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RESEARCH ARTICLE

Study on characters association and path analysis in field pea (*Pisum sativum* L.)

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SUMMARY

A study was conducted to determine the character associations and their mode of direct and indirect effect on grain yield in thirty-six genotypes in field pea. The genotypic correlation was higher than phenotypic correlation for all characters studies in field pea. Biological yield/plant and number of pods/plant had positive and highly significant correlation with grain yield/plant. Number of primary branches/plant and plant height (cm) had positive and significant correlation with grain yield/plant. Biological yield/plant, harvest index (%) and plant height (cm) had high positive and direct effect on grain yield/plant. Similarly days to 50 % flowering and pod length (cm) had positive and direct effect on grain yield/ plant.

Key Words : Correlation co-efficient analysis, Path co-efficient analysis, Field pea

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Field pea (*pisum sativum L*) is an important legume crop. Pea is the important source of protein, vitamins, and minerals. The nutritional value of dry seeds is similar to other legumes and contain 18-30% protein, 35-40 % starch, 4-7 % fibre. Pea is deficient in sulphur containing amino acids (methionine, cysteine) but relatively high level of lysine making it to a good dietary complement to cereals (Mc Phee, 2003). It also improves the soil fertility through biological nitrogen fixation with the help of Rhizobium bacteria found in their root nodules. The knowledge of association of plant traits is essential for any successful crop improvement programme. The correlation between components of yield provides the information about the likely consequence of selection for simultaneous improvement of desirable traits. The path analysis elucidates the intrinsic nature of the observed association between yield and its traits. In other words path analysis is used when we want to determine the amount of direct and indirect effect of traits on grain yield.

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MATERIAL AND METHODS

Thirty six (twenty two tall and fourteen dwarf) genotypes were evaluated in complete Randomized Block Design with three replications during *Rabi* season 2008 -2009 at Oil Seed Research Farm Kalyanpur, Kanpur (U.P.). The experimental material consisted of 4 checks, 20 advanced generations and 12 cultivars. All the recommended agronomic practices and necessary precaution were applied. Each plot consists of six rows with three-meter length with plant to plant and row-to-row distances were 10 cm and 30 cm, respectively. Data were recorded from the ten randomly selected plants from each replication for ten phenotypic traits *viz*., days to 50% flowering, plant height (cm), number of primary branches/ plant, number of pods/plants, pod length(cm), number of

grains/ pod, 100-seed weight(g), harvest index(%), biological yield/ plant(g) and grain yield /plant(g). The mean values were subjected to correlation co-efficient as suggested by Johnson *et al.* (1955). Path co-efficient analysis was calculated to understand direct and indirect effect of traits on seed yield (Dewey and Lu, 1959).

RESULTS AND DISCUSSION

The phenotypic and genotypic correlation co-efficient

Table 1 : Phenotypic (upper value) and genotypic (lower value) correlation for 10 characters in field pea (*Pisum sativum* L.)

Characters	Days to 50 % flowering	Plant height (cm)	No. of primary branches/ plant	No. of pods/ plant	Pod length (cm)	No. of seeds/ pod	100-seed weight	Biological yield/plant	Harvest index (%)	Grain yield/ plant
Days to 50 %	rp	0.313	0.232	0.319	-0.486**	-0.242	-0.137	0.405*	-0.429**	0.016
flowering	rg	0.318	0.332	0.328	-0.557**	-0.274	-0.139	0.410*	-0.446	0.013
Plant height (cm)		rp	0.534**	0.633**	-0.558**	-0.703**	0.426**	0.726**	-0.569**	0.350*
		rg	0.728**	0.642**	-0.628**	-0.814**	0.431**	0.761	-0.581**	0.358*
Number of primary			rp	0.439**	-0.362*	-0.379*	0.205	0.541**	-0.204	0.393*
branches/plant			rg	0.585**	-0.564**	-0.573**	0.268	0.742	-0.312	0.527**
Number of				rp	-0.373*	-0.367*	0.209	0.795**	-0.454**	0.434**
pods/plant				rg	-0.432**	-0.442**	0.215	0.806**	-0.464**	0.451**
Pod length (cm)					rp	0.530**	-0.019	-0.406*	0.280	-0.219
					rg	0.662**	-0.018	-0.458**	0.329	-0.244
Number of						rp	-0.368*	-0.479**	0.318	-0.317
seeds/pod						rg	-0.442**	-0.553**	0.376*	-0.372*
100 seed weight (g)							rp	0.324*	-0.136	0.245
							rg	0.328*	-0.145	0.250
Biological								rp	-0.682**	0.439**
yield/plant (g)								rg	-0.692**	0.448**
Harvest index (%)									rp	0.312
									rg	0.291

* and ** indicate significance of values at P=0.05 and 0.01, is 0.3246 and 0.4182, respectively

Table 2 : Phenotypic (upper diagonal) and genotypic (lower diagonal) direct and indirect effect of various traits on grain yield in field pea (*Pisum sativum* L.)

