

CORRELATION AND PATH COEFFICIENT ANALYSIS OF SOME FODDER YIELD COMPONENTS OF RICEBEAN (*VIGNA UMBELLATA*) UNDER RHIZOBIUM TREATMENT

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SUMMARY

The study was conducted to investigate the correlation coefficient and path coefficient in relation to fodder yield and other yield attributing traits. Correlation studies revealed that, both at genotypic and phenotypic levels, significant positive correlation of green forage yield was observed for days to 50 per cent flowering, plant height, leaf breadth, leaf area per plant, leaves per plant, leaf-stem ratio, primary branches per plant, length of primary roots, root volume per plant and dry matter yield. Path analysis showed that, dry matter yield showed the highest and positive direct effect on green forage yield. Leaf area per plant and primary branches per plant had negative direct effect on green forage yield.

Key words : Correlation coefficient, path coefficient, green forage yield, ricebean

Ricebean has been identified as one of the promising fodder crops. After food, livestock fodder is another purpose of the ricebean. It grows well on a range of soils. To meet the demand of fodder during lean period, ricebean has been identified as the most promising fodder crop. It is palatable and highly nutritious fodder and is richer than other legume fodders like cowpeas and mothbean in protein, calcium and phosphorus with more fodder yield (Chatterjee and Das, 1989). It can produce 32-82 q/ha dry herbage to meet scarcity of green forage during lean period (Mukherjee *et al.*, 1980). Rice bean is also a N-fixing legume that improves the N status of the soil and provides N to the following crop. It possesses nodules on its roots, containing the nitrogen fixing bacteria *Rhizobium* species that fix nitrogen in symbiotic association with plants and release a significant amount of nitrogen for plant growth and development. The determinate types of rice bean cultivars produce profuse growth and nodulation (Singh and Verma, 1988). The number of the nodules and their rate of N fixation are determined by the effectiveness and the number of rhizobia in the soil (Amijee and Giller, 1998).

The experimental material consisted of 21 ricebean genotypes. The experiment was laid out in randomized block design with two replications during *kharif* 2014 conducted at Assam Agricultural University, Jorhat. Each entry was grown with a

spacing of 30 cm row to row and 15 cm plant to plant. The observations were recorded for seventeen characters viz., days to 50 per cent flowering (D50F), plant height (PH), leaves per plant (L/P), leaf length (LL), leaf breadth (LB), leaf area per plant (LA/P), leaf-stem ratio (L:S), primary branches per plant (PB), length of primary roots (PR), root volume per plant (RV), nodule number per plant (NN), weight of effective nodules (WEN), nitrogen content (N%), crude protein (CP), ash content (%), dry matter yield (DMY) and green forage yield (GFY). The genotypic and phenotypic correlation coefficients between any two characters under study were computed as per Singh and Chaudhary (1985). The path analysis was worked out by the formula applied by Dewey and Lu (1959) on wheat grass. Path analysis was carried out in eight forage yield characters.

In the present study, both at genotypic and phenotypic levels (Table 1), significant positive correlation of green forage yield was observed for days to 50 per cent flowering, plant height, leaf breadth, leaf area per plant, leaves per plant, leaf-stem ratio, primary branches per plant, length of primary roots, root volume per plant and dry matter yield. The relatively simply inherited traits as compared to the green forage yield or dry matter yield were days to 50 per cent flowering, plant height, leaf breadth, leaf area per plant, leaves per plant, leaf-stem ratio and primary branches per plant. Indirect selection, if exercised for

TABLE 1
Genotypic (upper diagonal) and phenotypic (lower diagonal) correlation coefficients between different characters in ricebean

