



## Research Article

# STUDY OF CORRELATION AND PATHCOEFFICIENT ANALYSIS IN RADISH (*RAPHANUS SATIVUS* L.) UNDER PARTIAL SHADE CONDITION OF ORCHARD

YADAV M.P.<sup>1</sup>, RAJPUT P.K.<sup>2</sup>, KEERTI<sup>1</sup>, KUMAR S.<sup>1</sup>, VISHWAKARMA S.K.<sup>1</sup>, YADAV S.S.<sup>3</sup> AND YADAV M.K.<sup>\*4</sup>

<sup>1</sup>Department of Horticulture, Janta College, Bakewar, Etawah, 206124, Chhatrapati Shahu Ji Maharaj University, Kanpur, 208024, Uttar Pradesh, India

<sup>2</sup>Department of Soil Conservation, Janta College, Bakewar, Etawah, 206124, Chhatrapati Shahu Ji Maharaj University, Kanpur, 208024, Uttar Pradesh, India

<sup>3</sup>Department of English, Pt. D.D.U. Govt. Girls P.G. College, Rajajipuram, Lucknow, 226017, Lucknow University, Lucknow, 226007, Uttar Pradesh, India

<sup>4</sup>Department of Plant Pathology, Janta College, Bakewar, Etawah, 206124, Chhatrapati Shahu Ji Maharaj University, Kanpur, 208024, Uttar Pradesh, India

\*Corresponding Author: Email - [manojbhu87@gmail.com](mailto:manojbhu87@gmail.com)

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**Abstract:** Genotypic and phenotypic correlation coefficients and path coefficient analysis were carried out in radish using Twenty-five diverse genotypes for fourteen quantitative characters. In general, magnitudes of genotypic correlation coefficient were higher than their corresponding phenotypic correlation coefficient, suggesting therefore, a strong inherent relationship in different pair of characters. 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. On the other hand, negative and significant correlation was found with leaf: root length ratio at phenotypic level only. Therefore, these characters should be taken into considerable, while making selection for improvement of root yield. 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, which indicating these are the main contributor to root weight. Root size had high direct positive effect towards root weight, whereas, root thickness has less direct effects on root weight.

**Keywords:** Genotypic and phenotypic, Correlation coefficients, Coefficient analysis

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## Introduction

Radish is an important root vegetable due to high yielding and early maturing nature. The leafy tops are very rich in minerals particularly calcium and iron. Radish is a good appetizer and considered to be useful for patients suffering from piles and gastro-dyria, liver and gall bladder trouble and jaundice. The nature and degree of association between yield and its components claims distinct importance and will assist the breeder to ascertain the actual yield components and furnish an effective basis of phenotypic selection. Path coefficient analysis provide the intrinsic nature of observation associated between yield and its attributes and reveal the extent of contribution made by various traits in constructing yield. Path analysis facilitates the portioning of correlation coefficient into the direct and indirect effects on yield and other significant 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 m radish [1-4].

## Materials and Methods

The present investigation was carried out in the orchard of Department of Horticulture, Janta P.G. College, Bakewar, Etawah during rabi season in the year of 2016. Twenty five diverse genotypes tested were in this experiment. The trial was laid out in a randomized block design with three replications. Observations were recorded on ten randomly selected representative plants from each replication in each genotype on fourteen economically important quantitative characters. The genotypic and phenotypic correlation coefficients were calculated as per method given by Panse and Sukhatme (1967) [5]. The path coefficients were obtained by subsequent the method of Dewey and Lu (1959) [6].

## Results and Discussion

In general, the estimate genotypic correlation coefficient was higher than the corresponding 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, thereby suggesting the usefulness of genotypic estimate. Similar findings were obtained by Singh *et al* (1977) [7]. Root yield being dependent character is highly influenced by environment, which required considerable breeding value for 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 [8-10]. On the other sense, negative and significant correlation was found with Leaf: Root length ratio and leaf: root weight ratio at phenotypic level only. Therefore, these characters should be taken into considerable, while making selection for improvement of root yield. Leaf: root weight ratio showed significant and positive correlation with all the characters except root length, root thickness, root 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 with root shape at both the levels. Similar trend was observed in radish by Khan *et al.* (1983) and Singh *et al.*, (2002).

Path analyses signifies the method of portioning of the total correlation coefficient into direct and indirect effects and measure the relative importance of casual 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 indicating 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.

