this, the available local collections at the Agricultural College and Research Institute, Madurai were tested for their ability to combine with the male sterile lines to produce best heterotic hybrids.

MATERIALS AND METHODS

A total of 30 hybrid combinations involving six male sterile lines *viz.* ms 10570 A, ms 1036 A, ms Ck 60A, ms 2758 A, ms 296A and ms 2077A and five restorer lines *viz.* Chellampatti-1, DSV 23, Dindigul-1, Usilampatti-2 and K6 was studied during 1984 at the College farm Agricultural College and Research Institute, Madurai. Each of the hybrids and

parents were raised in single rows of 15 plants with a spacing of 45 cm between rows and 15 cm between plants in a randomised block design replicated thrice. Data on plant height, Panicle length and grain yield per plant were recorded on five randomly chosen plants in each replication. The analysis of variance for these traits was worked out. The hybrid vigour was estimated as superiority over mid parent, better parent and over the standard variety (Co 24) as per the standard procedure.

RESULTS AND DISCUSSION

The mean plant height for the seed parents ranged from 96.2 to 119.8 cm while that of pollen parents from 125.4 to 161.9 cm (Table 1.) Heterosis was observed in all crosses for plant height. Relative heterosis ranged from 23.0 to 114 per cent maximum being recorded by the cross CK 60A x DSV 23. The hybrids involving red sorghum types as the male

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Table 1 Mean Performance of parents and hybrids

| Hybrids/Parents | Plant height (cm) | Panicle length (cm) | Per plant yield (g) |
|-------------------------|----------------------|------------------------|------------------------|
| 10570 A x Usilampatti 2 | 210.5 | 18.3 | 37.9 |
| .. x DGL 1 | 199.3 | 17.7 | 23.7 |
| .. x DSV 23 | 171.3 | 27.0 | 41.7 |
| .. x K 6 | 200.7 | 19.9 | 24.9 |
| .. x Chellam | 226.3 | 19.7 | 32.7 |
| 1036 A x K 6 | 206.4 | 21.7 | 33.3 |
| .. x DSV 23 | 181.4 | 25.3 | 31.6 |
| .. x Usilam 2 | 252.9 | 22.6 | 39.7 |
| .. x DGL 1 | 239.8 | 20.2 | 29.4 |
| .. x Chellam 1B | 244.3 | 18.5 | 21.9 |
| 296 A x DSV 23 | 185.2 | 16.5 | 17.3 |
| .. x Usilam 2 | 169.9 | 17.3 | 13.3 |
| .. x K 6 | 223.8 | 19.8 | 21.7 |
| .. x Chellam 1 | 240.4 | 26.4 | 36.7 |
| .. x DGL 1 | 208.9 | 18.9 | 20.5 |
| 2077 A x DSV 23 | 215.6 | 27.9 | 27.2 |
| .. x DGL 1 | 168.9 | 25.7 | 29.2 |
| .. x K 6 | 260.9 | 27.2 | 31.1 |
| .. x Chellam 1 | 270.5 | 24.8 | 28.6 |
| .. x Usilam 2 | 223.7 | 20.5 | 20.5 |
| CK 60 A x Chellam 1 | 236.1 | 20.5 | 22.3 |
| .. x K 6 | 216.2 | 23.0 | 46.0 |
| .. x DSV 23 | 236.5 | 25.1 | 34.6 |
| .. x DGL 1 | 225.2 | 22.4 | 38.3 |
| .. x Usilam 2 | 200.9 | 18.5 | 28.0 |
| 2758 A x Chellam 1 | 167.7 | 20.4 | 26.3 |
| .. x K 6 | 212.9 | 21.8 | 57.3 |
| .. x DSV 23 | 183.4 | 21.6 | 39.0 |
| .. x DGL 1 | 192.4 | 22.8 | 49.6 |
| .. x Usilam 2 | 193.3 | 18.6 | 36.3 |
| Usilampatti 2 | 149.1 | 14.1 | 11.7 |
| Dindigul 1 | 161.9 | 17.7 | 19.9 |
| DSV 23 | 125.4 | 11.2 | 17.7 |
| K 6 | 152.0 | 14.5 | 11.6 |
| Chellampatti 1 | 160.7 | 15.5 | 16.6 |
| 10570 B | 97.7 | 16.8 | 23.4 |
| 1036 B | 97.1 | 19.6 | 38.0 |
| 2077 B | 112.6 | 17.0 | 27.8 |
| CK 60 B | 96.2 | 15.5 | 27.6 |
| 2758 B | 97.9 | 13.1 | 32.1 |
| 296 B | 119.8 | 15.9 | 27.3 |
| Co 24 | 168.4 | 20.9 | 45.3 |

DGL 1 = Dindigul 1

Chellam 1 = Chellampatti 1

Usilam 1 = Usilampatti 1

parent were found to manifest heterosis for plant height, capable of yielding more fodder. Of the 30 hybrids, two hybrids *viz.*, CK 60A x DSV 23 and 1036A x Usilampatti 2 recorded more than 100 per cent relative heterosis. The parents involved in these two crosses might be used in heterosis breeding for fodder purpose. The positive heterosis estimated on all the three bases indicated a clear dominance bias towards tallness. Among the several sorghum workers Kirby and Atkins (1968), Goud *et al* (1973) and Ravi (1982), reported positive heterosis for plant height.

Besides plant height, panicle length exhibited high heterosis. Twenty three out of 30 hybrids manifested highly significant positive heterosis for panicle length which ranged from 22.0 to 73.0 per cent. Hybrids 10570A x DSV 23, 296A x Chellampatti 1, 2077A x DSV 23, 2077A x Chellampatti-2, CK 60A x K 6, CK 60A x DSV 23 and 2758A x K6 manifested more than 50 per cent positive significant heterosis (Table 2). The CMS parents 296A, 2077A, CK 60A and 2758A when crossed with DSV 23 K6 and Chellampatti 1 invariably recorded high heterosis for panicle length. These parents might be useful for exploiting heterosis for panicle length. The positive heterosis for panicle length indicated a general dominance bias towards longer panicle. Expression of heterosis for panicle length was reported by, Vasudeva Rao and Goud (1970), Kambal and Abu El-Gasim (1976) among others.

In respect of single plant yield, five crosses *viz.*, 2758 A x K6, CK 60A x K6, 10570 A x Usilampatti 2, 10570A x DSV 23 and 2758 A x Dindigul-1 sho-

wed highly significant and positive relative heterosis. The cross 2758A x K6 recorded 163 per cent heterosis which also figured as the one having the maximum significant heterobeltiosis. However this hybrid could not be relied upon for heterosis breeding since the standard heterosis was on the negative side. Heterosis for grain yield in sorghum was reported by Vasudeva Rao (1937), Andrews (1975), Kambal and Abu-El-Gasim (1976), Dremlyuk (1979) and Ravi (1982).

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