

Path-Coefficient Analysis in Hybrid Sorghum (CSH 5) Under Different Nitrogen Levels*

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An experiment was conducted to study the effect of graded levels of N on the yield attributes and yield of sorghum (CSH. 5.) The association of the yield attributes on the grain yield was studied through simple correlations and path-coefficient analysis. The results revealed that the effect of the yield attributes *viz.*, ear length, grain number/ear, 1000 grain weight and leaf area index (LAI) was only 44% in the overall picture of N effect on the yield attributes and sorghum grain yield. But the effect was as high as 60 and 63% under 100 kg N/ha and 150 kg N/ha, respectively. Moreover, under unfertilized condition LAI had the major role in influencing the yield but under higher levels of N application ear length and LAI were important.

A study was taken up to investigate the contribution of different yield attributes on grain yield of sorghum (CSH-5) under graded level of N and the results are presented in this paper.

MATERIAL AND METHODS :

The experiment was laid out with four levels of N *viz.*, 0, 50, 100 and 150 kg/ha. The leaf area index (LAI) was computed at flowering (60th day) adopting the procedure suggested by Krishnamurthy *et al.* (1974). From the randomly selected five plants the yield attributes *viz.*, length of ear, grain number/ear and 1000 grain weight were recorded.

The method of correlation and path-coefficient analysis was used to

evaluate the influence of yield attributes on grain yield. Simple correlations were worked out by the method out-lined by Snedecor and Cochran (1967) between yield and yield attributes. Path Co-efficients were worked out by the simultaneous solution of the equations for four variables as given by Dewey and Lu (1959).

RESULTS AND DISCUSSION :

Applied N increased the grain yield over control. Even low level of application (50 kg/ha) more than doubled the grain yield. Each increment in the level of N application had favourably and significantly influenced the grain yield. The significant improvement in the growth characters and yield attributes brought

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about by N application had resulted in increased grain yield. All the component studied had a positive relationship with yield (Table I).

Table I: Correlation between yield components and yield

	Grain number/ ear	1000 grain weight	Leaf area index	Grain Yield
Ear length	0.6179**	0.4109**	0.5019**	0.6092**
Grain number/ear		0.6219**	0.6571**	0.8361**
1000 grain weight			0.6073**	0.6658**
Leaf area Index				0.7818**

**Significant at 1% level

The correlation coefficients were then partitioned into direct effects and indirect effects via other characters (Table II). The R^2 value of 0.438

indicates that 43.8% of the yield could be explained by the four yield contributing characters studied.

Table II: Components of correlation coefficients depicting the direct and indirect effects of yield contributing characters (Direct effects are under lined)

	Ear length (X_1)	Grain number/ ear (X_2)	1000 grain weight (X_3)	Leaf area index (X_4)	Grain yield (X_5)
Ear length (X_1)	<u>0.0900</u>	0.2933	0.0493	0.1766	0.6092
Grain number/ear (X_2)	0.0556	<u>0.4747</u>	0.0746	0.2312	0.8361
1000 grain weight (X_3)	0.0370	0.2952	<u>0.1199</u>	0.2137	0.6658
Leaf area index (X_4)	0.0452	0.3119	0.0728	<u>0.3519</u>	0.7818

$$R_2 = 0.438$$

Grain number/ear had the maximum direct effect. Its indirect positive effect through LAI was also substantial. The correlation obtained with yield is thus explained by these two effects mostly. The indirect effect through ear length and 1000 grain weight was feeble.

Following grain number/ear, LAI had the next highest direct effect. Coupled with this, its indirect positive effect through grain number/ear accounted for most of the correlation. The contribution of its positive indirect effect through ear length and 1000 grain weight was negligible.

The direct effect of 1000 grain weight was not appreciable, but its indirect effect through grain number per ear was substantial. This in conjunction with its positive effect through LAI and ear length had yielded the significant correlation.

The ear length had very feeble effect on grain yield. But its indirect effects through other characters,

especially, grain number/ear and LAI explains its significant correlation with yield.

To study the nature of relationships of the above yield components on the yield at different N levels, correlations and path coefficients among these characters and yield were worked out and are presented in Tables III and IV.

