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CORRELATION AND PATH COEFFICIENT ANALYSIS IN GREEN GRAM UNDER SALINE WATER IRRIGATION

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ABSTRACT

The studies on correlation and path coefficient analysis in greengram (*Vigna radiata*) as influenced by saline water irrigation showed that the seed yield/plant was positively and significantly correlated with dry matter at 50 (DAS) days after sowing also late growth rate leaf area duration and specific leaf area at 35-50 DAS among growth components, pod weight/plant, threshing percentage, number of pods/plant and 1000-seed weight among yield components. These characters also recorded the maximum direct effect on seed yield/plant indicating that the seed yield was a function of both growth and yield components.

KEY WORDS : Green Gram, Saline Water Irrigation, Path Analysis

Information on the correlation and path coefficient analysis among yield and yield components is one of the pre requisite techniques to know productivity and also potentiality of the crop under different environmental conditions. Such studies are very less, particularly under saline water irrigation to the crop and productivity.

In the present study, an attempt has been made to study the correlation and path analysis both for growth and yield components seperately to know their effects individually on seed yield in green gram.

MATERIALS AND METHODS

A field experiment was conducted on a pre-salinised vertisols in plots of 2.5 x 2.5 m size in a randomised block design. The plots were seperated by polythene sheet to a depth of one m to avoid the movement of salts from one plot to other. The saline water (6 dS/m) was artificially prepared by dissolving the salts of NaCl, $NaHCO_3$, $MgSO_4$ and $CaCl_2$, maintaining the ratios of Na:Mg:ca:: 4:1:7:1 and Cl:SO_4: HCO_3::2:1:1 by maintaining the neutral pH without precipitation of salts. Initial soil pH_2 and EC_2 varied from 8.2 to 8.5 and 0.35 to 0.65 dS/m in good water (GW) and saline water (SW) irrigation alone, respectively. The irrigation treatments included GW, two GW followed by one SW, one GW followed by one SW, one GW followed by two SW and SW alone. Totally, each plot received seven irrigations during the experimental period. Green gram (*Vigna radiata* cv. chainamung) a sensitive lugume was selected as fertilized with 25:50:0 kg/NPK/ha. Five randomly selected plants from each plot at 15 days interval from 20 DAS (days after sowing) upto harvest were used to record growth and yield components.

The observations on the absolute growth rate (AGR), relative growth rate (RGR), crop growth rate (CGR), net assimilation rate (NAR), leaf area duration (LAD), leaf weight ratio (LWR), specific leaf area (SLA) and dry matter (DM) at 35 and 50 DAS were calculated (Snedecor and Cochran, 1969). The correlation and path coefficient analysis was carried out by the method suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Growth components

The results showed that the seed yield/plant was positively and significantly correlated with DM at 50 DAS (0.809), LAD (0.786), AGR (0.777), CGR (0.776) and SLA (0.539) indicating their strong association with the seed yield/plant. However, DM at 35 DAS (0.498) and RGR (0.453) also showed the positive and significant correlation with the seed yield/plant (Table 1). Maloo and Sharma (1987) also reported a strong and positive association of dry matter with grain yield in gram. Further, the direct and indirect effects also indicated that the AGR had a maximum positive direct effect (5.755) on seed yield/plant followed by DM at 50 DAS (0.833), LAD (0.232) and SLA (0.118). These characters also exhibited the positive and highly significant association with

Table 1. Correlation coefficient and path coefficient analysis for growth components on seed yield/plant of green gram (n = 23)

	AGR (35-50 DAS)	RGR (25-50 DAS)	CGR (35-50 DAS)	NAR (35-50 DAS)	LAD (35-50 DAS)	LWR (35-50 DAS)	SLA (35-50 DAS)	DM (35 DAS)	DM (50 DAS)	Seed yield/plan
Correlation coefficients :										
AGR	1.000	e.785**	0.999**	0.600**	0.753**	0.158	0.567**	0.384	0.921**	0.777**
RGR		1.000	0.782**	0.577**	0.283	0.186	0.333	-0.083	0.571**	0.453*
CGR			1.000	0.605**	0.756**	0.157	0.564**	0.391	0.924**	0.776**
NAR				1.000	0.256	0.089	0.139	0.189	0.526**	0.301
LAD					1.000	0.018	0.504*	0.800**	0.907**	0.786**
LWR						1.000	0.339	-0.166	0.031	0.074
SLA							1.000	0.062	0.438*	0.539**
DM (35 DAS)								1.000	0.691**	0.498*
DM (50 DAS)									1.000	0.809**
Path Coefficient analysis showing direct and indirect effects :										
AGR	5:755	-0.071	-5.794	-0.041	0.175	-0.001	0.067	-0.081	0.767	0.777
RGR	4.517	-0.090	-4.532	-0.039	0.066	-0.001	0.039	0.017	0.476	0.453
CGR	5.754	-0.070	-5.795	-0.041	0.175	-0.001	0.067	-0.082	0.769	0.776
NAR	3.453	-0.052	-3.506	-0.068	0.059	-0.001	0.016	-0.040	0.438	0.301
LAD	4.335	-0.026	-4.385	-0.017	0.232	-0.001	0.059	-0.168	0.755	0.786
LWR	0.909	-0.017	-0.910	-0.006	0.004	-0.007	0.040	0.035	0.026	0.074
SLA	3.266	-0.030	-3.270	-0.009	0.117	-0.002	0.118	-0.013	0.365	0.539
DM (35 DAS)	2.210	0.007	-2.268	-0.013	0.186	0.001	0.007	-0.210	0.576	0.498
DM (50 DAS)	5.303	-0.052	-5.356	-0.035	0.210	-0.001	0.052	-0.145	0.833	0.809

