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Correlation and path analysis in garden pea (*Pisum sativum* L. var. Hortense)

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ABSTRACT : An experiment was carried out at experimental farm of Department of Horticulture, Janta P.G. College, Bakewar, Etawah during the year 2007-08. Genotypic and phenotypic correlation coefficients and path coefficient analysis were carried out in garden pea using twenty five diverse genotypes for thirteen quantitative characters. In general, magnitudes of genotypic correlation coefficient were higher than their corresponding phenotypic correlation coefficient, suggesting, a strong inherent relationship in different pair of characters. Analysis of variance indicated highly significant difference was observed in the genotypes for all the characters under study. Green pod yield/plant had positively and highly significant with plant height, days to 1st flower emergence, days to 50 per cent flower emergence, days to 1st pod set, days to maturity of edible green pod, number of primary branches/plant, number of seeds/pod and number of pods/plant at phenotypic and genotypic level, respectively, while pod width at genotypic level only. This indicated that these characters could be considered as criteria for selecting high yielding genotypes of pea.

KEY WORDS : Garden pea, *Pisum sativum* L. var. Hortense, Correlation, Path analysis

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Pea is an important vegetable crop grown throughout India for its tender and immature seeds which is used as vegetable. It is grown as winter vegetable in the plains of north India. The protein concentration of peas ranges from 15.50-39.70per cent (Davies *et al*., 1985). Large proportion of peas is processed (canned, frozen or dehydrated) for consumption in off season. The understanding of association of characters is of prime importance in developing an efficient breeding programme. The correlation studies provide information about association between any two characters. The path coefficient analysis provides the partioning of correlation coefficients into direct and indirect effects giving the relative importance of each of the causal factors. The present study was undertaken in order to find out the interrelationships among different characters and the direct and indirect contributions of these characters towards yield.

RESEARCH METHODS

An experiment was carried out at experiment field of Department of Horticulture, Janta P.G. College, Bakewar, Etawah during the year 2007-08 to evaluate twenty five diverse genotypes of pea germplasms. The experiment was laid out in Complete Randomized Design (CRD) with three replications. Observations were recorded from ten randomly selected plants of each genotypes in each replication for thirteen characters *viz.,* plant height (cm), days to 1st flower emergence, days to 50per cent flower emergence, days to 1st pod setting, days to maturity of edible green pod, number of primary branches/plant, pod length (cm), pod width (cm), number of seeds/pod, number of pods/plant, 100-seed weight (g), shelling percentages (%) and green pod yield/plant (g). All the recommended agronomic package of practices were performed to get the healthy crop stand. Mean values of ten plants were used for statistical analysis. For calculating, the genotypic and phenotypic correlation coefficients for all possible combination the formula suggested by Johnson *et al.* (1955) and Hanson *et al.* (1956) were adopted. Path co-efficient analysis was done following the formula of Dewey and Lu (1959).

Table 1 : Estimates of genotypic and phenotypic correlation coefficients among various traits of garden pea

Sr. No.	Characters		Days to 1st flower emergence	Days to 50% flower emergence	Days to 1st pod	Days to maturity of green pod	No. of primary branches /plant	Pod length (cm)	Pod width (cm)	No. of seeds /pod	No. of pods /plant	100-grain weight (g)	Shelling percentage	Green pod yield /plant (g)
1.	Plant height (cm)	P	0.601	0.614**	0.607**	0.616**	0.536**	0.325	0.114	-0.084	0.115	0.099	0.013	0.353*
		G	0.604	0.614**	0.607**	0.618**	0.539**	0.343	0.133	-0.087	0.184	0.103	0.009	0.369*
2.	Days to 1st flower	P		0.992**	0.992**	0.981**	0.191	0.460*	0.243	0.192	0.204	-0.159	-0.197	0.451*
	emergence	G		0.999**	1.000**	0.992**	0.186	0.479*	0.276	0193	0.319	-0.183	-0.220	0.452*
3.	Days to 50%flower	P			0.998**	0.990**	0.187	0.449*	0.227	0.159	0.298	-0.171	-0.196	0.449*
	emergence	G			0.999**	0.993**	0.183	0.471*	0.259	0.157	0.313	-0.203	-0.228	0.448*
4.	Days to 1st pod set	P				0.991**	0.177	0.457*	0.245	0.177	0.207	-0.165	-0.208	0.461*
		G				0.994**	0.170	0.474*	0.273	0.174	0.232	-0.196	-0.254	0.460*
5.	Days to maturity of	P					0.152	0.461*	0.253	0.144	0.299	-0.161	-0.228	0.459*
	edible green pod	G					0.142	0.482*	0.147	0.137	0.319	-0.206	-0.283	0.457*
6.	No. of primary branches	P						0.231	0.097	0.192	0.352*	0.022	0.135	0.403*
	/plant	G						0.224	0.022	0.182	0.369*	-0.001	0.117	0.409*
7.	Pod length (cm)	P							0.492*	0.167	0.006	-0.292	0.013	0.132
		G							0.580*	0.172	0.047	-0.358*	-0.222	0.134
8.	Pod width (cm)	P								0.042	0.219	0.244	-0.222	0.307
		G								0.046	0.435*	0.248	-0.165	0.367*
9.	No. of seeds/pod	P									-0.030	-0.056	-0.207	0.353*
		G									-0.049	-0.083	0.042	0.364*
10.	No. of pods/plant	P										-0.047	0.042	0.607**
		G										-0.088	0.024	0.957**
11.	100-grain weight (g)	P											0.139	-0.065
		G											0.069	-0.085
12.	Shelling percentage	P												-0.176
		G												-0.206

