



Original Research Article

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## Some Promising High Yielding and Early Maturing Cross Combinations in Post Rainy Sorghum

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### ABSTRACT

#### Keywords

Heterosis, Standard heterosis, Sorghum

#### Article Info

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Five lines and ten testers were crossed in line x tester design to produce 50 cross combinations in order to identify the high yielding and early flowering post rainy sorghum hybrids. Promising hybrids were sorted out based on positive significant standard heterosis for grain yield along with negative significant standard heterosis for days to maturity. Twelve crosses i.e. AKRMS-66-2A(38) x Rb-Local-1-1-sel-1, AKRMS-66-2A(38) x Elangovan-35, AKRMS-66-2A(38) x AKSV-370R, AKRMS-80-1A(39) x Rb-Local-1-1-sel-1, AKRMS-66-2-3A x SLR-136, AKRMS-66-2-3A X Elangovan-35, AKRMS-66-2A(40) x Rb-Local-1-1-sel-1, AKRMS-80-1-1A(62) X Rb-Local-1-1-sel-1, AKRMS-80-1A(39) X Elangovan-35, AKRMS-80-1A(39) X PKV-Kranti, AKRMS-66-2-3A X AKSV-370 and AKRMS-66-2-3A X Rb-Local-5(Bold) exhibited positive significant standard heterosis for grain yield along with negative significant standard heterosis for days to maturity. The best cross combination was AKRMS-66-2A (38) x Rb-Local-1-1-sel-1 with positive significant standard heterosis of 31.89 % for grain yield per plant along with the negative significant standard heterosis of -6.76 % for days to maturity.

### Introduction

Breeding for early post rainy sorghum varieties and hybrids assumes great significance in view of the crop grown under rainfed condition. It would help to overcome the terminal moisture stress. It is very well known that the post rainy sorghum is mostly grown on the conserved soil moisture that too decreasing soil moisture. The early flowering and maturing genotypes in rabi sorghum escape the terminal moisture stress which is responsible for the moisture deficit at the

flowering and grain maturity stage of the crop. This terminal moisture stress is one of the major factors responsible for the low productivity of the rabi sorghum. In this study, an effort was made to identify the high grain yielding and early maturing cross combinations produced by crossing newly developed parental lines of post rainy sorghum. The promising hybrids were sorted out based on positive significant standard heterosis for grain yield along with negative significant standard heterosis for days to maturity.

## Materials and Methods

The experimental material comprised of five male sterile lines viz., AKRMS-66-2A(38), AKRMS-66-2A(40), AKRMS-66-2-3A, AKRMS-80-1A(39) and AKRMS-80-1-1A(62) and ten testers viz., SLR-136, SLR-137, Elangovan-35, AKSV-252, Rb-Local-1-1-sel-1, Rb-Local-5(Bold), RSV-962, AKSV-330, PKV-Kranti and AKSV-370. These fifteen genotypes were crossed in line x tester fashion. Fifteen parents and their resulting 50 hybrids along with one standard check CSH-19R were sown in randomized block design with three replications. For grain yield/ plant the observation was recorded on five randomly selected plants per plot per replication. For days to maturity observation was recorded on plot basis. The average heterosis and heterobeltiosis were estimated as per cent increase or decrease of the mean of  $F_1$  over its mid parent and better parent values respectively. For computation of standard heterosis standard check CSH 19 R was used.

## Results and Discussion

Analysis of variance revealed the significant variation for both grain yield per plant and days to maturity. To determine the heterotic potential of the hybrids, average heterosis (over mid parent), heterobeltiosis (over better parent) and standard heterosis (over standard check) were calculated for grain yield per plant and days to maturity.

Top ranking crosses with positive significant standard heterosis for grain yield are presented in Table-1. Out of fifty crosses under study, fifteen crosses exhibited positive standard heterosis over the check CSH 19 R for grain yield/ plant and appeared best for development of high yielding hybrids. But in sorghum high grain yield alone is not sufficient. Along with high grain yield, the early maturity is also equally important

character. Present need is of development of early maturing post rainy sorghum hybrid with high grain yield. Out of these fifteen crosses, twelve crosses exhibited positive significant standard heterosis over the check CSH 19 R for grain yield/ plant along with negative significant standard heterosis for days to maturity and appeared best for development of high yielding and early maturing hybrids (Table-2). As post rainy sorghum is grown on the stored soil moisture, such early maturing genotypes will escape the terminal moisture stress condition. The adverse effect of terminal moisture stress on the productivity of such early flowering genotypes will be low.

