Madras Agric. J. 89 (1-3) : 85-88 January-March 2002
https://doi.org/10.29321/MAJ.10.A00191

Genetic variability and correlation studies in red grain sorghum hybrids under rainfed condition

S.MANONMANI, M. SURESH, AND A.K. FAZLULLAH KHAN
Centre for Plant Breeding and Genetics, Tamil Nadu Agrl. Univ., Coimbatore-641 003, Tamil Nadu.

Abstract: The range of variation for 14 different characters indicated wide differences among the genotypes. The magnitudes of GCV were more or less equivalent to PCV for most of the characters studied indicating the least influence of the environment. High heritability coupled with high genetic advance as percent of mean and high GCV were recorded for grain yield, straw yield, ear head weight, number of secondary branches, number of primary branches and plant height indicating the presence of additive gene action for these traits. Number of primary and secondary branches, number of whorls, leaf width and length, number of leaves and plant height showed strong positive correlation with yield. Selection for number of whorls, primary and secondary branches, leaf length, number of leaves, plant height and ear head weight might be effective in achieving higher yield in red grain sorghum hybrids. *(Key words: Red grain Sorghum hybrids, Grain yield, Variability, Correlation).*

Sorghum *(Sorghum bicolor* (L.) Moench) s one of the most important dryland crops in Tamil Nadu State. Red grain sorghum genotypes are widely cultivated in dry areas especially in Salem and Dharmapuri districts of Tamil Nadu. Red Grain sorghum is used in biscut industries also. The development of a better variety having desirable attributes depends upon the nature and genetic basis of the breeding material available with the breeder. Yield is a complex character and is associated with a number of component characters. Therefore, it is essential that the breeder detects the characters having the greatest influence on yield. This is useful in designing and evaluating breeding programmes. Studies on variability and correlation in red grain sorghum hybrids under rainfed condition are very meagre. The main objective of the present investigation was for estimating the variability present in the red grain sorghum hybrids and identifying the characters which are highly correlated with grain yield.

Materials and Methods

Thirty five genotypes of red grain sorghum hybrids were evaluated in three rows of 4 m length adopting a randomised block design with three replications during *Kharif* season 1995 at the Regional Research Station, Paiyur. Observations were recorded on five plants at random in each replication. A total of 14 characters was studied. All the agronomic and plant protection measures were practiced as per the standard package of practices for sorghum. Genotypic and phenotypic coefficients of variation (GCV and PCV) were estimated by using the method by Burton (1952) and Johnson *et al,* (1955). The data were analysed for correction co-efficient as per the method of Falconer (1964).

Results and Discussion

The data (Table 1) revealed that there is significant genotypic variability among the genotypes of red grain sorghum hybrids. There was a wide range of variation for all the characters studied. In general, the magnitude of PCV and GCV were more or less equivalent for duration, plant height, leaf length, number of primary branches, number of secondary branches, ear head weight, 100 grain weight, straw yield and grain yield. This showed that these characters were least affected by environmental fluctuations. These characters might offer scope for selection. Similar results were reported earlier by Sankarapandian *et al.* (1996) in white grain sorghum. The magnitude of PCV was slightly higher than GCV for number of leaves, leaf width, panicle length and breath and number of whorls.

The heritability was very high for plant height (97%), straw yield (97%), grain yield (97%), earhead weight(96%), number of primary branches (94%) and number of secondary branches (92%).

Table 1. Genetic variability for fourteen characters in red grain sorghum

Characters	Range	Mean	GCV (%)	PCV (%)	Heritability (%)	GA as % of mean
Duration	89-109.3	99.11	4.98	5.36	86	9.44
Plant height	87.8-202.3	150.61	20.11	20.24	99	61.99
No. of leaves	4.6-8.2	6.24	14.45	18.25	63	1.47
Leaf length	43.1–74.1	59.27	11.39	12.22	87	12.96
Leaf width	5.4-9.2	6.85	9.66	13.86	49	0.95
Panicle length	13.6-26.8	21.52	2.09	15.32	62	4.23
Panicle width	3.0-8.2	5.16	21.51	24.43	78	2.01
No. of whorls	8.6-13.8	12.19	9.30	11.23	69	1.93
No. of primary branches	24.6-68.3	45.84	24.14	24.94	94	22.06
No. of secondary branches	87.1-462.3	255.06	29.11	30.32	92	146
Ear head weight	25.7-120.7	51.7	33.34	34.07	96	34.74
100 grain weight	1.6-3.2	2.43	13.12	14.33	84	0.60
Straw yield	14.5-94	34.15	39.66	40.21	97	27.52
Grain yield	29.2-167.8	81.93	36.53	37.09	97	60.71

High heritability will facilitate reliable selection towards improvement. Similar high heritability was reported by Nimbalkar *et al.* (1988) in grain sorghum for number of grains per ear, and for plant height by Sankarapandian *et al.* (1996).High heritability was also recorded for duration (86%), leaf length (87%). 100 grain weight (84%), number of leaves (63%), panicle length (62%),panicle width (78%) and number of whorls (69%). Moderate heritability was recorded for leaf width (49%). Potdukhe *et al.* (1993) had reported very low heritability for number of leaves.

Genetic advance as percent of mean was highest for secondary branches (146.86). Higher genetic advance was also recorded for plant height (61.99%) and grain yield (60.71). High values of heritability associated with high values of genetic advance as per cent of mean suggested that these characters are under the control of additive gene action. The high genetic advance coupled with high to moderate heritability would give better scope for selection (Panse, 1957). The characters *viz.* plant height, number of primary branches, number of secondary branches, ear head weight, straw yield and grain yield recorded high heritability coupled with high GCV and genetic advance as percentage of mean indicated that additive effects had a major role in the expression of these characters. Moderate heritability for leaf width coupled with low GCV and genetic advance as per cent of mean. It indicated the importance of both additive and non additive gene action for this character. The characters such as 100 grain weight which had very low genetic advance will have poor response for selection.

