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ESTIMATES OF GENETIC PARAMETERS AND CORRELATION COEFFICIENTS IN FODDER SORGHUM

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ABSTRACT

A wide range of variation was observed for all the twelve characters in 30 genotypes of fodder sorghum and it was more pronounced in plant stand, plant height, leaf length and earhead weight. Further, plant height, plant stand, total soluble solids and leaf length showed large genotypic variability. Highest genotypic coefficient of variation was observed for fodder yield, followed by total soluble solids and grain yield. Total soluble solids, grain yield, plant height, number of leaves, earhead girth and leaf width had high heritability estimates combined with high genetic advance. Fodder yield had high genetic advance but moderate heritability. The genotypic correlation coefficients were larger than phenotypic correlation coefficients. Plant height and total soluble solids showed high positive correlation with fodder yield. Plant height was by itself correlated with plant stand, leaf length, leaf width and grain yield and this character would be an ideal selection criterion in fodder sorghum.

KEY WORDS : Fodder Sorghum, variability, correlation.

Fodder cholam (*Sorghum dochna*) popularly called as '*Irungu cholam*' or '*Nattu Cholam*' or '*Adai Cholam*' is cultivated as a pure crop in an estimated area of 50, 000 ha. in the southern districts of Tamil Nadu, especially during the north-east monsoon. After the removal of earheads with sparsely set seeds, the stem along with leaves is cut at maturity, dried and staked to be used as hay for feeding the livestock. Seeds at a very high rate of 75 - 100 kg/ha are sown in fields prepared before hand and covered with country plough. No thinning is done and hence a high density of population is maintained with the result the plants are thin stemmed, less pithy and less fibrous but highly palatable. Fodder cholam possesses a wide range of variability which can be exploited for improving the quality and quantity of fodder besides grain yield.

Practically, no information is available regarding the range of variation and character association in fodder cholam. The present investigation was undertaken with a view to ascertain the variability present for different characters of economic importance and to determine the heritable component of variation and also to obtain information on character association.

MATERIALS AND METHODS

A set of 30 varieties and breeding lines from the genetic stocks of fodder sorghum maintained at the Agricultural Research Station, Kovilpatti was grown in a randomised block design with three replications in plots of 4.0 m x 2.7 m during the north-east monsoon season of 1987-88. A seed rate of 100 kg/ha was adopted and the seeds were sown broadcast on to the dry field plot prepared in advance and covered with harrow. The crop was dependent on monsoon rains for its water requirement. Observations were recorded on five random plants in each plot. Standard statistical procedures were used for the analysis of variance, covariance and correlation coefficients (Panse and Sukatme, 1967 and Al jibouri, 1958), genotypic coefficient of variation (Burton, 1952) and heritability and genetic advance as per cent of mean (Johnson *et al.*, 1955).

Table 1. Means, range, mean squares, genetic coefficients of variation (GCV), heritability estimates (h and expected genetic advance (GA) of different characters in fodder sorghum

Character	Mean	Range	Mean Square		GCV	h^2	GA as % of mean
			Varieties	Error			
Dry fodder yield (kg)	2.16	1.44 – 2.90	4.30**	0.85	49.65	57.50	77.56
Total soluble solids	11.04	3.60 – 19.80	62.53**	0.68	45.23	96.85	91.77
Plant height (cm)	210.64	158.00 – 260.00	2764.90**	18.03	14.37	98.07	29.31
Number of leaves	9.08	7.00 – 11.00	3.23**	0.17	11.13	85.94	21.26
Leaf length (cm)	51.64	36.00 – 66.00	231.25**	2.04	16.92	97.40	4.61
Leaf width (cm)	4.67	3.00 – 6.00	2.22**	0.39	16.72	61.00	26.90
Grain yield (Kg)	1.29	0.80 – 1.90	0.45**	0.01	29.72	93.60	59.28
Days to 50% flowering	66.82	63.00 – 70.00	7.53**	0.58	1.34	80.00	2.46
Earhead length (cm)	24.78	21.80 – 28.50	4.52**	0.41	4.72	77.40	8.55
Earhead girth (cm)	3.84	1.80 – 6.30	1.68**	0.14	11.94	78.83	21.87
Plant stand	37.58	20.93 – 55.30	66.92**	9.45	11.65	66.99	19.64
Earhead weight (g)	15.00	6.00 – 26.00	0.48**	0.09	2.37	55.95	3.68

** Significant at 1% level

RESULTS AND DISCUSSION

The range of variation was substantially high for all the characters under study, and it was particularly pronounced in plant stand, plant height, leaf length and earhead weight (Table 1). The analysis of variance revealed highly significant differences among the genotypes for all the twelve characters. Plant height, plant stand, total soluble solids and leaf length showed large genotypic variability.