* and ** indicate significance of values at P 0.05 and 0.01, respectively

Table 2 : Genotypic and phenotypic path coefficient effect of various traits of garden pea

Sr. No.	Characters		Plant height (cm)	Days to 1st flower emergence	Days to 50% flower emergence	Days to 1st pod set	Days to maturity of green pod	No. of primary branches /plant	Pod length (cm)	Pod width (cm)	No. of seeds /pod	No. of pods /plant	100-grain weight (g)	Shelling percentage	Green Pod yield /plant (g)
1.	Plant height (cm)	P	0.000	-0.162	-0.656	0.560	0.457	0.194	-0.133	0.036	-0.012	0.046	-0.016	-0.003	0.353*
		G	-2.143	1.389	-14.136	-8.161	23.522	2.515	-2.140	0.860	-0.072	-0.772	-0.264	0.013	0.369*
2.	Days to 1st flower	P	0.000	-0.270	-1.059	0.916	0.728	0.069	-0.188	0.077	0.028	0.081	0.026	0.044	0.451*
	emergence	G	-1.295	2.298	-23.483	-13.442	37.734	0.868	-2.994	1.784	0.161	-1.336	0.472	-0.315	0.452*
3.	Days to 50% flower	P	0.000	-0.268	-1.068	0.921	0.735	0.068	-0.183	0.072	0.023	0.078	0.028	0.044	0.449*
	emergence	G	-1.317	2.296	-23.501	-13.427	37.7793	0.854	-2.941	1.675	0.132	-1.312	0.522	-0.327	0.448*
4.	Days to 1st pod set	P	0.000	-0.268	-1.065	0.923	0.736	0.064	-0.186	0.077	0.026	0.082	0.027	0.046	0.461*
		G	-1.302	2.298	-23.482	-13.438	37.831	0.795	-2.962	1.763	0.145	-1.341	0.504	-0.352	0.460*
5.	Days to maturity of	P	0.000	-0.265	-1.052	0.915	0.742	0.055	-0.188	0.080	0.021	0.079	0.027	0.051	0.459*
	green pod	G	-1.325	2.278	-23.341	-13.360	38.052	0.663	-3.008	1.595	0.115	-1.337	0.531	-0.406	0.457*
6.	No. of primary branches	P	0.000	-0.052	-0.200	0.164	0.113	0.362	-0.094	0.031	0.028	0.085	-0.004	-0.030	0.403*
	/plant	G	-1.155	0.428	-4.300	-2.291	5.411	4.666	-1.398	0.142	0.152	-1.422	0.002	0.168	0.409*
7.	Pod length (cm)	P	0.000	-0.124	-0.480	0.421	0.342	0.084	-0.408	0.115	0.024	0.002	0.048	0.067	0.132
		G	-0.734	1.101	-11.064	-6.372	18.325	1.044	-6.246	3.748	0.144	-0.195	0.922	-0.539	0.134
8.	Pod width (cm)	P	0.000	-0.066	-0.242	0.226	0.188	0.035	-0.200	0.316	0.006	0.087	-0.400	-0.003	0.307
		G	-0.285	0.634	-0.088	-3.664	9.384	0.102	-3.621	6.466	-0.039	-1.824	-0.380	-0.318	0.307
9.	No. of seeds/pod	P	0.000	-0.052	-0.170	0.163	0.107	0.069	-0.068	0.013	0.147	0.012	0.009	0.037	0.353*
		G	0.186	0.443	-3.700	-2.334	5.214	0.847	-1.072	-0.300	0.837	0.205	0.215	-0.296	0.364*
10.	No. of pods/plant	P	0.000	-0.055	-0.211	0.191	0.148	0.078	-0.003	0.069	-0.004	0.395	0.008	-0.009	0.607**
		G	-0.395	0.733	-7.358	-4.303	12.141	1.583	-0.291	2.815	-0.041	-4.189	0.227	0.034	0.967**
11.	100-grain weight (g)	P	0.000	0.043	0.182	-0.153	-0.120	0.008	0.119	0.077	-0.008	-0.019	-0.164	-0.031	-0.065
		G	-0.220	-0.421	4.765	2.628	-7.847	-0.004	2.237	0.954	-0.070	0.370	-2.576	0.099	-0.085
12.	Shelling percentage	P	0.000	0.053	0.210	-0.192	-0.169	0.049	0.123	0.004	-0.024	0.017	-0.023	-0.223	-0.176
		G	-0.020	-0.505	5.361	3.298	-10.785	0.546	2.350	-1.434	-0.173	-0.099	-0.178	1.433	-0.206

