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HETEROSIS STUDIES FOR GRAIN YIELD CHARACTERS IN RABI SORGHUM (*SORGHUM BICOLOR* (L.) MOENCH)

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ABSTRACT

Three male sterile lines, viz. 36 A, 1202 A and 1258 A, developed at Sorghum Research Station, Parbhani, and 11 restorers of diverse origin were crossed in line x tester mating design. A trial consisting of 33 hybrids along with 14 parents was planted during rabi 1981. Heterosis over better parent was studied for earhead and grain characters. Crosses with line 1258 A showed marked heterosis for primary, secondary and tertiary spikelets alongwith grain yield characters, followed by line 36 A. Male parents PVR-7, PVR-25, PD-3-1-11 and 1235 gave marked heterosis for yield characters with male sterile lines 36 A, 1202 A and 1258 A. Manifestation of heterosis for grain yield was due to increased number of seeds per earhead, earhead length, and grain size.

Key words: Heterosis over better parents, rabi sorghum.

Sorghum is a staple food of Marathwada region and is preferred for cultivation over wheat and pearl millet because of its grain quality and fodder. The initial success with exploitation of hybrid vigour has led to identification of heterotic combinations with higher production potential for grain and fodder. The newly developed male sterile lines 36 A, 1202 A and 1258 A, offer a great scope for the exploitation of new heterotic combinations. To replace the existing late maturing and low yielding rabi varieties like M-35-1, Shalu and Manthi and hybrids with poor grain quality like CSH-7R and CSH-8R, it is essential to develop hybrids combining high heterosis for grain yield with better grain quality. An attempt has been made to analyse the earhead characters contributing to heterosis for grain yield.

MATERIALS AND METHODS

In the present investigation three male sterile lines (suitable for rabi season), viz., 36 A, 1202 A and 1258 A developed by Sorghum Research Station, Parbhani, and 11 pollinators of diverse origin have been crossed in line x tester mating design. A trial consisting of 33 hybrids along with their 14 parents was conducted in R.B.D. with 3 replications during rabi 1981 under rainfed conditions, and the recommended package of practices was followed. Five plants per treatment were randomly selected and observations on yield contributing characters, viz., ear length, girth, number of whorls, primary, secondary, tertiary spikelets, cob weight, 250-grain

weight, and grain yield were recorded. Heterosis over better parent (BP) was calculated following the formula of Fonesca and Patterson [1].

RESULTS AND DISCUSSION

The proportion of hybrids exhibiting significant negative BP heterosis was more than positive for all characters except primary spikelets, cob weight, and grain yield. Maximum number of crosses exhibiting significant heterosis were observed for grain yield (16 crosses), followed by cob weight (15 crosses), and ear length (10 crosses). The values of significant BP heterosis along with other characters are presented in Table 1.

Table 1. Heterosis over better parent for ear and grain yield characters in rabi sorghum

Cross	Ear length	Ear girth	Primary spikelets	Secondary spikelets	Tertiary spikelets	Cob weight	Test weight	Grain yield
36 A X PVR-7	-3.9	20.7**	3.6	17.3*	11.2**	39.5**	-21.2**	51.1**
36 A X PVR-10	-0.3	-5.3	10.2	7.7	9.5	24.0**	-11.9**	53.8**
36 A X PVR-12	-12.1**	-8.3*	22.6**	-7.0**	9.6	58.5**	-1.1	72.6**
36 A X 1235	-33.7**	-10.5*	2.6	7.5	-5.0	30.5**	33.4**	33.0**
36 A X PD-3-1-11	-21.9**	-3.3	8.4	-1.0	2.1	15.0	38.5**	24.4**
36 A X Niralwani	-1.1	17.3*	4.4	-4.2	3.2	-45.5**	-8.6	31.8**
1202 A X CS 3541	11.9**	-12.1**	12.9*	-3.6*	-3.6	-43.5**	0.4	17.9**
1202 A X 168	2.9	-15.7**	5.6	5.0	15.6**	47.4**	22.8**	10.2**
1258 A X PVR-7	-3.2	26.4**	20.1**	16.0**	62.9**	23.3**	17.6**	68.2**
1258 A X PVR-10	2.0	1.3	0.1	-7.1	1.4	19.1	13.6**	43.7**
1258 A X PVR-19	-14.4**	-5.5	-2.4	-9.2	2.3	16.8**	29.3**	52.9**
1258 A X PVR-25	-4.6	15.4**	-10.6	-0.8	42.6**	26.8**	19.2**	72.9**
1258 A X 1324	5.0	-7.8*	12.1*	-4.4	-19.4**	-40.1**	19.7**	72.2**
1258 A X 1235	13.5**	6.6	19.5**	72.6**	9.2	48.7**	13.5**	47.0**
1258 A X PD-3-1-11	-2.7	1.9	25.3**	37.8**	6.2	51.3**	0.2	78.3**
1258 A X 168	5.4	3.8	42.0**	14.2**	9.1	34.5**	16.2**	31.5**
1258 A X Niralwani	-12.9	7.4*	10.7*	-4.3	4.0	26.4**	20.0**	27.3**

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

The cross 1258 A x 1235 with maximum heterosis for ear length also exhibited significant heterosis for primary, secondary spikelets, cob weight, and grain yield. Similarly, hybrid 1258 A x PVR-7, which gave maximum BP heterosis for ear girth, also showed significant heterotic effect for other ear and grain yield characters. The crosses showing significant heterosis for primary, secondary and tertiary spikelets also exhibited significant heterosis for cob weight and ultimately grain yield. In general, the results indicated that hybrids showing significant BP heterosis for grain yield were also shown significantly superior for at least 3-4

ear and grain characters. This manifestation to heterosis in grain sorghum is reported due to higher number of seeds/earhead, grain size, and ear length [2, 3]. Cross 1258 A x PD-3-1-11, which gave maximum heterosis (78.3%) for grain yield, was also significantly heterotic for primary and secondary spikelets, and cob weight. It is interesting to note that the proportion of hybrids exhibiting significant heterotic effect for grain yield with line 1258 A was greater as compared to lines 36 A and 1202 A. The male parents PVR-7, PVR-25 and 1235 showed positive heterosis with female lines 36 A and 1258 A for ear and grain yield traits. The crosses with line 1258 A exhibited pronounced effect on ear characters, early flowering and grain yield, possibly due to earliness of the parent lines 1258 A, PVR-10, PVR-19 and 1235. These findings are in agreement with the studies of [4, 5]. Hybrids 1202 A x 1324, 1258 A x 168, and 36 A x CS 3541 exhibited significant positive heterosis for ear length, which involved long x long panicle parents, indicating reinforcement effect of both parents on increasing ear length.

The study revealed that parent 1258 A can be used for producing early maturing, high yielding hybrids. Further, heterosis for grain yield was due to increased number of seeds/earhead, ear head length, secondaries and cob weight.

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