The genotypic coefficient of variation was maximum for dry fodder yield followed by total soluble solids, grain yield, leaf length, leaf width, plant height and earhead girth. It was low for days to 50% flowering, earhead weight, earhead length and plant stand. The heritability estimates that help the breeder in selection based on the phenotypic performance were moderate for dry fodder yield and earhead weight and mostly high for the rest of the characters pointing out that these were less influenced by the environment and at the same time there was much correspondence between the phenotypic and breeding values. High heritability combined with high genetic advance was obtained for total soluble solids, grain yield, plant height, number o leaves, earhead girth and leaf width anc these characters appeared to be under the Influence of additive gene action (Panse, 1957). The expected genetic grain as per cent of mean was the highest in total soluble solids with high heritability. Dry fodder yield also had high genetic gain as per cent of mean but it had moderate heritability. The characters, days to 50% flowering and leaf length had high heritability but low genetic advance indicating the operation of non-additive gene action. The lowest but moderate heritability estimate and comparatively low genetic gain recorded for earhead weight would suggest modified breeding methods other than selection.

In general, the genotypic correlation coefficients were greater than the phenotypic and environmental correlation coefficients (Table 2).

Fodder is valued in terms of an increased production and quality based on high total soluble solids. Dry fodder yield was positively correlated with plant height and total soluble solids, the correlation coefficients beinc significant at both the

Table 2. Pheno typic (P), genotypic (G) and Environmental (E) correlation coefficients between pairs of characters in fodder sorghum

Character		Plant height	Plant stand	No. of leaves	Leaf length	Leaf width	Grain yield	Total soluble solids
Fodder yield	P	0.396*	0.344	0.163	0.338	-0.175	0.005	0.433**
	G	0.488*	0.491*	0.211	0.457*	-0.329	0.253	0.541**
	E	0.052	0.106	0.059	-0.040	0.033	-0.172	0.253
Plant height	P		0.362*	0.073	0.935**	-0.370*	0.839**	0.185
	G		0.444*	0.080	0.552**	0.446*	0.873**	0.202
	E		-0.097	-0.016	-0.203	-0.402	0.018	-0.107
Plant Stand	P			-0.365*	0.104	-0.333	-0.123	0.307
	G			-0.419*	0.176	-0.484*	-0.185	0.352
	E			-0.218	0.055	-0.065	0.049	0.229
No. of leaves	P				0.531**	0.079	0.211	0.367*
	G				0.537**	0.155	0.236	0.498*
	E				0.130	-0.126**	-0.030	0.142
Leaf length	P					0.039	0.001	0.297
	G					0.151	0.010	0.315
	E					-0.164	-0.009	0.108
Leaf width	P						0.501**	-0.118
	G						0.629**	-0.259
	E						-0.280	0.087
Grain yield	P							0.496**
	G							0.686**
	E							0.273

** Significantly at 5% and 1% level respectively

phenotypic and genotypic levels. Plant height was by itself correlated with plant stand, leaf length, leaf width and grain yield. Therefore, selection practised for plant height would not only result in an increased fodder yield but also other related characters like leaf length, leaf width and grain yield. Fodder yield was positively and significantly correlated with plant height and number of leaves (Naphade, 1972 and Rohewal *et al.*, 1964). Total soluble solids also was positively and significantly correlated with number of leaves and grain yield. Similarly, number of leaves with leaf length and leaf width with grain yield were observed to be positively and significantly correlated at both the phenotypic and genotypic levels. Plant stand showed a negative association with number of leaves, leaf width and total soluble solids.

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