

Genetic variability analysis in *rabi* sorghum germplasm

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ABSTRACT

The heritability in broad sense for growth characters 1000 seed weight, grain yield, number of leaves per plant, leaf width internode length, peduncle length and earhead length was highest. High heritability accompanied with high genetic advance was observed for growth traits *viz*; grain yield, 1000 grain weight, number of leaves per plant, earhead length, leaf width, internode length, peduncle length and plant height suggesting additive gene control in the inheritance of their traits and scope per selection in the improvement of these characters. On the basis of superiority of the different genotypes over better check some genotypes were isolated and suggested for further improvement programme of *rabi* sorghum. Sufficient variability was present in germplasm under study for all characters. Magnitude of pcv was found more than gcv all characters.

Key words : Variability , gcv , pcv , Heritability and Genetic advance.

INTRODUCTION

Rabi sorghum is the major cereal crops grown on dryland ecosystem of Maharashtra and parts of Karnataka and Andhra Pradesh. In Maharashtra the crop is grown on area of 33 lakh ha. However, the productivity of *rabi* sorghum in Maharashtra is very low. Efforts are being made to develop the varieties resistant to drought particularly terminal stress. Local landraces present in different tracts of sorghum growing areas of Maharashtra are very good source as donor parent to develop the drought tolerant varieties. Presence of genetic variability in the population is prerequisite for the development of varieties by selection and more effective use of plant genetic resources is crucial for the sustainable of the food of the country. Greater efforts are required to characterized the landraces.

MATERIALS AND METHODS

The material for the proposed study consist of 550 different germplasm of *rabi* sorghum landraces available at Sorghum Improvement Project, Mahatma Phule Krishi Vidyapeeth, Rahuri. These germplasm lines were collected from different *rabi* sorghum growing tracts of Maharashtra. The variability parameters were estimated as follows a range, (Panse and Sukhatme 1978), Estimation of coefficient of variation (Burton, 1952), heritability (Hanson *et al.*, 1956) and genetic advance (Allard, 1960).

RESULTS AND DISCUSSION

The analysis of variance for 13 quantitative character is given in Table 1. Variance due to block effect were

significant ($P < 0.5$) for number of leaves, earhead length, 1000 seed weight, grain yield, leaf width, plant height, internode length, peduncle length, days to 50 of flowering, days to maturity, leaf length and number of internodes. Mean squares due to treatments were significant for number of leaves per plant, earhead length, 1000 seed weight, grain yield, leaf width, plant height, internode length, and peduncle length indicating genotypes under study different significantly for these eight traits ($P < 6.1$).

Variability Parameters:

Range of variability:

Wide range of variability was observed in respect of all the characters under study. This indicated ample scope for exploitation of all the above character. Dhimmam and Desai (1978) observed similar, results for earhead length, grain yield, plant height, days to half bloom, days to maturity and 1000 seed weight. Potdukhe *et al.* (1993) observed similar results for plant height, days to 50 % flowering, number of leaves and grain yield / plant. Umakanth *et al.* (2002), Patankar (2003) observed similar results for plant height and days to 50 % flowering.

Genotypic coefficient of variation:

In general, the estimates of pcv were higher than those for gcv , high estimates of gcv were observed for grain yield (24.27), leaf width, (22.76) number of leaves per plant (31.86) and earhead length (38.01), medium (15.30), internode length (12.02) and peduncle length (17.49) while low estimates of gcv were observed for six characters, earhead length (5.26), days to 50 % flowering (4.61), days to maturity (2.51) plant height (8.05), leaf length (4.49) and number of internodes per plant (4.64).

Table 1 : Analysis of variance of 13 growth characters

Sr. No.	Character	Block MSS	Treatment MSS	σ^2_e	σ^2_g	σ^2_p
1.	Number of leaves / plant	17.99**	10.401**	0.556	9.845**	10.401
2.	Leaf length (cm)	146.098**	0.749**	14.239	8.223	0.749
3.	Leaf width (cm)	162.581**	4.386**	1.579	2.807**	4.386
4.	Plant height (cm)	5102.660**	341.20**	154.03	187.17*	341.20
5.	Number of internodes /plant	3.47**	0.908**	0.749	0.159	0.908
6.	Internode length (cm)	25.814**	6.449**	1.428	5.021**	6.449
7.	Peduncle length (cm)	79.688**	25.269**	4.195	21.074**	25.269
8.	Days to 50 % flowering	116.08**	33.602**	20.79	12.81	33.602
9.	Earhead length (cm)	125.229**	40.539**	8.396	32.143**	40.539
10.	Earhead width (cm)	3.624	1.902	1.75	0.152	1.902
11.	Days to maturity	83.689**	29.74	20.90	9.65	29.74
12.	1000 seed weight (g)	150.266**	34.012**	7.99	26.022**	34.012
13.	Grain yield (g)	269.421**	129.83	14.31	115.58**	129.83

