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Genetic Variability for Yield and Yield Attributing Traits in *Rabi* Sorghum (*Sorghum bicolor* L. Moench)

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ABSTRACT

Studies were carried out to estimate the extent of genetic variability in cultivated genotypes of *rabi* sorghum. Significant mean squares were obtained for all characters in the analysis of variance. High estimates of PCV and GCV were observed for grain yield per plant, stover yield per plant, harvest index, panicle weight, panicle length, 100-seed weight and dead heart percentage. Moderate GCV and PCV were observed for plant height and number of primaries per panicle. High heritability coupled with high genetic advance as percent of mean was observed for almost all the characters under study except for days to 50 per cent flowering.

Key words : Genetic advance, Heritability, Variability.

Rabi sorghum [*Sorghum bicolor* (L.) Moench] is an important crop grown under residual moisture condition in Andhra Pradesh. Grain yields are observed low due to absence of high yielding varieties. Screening of sorghum lines for variability under *rabi* season is pre-requisite for initiating appropriate breeding procedures for effective selection of superior genotypes. The partitioning of total variability into heritable and non-heritable components by using suitable design will enable the breeders to know whether the superiority of selection is inherited by the progenies. Since natural genetic variation for most of the yield attributes is considerably high in sorghum, there is an urgent need for information on the nature and magnitude of variation available in the material and part played by environment in expression of different characters. Keeping in view the above facts, the present investigation was undertaken to estimate the magnitude of variability, heritability and genetic advance in *rabi* sorghum.

MATERIAL AND METHODS

The material for the present study comprised of 25 *rabi* sorghum genotypes. These genotypes were maintaining at Millet Scheme of Regional Agricultural Research Station (ANGRAU), Nandyal. The present study was carried out at RARS, Nandyal during *rabi* 2011-12. The experiment was laid out in a randomized block design with 3 replications. Each accession was sown in 3 rows of 4 m length with a spacing of 45 cm between the rows and 15 cm within the row. Recommended package of practices were followed for raising a normal crop. In each accession, five plants were selected randomly and used for collecting data on days to 50% flowering, plant height (cm), panicle length (cm), panicle weight (g),100-seed weight (g), dead heart percentage for screening to shootfly, fodder yield (kg/ha), harvest index and seed yield (kg/ha). The mean values were used for statistical analysis. The data was analyzed statistically for genotype and phenotype coefficients of variation (Burton, 1952), heritability (Burton, 1952) and genetic advance (Johnson *et al*., 1955).

RESULTS AND DISCUSSION

The analysis of variance revealed that the significant differences among genotypes for all characters, which indicated the presence of variability among the genotypes evaluated and ample scope of improvement by selection. The range of variation and the estimate of genetic parameters which include coefficient of variation (GCV and PCV), heritability in broad sense and genetic advance are presented in table 1. The range was observed for plant height (144.60 – 331.06 cm)

followed by stover yield per plant (31.32 - 201.24 gm), panicle weight (23.67 -119.81 gm), grain yield per plant (18.07 -101.43 gm), harvest index (17.53 - 68.76), number of primaries per panicle (45.33 - 92.00), dead heart percentage (6.15-38.63), panicle length (6.50 -30.78 cm), days to 50 per cent flowering (54.00 -74.00) and 100-seed weight (1.38 -3.73 gm).

However high genotypic and phenotypic variances were exhibited for plant height, stover yield per plant and panicle weight. High GCV and PCV was observed for grain yield per plant followed by stover yield per plant, harvest index, panicle weight, panicle length, 100-seed weight and dead heart percentage in the decreasing order of their magnitude. Similar kind of high estimates of variability were reported by Kamatar *et al.* (2011) and Mahajan *et al*. (2011) for grain yield per plant; Mahajan *et al*. (2011) for harvest index; Goud *et al.* (1980) for panicle weight; Hemlata Sharma *et al.* (2006) for panicle length; Hemlata Sharma *et al.* (2006) and Prabhakar *et al.* (2001) for 100-seed weight; Kamatar *et al*. (2011) for dead heart percentage. Comparatively high estimates of variability observed in the above characters especially for grain yield per plant, stover yield per plant, harvest index, panicle weight and panicle length shows that there is ample scope for selection. The moderate estimates of coefficients of variation were observed for plant height and number of primaries per panicle. Similar kind of moderate estimates of variability were reported by Negash *et al.* (2005) for plant height; Rajkumar *et al.* (2007) for number of primaries per panicle. Whereas low estimates of coefficients of variation were recorded for days to 50 per cent flowering. Similar kind of low estimates of variability were reported by Rizwan Haris *et al*. (2001) and Prabhakar *et al.* (2001).