Character	D50F	PH	LL	LB	LA/P	L/P	L : S	PB	PR	RV	NN	WEN	N %	CP	Ash	DMY	GFY
D50F		0.68**	-0.4582	0.81**	0.40**	0.52**	0.54**	0.87**	0.83**	0.71**	0.14	-0.40	0.26	0.26	-0.13	0.58**	0.68**
PH	0.49*		-0.02	0.46**	0.51**	0.84**	0.78**	0.91**	0.89**	0.73**	-0.04	-0.22	0.27	0.28	-0.22	0.66**	0.86**
LL	-0.32*	-0.01		-0.35	0.12	-0.01	-0.08	-0.22	-0.14	-0.07	-0.04	0.01	-0.35	-0.35*	-0.11	-0.25	-0.10
LB	0.49**	0.46**	-0.29		0.55**	0.46**	0.34*	0.43**	0.62**	0.63**	0.09	-0.26	0.45**	0.46**	0.22	0.59**	0.55**
LA/P	0.14	0.43**	0.11	0.46**		0.75**	0.51**	0.35*	0.55*	0.57**	-0.06	0.03	0.72**	0.73**	0.30	0.60**	0.49**
L/P	0.34*	0.74**	-0.13	0.41**	0.60**		0.72**	0.77**	0.90**	0.78**	0.07	0.08	0.46**	0.45**	0.12	0.41**	0.55**
L:S	0.31*	0.70**	-0.09	0.32*	0.47**	0.66**		0.72**	0.67**	0.47	0.05	0.10	0.28	0.28	-0.06	0.76**	0.73**
PB	0.61**	0.84**	-0.19	0.43**	0.19	0.67**	0.60**		0.96**	0.79**	0.07	-0.19	0.05	0.05	-0.24	0.54**	0.76**
PR	0.58**	0.88**	-0.12	0.55**	0.46**	0.79**	0.55**	0.84**		0.89**	-0.002	-0.27	0.37**	0.38*	-0.14	0.50**	0.75**
RV	0.49**	0.72**	-0.06	0.56**	0.48**	0.67**	0.39*	0.67**	0.89**		-0.01	-0.32	0.46**	0.47**	0.17	0.25	0.66**
NN	0.09	-0.03	-0.05	0.09	0.01	0.08	0.04	0.06	0.02	0.02		0.78**	0.18	0.20	0.02	-0.26	-0.30
WEN	-0.26	-0.16	0.02	-0.22	-0.02	-0.05	0.06	-0.12	-0.21	-0.27	0.72**		-0.03	-0.02	-0.14	-0.29	-0.37
N%	0.30	0.24	-0.28	0.37*	0.35*	0.38*	0.19	0.18	0.32	0.34	0.13	0.006		1.00**	0.54**	0.10	0.22
CP	0.30	0.25	-0.28	0.39*	0.36*	0.39*	0.2	0.19	0.31*	0.30	0.14	0.01	0.99**		0.53**	0.11	0.23
Ash	-0.15	-0.19	-0.11	0.16	0.23	0.13	-0.04	-0.22	-0.1	0.15	-0.01	-0.12	0.35*	0.35*		-0.26	-0.27
DMY	0.52**	0.52**	-0.19	0.43**	0.36*	0.03	0.51**	0.49**	0.42**	0.19	-0.24	-0.23	0.09	0.09	-0.19		0.76**
GFY	0.45**	0.82**	-0.09	0.49**	0.35*	0.48**	0.59**	0.72**	0.73**	0.60**	-0.27	-0.29	0.21	0.22	-0.21	0.65**	

*Significant at 5% probability level, ** Significant at 1% probability level.

these traits, will improve the productivity of the genotypes for green forage yield easily as direct selection for green forage yield and dry matter yield would be difficult due to complex inheritance of these two traits and predominant role of environment upon it. The component traits *viz.*, days to 50 per cent flowering, plant height, leaf breadth, leaf area per plant, leaves per plant, leaf-stem ratio, primary branches per plant and dry matter yield were correlated with green forage yield. Indirect selection of plants with late flowering behaviour, taller plants, broader leaves, higher leaf area, more number of leaves and more number of primary branches will enhance productivity of ricebean in terms of green forage yield. Genetic correlation of green forage yield with each of such traits is either due mostly to genes having pleiotropic effects (contributing to both traits) or genetic linkage between genes controlling the two traits or both of linkage and pleiotropy. Radhika (2003) revealed that plant height and number of primary branches per plant had positive significant correlation with green fodder yield in cowpea.