The best cross combination for high yield and early maturity was AKRMS-66-2A(38) x Rb-Local-1-1-sel-1 with the mean grain yield of 73.18 g. and days to maturity of 110.33 days. This cross combination recorded the highest positive significant standard heterosis of 31.89 % for grain yield per plant along with the negative significant standard heterosis of -6.76 % for days to maturity (Table-2). Similarly this cross recorded positive significant mid parent as well as better parent heterosis for grain yield per plant. For days to maturity also this cross recorded negative significant mid parent as well as better parent heterosis. The negative heterosis for days to maturity is desirable as it indicates the early maturity in cross combinations as compared to the check CSH-19 R.

The second promising cross combination for high yield and early flowering was AKRMS-66-2A(38) x Elangovan-35 with the mean grain yield of 71.19 g and days to maturity of 107.00 days. This cross combination recorded the positive significant standard heterosis of 28.30 % for grain yield per plant along with the negative significant standard heterosis of -9.58 % for days to maturity.

**Table.1** Heterotic cross combinations for grain and days to maturity

S N	Crosses	Per se (g)		Heterosis (%) for grain yield/ plant over			Heterosis (%) for day to maturity over		
		Grain yield/ plant (g)	Days to maturity	MP	BP	SC	MP	BP	SC
1	AKRMS-66-2A(38) xRb-Local-1-1-sel-1	73.18	110.33	49.03**	13.89**	31.89**	-5.02**	-3.78*	-6.76**
2	AKRMS-66-2A(38) X SLR-137	72.21	122.00	23.95**	12.39**	30.15**	3.39*	3.68*	3.1
3	AKRMS-66-2A(38) x Elangovan-35	71.19	107.00	17.90**	10.79**	28.30**	-6.41**	-3.6	-9.58**
4	AKRMS-66-2A(38) x AKSV-370	69.91	108.00	31.31**	8.81*	26.01**	-6.09**	-3.86*	-8.73**
5	AKRMS-80-1A(39) x Rb-Local-1-1-sel-1	69.87	109.33	103.28**	100.83**	25.93**	-6.15**	-4.65*	-7.61**
6	AKRMS-66-2-3A x SLR-136	69.17	108.67	75.80**	66.24**	24.67**	-1.21	0.62	-8.17**
7	AKRMS-66-2A(38) X Rb-Local-5(Bold)	68.92	118.33	23.32**	7.26*	24.21**	-0.7	0.57	0.00
8	AKRMS-66-2-3A X Elangovan-35	68.52	113.33	46.43**	21.27**	23.50**	1.64	2.1	-4.23*
9	AKRMS-66-2A(40) x Rb-Local-1-1-sel-1	68.00	109.67	39.44**	6.95	22.57**	-5.46**	-4.36*	-7.32**
10	AKRMS-80-1-1A(62) X Rb-Local-1-1-sel-1	67.46	107.33	68.79**	46.71**	21.59**	-7.60**	-6.40**	-9.30**
11	AKRMS-80-1A(39) X Elangovan-35	66.76	108.67	46.25**	18.15**	20.32**	-5.23**	-2.1	-8.17**
12	AKRMS-80-1A(39) X PKV-Kranti	66.42	108.67	74.66**	60.95**	19.72**	-7.25**	-6.32**	-8.17**
13	AKRMS-66-2-3A X AKSV-370	65.36	106.67	64.81**	54.77**	17.80**	-4.90**	-4.76*	-9.86**
14	AKRMS-66-2A(38) X RSV-962	65.26	115.00	13.82**	1.56	17.61**	1.47	5.50**	-2.82
15	AKRMS-66-2-3A X Rb-Local-5(Bold)	63.42	107.00	49.93**	33.47**	14.30**	-8.02**	-4.46*	-9.58**

MP-Mid Parent, BP-Better Parent, SC- Standard Check

\* - significant at 5% level of significance \*\* - significant at 1% level of significance