Table III Correlations among the different characters

Variables	Levels of N (kg/ha)			
	0	50	100	150
YX ₁	0.0954	0.7511	0.7156	0.5496
YX ₂	0.4084	0.2847	0.5874	0.5430
YX ₃	-0.2742	-0.0014	0.0073	-0.0721
YX ₄	0.2710	0.5635	0.5432	0.4476
X ₁ X ₂	0.4197	0.2772	0.7610	0.7808
X ₁ X ₃	0.0815	0.0423	-0.0598	-0.2934
X ₂ X ₄	0.2602	0.4234	0.3213	0.1848
X ₂ X ₃	-0.3044	-0.1576	0.0146	-0.2937
X ₂ X ₄	0.2177	-0.1950	0.2623	0.2783
X ₃ X ₄	0.3975	-0.2563	0.0484	-0.1960

Table IV Path Co-efficient analysis of grain yield.

Nature of influence and association.	Nitrogen levels (kg/ha)			
	0	50	100	150
(1)	(2)	(3)	(4)	(5)
Yield VS. Ear length r 15	0.0954	0.7572	0.7156	0.5496
Direct effect P 15	-0.0828	0.4949	0.5418	0.3787
Indirect effect via Gr. no / ear r 12 P 25	0.1096	0.0698	0.0639	0.1541
Indirect effect via 100 gr. wt. r 13 P 35	-0.0273	0.0054	-0.0013	-0.0489
Indirect effect via Leaf area r 14 P 45	0.0959	0.1841	0.1112	0.0658
Yield Vs. Gr. No./ear r 25	0.4084	0.2847	0.5874	0.5430

Table-IV Path Co-efficient analysis of grain yield.

(1)	(2)	(3)	(4)	(5)
Direct effect P 25	0.2611	0.2518	0.0840	0.1973
Indirect effect Via Ear length r 15 P 15	-0.0348	0.1380	0.4123	0.2957
Indirect effect Via 1000 gr. wt r 23 P 35	0.1018	-0.0203	0.0003	-0.0489
Indirect effect Via Leaf area V 24 P 45	0.0803	-0.0848	0.0908	0.0989
Yield Vs. 1000 gr. wt. r. 35	-0.2742	-0.0014	0.0073	-0.0721
Direct effect P 35	-0.3345	-0.1287	0.0216	0.1666
Indirect effect Via Ear length r 13 P 15	-0.0068	0.0211	0.0324	-0.1110
Indirect effect Via Gr. No./ ear r 23 P 25	-0.0795	0.0398	0.0012	-0.0580
Indirect effect Via Leaf area r 34 P 45	0.1466	-0.1114	0.0169	-0.0697
Yield Vs. Leaf area r 45	0.2710	0.5635	0.5432	0.4476
Direct effect P 45	0.3687	0.4348	0.3460	0.3554
Indirect effect Via Ear length r,14 P 15	-0.0215	0.2108	0.1741	0.0700
Indirect effect Via Gr. no/ ear r 24 P 25	0.0568	-0.0491	0.0220	0.0549
Indirect effect Via 1000 gr. wt. r 34 P 35	-0.1330	-0.0330	0.0011	-0.0327
R ²	0.1993	0.3445	0.6009	0.6324
P X Y ...	0.8948	0.8096	0.6317	0.6024

Although the R² value, is a measure of explaining the association of the characters on yield, was only 44 %, it was as high as 60 and 63% under 100 kg N/ha and 150 kg N/ha levels, respectively. Path analyses of yield, under the different N levels, have brought into light some interesting results. While the interrelationships among the characters was similar in fertilized plots, a different trend was seen under control. In unfertilized plot, LAI had the maximum direct effect, but in N applied plots, ear length exerted greater direct effect.

From the results, it is evident that grain yield of sorghum is related to a number of characters like LAI, length of ear, number of grain/ear and 1000 grain weight. The relation-

ships of the above yield components on yield at different N levels studied through path analysis revealed that under unfertilized condition LAI had major role in influencing the yield while under higher levels of N application, both ear length and LAI were important.

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