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Estimation of Genetic Parametrs for Yield Components in *Rabi* Sorghum (*Sorghum bicolor* (L.) Moench)

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ABSTRACT

Genetic variability, heritability and genetic advance for 10 quantitative traits in 50 genotypes of *rabi* sorghum (*Sorghum bicolor* (L.) Moench) were studied at Agricultural College Farm, Bapatla during *rabi* 2016-2017. The analysis of variance revealed significant differences among the genotypes for all the characters studied indicating that the data generated from the above diverse material shall represent wide variability. The genotypic coefficients of variation for all the characters studied were lesser than the phenotypic coefficients of variation indicating the masking effects of the environment. High PCV coupled with high GCV observed for ear head length and grain yield per plant indicate the presence of wider variability for these traits in the population studied. High heritability coupled with high genetic advance as per cent of mean was recorded for plant height, leaf length, ear head length, ear head width, 100 grain weight,grain yield per plant and harvest index indicating the operation of additive gene action in the inheritance of these traits and improvement of these characters is possible through simple selection.

Key words: *Genetic Advance, Heritability, Variability.*

Sorghum also known as great millet. Jowar or milois is a grass species cultivated for its grain, which is used for food, both for animals and humans and also for ethanol production. It is a C_4 crop having carbon fixing properties and it is the best alternative for extreme weather conditions and well suited to drought-prone regions it is the richest source of nutrition. The main reasons for *rabi* low productivity are crop is grown on residual moisture, non-availability of high yielding varieties, partial or less use of chemical fertilizers, high seed rate and narrow row spacing etc. However, the grain quality is much superior in *rabi* season as compared to *kharif* season.

The amount of variability for important economic attributes in any crop determines the progress that can be achieved through selection. An assessment of the variability is required to judge its potential as base material for crop improvement programme. Yield is a polygenically controlled complex character and highly influenced by environment. This necessitates a deeper insight into the nature of genetic variation that is heritable in the progeny and genetic advance that can be achieved through selection.

MATERIAL AND METHODS

A total of 50 genotypes of Sorghum (*Sorghum bicolor* (L.) Moench) were grown in a randomized block design with two replications during *rabi* 2016-2017 at Agricultural College Farm, Bapatla. The net plot size was 1.78 meter square and spacing adopted was 45 × 15 cm. The crop was grown following the recommended package of practices. The data was collected on 10 randomly selected plants per replication for 10 quantitative traits *viz.,*days to 50% flowering, plant height (cm) , total number of leaves per plant, leaf length (cm), leaf width (cm), ear head length (cm), ear head width(cm), grain yield per plant (g) ,100 grain weight(g) and harvest index (%). The mean data was utilized for calculating the genetic parameters *viz.,* phenotypic/ coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability (h^2) ,expected genetic advance as percent of mean (GAM) as suggested by Burton and Devane (1953), Allard (1960), Lush (1940) and Johnson *et al.* (1955).

RESULTS AND DISCUSSION

All the genotypes displayed considerable amount of differences in their mean performance with respect to all the quantitative traits studied. This is also exemplified by highly significant mean sum of squares for these traits which indicated that genotypes under study were genetically diverse. They also showed a wide range of variation which provides ample scope for selection of superior and desirable genotypes for plant breeder for further genetic improvement.

The genotypic coefficients of variation for all the characters studied were lesser than the phenotypic coefficients of variation indicating the masking effects

Table 1. Analysis of variance for yield and yield components among 50 genotypes of sorghum [*Sorghum bicolor* (L.) Moench]

S. No	Source	Replications	Treatments	Error
	Degree of freedom	1	49	49
	MEAN SUM OF SQUARES			
1	Days to 50% flowering	0.81	18.07122**	0.871224
2	Plant height (cm)	22.25669	865.93927**	22.540322
3	Total number of leaves	0.1369	0.86151**	0.350165
4	Leaf length (cm)	0.01737	44.56732**	7.86479
5	Leaf width (cm)	0.00001	1.30813**	0.095207
6	Ear head length (cm)	0.00204	37.24788**	1.573965
7	Ear head width (cm)	0.16769	1.83195**	0.069082
8	100 Grain weight (g)	0.00002	0.63048**	0.003079
9	Grain yield per plant (g)	0.12027	42.60659**	2.362418
10	Harvest Index (%)	0.3068	47.50431**	1.003914

**significant at 1% level

Table 2. Mean, variability, heritability and genetic advance as per cent of mean for yield, yield components in sorghum [*Sorghum bicolor* (L.) Moench].

