



# POTENTIAL PARENTS FOR GRAIN YIELD AND EARLY MATURITY IN RABI SORGHUM

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## Abstract

Three lines and twenty two testers were crossed in line  $\times$  tester fashion and the resultant 66 hybrids were evaluated along with the check for days to 50% flowering, days to maturity and grain yield per plant for combining ability analysis. The general combining ability study revealed that among the lines, the line AKRMS-47 A and among the testers, the tester RL-5-1, Rb-397-2, AKSV 70 R and G-45-3-1-1 were found to be the good general combiners for grain yield along with earliness. This one line and four testers need to be extensively used in crossing programme for development of high yielding and early maturing *rabi* sorghum hybrids.

**Key words :** Sorghum, *gca*, combining ability analysis, line  $\times$  tester, randomized block design (RBD).

## Introduction

Early maturity is desirable in *rabi* sorghum as early maturing genotypes escape the terminal moisture stress condition thereby reducing the adverse effect of the low moisture on the yield potential. The *rabi* sorghum is grown on the stored soil moisture and this moisture is receding. This moisture stress mostly affect the plant at flowering and grain filling stage, which drastically reduce the yield potential of *rabi* sorghum. So, there is need to develop the high yielding and early maturing hybrid in *rabi* sorghum. For this identification of the suitable parental lines having potential for earliness and high grain yield needs to be done. In the present investigation, the promising parental lines for high grain yield and earliness were sorted out based on their general combining ability effects.

## Materials and Methods

The experimental material comprised of three male sterile lines *viz.*, AKRMS 80A, AKRMS 80-1-1-1A, AKRMS 47A and twenty-two testers *viz.*, Rb-307-11, Rb-400, PKV Kranti as R, Rb-local 1-2, Rb-309, Rb-397-2, AKSV-47R, Rb-324 (AKR-73  $\times$  504-1), AKSV-70R, RS-585, AKSV-219R, G-45-3-1-1, AKSV-205R, RL-5-1, RL-5-5, Rb-316-3, AKRb-356-6-2, RL-5-3, AKSV-72R (104B  $\times$  Akent 8-1-3), (275  $\times$  104B  $\times$  1201  $\times$  Ringini  $\times$  18551  $\times$  89022 17-1-1). These twenty-five

genotypes were crossed in line  $\times$  tester fashion. Twenty-five parents and their resulting 66 hybrids along with one standard check CSH-19R were sown at Sorghum Research Unit, Dr. P. D. K. V. Akola (M.S.), India, during *rabi* 2013-14 in randomized block design with three replications. The observations were recorded on five randomly selected plants per plot per replication for grain yield per plant (g). For days to 50% flowering and days to maturity, observations were recorded on plot basis. The data on all the above characters was subjected to combining ability analysis by following, Kempthorne (1957) method.

## Results and Discussion

Analysis of variance for combining ability is presented in table 1. The total variance due to hybrids was partitioned into portions attributable to lines (females), testers (males), their interaction (lines  $\times$  testers) and error sources. The components of variances attributable to lines and testers were used as a measure of general combining ability. The lines (females) recorded significant variation for day's to 50% flowering.

The estimates of general combining ability effects of the lines and testers are presented in tables 2 and 3, respectively. In sorghum, positive *gca* effects is desirable for grain yield per plant while for days to 50% flowering and days to maturity negative *gca* effects are desirable.

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**Table 1** : Analysis of variance for combining ability for various characters.

Source of variation	d.f.	Mean Sum of Squares		
		Days to 50% flowering	Days to maturity	Grain yield/plant (g)
Replications	2	0.35	7.11	44.62
Lines	2	118.47**	10.76	496.70
Testers	21	7.39	2.87	178.50
Line × Tester	42	11.23**	4.07	159.49**
Error	130	4.25	9.43	24.23

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

**Table 2** : Estimates of general combining ability effects of lines.

Parents	Days to 50% flowering	Days to maturity	Grain yield/plant (g)
<b>Lines ( Females)</b>			
AKRMS-80A	1.14	0.46	-2.52*
AKRMS-80-1-1-1A	0.33	-0.23	-0.39
AKRMS-47A	-1.47**	-0.23**	2.91**
SE (gi)±	0.25	0.37	0.60
CD AT 5%	0.50	0.74	1.19
CD AT 1%	0.66	0.98	1.58