* and ** indicate significance of values at P 0.05 and 0.01, respectively
Residual Value: (phenotypic 0.321 and genotypic 0.398)

RESEARCH FINDINGS AND DISCUSSION

The present investigations revealed that genotypic correlation coefficients were higher in magnitude than respective phenotypic correlation coefficients for most of the characters (Table 1), suggesting, therefore, a strong inherent relationship in different pairs of traits. Similar observations were found by Chaudhary and Sharma (2003), Kumar *et al.* (2003), Kumar *et al*. (2004), Singh and Singh (2005) and Singh (2007) and indicating the low influence of the environment and the main role of genetic factors in the expression of characters. In present investigation, green pod yield/plant was found to be significantly and positively correlated with plant height (0.353 and 0.369), days to 1st flower emergence (0.450 and 0.452), days to 50per cent flower emergence (0.449 and 0.449), days to 1st pod set (0.461 and 0.460), days to maturity of edible green pod (0.459 and 0.459), number of primary branches/plant (0.403 and 0.409), number of seeds/pod (0.353 and 0.364) and number of pods/plant (0.607 and 0.953) at phenotypic and genotypic level, respectively, while pod width (0.367) at genotypic level only. This indicated that these characters could be considered as criteria for selecting high yielding genotypes of pea. Positive and significant associations of these characters with green pod yield/plant are in accordance with earlier reports by Dev and Rastogi (1999), Kumar *et al*. (2003), Chaudhary and Sharma (2003) and Patel *et al*. (2006).

Plant height was positively and significantly correlated with days to 50per cent flower emergence (0.992 and 0.999), days to 1st pod setting (0.992 and 0.992), days to maturity of edible green pod (0.981 and 0.992) and pod length (0.460 and 0.479) at phenotypic and genotypic levels, respectively. Kumar *et al.* (2004) and Sirohi *et al.* (2006) also reported the plant height was positively correlated with pod length.

Days to 50per cent flower emergence was positively and significantly correlated with days to 1st pod setting (0.998 and 0.999), days to maturity of edible green pod (0.990 and 0.993) and pod length (0.449 and 0.471). Similar results were observed by Sirohi *et al.* (2006). Days to 1st pod set with days to maturity of edible green pod (0.991 and 0.994) and pod length (0.457 and 0.474) at phenotypic and genotypic levels, respectively. Days to maturity of edible green pod were positively and significantly correlated with pod length (0.461 and 0.482); number of primary branches/plant with number of pods/plant (0.352 and 0.369) at both levels. Similar results were realized by Kumar *et al.* (2003) and Sirohi *et al.* (2006). Pod length was positively and significantly correlated with pod width (0.492 and 0.580) at both levels while 100-seed weight (-0.358) and shelling percentage (-0.376) were observed negative and significant at genotypic level only.