The effectiveness of selection for any character depends not only on the extent of genetic variability but also in the extent to which it will be transferred from one generation to next generation. High heritability was observed for harvest index (94.10%) followed by grain yield per plant (93.60%), stover yield per plant (93.10%), panicle weight (92.61%), panicle length (92.22%), 100-seed weight (92.04%), dead heart percentage (89.71%), plant height (88.00%), number of primaries per panicle (87.00%) and days to 50 per cent flowering (68.32%) in the decreasing order of their magnitude . Similar kind of high estimates of high heritability were reported by Chavan *et al.* (2010) for harvest index, plant height, number of primaries per panicle and grain yield per plant; Hemlata Sharma *et al.* (2006) for panicle length; Veerabadhiran and Kennedy (2001) for days to 50 per cent flowering.

The highest genetic advance was recorded for plant height (97.81%), followed by stover yield per plant (85.72%), panicle weight (52.75 %), grain yield per plant (48.80%), harvest index (26.17%) and number of primaries per panicle (21.76%). Moderate value of genetic advance was observed for dead heart percentage (15.50%) and panicle length (13.09%) where as other characters such as days to 50 per cent flowering (9.40%) and 100-seed weight (1.51%) registered low estimates of genetic advance in decreasing order of their magnitude.

The high heritability value alone provides no indication of the amount of genetic progress that would result from the selection of the best individuals. The heritability and genetic advance when calculated together are most useful for predicting the genetic gain from selection. Since, magnitude of genetic advance is influenced by units of measurement, genetic advance as percentage of mean was computed.

High heritability coupled with high genetic advance as percentage of mean was recorded for majority of characters *viz.,* grain yield per plant, stover yield per plant, harvest index, panicle weight, panicle length, 100-seed weight, dead heart percentage, plant height and number of primaries per panicle. Similar kind of high estimates of high heritability coupled with high genetic advance as percentage of mean were reported by Kamatar *et al.* (2011), Mahajan *et al.* (2011) and Chavan *et al.* (2010) for grain yield per plant; Deepalakshmi *et al.* (2007) for panicle weight; Mahajan *et al.* (2011), Chavan *et al.* (2010) for plant height; Deepalakshmi *et al.* (2007) for number of primaries per panicle; Amit *et al*. (1999) for harvest index; Deepalakshmi *et al.* (2007) for 100-seed weight; Bello *et al.* (2007) for panicle length; Kamatar *et al.* (2011) for dead heart percentage. Thus these traits are most probably controlled by additive gene action and hence these traits can be fixed by selection.

Table 1. Genetic variability parameters for yield and its attributing traits in *rabi* sorghum (*Sorghum bicolor* L. Moench) genotypes.

Sl. No.	Character	Mean	Range		Variance		Coefficient of variation		Heritability (broad sense) (%)	Genetic advance (GA)	Genetic advance as percent of mean (%)
			Min.	Max.	Genotypic	Phenotypic	Genotypic	Phenotypic			
1.	Days to 50 per cent flowering	64.41	54.00	74.00	30.49	44.63	8.57	10.37	68.32	9.40	14.59
2.	Dead heart percentage	26.86	6.15	38.63	63.17	70.41	29.58	31.23	89.71	15.50	57.72
3.	Plant height (cm)	262.70	144.60	331.06	2562.62	2912.92	19.26	20.54	88.00	97.81	37.23
4.	Panicle length (cm)	19.56	6.50	30.78	43.78	47.41	33.81	35.21	92.22	13.09	66.90
5.	Panicle weight (g)	73.77	23.67	119.81	707.99	764.41	36.06	37.47	92.61	52.75	71.50
6.	Number of primaries per panicle	68.06	45.33	92.00	128.35	147.61	16.64	17.85	87.00	21.76	31.97
7.	100-seed weight (g)	2.57	1.38	3.73	0.59	0.64	29.87	31.14	92.04	1.51	59.04
8.	Stover yield per plant (g)	101.24	31.32	201.24	1860.94	1999.88	42.61	44.16	93.10	85.72	84.67
9.	Harvest index (%)	35.99	17.53	68.76	171.67	182.51	36.40	37.53	94.10	26.17	72.73
10.	Grain yield per plant (g)	55.40	18.07	101.43	599.59	640.63	44.19	45.68	93.60	48.80	88.07

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