Characters	Days to 50 % flowering	Plant height (cm)	Number of primary branches/ plant	Number of pods/ plant	Pod length (cm)	Number of seeds/ pod	100 seed weight (g)	Biological yield/ plant (g)	Harvest index (%)	Correlation with grain yield
Days to 50%	0.018	0.630	-0.024	-0.024	-0.015	0.019	0.008	0.494	-0.524	0.016
flowering	0.044	0.094	-0.106	-0.050	-0.019	0.034	0.014	0.611	-0.608	0.013
Plant height (cm)	0.006	0.200	-0.055	-0.047	-0.017	0.056	-0.025	0.927	-0.694	0.350*
	0.014	0.296	-0.232	-0.099	-0.022	0.103	-0.043	1.133	-0.793	0.358
Number of primary	0.004	0.107	-0.104	-0.033	-0.011	0.030	-0.012	0.660	-0.249	0.393*
branches/plant	0.015	0.215	-0.318	-0.090	-0.019	0.072	-0.027	0.104	-0.425	0.527
Number of	0.006	0.127	-0.046	-0.074	-0.012	0.029	-0.012	0.970	-0.554	0.434*
pods/plant	0.014	0.190	-0.186	-0.154	-0.015	-0.056	-0.022	1.200	-0.633	0.451
Pod length (cm)	-0.009	-0.111	0.038	0.028	0.031	-0.043	0.001	-0.496	0.342	-0.219
	-0.024	-0.186	0.179	0.067	0.034	-0.083	0.002	-0.681	0.449	-0.244
Number of	-0.004	-0.141	0.039	0.027	0.017	-0.008	0.022	-0.584	0.388	-0.317
seeds/pod	-0.012	-0.241	-0.182	0.068	0.023	-0.126	0.044	-0.823	0.513	-0.372
100 seed weight (g)	-0.002	0.085	-0.021	-0.015	-0.001	0.030	-0.059	0.395	-0.167	0.245
	-0.006	0.128	-0.085	-0.033	-0.001	0.056	-0.100	0.489	-0.197	0.250
Biological yield /	0.007	0.152	-0.056	-0.059	-0.013	0.038	-0.019	1.221	-0.832	0.439*
plant (g)	0.018	0.225	-0.236	-0.124	-0.016	0.070	-0.033	1.489	-0.945	0.448
Harvest index (%)	-0.008	-0.114	0.021	0.034	0.009	-0.025	0.008	-0.833	1.220	0.312
	-0.019	-0.172	0.099	0.071	0.011	-0.047	0.014	-1.031	1.365	0.291

Phenotypic residual effect = 0.0807, Genotypic residual effect =0.0519
Bold value shoved direct effect on grain yield

of all possible combination among ten traits work out for thirty-six genotypes. The results are presented in Table 1. In general, value of genotypic correlation was higher than phenotypic correlation for all traits. Out of 45 combinations, only 14 associations were found positive and significant. Plant height, number of primary branches/plant, number of pod/plant and biological yield/plant had positive and significant correlation with grain yield/plant. Similar result was found by Shinde *et al*. (1998), Singh (1999) and Navab *et al.* (2008). The other significant and positive correlation of traits were days to 50% flowering with biological yield, plant height with number of primary branches/plant, number of pods/ plant and biological yield/ plant, 100-seed weight with plant height, number of primary branches/plant with number of pods/plant and biological yield /plant with grain yield/plant, pod length with number of seeds/pod. Hence, plant height (cm), no. of primary branches/plant, no. of pods/plant and biological yield/plant appear to be the most important selection criteria for seed yield in field pea.

Information derived from correlation co-efficient indicates only measure of association between the traits while path co-efficient analysis helps in understanding the direct and indirect contribution of each independent trait on the dependent traits (grain yield Table 2). In the present investigation path co-efficient analysis revealed that plant height (cm), biological yield/plant and harvest index (%) had high positive and direct effect on grain yield/plant. Similar findings were reported by Singh and Misra (2002), Satyawan *et al*. (2004) and Kumar and Ojha (1997) for various attributing traits with grain yield. The maximum positive direct effect showed biological yield followed by harvest index, plant height, days to 50% flowering and pod length. The indirect effect of this character via other traits was also considerable. Most traits had positive indirect via the attributing traits on grain yield. It indicates that these traits are main yield field pea.

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