

## Correlation and path coefficient studies in garlic (*Allium sativum* L.)

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Garlic is the second most important cultivated *Allium* after onion and propagated vegetatively. It is used as a spice, flavoring agent and in pharmaceutical preparations due to its high valued medicinal properties like antimicrobial, antidiabetic, hypocholesterolemic and anticarcinogenic actions. It is also good foreign exchange earner and large quantity of garlic is exported every year. Garlic is commercially propagated vegetatively using clove. Therefore, clonal selection is the important breeding method to develop varieties and very scanty work have been done on the association between different characters which is pre-requisite for executing a selection programme. Yield being a complex quantitative character is dependent on a number of attributing traits. Therefore, Knowledge of association of different components together with their relative contributions have immense value in selection. Since estimates of correlation coefficient indicate only the inter relationship of the characters but do not furnish information on the cause and effect, separation of correlation of coefficient into the components of direct and indirect effect through path analysis become important. Thus present study was conducted to investigate association among different components and their direct and indirect contribution to bulb yield in garlic.

The present study was conducted at Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.) under AICRP on vegetable crops, during *rabi* season 2009-10. The cloves of 45 genotypes were planted in the last week of November, 2009. The experiment was carried out in Randomized Block Design with two replications. The plot size of 3m x 2m<sup>2</sup> and cloves planted at 15cm x 10cm spacing. All the recommended cultural practices were followed to ensure a good crop. The observations were recorded on five randomly selected plants in each entry per replication for plant height, number of leaves per plant, neck thickness, average weight of bulb, length of

bulb, diameter of bulb, average weight of 10 cloves, number of cloves/bulb, yield/plot, yield/ha. and days required to harvest. Recommended plant protection measures were followed as and when required for control of pest and diseases. The data recorded were analyzed statistically and correlation coefficient and path analysis were worked out according to Dewey and Lu (1959).

The data presented in Table 1 regarding correlation coefficients revealed that neck thickness, average bulb weight, bulb length, bulb diameter, average weight of 10 cloves, days required for harvest were positively and significantly correlated with yield while plant height showed positive correlation of at low magnitude. These findings was in close agreement with Thakur *et al.* (1997) who reported that yield was positively and significantly associated with average weight per bulb, plant height, leaves per plant, leaf length and leaf breadth.

In the present study plant height was significantly and positively correlated with neck thickness, average bulb weight, bulb diameter, yield / ha and days required for harvest at both genotypic and phenotypic levels. Similar findings were reported by Selvaraj *et al.* (1997) and Hayder *et al.* (2007). Neck thickness showed positive and significant correlation with bulb weight, bulb length, bulb diameter, weight of 10 cloves and yield at both the levels. The average bulb weight was positively and significantly correlated with number of leaves per plant, plant, height, neck thickness, bulb length, bulb diameter, weight of 10 cloves, and days required for harvest. These findings were in agreement with Lokhande and Pawar (1988) and Hayder *et al.* (2007). Average bulb length showed positive and significant correlation with bulb diameter, weight of 10 cloves and yield at both genotypic and phenotypic level.

The average bulb diameter was positively and significantly correlated with weight of cloves, yield /ha and days required for harvest. These results were in conformity with the findings of Shaha *et al.* (1990). Average weight

**Table 1.** Estimates of Phenotypic (P) and Genotypic (G) correlations of 11 different characters in garlic.

Characters		Number of leaves / plant	Plant height (cm)	Neck thick-ness (cm)	Average bulb weight (g)	Average bulb length (cm)	Average bulb diameter (cm)	Average Weight of 10 cloves (g)	Number of cloves/ bulb	Yield/ plot (kg)	Yield/ ha (q)	Days required for harvest
Number of leaves per plant	P	0.000	0.025	0.402**	0.365**	0.460**	0.155	0.447**	-0.375**	0.184	0.184	-0.234
	G	0.000	0.220	0.572**	0.412**	0.642**	0.240	0.594**	-0.469**	0.225	0.225	-0.298*
Plant height (cm)	P			0.379**	0.488**	0.136	0.439**	0.032	0.221	0.320*	0.320*	0.309*
	G			0.460**	0.632**	0.076	0.561**	0.018	0.315*	0.532**	0.532**	0.393**
Neck thickness (cm)	P				0.744**	0.581**	0.708**	0.459**	-0.100	0.466**	0.466**	0.263*
	G				0.871**	0.684**	0.814**	0.536**	-0.106	0.630**	0.630**	0.306*
Average bulb weight (g)	P					0.550**	0.825**	0.374**	0.118	0.675**	0.675**	0.392*
	G					0.603**	0.924**	0.397**	0.142	0.989**	0.989**	0.408**
Average bulb length (cm)	P						0.466**	0.518**	-0.253*	0.329*	0.329*	-0.298*
	G						0.477**	0.531**	-0.266*	0.416**	0.416**	-0.309*
Average bulb diameter (cm)	P							0.306*	0.152	0.621**	0.621**	0.485**
	G							0.329*	0.188	0.839**	0.839**	0.535**
Average weight of 10 cloves (g)	P								-0.695**	0.242	0.242	0.041
	G								-0.707**	0.277*	0.277*	0.041
Number of Cloves per bulb	P									0.160	0.160	0.246
	G									0.197	0.197	0.250
Yield/plot (kg)	P										1.000**	0.457**
	G										1.000**	0.521**
Yield/ha (q)	P											0.457**
	G											0.521**
Days required for harvest	P											0.000
	G											0.000