Path analysis (Fig. 1 & Table 2) at genotypic level revealed that the highest and positive direct effect on green forage yield was shown by dry matter yield which was followed by leaves per plant, crude protein, days to 50 per cent flowering and plant height. The highest negative direct effect on green forage yield was observed for leaf area per plant and primary branches per plant. Further, it was observed that the following traits showed indirect positive effects on green forage yield as given herein: days to 50 per cent flowering via dry matter yield; plant height via leaves per plant and primary branches per plant via leaves per plant. From the results of path analysis, it was observed that days to 50 per cent flowering, plant height, leaf area per plant and dry matter yield were the most important characters which could be used as selection criteria for effective improvement of green forage yield of ricebean through indirect selection. The estimate of residual effect was found to be 0.484 which indicates that more number of forage yield component traits can be considered in path analysis in future. Nath and Tajane (2014) in their study in cowpea revealed

TABLE 2
Direct (diagonal values in bold face) and indirect effects of component characters on green forage yield in ricebean

	D50F	PH	LA/P	L/P	PB	CP	DMY	rg (with GFY)
D50F	0.3043	0.0939	-0.4893	0.4787	-0.4491	0.1293	0.6133	0.69**
PH	0.2073	0.1378	-0.6215	0.7702	-0.4657	0.1324	0.7021	0.87**
LA/P	0.1231	0.0708	-1.2092	0.6900	-0.1782	0.3489	0.6397	0.49**
L/P	0.1584	0.1154	-0.907	0.9199	-0.3935	0.2169	0.4359	0.55**
PB	0.2668	0.1253	-0.4206	0.7064	-0.5124	0.0243	0.5728	0.77**
CP	0.0819	0.038	-0.8781	0.4153	-0.0259	0.4805	0.1176	0.23
DMY	0.1756	0.091	-0.7278	0.3773	-0.2761	0.0532	1.0629	0.76**

*Significant at 5% probability level, ** Significant at 1% probability level, Residual effect=0.4849.

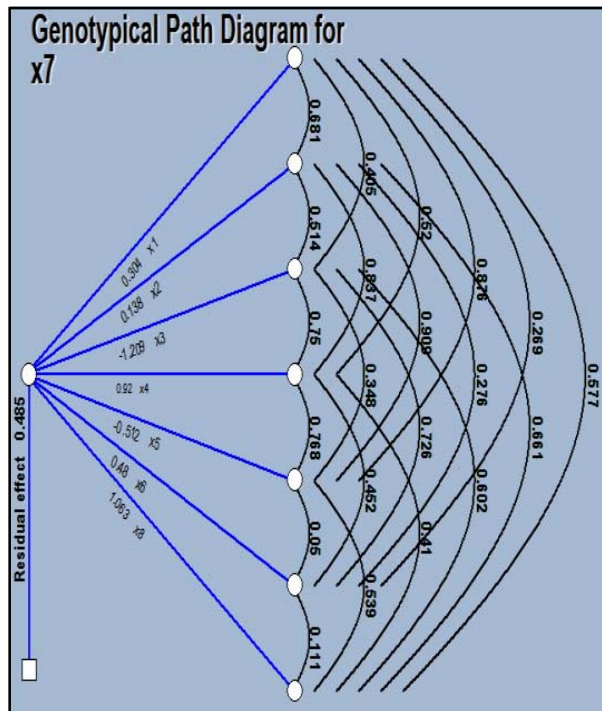


Fig. 1. Path diagram at genotypic level showing direct and indirect effect of various traits on green forage yield (With rhizobium inoculation). x1= D50F; x2= PH; x3= LA; x4= LP; x5= PB; x6= CP; x7= GFY and x8= DMY.

that, the characters dry matter yield and days to 50% flowering recorded maximum and positive magnitude of direct effect on green forage yield. Radhika (2003) in cowpea also reported that plant height and number of primary branches per plant had positive direct effect on green fodder yield. Macwana *et al.* (2005) also reported that plant height and number of leaves per plant showed positive and significant correlation with green forage yield in forage maize genotypes.

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