The result of present investigation on path coefficient analysis (direct and indirect effects), (Table 2) which revealed that days to maturity of green pods had highest positive and direct effect (38.052) on green pod yield/plant followed by pod width (6.466), number of primary branches/plant (4.666), days to 1st flower emergence (2.98), shelling percentage (1.433) and number of seeds/pod (0.837) indicating that if other factors are held constant, an increase in these characters individually will reflect in the increased pod yield, which indicating these are the main contributor to green pod yield/plant. Days to 50per cent flower emergence (-23.501) had highest negative effect on green pod yield/plant followed by days to 1st pod set (-13.438), pod length (-6.246), number pods/plant (-4.189) and 100-seed weight (-4.189) at genotypic level as presented in Table 2. Days to 1st pod set (0.923) had highest positive and direct effect on green pod yield/plant followed by days to maturity of edible green pod (0.742), number of seeds/pod (0.347) and number of primary branches/plant (0.362) indicating that if other factors are held constant, an increased yield whereas, days to 50per cent flower emergence (-1.068) had highest negative direct effect on green pod yield/plant followed by pod length (-.0408) at phenotypic level. Days to 50per cent flower emergence had highest indirect effect on green pod yield/plant through days to 1st pod set at genotypic level and days to 1st pod set had highest indirect effect on green pod yield/plant through days to maturity of green pod at phenotypic level as presented in Table 2. In this study, residual effect was relatively low (0.321 and 0.398) at phenotypic and genotypic level, respectively. Positive direct effect of number of primary branches/plant on green pod yield/plant also reported by Kalloo and Dhankhar (1977) and Singh (2007). Positive direct effect of number of seeds/pod on green pod yield/plant was reported by Singh and Singh (2005), Sirohi *et al.* (2006) and Singh (2007). Direct effect of shelling percentage on green pod yield was reported by Bhardwaj and Kohli (1999) and Patel *et al*. (2006). Negative direct effect of days to 50per cent flower appearance was also reported by Jamwal *et al*. (1999), Chaudhary and Sharma (2003) and Kumar *et al.* (2003).

REFERENCES

Bhardwaj, R.K. and Kohli, U.K. (1999). Association and path analysis in garden pea (*Pisum sativum* L.). *Hort. J.,* **12** (2):61-65.

Chaudhary, D.K. and Sharma, R.R. (2003). Genetic variability correlation and path analysis for green pod yield and its components in garden pea. *Indian J. Hort*., **60** (3):251-256.

Davies, D.R., Berry, G.J.; Health, M.C. and Dawkins, T.C.K. (1985) In: *Pea* (*Pisum sativum* L.) (R.J. Summerfield and E.H. Roberts eds), Williams Collins Sons and Co. Ltd., London, UK, pp. 147-198.

Dewey, D.R. and Lu, K.H. (1959). A correlation and path coefficient analysis of field component of crested wheat grass seed production. *Agron. J*., **51**: 515-518.

Dev, H. and Rastogi, K.B. (1999). Association and path analysis of pod yield and morphological traits of powdery mildew resistant advanced breeding lines of pea. *Adv. Hort. & Forestry*, **6** : 93-97.

Johnson, H.W., Robinson, H.F. and Comstock, R.E. (1955). Estimation of genetic and environmental variability in soybean. *Agron. J.,* **47**: 314-318.

Jamwal, R.S., Pathak, Sanjeev and Kalia, Pritam (1999). Path analysis in powdery mildew resistant genotypes of garden pea (*Pisum sativum* L.). *South Indian J. Hort*., **47** (1-6):313-314.

Hanson, G.H., Robinson, H.F. and Comstock, R.E. (1956). Biometrical studies on yield and segregating population of Korean Lespedeza. *Agron. J.,* **48** : 268-271.

Kalloo, G. and Dhankhar, B.S. (1977). Path analysis of yield components in pea (*Pisum sativum* L.). *Haryana Agric. Univ. J. Res*., **7**(3): 103-105.

Kumar, Manoj, Tewatia, A.S. and Sharma, N.K. (2003). Correlation and path analysis in pea (*Pisum sativum* L.). *Haryana J. Hort. Sci*., **32** (1/2): 104-107.

Kumar, P., Pratap, P.S. and Rana, M.K. (2004). Correlation studies in garden pea (*Pisum sativum* L.). *Haryana J. Hort. Sci*., **33** (3/4): 243-245.

Patel, P.J., Patel, N.H., Prajapati, B.H., Tikka, S.B.S. and Patel, P.T. (2006). Correlation and path analysis in field pea. *Indian J. Pulse Res*., **19** (1): 109-110.

Singh, A.K. and Singh, I.P. (2005). Studies on correlation and path coefficient analysis in pea (*Pisum sativum* L.). *National J. Plant Improve.*, **7** (1): 59-60.

Singh, A.K. (2007). Interrelationship among characters and path coefficient study in pea under cold arid region of Ladakh. *Indian J. Hort*., **64** (1): 98-100.

Sirohi, P.S., Yadav, Rameshray and Malik, Sanjay (2006). Genetic variability, correlation and path coefficient analysis for seed yield and its component characters in pea (*Pisum sativum* L.). *Plant Archives*, **6** (2): 737-740.

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