

CHARACTER ASSOCIATION AND PATH ANALYSIS IN RABI SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH]

K. HUSSAIN SAHIB¹ and B.B. REDDY²

ABSTRACT

Ten parents and 45 F₁ hybrids of sorghum [*Sorghum bicolor* (L.) Moench] were studied in rabi season for genotypic correlations and path analysis. Grain yield showed significant positive correlation with panicle breadth, plant height and 100-grain weight in parents, while with panicle breadth, number of leaves and days to flowering in F₁s. plant height had the highest positive direct effect on grain yield followed by days to flowering in parents. In F₁s, number of leaves had the highest direct effect followed by panicle breadth and plant height. Though days to flowering showed negative direct effect on yield in F₁s, its indirect effect through number of leaves was high, resulting in significant positive genotypic correlation. Improvement in grain yield in rabi sorghum would be possible through selection for plant height, number of leaves and days to flowering.

KEY WORDS : Sorghum, Correlation, Path analysis.

Sorghum [*Sorghum bicolor* (L.) Moench] is an important food and feed crop cultivated both in *Kharif* and *rabi* seasons in India. *Rabi* sorghum yields are stagnant for the past two decades and need a thorough genetic manipulation. A knowledge of the nature of character association through path analysis can furnish a clue to partitioning of genetic associations of a complex trait like grain yield. Such studies are limited and mostly reported by evaluating the material during *Kharif* season (Debolkar *et al.*, 1970; Singh and Baghel, 1977). The present study was, therefore, taken up to know the nature of character association among yield components and to judge the direct and indirect effects of different yield components in parents and F₁ hybrids of sorghum grown in *rabi* season.

MATERIALS AND METHODS

The material comprised 10 parental lines of sorghum viz., SPV-232, SPV-104, M35-1, 296B, 2219B, CSV-BR, 36B, D-71396, E36-1 and CSV-5. These parents and their 45 F₁s obtained from crossing in

all possible combinations, excluding reciprocals, were grown in a randomized complete block design with three replications in *rabi* season of 1982-83. Each genotype was grown in 3 m long single row with 45 cm x 15 cm spacing. Observations were recorded on five random competitive plants in each of the parents and F₁s in each replication. Correlation coefficients were calculated at the genotypic level using the procedure given by Al-Jibouri *et al.* (1958). The path-coefficient analysis was carried out as described by Dewey and Lu (1959).

RESULTS AND DISCUSSION

For most of the character pairs, genotypic correlation coefficients showed similar trend in both the parents and F₁s. (Table 1).

Grain yield had significant positive correlation with panicle breadth, plant height and 100-grain weight in parents and with panicle breadth, number of leaves and days to flowering in F₁s. In both parents and F₁s, days to flowering had significant positive correlation with number of leaves. As in the present study, Goud and Krishna

* Part of the Ph.D. thesis submitted by the senior author to APAU.

1. Sorghum Breeder, RARS, Nandyal - 518 503 (A.P)
2. Scientist S-2, AICSP, Hyderabad

Table 1. Genotypic correlation coefficients for parents and F₁s in sorghum

		Plant height	No. of leaves	Peduncle length	Panicle length	Panicle breadth	No. of primaries	No. of whorls	100 grain weight	Grain yield
Days to flowering	P	-0.070	1.038**	-0.758*	-0.399	0.440	0.318	0.285	0.079	0.304
	F ₁	-0.206	0.800**	-0.806**	-0.455**	0.470**	0.685**	0.120	-0.036	0.344*
Plant height	P		0.049	-0.314	-0.019	0.722*	-0.028	-0.132	0.857**	0.836**
	F ₁		-0.193	0.349*	0.073	0.303*	-0.180	-0.455**	0.814**	0.274
No. of leaves	P			-0.924**	-0.220	0.678*	0.483	0.444	0.050	0.469
	F ₁			-0.680**	-0.206	0.711**	0.616**	0.257	-0.049	0.579**
Peduncle length	P				0.477	-0.468	-0.414	-0.238	-0.190	-0.416
	F ₁				0.466**	-0.333*	-0.570**	-0.167	0.107	-0.250
Panicle length	P					0.252	0.084	0.299	0.061	0.134
	F ₁					-0.395**	-0.195	0.211	-0.217	-0.280
Panicle breadth	P						0.629	0.528	1.032**	1.071**
	F ₁						0.240	0.491**	0.209	0.952**
No. of primaries	P							0.669*	0.050	0.349
	F ₁							0.360*	-0.026	0.183
No. of whorls	P								0.325	0.114
	F ₁								-0.212	-0.434**
100 / grain weight	P									0.819**
	F ₁									0.207

Sastry (1974) and Reddy and Rao (1982) reported that number of leaves and days to flowering were very important in influencing the yield through higher leaf area index and leaf area duration. Plant height and panicle breadth were also important in giving high dry matter production and high grain yield. Plant height had significant positive correlation with panicle breadth and also with 100 grain weight in both the parents and F₁s which is in accordance with the reports of Shahana and Borikar (1982a). The correlation coefficients of number of leaves with panicle breadth were negative and significant in both the parents and F₁s.

Peduncle length had significant positive correlation with panicle length, while it had significant negative correlation with panicle breadth and also with number of primaries in F₁s. The association of panicle length and panicle breadth was negative and significant in F₁s. Panicle breadth had significant positive association with 100 grain weight in parents.

