

# CORRELATION AND PATH COEFFICIENT ANALYSIS IN SORGHUM (SORGHUM BICOLOR L. MOENCH)

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## ABSTRACT

A study undertaken with 40 sorghum types revealed the high positive and significant association of plant height, peduncle thickness, leaf number, grain number, grain weight and straw yield with grain yield both at phenotypic and genotypic level. Among the inter-correlations, the positive association of straw yield with days to half bloom, leaf number and plant height was significantly positive. Significant negative associations were observed for panicle length with grain weight and peduncle thickness. The path coefficient analysis indicated the high direct effects of grain number and grain weight on yield. Plant height, leaf number, peduncle thickness and straw yield had positive indirect effects on grain yield through grain number, but the indirect effects of grain weight and whorl number were negative on grain yield, through number of grains.

KEY WORDS : Sorghum, Correlation, Path analysis

Yield is a complex character; hence a knowledge of association of different yield components with yield and their inter-correlations among themselves both at genotypic and level and the causal system of each component by partitioning them into direct and indirect effects is essential for any crop improvement programme. Hence a study was undertaken with sorghum types representing both dwarf and tall types to study the correlation and path coefficients among the yield and its components.

## MATERIALS AND METHODS

Forty types of sorghum maintained at Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore with diverse characters were selected and raised in a RBD with three replications. The plants were raised with a spacing of 40 cm between rows and 15 cm between plants. Observations were recorded on five plants selected at random. Genotypic, phenotypic and environmental correlations (Johnson *et al.*, 1955) and path coefficient were worked out.

## RESULTS AND DISCUSSION

In general, the genotypic correlation coefficients were higher than that of the phenotypic correlation coefficients (Table 1). This is an agreement with the earlier reports by Johnson *et al.* (1955), Lal and Haque (1971) and Gomez *et al.*, (1986). This may confirm the considerable role of environment in modifying the total expression of the genotypes (Nandpuri *et al.*, 1973).

Plant height, peduncle thickness, leaf number, grain number, grain weight and straw yield showed high positive association with grain yield both at phenotypic and genotypic level, while days to half bloom showed positive association with grain yield only at genotypic level. Nishibe *et al.* (1974), Moussa Adamu and Weibel (1976), Jan-orn *et al.* (1976), Ramasamy *et al.* (1986) and Gomez *et al.* (1986) also reported positive association of grain number with grain yield. Gao (1984) and Gomez *et al.* (1986) also reported significant correlation between grain yield and plant height and 1000 grain weight.

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Table 1. Phenotypic (P), genotypic (G) and environmental (E) correlation coefficients among characters in sorghum types (pooled)

Character	Days to half bloom	Leaf No.	Peduncle thickness	Panicle length	Whorl No.	Grain No.	Grain weight	Straw yield	Grain yield
Plant height	P -0.1003	-0.0254	0.2558	-0.4231**	-0.3535*	0.2147	0.3413*	0.6333**	0.3562*
	G -0.0999	-0.0570	0.3075	-0.4378**	-0.3860*	0.2452	0.3694*	0.6620**	0.4162**
	E 0.1169	0.4188**	0.0819	-0.0479	-0.1094	0.0497	0.0162	0.3462*	0.0293
Days to half bloom	P 0.8131**	0.8131**	0.0946	0.0212	0.3921*	0.0659	0.3889*	0.4419**	0.2635
	G 0.8610**	0.8610**	0.1294	0.0185	0.4147**	0.0707	0.4080**	0.4843**	0.3083*
	E -0.3203*	-0.3203*	-0.0893	0.1272	0.2857	0.0627	0.1600	0.1573	-0.0633
Leaf No.	P 0.2133	0.2133	0.2133	0.0160	0.2752	0.1810	0.4038**	0.4858**	0.3844**
	G 0.2218	0.2218	0.2218	0.0174	0.3303*	0.2318	0.4551**	0.4864**	0.4311**
	E 0.2450	0.2450	0.2450	-0.0102	-0.1084	-0.0920	-0.0735	0.4869**	0.1789
Peduncle thickness	P -0.3325*	-0.3325*	-0.3325*	-0.3325*	-0.2137	0.5511**	0.2527	0.5371**	0.6463**
	G -0.4612**	-0.4612**	-0.4612**	-0.4612**	-0.2738	0.5433**	0.2843	0.5669**	0.7135**
	E -0.3644*	-0.3644*	-0.3644*	-0.3644*	-0.0522	0.6405**	0.1909	0.5372**	0.5027**
Panicle length	P 0.3584*	0.3584*	0.3584*	0.3584*	0.3584*	0.0403	-0.3272*	0.4168**	-0.1813
	G 0.3676*	0.3676*	0.3676*	0.3676*	0.3676*	0.0399	-0.3442*	0.4403**	-0.2133
	E 0.4219**	0.4219**	0.4219**	0.4219**	0.4219**	0.0766	-0.1171	0.1457	0.0261
Whorl No.	P -0.2260	-0.2260	-0.2260	-0.2260	-0.2260	-0.2260	-0.0629	-0.1558	-0.2418
	G -0.2459	-0.2459	-0.2459	-0.2459	-0.2459	-0.2459	-0.0741	-0.1742	-0.2626
	E -0.1690	-0.1690	-0.1690	-0.1690	-0.1690	-0.1690	0.0081	-0.0448	-0.1653
Grain No.	P -0.1476	-0.1476	-0.1476	-0.1476	-0.1476	-0.1476	0.0922	0.2817	0.8215**
	G -0.1959	-0.1959	-0.1959	-0.1959	-0.1959	-0.1959	0.0922	0.2589	0.8112**
	E 0.0922	0.0922	0.0922	0.0922	0.0922	0.0922	0.0922	0.4177	0.8540**
Grain Weight	P 0.6367**	0.6367**	0.6367**	0.6367**	0.6367**	0.6367**	0.6367**	0.6367**	0.4218**
	G 0.7442**	0.7442**	0.7442**	0.7442**	0.7442**	0.7442**	0.7442**	0.7442**	0.4305**
	E 0.2413	0.2413	0.2413	0.2413	0.2413	0.2413	0.2413	0.2413	0.4206**
Straw yield	P 0.4977**	0.4977**	0.4977**	0.4977**	0.4977**	0.4977**	0.4977**	0.4977**	0.4977**
	G 0.7075**	0.7075**	0.7075**	0.7075**	0.7075**	0.7075**	0.7075**	0.7075**	0.7075**
	E 0.4869**	0.4869**	0.4869**	0.4869**	0.4869**	0.4869**	0.4869**	0.4869**	0.4869**