Table-1 Estimate of phenotypic (P) and genotypic (G) Correlation for different characters of Radish

Parameter		No. of leaves	Leaf length (cm)	Leaf width (cm)	Leaf size (cm <sup>2</sup> )	Leaf shape	Leaf weight (g)	Root length (cm)	Root thickness (cm)	Root size (cm <sup>2</sup> )	Root shape	Leaf: root length ratio	Leaf: root weight ratio	Root weight (g)
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**	0.602**	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	0.306	0.107	0.676**	0.000
Leaf length	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	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	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	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	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	P									0.647**	-0.365*	0.111	0.024	0.424*
	G									0.898**	-0.703	0.687**	0.245	0.988**
Root size	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
Leaf: root length ratio	P												0.525**	-0.533**
	G												0.780**	-0.129
Leaf: root weight ratio	P													0.388*
	G													-0.276

\*Significant at 5% and \*\*Significant at 1%

Table-2 Path Coefficient analysis of different traits in Radish

Parameter		Plant height (cm)	No. of leaves	Leaf length (cm)	Leaf width (cm)	Leaf size (cm <sup>2</sup> )	Leaf shape	Leaf weight (g)	Root length (cm)	Root thickness (cm)	Root size (cm <sup>2</sup> )	Root shape	Leaf: root length ratio	Leaf: root weight ratio	Root weight (g)
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	0.259	-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	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	-2.028	-0.202	0.173	-1.999	-0.058	0.204	0.945	0.288	-0.638	2.318	0.208
Leaf width	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	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	-0.113	-2.161	-0.030	0.206	0.963	0.361	-0.631	2.400	0.266
Leaf shape	P	0.053	-0.013	-0.052	-0.009	0.049	0.100	0.144	-0.003	0.003	0.103	-0.001	-0.154	-0.205	0.016
	G	1.690	-0.106	-1.944	0.003	-0.036	-0.181	-1.436	-0.14s3	0.206	0.934	0.167	-0.372	1.526	0.209
Leaf weight	P	0.068	-0.026	-0.060	0.020	0.112	0.039	0.369	-0.008	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	-2.262	-0.231	1.220	0.260	0.477	-2.588	0.356**
Root length	P	0.023	0.011	-0.003	-0.003	0.002	0.008	0.080	-0.026	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	-0.884	0.236	1.862	0.133	-0.233	-0.375	0.488*
Root thickness	P	0.044	0.006	0.029	0.013	0.064	0.012	-0.148	-0.015	0.224	0.217	0.004	-0.501	-0.012	0.424*
	G	1.523	0.024	-1.408	-0.026	-0.060	-0.127	-1.972	-0.709	0.294	2.608	0.687	-0.504	0.739	0.988**
Root size	P	0.856	0.001	-0.034	0.008	-0.096	0.031	0.194	-0.025	0.015	0.335	0.003	-0.016	-0.025	0.602**
	G	1.139	0.001	-0.880	-0.015	-0.049	-0.078	-1.402	-0.756	0.353	2.177	0.252	-0.029	0.127	0.802**
Root shape	P	-0.022	-0.004	0.024	-0.012	0.126	-0.014	-0.082	-0.001	-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
Leaf: root 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
Leaf: root 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	0.110	0.072	0.091	0.154	-0.579	3.023	-0.276

Residual effect- Phenotypic (P)=0.209, Genotypic (G)= 0.6131 (Bold diagonal values are direct effect) \*Significant at 5% and \*\*Significant at 1%

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 this 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 the 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, respectively, indicating that adequate character was utilized for the study. These results are in accordance with the results of Prakash *et al.*, (1982) [11] and Singh *et al.*, (2005) [12].

### Summary

In general, magnitudes of genotypic correlation coefficient were higher than their corresponding phenotypic correlation coefficient, suggesting therefore, a strong inherent relationship in different pair of characters in Radish. 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 indicating these are the main contributor to root weight.

**Application of research:** The research work based the interrelationship among the components responsible for yield and the direct and indirect influences of each component character towards the production of root m radish.

### Research Category: Horticulture

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**\*\*Principal Investigator or Chairperson of research: Dr M. K. Yadav**

University: Chhatrapati Shahu Ji Maharaj University, Kanpur, 208024, Uttar Pradesh, India

Research project name or number: Research station trials

**Author Contributions:** All authors equally contributed

**Author statement:** All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

**Study area / Sample Collection:** Department of Horticulture, Janta P.G. College, Bakewar, Etawah during rabi season in the year of 2016.

**Cultivar / Variety / Breed name:** Radish (*Raphanus sativus* L.)

**Conflict of Interest:** None declared

**Ethical approval:** This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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