Path analysis revealed that in parents, plant height had high positive correlation with yield due to its high direct effect while it had mild positive correlation with yield in F₁s. (Table 2). The direct effect of days to flowering on yield was high in parents, while it had negative direct effect in F₁s. But, the indirect effect of days to flowering through number of leaves was high which resulted in significant positive correlation between days to flowering and grain yield. In parents, days to flowering itself had a high direct positive effect. In F₁s, the direct contribution of number of leaves on the yield was the highest followed by panicle breadth and plant height. This shows that height and maturity along with number of leaves influenced towards more yield. Giriraj and Goud (1983) reported high positive direct as well as indirect effects through other character viz., plant height, days to flowering and 100 grain weight on grain yield. The indirect effects of panicle breadth through plant height in parents and through number of leaves in F₁s were high, which resulted in high correlations. The

Table 2. Path-coefficient analysis of genotypic correlations for parents and F₁s in sorghum

Character		Days to flowering	Plant height	No. of leaves	Peduncle length	Panicle length	Panicle breadth	No. of primaries	No. of whorls	100 grain weight	Grain yield
Days to flowering	P	0.725	-0.055	-0.105	-0.251	-0.116	0.051	0.148	-0.102	0.009	0.304
	F ₁	<u>-0.546</u>	-0.033	0.776	-0.041	-0.088	0.083	0.070	0.055	0.003	0.344
plant height	P	-0.051	<u>0.787</u>	-0.005	-0.104	-0.005	0.083	-0.013	0.047	0.097	0.836
	F ₁	0.112	<u>0.160</u>	-0.187	0.018	-0.014	0.053	-0.019	0.210	-0.061	0.274
No. of leaves	P	0.753	0.039	<u>-0.101</u>	-0.306	-0.064	0.078	0.224	-0.159	0.006	0.469
	F ₁	-0.437	-0.031	<u>0.969</u>	-0.035	0.040	0.125	0.063	-0.119	0.004	0.579
Peduncle length	P	-0.549	-0.247	0.093	<u>0.331</u>	0.139	-0.054	-0.192	0.085	-0.021	0.416
	F ₁	0.440	0.056	0.659	<u>0.051</u>	-0.090	-0.059	-0.058	0.077	0.008	0.250
Panicle length	P	-0.289	-0.015	0.022	0.158	<u>0.291</u>	0.029	0.039	-0.107	0.007	0.134
	F ₁	0.248	0.012	0.200	0.024	<u>0.194</u>	0.070	-0.020	-0.098	0.016	0.280
Panicle breadth	P	0.319	0.568	-0.068	-0.155	0.073	<u>0.115</u>	0.292	-0.189	0.116	1.071
	F ₁	-0.257	0.049	0.689	-0.017	0.076	<u>0.176</u>	0.025	0.227	0.016	0.952
No. of primaries	P	0.231	-0.022	-0.049	-0.137	0.024	0.072	<u>0.463</u>	-0.240	0.006	0.349
	F ₁	-0.374	-0.029	0.597	-0.029	0.038	0.042	<u>0.102</u>	-0.166	0.002	0.183
No. of whorls	P	0.207	-0.104	-0.045	-0.079	0.087	0.061	0.310	<u>-0.359</u>	0.037	0.114
	F ₁	-0.065	-0.073	0.249	-0.009	-0.041	-0.086	0.037	<u>-0.462</u>	0.016	0.434
100 / grain weight	P	0.057	0.675	-0.005	-0.063	0.028	0.119	0.023	-0.117	<u>0.113</u>	0.819
	F ₁	0.019	0.131	-0.048	0.006	0.042	0.037	-0.003	0.098	<u>-0.075</u>	0.207

* Significant at 0.05 level ; ** Significant at 0.01 level

direct effect of 100-grain weight was small which was also reported by Shahana and Borikar (1982b). The characters plant height, number of leaves and days to flowering had high direct as well as indirect effects through other characters on grain yield. This is understandable because plant height, number of leaves and days to flowering bring in more dry matter, more leaf area index and leaf area duration. Thus in breeding programmes, simultaneous selection for these characters will be useful in bringing higher yields.

ACKNOWLEDGEMENTS

The senior author is thankful to Indian Council of Agricultural Research for the award of senior fellowship and to Andhra Pradesh Agricultural University for providing the facilities.

REFERENCES

- AL-JIBOURI, H.A., MILLER P.A. and ROBINSON, H.F. 1958. Genotypic and environmental variances and covariances in an upland cross of interspecific origin. *Agron. J.*, **50**: 633-6.
- DABHOLKAR, A.R., TELANG, S.W. and PATEL, S.G. 1970. Path analysis of yield components in hybrid sorghum. *Indian J. Genet.*, **30**: 625-9.
- DEWEY, D.R. and LU, K.H. 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.* **51**: 515-8.
- GIRIRAJ, K. and GOUD, J.V. 1983. Association of yield components and developmental traits in grain sorghum. *Indian J. agric. Sci.*, **44**: 253-6.
- REDDY, B.B. and RAO, N.G.P. 1982. Bridging the gap between hybrid and varietal performance in sorghum. *Indian J. Genet.*, **42**: 64-9.
- SHAHANE, T.G. and BORIKAR, S.T. 1982a. Character association and path analysis in winter sorghum. *Indian J. agric. Sci.*, **52**: 429-31.
- SHAHANE, T.G. and BORIKAR, S.T. 1982b. Note on path analysis in sorghum. *Indian J. agric. Sci.*, **52**: 788-9.
- SINGH, R.P. and BAGHEL, S.S. 1977. Yield components and their implications to selection in sorghum. *Indian J. Genet.*, **37**: 62-7.