S. No.	Character	Mean	Range		Coefficient of variation		Heritability (%) (broad sense)	Genetic advance as per cent of mean (5 % level)
			Minimum	Maximum	PCV %	GCV %		
1	Days to 50% Flowering	57.49	53.00	63.00	5.35	5.10	90.08	10.01
2	Plant height (cm)	142.26	102.74	194.25	14.81	14.43	94.93	28.97
3	Total number of leaves	8.95	8.00	11.10	8.69	5.65	42.20	7.56
4	Leaf length (cm)	49.78	40.85	57.41	10.28	8.60	70.00	14.83
5	Leaf width (cm)	5.15	3.97	8.60	16.26	15.12	86.43	28.95
6	Ear head length (cm)	20.02	12.88	31.01	22.00	21.09	91.89	41.66
7	Ear head width (cm)	4.90	3.62	7.80	19.89	19.16	92.73	38.00
8	Grain yield per plant (g)	21.37	13.85	31.29	22.18	20.99	89.49	40.90
9	100 grain weight (g)	3.11	2.22	4.63	18.08	18.00	99.03	36.89
10	Harvest Index (%)	29.56	18.65	39.84	16.65	16.30	95.86	32.89

PCV = Phenotypic coefficient of variation GCV = Genotypic coefficient of variation

of the environment. High PCV coupled with high GCV observed for ear head length indicating the presence of wider variability for these traits among the genotypes under study. Similar observations were recorded by Kassahun *et al.* (2015) and Rekha and Biradar (2015). Low PCV and GCV were recorded for days to 50% flowering (5.35 & 5.10) and total number of leaves (8.69 & 5.65). These results are in agreement with Umakanth *et al.* (2004) Jain *et al.* (2010). Moderate values of PCV and GCV were recorded for plant height (14.81 & 14.43), leaf width (16.26 & 15.12), ear head width (19.89 & 19.16), 100 grain weight (18.08 & 18.00) and harvest index (16.65 & 16.30). Similar results were observed by Manonmani *et al.* (2002) and Umakanth *et al.* (2004) , Kumari *et al*. (2009), Jain and Patel (2013), Khandelwal *et al.* (2015), Rekha and Biradar (2015). (Table 2) .

Heritability can be determined with greater accuracy if it is studied with genetic advance and genetic advance with per cent of mean (Johnson *et.al.,* 1955). In the study, all the traits showed high estimates of broad sense heritability indicating that environment effect may not reduce the inheritance of these traits.

This also indicates the major role of additive gene action for these traits. High heritability estimates were also recorded by Umakanth *et al.* (2004). High values of heritability for quantitative traits such as days to 50% flowering (90.08%), plant height (94.93%), leaf length (70%), leaf width (86.43%), ear head length (91.89%), ear head width (92.73%), grain yield per plant (89.49%),100 grain weight(99.03%) and harvest index (95.86%) are useful to the plant breeders for making effective selection using these traits on a phenotypic basis (Table 2).

The components of grain yield like ear head length, ear head width, 100 grain weight and harvest index exhibited high genetic advance over mean coupled with high estimate of broad sense heritability values indicating that variations are attributed to high level of additive gene effects. Similar results were reported by Umakanth *et al.* (2004), Kumari *et al*. (2009), Arunkumar and Biradar(2004) and Veerbhadhiran and Kennedy (2001).

CONCLUSION

Studies indicated that the material used in the present investigation possessed enormous variability, which provides sufficient basis for selection for the plant breeder.The heritability estimates (broad sense) revealed that 9 characters exhibited high heritability and total number of leaves exhibited moderate heritability estimates. Presence of high heritability coupled with high genetic advance as per cent of mean as in case of leaf width, ear head length, ear head width, grain yield per plant, 100 grain weight, harvest index indicates the operation of additive gene action and improvement in these characters is possible through simple direct selection.

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