\*, \*\* significance at 5% and 1% levels, respectively.

of 10 cloves exhibited negative and significant correlation with number of cloves per bulb. Similar results were reported by Korla and Rastogi (1979). Number of cloves per bulb showed positive and non-significant correlation with yield/ha and days required for harvest. The most important traits like yield per plot and per hectare showed positive and significant correlation with days required for harvest, weight of 10 cloves, bulb length, bulb diameter, bulb weight, neck thickness and plant height. Similar results were reported by Kalloo *et al.* (1982), Shrivastava *et al.* (1993), Singh *et al.* (2010).

The date presented in Table 2 regarding path analysis in garlic revealed that most of the characters except neck thickness showed positive direct effect on yield. The direct effect of plant height on bulb yield was positive and indirect effect was mostly via number of leaves per plant, bulb length and diameter, weight of 10 cloves, number of cloves per bulb and days required for harvest were positive. Similar findings were reported by Korla and Rastogi (1979). The direct effect of number of leaves per plant was positive and indirect effects was mainly through plant height, bulb length and diameter,

weight of 10 cloves which may be due to increased supply of photosynthesis to sink directly contributing to yield as evident from positive correlation among the characters.

The bulb length showed maximum direct and positive effects on yield and indirect effect via. Number of leaves per plant, plant height, average bulb diameter, weight of 10 cloves. Similar reports were also noted by Rahman and Das (1985). These traits have significant and positive correlation with yield indicate the true relationship between them and suggest that direct selection based on this may help in improving yield in garlic.

The direct effect of bulb diameter on yield was positive and high magnitude showing close proximity with the results of Selvaraj *et al.* (1997) and indirect effects were through plant height, bulb length, weight of 10 cloves, number of cloves per bulb and days required for harvest were positive and these traits exhibited positive correlation with yield. Direct effect via number of leaves per plant, bulb weight, bulb length and diameter, weight of 10 cloves, number of cloves per bulb and days required for harvest were substantial as also shown by

**Table 2.** Direct (diagonal) and indirect effects for yield and yield components in garlic.

Character	Number of leaves / plant	Plant height (cm)	Neck thick-ness (cm)	Average bulb weight (g)	Average bulb length (cm)	Average bulb diameter (cm)	Average Weight of 10 cloves (g)	Number of cloves/ bulb	Days required for harvest	Correlation value of yield/ha at genotypic level
Number of leaves /plant	0.2891	0.0350	-0.3675	-0.1033	0.4150	0.1845	0.0204	-0.0719	-0.1764	0.2249
Plant height (cm)	0.0637	0.1591	-0.2952	-0.1585	0.0492	0.4316	0.0006	0.0483	0.2328	0.5316**
Neck thickness (cm)	0.1655	0.0732	-0.6421	-0.2185	0.4423	0.6262	0.0184	-0.0162	0.1811	0.6299**
Average bulb weight (g)	0.1190	-0.1995	-0.5590	0.2510	0.3897	0.7110	0.0136	0.0218	0.2418	0.9894**
Average bulb length (cm)	0.1855	0.0121	-0.4392	-0.1512	0.6467	0.3672	0.0182	-0.0407	-0.1827	0.4159**
Average bulb diameter (cm)	0.0693	0.0893	-0.5227	-0.2320	0.3087	0.7693	0.0113	0.0289	0.3165	0.8387**
Average weight of 10 cloves (g)	0.1717	0.0028	-0.3444	-0.0996	0.3431	0.2528	0.0344	-0.1083	0.0246	0.2771*
Number of Cloves per bulb	-0.1355	0.0502	0.0680	-0.0357	-0.1718	0.1449	-0.0243	0.1533	0.1481	0.1971
Days required for harvest	-0.0862	0.0626	-0.1965	-0.1025	-0.1996	0.4113	0.0014	0.0383	0.5920	0.5209**

Underlined and bold value denotes direct effect

Residual value (R) = 0.

Korla and Rastogi (1979). The average weight of 10 cloves on yield was positive with low magnitude and indirect effect via number of leaves per plant, plant height, bulb length and diameter and days required for harvest, revealing that genotypes with comparatively more leaves per plant and long vegetative phase accumulate more photosynthesis for clove development. The days required for harvesting also showed positive direct effect on yield and indirect effect through plant height, bulb diameter, weight of 10 cloves and number of cloves per bulb were noted. Thus the results inferred that one should lay emphasis on weight of clove, clove length, number of leaves per plant and plant height during making direct selection for improvement of bulb yield in garlic.

## Referances

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