\* Significant at 5% level

\*\* Significant at 1% level

Rangaswamy Ayyangar *et al.* (1935) reported positive association of straw yield and peduncle thickness with grain yield. According to Moussa Adamou and Welbel (1976), Tripathi *et al.* (1976) and Ramasamy *et al.* (1986), the correlation between grain weight and grain yield was positive. It can therefore be concluded that in populations consisting both dwarf and tall individuals, selection for more number of leaves with thick peduncle, high grain number, grain weight and straw yield either individually or in combination may result in isolating high yielding lines.

Among the inter-correlations, the positive association of straw yield with days to half bloom, leaf number and grain weight and also positive inter-relationship among them were observed consistent in pooled as well as dwarf and tall groups of sorghum types. In addition, plant height was also positively associated with straw yield. Vishnu Swarup and Chaugale (1962) also reported positive association of straw yield with days to half bloom. Positive inter-correlations between days to half bloom, leaf number and grain weight were observed by Liang *et al.* (1969) and Krishnasamy (1986). Hence for improving straw yield in sorghum, these characters may be given importance for selection. Absence of any significant association of panicle length with grain yield indicated that the yield can be improved under various background of panicle length depending on the local preference to the panicle type.

### Path analysis

Path values based on genotype correlations showing direct and indirect effects of nine characters on yield are presented in Table 2. The characters like grain number and grain weight had high direct effect on grain yield followed by days to half bloom. The very low residual effects in all the three groups indicated that the characters chosen for the path analysis are

Table 2. Path coefficient analysis showing the direct and indirect effects of nine characters on grain yield in sorghum

Character	Plant height	Days to bloom	Leaf No.	Peduncle thickness	Panicle length	Whorl No.	Grain No.	Grain weight	Straw yield	$r_g$ with yield
Plant height	<u>-0.0700</u>	0.0239	0.0210	0.0182	-0.0108	0.0165	0.2560	0.2866	-0.0444	0.4162**
Days to half bloom	0.0070	<u>0.2345</u>	-0.3179	0.0076	0.0005	0.0177	0.0738	0.3166	-0.0325	0.3083**
Leaf No.	0.0040	0.2062	<u>-0.3692</u>	0.0131	0.0004	0.0141	0.2420	0.3531	-0.0326	0.4311**
Peduncle thickness	-0.0215	0.0310	-0.0819	<u>0.0591</u>	-0.0113	0.0117	0.5672	0.2206	-0.0380	0.7135
Panicle length	0.0306	0.0044	-0.0064	-0.0273	<u>0.0246</u>	0.0157	0.0417	-0.2671	-0.0295	-0.2133
Whorl No.	0.0270	0.0993	-0.1219	-0.0162	0.0090	<u>0.0427</u>	0.2567	-0.0575	0.0117	-0.2626
Grain No.	-0.0172	0.0169	-0.0856	0.0321	0.0010	0.0105	<u>1.0430</u>	-0.1520	-0.0174	0.8112**
Grain Weight	-0.0259	0.0977	-0.1680	0.0168	-0.0085	0.0032	-0.2045	<u>0.7759</u>	-0.0499	0.4305**
Straw yield	-0.0463	0.1160	-0.1795	0.0334	0.0108	-0.0074	0.2703	0.5773	-0.0671	0.7075**

Underlined figures denote the direct effects.

Residual effect =  $P^2_{xy}$  = -0.0458

appropriate and adequate. Niehaus and Pickett (1966) and Dabholkar *et al.* (1970) also reported the high positive direct effects of grain number and grain weight on grain yield in sorghum. Gomez *et al.*, (1986) also reported the positive direct effect of grain number per panicle on yield. Although the characters like plant height and leaf number had positive association with grain yield, their direct effects on grain yield were negative. Thus the need for the path analysis for the correlation of characters with grain yield is emphasized. However, plant height, leaf number, peduncle thickness and straw yield had positive indirect effects through grain number and grain weight on grain yield. Palanisamy *et al.* (1986) also reported the positive indirect effect of plant height through other characters. But the indirect effects of grain weight and whorl number through grain number were negative. Dabholkar *et al.* (1970) and Gomez *et al.*, (1986) also reported such negative indirect effect on grain weight through grain number on grain yield. Hence during selection for grain number, it is appropriate to have judicious weightage on grain weight and whorl number. Similarly the indirect effect of days to half bloom through leaf number was also negative. Hence while selecting late and early types it is essential to have optimum number of leaves per plant.

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