Correlation studies indicated that plant height, number of leaves, leaf length, leaf width, number of whorls, number of primary branches and number of secondary branches had direct positive correlation with grain yield (Table 2) in red grain sorghum under rainfed condition. Positive association of plant height with grain yield was observed by Patil and Thombre (1983) and Gomez *et al.* (1986). Patil *et al.* (1993) observed positive correlation of number of primary and secondary branches with grain yield. The increase in number of primary and secondary branches per panicle might lead to more number of grains and hence more grain yield per plant.

Table 2. Inter correlation among yield and its components in red grain sorghum

Characters	Duration	Plant Height	No.of leaves	Leaf length	Leaf width	Panicle length	Panicle width	No. of whorls	No.of primary whorls	No. of secondary branches	Ear head weight	100 grain weight	Straw yield	Grain yield
Duration	1.000	0.102	0.390**	-0.040**	0.113	0.081	0.123	0.256	0.396**	0.502**	0.158	-2.57	0.035	0.173
Plant height		1.000	0.625**	0.526**	0.290*	-0.100	0.354*	0.375**	0.574**	0.534**	0.0254	-0.024	0.139	0.360*
No. of leaves			1.000	0.311	0.472**	0.032	0.540**	0.388**	0.611**	0.578**	0.436**	-0.001	0.303*	0.360*
Leaf length				1.000	0.430**	0.384**	0.555**	0.363*	0.459**	0.402**	0.529**	0.231	0.435**	0.448**
Leaf width					1.000	0.083	0.307*	0.267	0.428**	0.471**	0.577**	0.211	0.331*	0.463
Panicle length						1.000	0.425**	0.474**	0.082	0.324*	0.527**	0.042	0.476**	0.120
Panicle width							1.000	0.473**	0.519**	0.581**	0.613**	0.333**	0.517**	0.230
No. of whorls								1.000	0.674**	0.685**	0.396*	-0.007	0.404**	0.458**
No. of primary branches									1.000	0.797**	0.456**	0.021	0.291	0.495**
No. of secondary branches										1.000	0.647**	0.054	0.486**	0.406**
Ear head weight											1.000	0.396**	0.897**	0.206
100 grain weight												1.000	0.429**	-0.003
Straw yield													1.000	0.044
Grain yield														1.000

** Significant at 1% level.

Number of leaves, leaf length, leaf width, panicle length, panicle width, number of whorls, number of secondary branches, ear head weight and 100 grain weight, recorded positive significant correlation with straw yield. Ear head weight was positively correlated with 100 grain weight number of secondary branches, number of primary branches, number of whorls and panicle width. Duration, number of leaves, leaf length, leaf width, panicle length, panicle width and number of whorls were closely interrelated with number of secondary branches. Except panicle length all the above characters were also found to be interrelated with number of primary branches. Plant height, number of leaves, leaf length and panicle length and breadth were positively correlated with number of whorls. Plant height, number of leaves, leaf length and width and panicle length were associated with panicle width. Plant height was positively correlated with number of leaves, leaf length- and leaf width. Crop duration was positively correlated with number of leaves. Similar results were also reported by Potdukhe *et al.* (1993) and Raveendran *et al.* (1996).

Hence, on the basis of variability parameters and correlation the present study revealed that the importance of number of whorls, primary and secondary branches, leaf length, number of leaves, plant height and ear head weight in influencing the grain yield. Selection based on these characters may be helpful in planning an efficient breeding programme.

References

Burton, G.V. (1952). Quantitative inheritance in grasses. *Proc. 6th Int. Grassland Cong.* I: 277-288.

Falconer, D.S. (1964). Introduction to quantitative genetics. Edinburgh, Oliver and Boyd, pp. 312-318.

Gomez, F., Miller, F.R. and Rooney, L.W. (1986) Association of yield and yield component in some food type sorghums. *Sorghum Newsl* **29**: 22-24.

Johnson, H.W., Robinson, H.F. and Comstock, R.E (1955). Estimate of genetic and environmenta variability in soybeans. *Agron. J.* **47**: 314 318.

Nimbalker, V.S., Bapat, D.R. and Patil, R.C. (1988) Genetic variability interrelationships and patl coefficients of grain yield and its attribute in sorghum. *J. Maharashtra Agric. Univ* **13**: 207-208.

Panse, V.G. (1957). Genetics of quantitative character in selection to plant breeding. *Indian J. Genet and Pl. Breed.* **17**:318-327.

Patil, P.B., Patil, D.V., Makne, V.G., Menta, H.D and Shete, D.M. (1993). Genotypic correlation and path coefficient studies under three environments in *rabi* sorghum. *J. Maharashtr Agric. Univ.*, **18**:189-191.

Patil, R.C. and Thombre, M.V. (1983). Inter relationshi between yield and some agronomic character in a 4 x 5 line x tester cross set in sorghum *Sorghum Newsl.* **26**: 27.

Potdukhe, N.R., Wanjari, S.S., Thote, S.G. and Shekar V.B. (1993). Variability and genetic correlation in sorghum. *J. Maharashtra Agric. Univ.* **18**:486-487.

Raveendran, M., Sree Rangasamy, S.R. and Senthil, N. (1996). Correlation studies for biomass yield in fodder sorghum. *Madras Agric. J.* **83**: 663.

Sankarapandiyan, R., Rajarathinam, S. and Muppidathi, N. (1996). Genetic parameters, correlation and path analysis among yield and yield characters in grain sorghum. *Madras Agric. J.* **83**: 625-628.

(Received: December 2000; Revised: October 2001)