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

Among the three lines, the line AKRMS-47A recorded significant and desirable *gca* effects for grain yield per plant (2.91\*\*) as well as for days to 50% flowering (-1.47\*\*) and days to maturity (-1.23\*\*). Thus, the line AKRMS-47A was found to be suitable for developing high yielding and early maturing hybrids in rabi sorghum due to its positive significant *gca* effects for grain yield along with negative significant *gca* effects for days to 50% flowering and days to maturity. It is very well known that in *rabi* sorghum the crop is often exposed to the terminal moisture stress, which badly affects the yield of *rabi* sorghum. The early maturing hybrids escape this terminal drought so this line need to be extensively used in *rabi* hybridization programme for developing high yielding and early maturing hybrids.

Premalatha *et al.* (2006) also reported that negative *gca* effects for days to 50% flowering might be useful in breeding programme for earliness. Prabhakar *et al.* (2013) also identified one line SL-39B with positive significant

**Table 3** : Estimates of general combining ability effects of testers.

Parents	Days to 50% flowering	Days to maturity	Grain yield/plant (g)
<b>Testers</b>			
RS-585	-0.47	-0.39	3.53
AKSV-219R	1.88	0.56	-5.42
(275 × 104B × 1201 × Ringini × 18551 × 89022 17 1-1)	0.85	-0.10	-0.73
Rb-397-2	-1.02**	-0.3**	6.36 *
G-45-3-1-1	1.06	-0.45**	4.70**
(AKR-73 × 504-1)	1.25	-0.11	-8.21 **
RL-5-3	-0.14	0.21	-3.33
(104B × Akent 8-1-3)	0.75	0.09	-7.37 *
Rb-316-3	-0.74	0.25	-4.10
PKV Kranti New R	-1.11	1.20	-4.32
AKSV-47R	-0.53	0.50	-3.65
AKSV-205R	0.74	-0.45	-0.15
Rb-324	0.26	-0.44	0.34
Rb-307-11	-0.49	-0.15	0.59
RL-5-1	-0.83**	-1.47**	7.95 **
RL-5-5	1.26	-0.11	0.99
AKSV-72R	-1.19	-0.18	-1.30
Rb local 1-2	-0.94	-0.28	2.58
Rb-400	0.16	0.86	0.74
AKRb-356-6-2	0.22	-0.17	0.24
AKSV-70R	-0.85**	0.44	5.35**
Rb-309	-0.12	0.57	5.19
SE (gi) ±	0.68	1.02	1.64
CD at 5%	1.36	2.02	3.24
CD at 1%	1.79	2.67	4.28

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

*gca* for grain yield and negative significant *gca* for days to flowering and reported the use of this line in developing high yielding early maturing hybrids in *rabi* sorghum.

Among the testers, the tester RL-5-1 exhibited positive significant *gca* effects for grain yield per plant (7.95\*\*) along with negative *gca* effects for days to 50% flowering (-0.83\*\*) and days to maturity (-1.47\*\*). Another tester Rb-397-2 also recorded positive significant *gca* effects for grain yield per plant (6.36\*) along with

negative *gca* effects for days to 50% flowering (-1.02\*\*) and days to maturity (-0.30\*\*). Third tester AKSV 70 R with positive significant *gca* effects for grain yield per plant (5.35\*\*) along with negative *gca* effects for days to 50% flowering (-0.85\*\*) was also found promising. Fourth tester G-45-3-1-1 also exhibited positive significant *gca* effects for grain yield per plant (4.70\*\*) along with negative *gca* effects for days to maturity (-0.45\*\*). All these four testers appeared to be promising for development of early maturing and high yielding *rabi* sorghum hybrids. Prabhakar *et al.* (2013) also reported the tester SLR-66 with significant desirable *gca* effects for grain yield per plant along with days to 50% flowering and reported the usefulness of this tester in developing high yielding and early maturing hybrids in *rabi* sorghum.

Thus, it was concluded from the present study that there is need to extensively use the line AKRMS 47A

and the testers RL-5-1, Rb-397-2, AKSV 70 R, G-45-3-1-1 in the hybridization programme to develop high yielding and early maturing *rabi* sorghum hybrids.

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