* and ** indicates significance of values at P=0.05 and 0.01, respectively

Table 2 : Variability parameter for thirteen growths characters in rabi sorghum

Sr. No.	Character	Range	Mean (X)	gcv	pcv	h^2	G.A.	GA as % of mean
1.	Number of leaves / plant	7-13	9.847	31.86	32.77	94.65	6.288	63.86
2.	Leaf length (cm)	46.8-80.6	63.81	4.49	7.42	36.61	3.57	5.59
3.	Leaf width (cm)	5.0-10.2	7.36	22.76	28.43	63.99	2.76	37.50
4.	Plant height (cm)	97-233	169.76	8.05	10.88	54.85	20.87	12.89
5.	Number of internodes /plant	5-12	8.58	4.64	11.10	17.51	0.343	3.99
6.	Internode length (cm)	10.2-29.6	18.63	12.02	13.63	77.85	4.07	21.84
7.	Peduncle length (cm)	14.2-44.8	26.24	17.49	19.15	83.42	8.63	32.88
8.	Days to 50 % flowering	70-93	77.71	4.61	7.45	38.12	4.50	5.85
9.	Earhead length (cm)	7.24-8	14.91	38.01	42.89	79.28	10.39	69.73
10.	Earhead width (cm)	4-12	7.41	5.26	18.61	7.91	0.22	3.96
11.	Days to maturity	110-143	123.57	2.51	4.41	31.44	3.64	2.94
12.	1000 seed weight (g)	15.68-57.64	33.34	15.30	17.49	76.50	9.19	27.56
13.	Grain yield per plant (g)	18.00-78.5	44.28	24.27	25.73	89.02	20.89	47.17

Phenotypic coefficient of variation:

High estimates of pcv were observed for grain yield (25.73), leaf width (28.43), number of leaves per plant (32.77) and earhead length (42.89) medium estimates of pcv were observed for 1000 seed weight (17.49), internode length (13.63), earhead width (18.61) number of internodes per plant (11.10) plant height (10.88) and peduncle length (19.15) while low estimates of pcv were observed for three characters viz; days to 50 % flowering (7.45), days to maturity (4.41) and leaf length (7.42).

Regarding gcv and pcv, Veerbhadhiran and Kennedy (2001) also reported high gcv and pcv for grain yield. Potdukhe *et al.* (1993) reported medium gcv and pcv for plant internode length and peduncle length and lower value of genotype and phenotypic coefficients of variation for earhead width, days to 50 % flowering, days to maturity, plant height, leaf length and number of

internodes per plant Nimbalkar *et al.* (1988) reported low gcv and pcv for days to 50 % flowering and days to maturity.

Heritability (B.S.) and genetic advance:

The genotypic coefficient of variation alone does not indicate the proportion of total heritable variation. The heritability estimates are better indicators in this respect. High estimates of heritability were observed for number of leaves per plant (94.65 %), 1000 seed weight (76.50), grain yield per plant (89.02 %), leaf width (63.99 %), internode length (77.85 %), peduncle length (83.42) and earhead length (79.28) where as medium estimates of heritability were observed for, days to 50 % flowering (38.12 %), days to maturity (31.44 %), plant height (54.85), while low estimates of heritability were observed in case of earhead width (7.9 %) and number of internodes per

plant (17.51 %).

The estimates of high genetic advance were observed for number of leaves per plant (63.86), 1000 seed weight (27.56), grain yield (47.17), leaf width (37.50), internode length (21.84), peduncle length (32.88) and earhead length (69.73), while the values were medium for the character plant height (12.89). Estimates of low genetic advance was observed for the character earhead width (2.96), days to 50 % flowering (5.85), days to maturity (2.94), leaf length (5.59) and number of internodes per plant (3.99).

High estimates of heritability accompanied with high genetic advance indicated additive gene action and thus selection for these characters in general diverse genetic improvement. Shinde *et al.* (1979) reported similar results for grain yield. Wankhede *et al.* (1985) reported similar results for 1000 seed weight and panicle length. Patankar (2003) also reported similar results for grain yield and internode length.

On the basis of superiority of the different genotypes over better check, some genotypes were isolated as an ideotypes for further improvement programme of sorghum.

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