

CORRELATION AND PATH ANALYSIS STUDIES IN RADISH GROWN UNDER PARTIAL SHADE

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ABSTRACT

*Genotypic and phenotypic coefficients and path coefficient analyses were carried out in radish (*Raphanus sativus* L.) using 25 diverse type genotypes of radish for fourteen quantitative characters. In general, magnitude of genotypic correlation coefficient were higher than their corresponding phenotypic correlation coefficient, suggesting strong inherent positive association with plant height, leaf weight, leaf length, root thickness and root size at phenotypic and genotypic levels. On the other hand, negative and significant correlations were observed with leaf: root length ration at phenotypic level only. Path coefficient analysis revealed that plant height, root length, root thickness, root size and leaf: root weight ratio has direct positive effect (at phenotypic and genotypic levels) on root weight. Root size had high direct positive effect towards root weight, whereas, root thickness has less direct effects on root weight. Therefore, these characters should be taken into consideration, while making selection for improvement of root yield.*

Key words: Radish, correlation, path coefficients, partial shade

INTRODUCTION

Radish (*Raphanus sativus* L.) is an important root vegetable due to high yield and short duration. The leaves are very rich in minerals particularly calcium and iron. It is a good appetizer and considered to be useful for patients suffering from piles, diarrhea, liver and gall bladder trouble and jaundice. The nature and degree of association between yield and its components will assist the breeder to fix the actual yield and furnish an effective basis of selection. Path analysis also facilitate in determining the direct and indirect effects on yield and other important characters. Therefore, the present investigation was undertaken to find out the interrelationship among the components responsible for yield and the direct and indirect influences of each component character towards the production of root in radish.

MATERIALS AND METHODS

The present investigation was carried out in the Department of Horticulture, Janta P.G. College, Bakewar, Etawah (U.P.) during rabi season in the year 2008-09. Twenty five diverse genotypes were used for experimentation. All the genotypes were sown in randomized block design and replicated thrice. Observations were recorded on ten randomly selected plants leaving the border row. Fourteen economically important quantitative characters i.e. plant height (cm), number of leaves, leaf length (cm), leaf width (cm), leaf size (cm²), leaf shape, leaf weight (g), root length (cm), root thickness (cm), root size (cm²), root shape, L:R length ratio, L:R weight ratio and root weight (g) traits were recorded for observation. The genotypic and phenotypic

correlation coefficients were calculated as per method given by Panse and Sukhatme (1967). The path coefficients were worked out using the method of Dewey and Lu (1959). The crop was arranged in a manner to get the shade effects from all the sides of trees.

RESULTS AND DISCUSSION

For clear understanding correlation coefficients are separated into genotypic and phenotypic levels in Table 1. In general, the estimate of genotypic correlation coefficient was higher than their corresponding phenotypic correlation coefficient (Table 1). This indicates a strong inherent association between different characters under study but phenotypic value lessened by the significant influence of environment, suggesting the usefulness of genotypic estimate. Similar findings were also obtained by Singh *et al.* (1977), Sharma and Kanaujia (1995) and Ullah *et al.* (2010). Root yield is highly influenced by environment, which required considerable breeding strategies for its improvement. Root weight was found to be significantly and positively associated with plant height, leaf weight, leaf length, root thickness and root size at phenotypic and genotypic levels (Khan *et al.*, 1983; Danu and Lal, 1998; Singht *et al.*, 2002; Panwar *et al.*, 2003; Ullah *et al.*, 2010 and Mapari *et al.*, 2010). On other hand, negative and significant correlations were found with leaf: root length ratio and leaf: root ratio at phenotypic level, only. Therefore, these characters should be taken into consideration, while making selection for root yield. Leaf: root weight ratio showed significant and positive correlation with all the characters except root length, root thickness, root

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Table 1: Estimate of phenotypic (P) and genotypic (G) correlation for thirteen characters of radish