**Table.2** Promising high yielding and early flowering cross combinations

Sr.No.	Crosses	Per se		Standard heterosis (%)	
		Grain yield (g)	Days to 50% flowering	Grain yield	Days to 50% flowering
1	AKRMS-66-2A(38) x Rb-Local-1-1-sel-1	73.18	110.33	31.89**	-6.76**
2	AKRMS-66-2A(38) x Elangovan-35	71.19	107.00	28.30**	-9.58**
3	AKRMS-66-2A(38) x AKSV-370R	69.91	108.00	26.01**	-8.73**
4	AKRMS-80-1A(39) x Rb-Local-1-1-sel-1	69.87	109.33	25.93**	--7.61**
5	AKRMS-66-2-3A x SLR-136	69.17	108.67	24.67**	-8.17**
6	AKRMS-66-2-3A X Elangovan-35	68.52	113.33	23.50**	-4.23*
7	AKRMS-66-2A(40) x Rb-Local-1-1-sel-1	68.00	109.67	22.57**	-7.32**
8	AKRMS-80-1-1A(62) X Rb-Local-1-1-sel-1	67.46	107.33	21.59**	-9.30**
9	AKRMS-80-1A(39) X Elangovan-35	66.76	108.67	20.32**	-8.17**
10	AKRMS-80-1A(39) X PKV-Kranti	66.42	108.67	19.72**	-8.17**
11	AKRMS-66-2-3A X AKSV-370	65.36	106.67	17.80**	-9.86**
12	AKRMS-66-2-3A X Rb-Local-5(Bold)	63.42	107.00	14.30**	-9.58**

\* - significant at 5% level of significance \*\* - significant at 1% level of significance

Similarly this cross recorded positive significant mid parent as well as better parent heterosis for grain yield per plant. For days to maturity also this cross recorded negative significant mid parent as well as better parent heterosis. Taking in to consideration positive significant standard heterosis for grain yield per plant along with negative significant standard heterosis for days to maturity, these two crosses viz., AKRMS-80A X Rb-307-11 and AKRMS-47A X AKSV-70 R need to be evaluated in the multilocation multiseason trails to find out the most stable early maturing and high yielding post rainy sorghum hybrid.

Besides these two crosses, rest of the ten cross combinations i.e. AKRMS-66-2A(38) x AKSV-370R, AKRMS-80-1A(39) x Rb-Local-1-1-sel-1, AKRMS-66-2-3A x SLR-136, AKRMS-66-2-3A X Elangovan-35, AKRMS-66-2A(40) x Rb-Local-1-1-sel-1, AKRMS-80-1-1A(62) X Rb-Local-1-1-sel-1, AKRMS-80-1A(39) X

Elangovan-35, AKRMS-80-1A(39) X PKV-Kranti, AKRMS-66-2-3A X AKSV-370 and AKRMS-66-2-3A X Rb-Local-5(Bold) exhibited positive standard heterosis for grain yield per plant, along with negative significant standard heterosis for days to maturity. Taking in to consideration positive standard heterosis for grain yield per plant along with negative significant standard heterosis for days to maturity, these four crosses can also be tested in the trials to find out the promising early maturing and high yielding post rainy sorghum hybrid.

Prabhakar *et al.*, (2013) reported eight promising cross combinations exhibiting positive significant heterobeltiosis for grain yield along with negative significant heterobeltiosis for days to 50% flowering. Gunjal (2014) reported the cross AKRMS-66-2A x Rb-413-1 which exhibited positive significant standard heterosis for grain yield

along with negative significant standard heterosis for days to maturity in *rabi* sorghum.

Ghorade *et al.*, (2015) reported three promising cross combination in *kharif* sorghum based on positive significant standard heterosis for grain yield along with negative significant standard heterosis for days to maturity.

Kalpande *et al.*, (2016) reported that the hybrid AKRMS-80-A x SLR-91 which exhibited positive significant standard heterosis of 33.05% for grain yield per plant along with the negative significant standard heterosis of -4.46% for days to maturity.

Ghorade *et al.*, (2018) reported the cross combination AKMS 90 A x AKR 337 with positive significant standard heterosis for grain yield per plant along with negative significant standard heterosis for days to flowering and days to maturity.

Ingle *et al.*, (2018) reported the cross combination AKMS 30 A x AKRB 335-3 suitable for development of high yielding and early maturity based on desirable significant standard heterosis.

Thus it was concluded from the present study that the twelve crosses viz., AKRMS-66-2A(38) x Rb-Local-1-1-sel-1, AKRMS-66-2A(38) x Elangovan-35, AKRMS-66-2A(38) x AKSV-370R, AKRMS-80-1A(39) x Rb-Local-1-1-sel-1, AKRMS-66-2-3A x SLR-136, AKRMS-66-2-3A X Elangovan-35, AKRMS-66-2A(40) x Rb-Local-1-1-sel-1, AKRMS-80-1-1A(62) X Rb-Local-1-1-sel-1, AKRMS-80-1A(39) X Elangovan-35, AKRMS-80-1A(39) X PKV-Kranti, AKRMS-66-2-3A X AKSV-370 and AKRMS-66-2-3A X Rb-Local-5(Bold) appeared best crosses for development of high

yielding and early maturing post rainy sorghum hybrids and need to be evaluated further by their testing on large scale multilocation and multiseason trials to find out the most stable high yielding and early maturing post rainy sorghum genotype for further exploitation.

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