* Significant, ** Highly significant, Residual effect = 0.274 Underlined figures indicate direct effects.
AGR : absolute growth rate; RGR : relative growth rate; CGR : crop growth rate; NAR : net assimilation rate; LAD : leaf area duratin; LWR : leaf weight ratio; SLA : specific leaf area; DM : dry matter

should be given on these characters to obtain higher seed yield in green gram. The CGR, DM (35 DAS) and RGR affected the seed yield though their direct effects were negative which seems to have been nullified by the indirect positive effects *viz.*, AGR, DM (50 DAS), LAD and SLA. The NAR and LWR have a negative direct effects on seed yield probably because of no significant association with seed yield/plant (Table 1). The value of residual factor for the characters which were not studied was less. Therefore, it would be rewarding to lay more emphasis on AGR, DM (50 DAS), LAD and SLA in selection programme for improving the seed yield in green gram.

Yield components

The seed yield/plant was positively and highly (0.989), number of pods/plant (0.874), harvest index/plant (0.639), threshing percentage (0.636), number of seeds/pod (0.557) and significantly with 1000-seed weight (0.404) indicating that the seed yield/plant is a function of these characters (Table 2). Therefore, simultaneous selection of these characters must be adopted to achieve a substantial yield improvement in green gram. Similar results were also reported by Mishra, Rao and Koutu (1988) and Mane (1989).

The direct and indirect effects indicated that the pod weight/plant (0.892) had the maximum positive direct influence on seed yield/plant followed by threshing percentage (0.159), number of pods/plant (0.021) and 1000-seed weight (0.016). The same characters have also exhibited the positive and highly signific[illegible]

Table 2. Correlation coefficient and path coefficient analysis for yield components on seed yield/plant of green gram (n = 23)

	Pod length	No. of pods/plant	Pod weight/plant	No. of seeds/pod	1000 seed weight	Threshing %	Harvest index/plant	Seed yield/plant
Correlation coefficients :								
Pod length	1.000	0.263	0.223	0.732**	0.501	0.392	0.300	0.254
No. of Pods/plant		1.000	0.866**	0.536**	0.186	0.550**	0.417*	0.874**
Pod wt/plant			1.000	0.547**	0.357	0.526**	0.570**	0.989**
No. of seeds/pod				1.000	0.262	0.474*	0.458*	0.557**
1000 Seed wt.					1.000	0.479*	0.514**	0.404*
Threshing %						1.000	0.778**	0.636**
Harvest index/plant							1.000	0.639**
Path Coefficient analysis showing direct and indirect effects :								
Pod length	0.012	0.006	0.199	-0.009	0.008	0.062	-0.001	0.254
No. of Pods/plant	0.003	0.021	0.772	-0.007	0.003	0.087	-0.001	0.874
Pod wt/plant	0.003	0.018	0.892	-0.007	0.006	0.083	-0.001	0.989
No. of seeds/pod	0.009	0.011	0.488	-0.123	0.004	0.075	-0.001	0.557
1000 Seed wt.	0.006	0.004	0.318	-0.003	0.016	0.076	-0.001	0.404
Threshing %	0.005	0.012	0.469	-0.006	0.008	0.159	-0.001	0.636
Harvest index/plant	0.004	0.009	0.508	-0.006	0.008	0.124	-0.001	0.639

* Significant, ** Highly significant, Residual effect = 0.002; Underlined figures indicate direct effects.

confirmity with the reports of Singh and Paroda (1986) and Maloo and Sharma (1987). Though the number of seeds/pod and harvest index/plant had a positive and highly significant correlation with seed yield/plant, their direct effects were negative which have been nullified by the indirect positive effects via pod weight/plant, threshing percentage, number of pods/plant and 1000- seed weight. The value of the residual factor for the characters which were not studied is less. It is evident that due emphasis should be given to the yield components like pod weight/plant, threshing percentage, number of pods/plant and 1000-seed weight in crop improvement programme.

The higher dry matter production/plant is an indication of accumulation of more carbohydrates during the vegetative phase and its subsequent transformation in reporductive parts during later stages resulting in more seed yield. This was indicated by the maximum positive direct effect of DM (50 DAS) and pod weight/plant on seed yield plant. In conclusion, the DM (50 DAS), AGR, RGR, SLA at 35-50 DAS as growth components and pod weight/plant, number of pods/plant and [illegible] as yield components, influence the seed yield of greengram under saline water irrigation. These characters must be given due importance in breeding programme to evolve salt resistant varieties.

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