Parameters		No. of leaves	Leaf length	Leaf width	Leaf size	Leaf shape	Leaf weight	Root length	Root thickness	Root size	Root shape	L:R length ratio	L:R Weight ratio	Root weight
Plant height (cm)	P	0.266	0.893**	0.353*	0.818**	0.567**	0.737**	0.243	0.479*	0.600**	-0.241	0.235	0.462*	0.325
	G	0.030	0.926**	0.471*	0.847**	0.912**	0.793**	0.307	0.821**	0.614**	-0.415*	0.649**	0.603**	0.407*
No. of leaves	P		0.292	0.161	0.327	0.226	0.448*	-0.180	-0.110	-0.021	0.067	0.003	0.452*	-0.053
	G		0.345	0.311	0.378*	0.267	0.554**	-0.232	-0.060	-0.025	0.305	0.107	0.676**	0.000
Leaf length (cm)	P			0.355*	0.856**	0.640**	0.746**	0.031	0.362*	0.419*	-0.245	0.347	0.585**	0.152
	G			0.524**	0.939**	0.950**	0.799**	0.066	0.694**	0.434*	-0.462*	0.870**	0.767**	0.208
Leaf width (cm)	P				0.656**	-0.236	0.491*	-0.076	0.333	0.199	-0.29	0.244	0.359*	0.070
	G				0.872**	-0.064	0.740**	0.008	0.479*	0.279	-0.552**	0.517**	0.644**	0.261
Leaf size (cm ²)	P					0.349	0.793**	0.015	0.453*	0.426*	-0.347	0.326	0.584**	0.191
	G					0.622**	0.864**	0.034	0.700**	0.442*	-0.579**	0.860**	0.794**	0.266
Leaf shape	P						0.389*	0.084	0.123	0.308	-0.141	0.337	0.402*	0.016
	G						0.574**	0.162	0.700**	0.429*	-0.269	0.507**	0.505**	0.209
Leaf weight (g)	P							0.217	0.400*	0.524**	-0.221	0.225	0.627**	0.277
	G							0.296	0.784**	0.560**	-0.418*	0.650**	0.856**	0.356*
Root length (cm)	P								0.426*	0.687**	-0.036	-0.147	-0.155	0.469*
	G								0.802**	0.855**	-0.214	0.317	-0.124	0.428*
Root thickness (cm)	P									0.647**	-0.365*	0.111	0.024	0.424*
	G									0.898**	-0.703**	0.687**	0.245	0.988**
Root size (cm ²)	P										-0.273	0.036	0.048	0.602**
	G										-0.404*	0.039	0.042	0.802**
Root shape	P											-0.594**	-0.266	0.140
	G											-0.870**	-0.248	-0.306
L:R length ratio	P												0.525**	-0.533**
	G												0.780**	-0.129
L:R Weight ratio	P													0.388*
	G													-0.276

* Significant at 5%, ** Significant at 1%

Table 2: Path coefficient analysis of thirteen characters in radish

Parameters		Plant height	No. of leaves	Leaf length	Leaf width	Leaf size	Leaf shape	Leaf weight	Root length	Root thickness	Root size	Root shape	L:R length ratio	L:R Weight ratio	Root weight
Plant height (cm)	P	0.093	-0.016	-0.072	0.014	0.115	0.057	0.272	-0.009	0.011	0.201	0.002	-0.108	-0.236	0.325
	G	1.854	-0.121	-1.879	-0.025	-0.184	-0.165	-1.984	-0.271	0.242	1.337	0.295	-0.476	1.821	0.407*
No. of leaves	P	0.025	-0.059	-0.024	0.006	0.046	0.023	0.166	0.007	-0.003	-0.007	-0.001	-0.001	-0.231	-0.053
	G	0.563	-0.398	-0.699	-0.016	-0.082	-0.048	-1.386	0.205	-0.018	-0.055	-0.190	0.079	2.045	0.000
Leaf length (cm)	P	0.083	-0.017	-0.081	0.014	0.121	0.064	0.275	-0.001	0.009	0.140	0.003	-0.159	-0.299	0.152
	G	1.718	-0.137	-2.028	-0.028	-0.202	0.173	-1.999	-0.058	0.204	0.945	0.288	-0.638	2.318	0.208
Leaf width (cm)	P	0.033	-0.009	-1.029	0.040	0.092	-0.024	0.181	0.003	0.008	0.066	0.003	-0.112	-0.183	0.070
	G	0.872	-0.124	-1.062	-0.053	-0.190	-0.012	1.852	-0.007	0.144	0.608	0.344	-0.380	1.947	0.261
Leaf size (cm ²)	P	0.076	-0.019	-0.069	0.026	0.141	0.035	0.293	-0.001	0.011	0.142	0.004	-0.149	-0.298	0.191
	G	1.569	-0.150	-1.884	-0.046	-0.218	-0.133	-2.161	-0.030	0.206	0.963	0.361	-0.631	2.400	0.266
Leaf shape	P	0.053	-0.13	-0.052	-0.009	0.049	0.100	0.144	-0.143	0.003	0.163	-0.001	-0.154	-0.205	0.016
	G	1.690	-0.106	-1.944	0.003	-0.036	-0.181	-1.436	-0.008	0.206	0.934	0.167	-0.372	1.526	0.209
Leaf weight (g)	P	0.068	-0.026	-0.060	0.020	0.112	0.039	0.369	-2.262	0.010	0.175	0.002	-0.103	-0.320	0.277
	G	1.470	-0.220	-1.620	-0.039	-0.188	-0.104	-2.502	-0.026	-0.231	1.220	0.260	0.477	-2.588	0.356*
Root length (cm)	P	0.023	0.011	-0.003	-0.003	0.002	0.008	0.080	-0.884	0.010	0.230	0.000	0.067	0.079	0.469*
	G	0.569	0.092	0.134	0.000	-0.007	-0.029	-0.741	-0.015	0.236	1.862	0.133	-0.233	-0.375	0.488*
Root thickness (cm)	P	0.044	0.006	0.029	0.013	0.064	0.012	-0.148	-0.709	0.224	0.217	0.004	-0.051	-0.012	0.424*
	G	1.523	0.024	-1.408	-0.026	-0.152	-0.127	-1.972	-0.025	0.294	2.608	0.687	-0.504	0.739	0.988**
Root size (cm ²)	P	0.856	0.001	-0.034	0.008	0.060	0.031	0.192	-0.756	0.015	0.335	0.003	-0.016	-0.025	0.602**
	G	1.139	0.001	-0.880	-0.015	-0.096	-0.078	-1.402	-0.001	0.353	2.177	0.252	-0.029	0.127	0.802**
Root shape	P	-0.022	-0.004	0.024	-0.012	-0.049	-0.014	-0.082	0.189	-0.010	-0.091	0.010	0.272	0.136	0.140
	G	-0.769	-0.122	0.937	0.029	0.126	0.049	1.046	0.189	0.325	0.888	-0.623	0.786	-0.748	-0.360
L:R length ratio	P	0.022	0.000	-0.028	0.010	-0.046	-1.034	0.083	0.005	0.003	0.012	0.006	-0.458	-0.268	-0.533
	G	1.203	0.043	-1.764	-0.027	-0.187	0.092	-1.627	-0.280	0.202	0.085	-0.667	-0.734	2.383	-0.129
L:R Weight ratio	P	0.043	-0.027	-0.047	0.014	0.082	0.040	0.232	0.006	0.001	0.016	0.003	-0.024	-0.510	-0.388
	G	1.117	-0.269	-1.525	-0.340	-0.173	-0.091	-2.142	0.111	0.072	0.091	0.154	-0.579	3.023	-0.276

Residual effect- Phenotypic (P) = 0.209, Genotypic (G) = 0.613 (Bold diagonal values are direct effects)

size and root shape at both the levels. Leaf: root length ratio had significant positive correlation with all the characters except the number of leaves/plant, root length and root size at genotypic level, while significant correlation recorded with root shape at both the levels. Similar trends were observed in radish by Khan *et al.* (1983); Singh *et al.* (2002) and Shama *et al.* (2009).

Path coefficient analysis signifies the method of partitioning of the total correlation coefficient into direct and indirect effects and measures the relative importance of causal factor individually. Plant height, root length, root thickness, root size and root: leaf weight ratio has direct positive effect at phenotypic and genotypic levels on root weight, which indicates that these are the main contributor to root weight (Table-2). Root size has high direct positive effect

towards root weight, whereas root thickness had less direct effect on root weight. Number of leaves per plant, leaf length, leaf weight, leaf width, leaf size, leaf shape, root length, root shape and leaf: root length ratio has the negative direct and indirect effect on root weight at genotypic level, thus these character should be rejected during selection. Root size had positive and significant association with plant height, leaf weight, root length and root thickness. Thus, in selection programme, more emphasis should be given for these characters due to more direct and indirect effect on root weight. In this study, residual effect was relatively low (0.209 and 0.613) at phenotypic and genotypic levels. These results are in accordance with the results of Prakash *et al.* (1982); Singh *et al.* (2005); Shama *et al.* (2009); Mapari *et al.* (2010) and Ullah *et al.*, 2010.

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