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CHARACTER ASSOCIATION AND PATH ANALYSIS IN PEA (*PISUM SATIVUM* L.)

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ABSTRACT

The understanding of association of traits is very important in developing an efficient breeding program. The study was carried out in order to find out the genetic variation, interrelationships among different characters and the direct and indirect contributions of these characters towards yield. The germplasm of pea containing 30 genotypes were analyzed to estimate the correlations and path coefficients for yield and yield related traits. Inter-relationship of various quantitative traits like days to flowering, branches per plant, pods per plant, pod length, pod width, pod weight per plant and seed yield per plant were ascertained. Correlation studies indicated that for improvement in pea yield, the intensive selection should be made for days to flowering, pods per plant, and pod weight as these traits showed significantly positive correlation with seed yield and also among themselves. Pod length and pod width also showed positive but non significant correlation with yield so these can also be used for improvement of yield. Partitioning through path coefficient analysis revealed that number of branches per plant played an important role for the improvement of grain yield in peas.

Key Words: Genotypic correlation, Path coefficient analysis, Yield components, Direct and Indirect effects, Pea

INTRODUCTION

Pea is an important winter crop of temperate regions of world and among the grain legumes, dry peas rank first regarding production in Europe (Tar'an *et al.*, 2005). Pea is among the four important cultivated legumes next to soybean, groundnut and beans (Husle, 1994). Pea (*Pisum sativum* L.), family Papilionaceae, is a multipurpose crop. It is a cheap source of protein and is known as poor man meat in the developing world and used in rotation with cereals and oil seed crops. It provides balanced diet in combination with wheat, rice and other cereals. The dried peas contain 1.4% fat, 60.7% carbohydrate, 10.9% protein, 1.4% crude fiber and 2.7% ash (Tzitzikas *et al.*, 2006). Increasing value of protein enriched food has led to a greater chance in this crop as a protein source (Santalla *et al.*, 2001). In Pakistan it is cultivated under an extensive range of agriculture regions, but the average yield per hectare is very low as compared to its potential and yield obtained in many other countries. The correlation studies provide information about association between any two characters. The path coefficient analysis provides the division of correlation coefficients into direct and indirect effects giving the relative importance to the causal factors. The current study was carried out in order to find out the genetic variation, interrelationships among different characters and the direct and indirect contributions of these characters towards yield. The estimate of genetic diversity and its relationship with germplasm collections and evaluation are useful for facilitating efficient germplasm collection, control and utilization (Nisar *et al.*, 2008).

The understanding of association of characters is very important in developing an efficient breeding program. The prime and long term objective of plant breeding is to increase productivity to meet the increasing food demands of people. New varieties with improved agronomic traits have been the major contributing factor to increase food production. The present study aims at the estimation of direct and indirect contribution of different yield components to the overall seed yield in peas.

MATERIALS AND METHODS

The experimental material having thirty genotypes collected from different organizations was evaluated to understand the correlation and character association of different yield components. All the genotypes used for the experiment had a wide range of yield traits. The experimental material was grown in a randomized complete block design with three replications under normal conditions. The plot size was 4 ×12 m with plant to plant and row to row distances of 9 cm and 18 cm, respectively. Uniform cultural practices were carried out through out crop growing season. Observation of different yield related traits like number of branches per plant, days to 50% flowering, number of pods per plant, seed yield per plant, pod width, pod length, pods weight per plant were recorded.

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For days to flowering, the data were recorded as the total number of days from the date of planting to the time when 50 percent plants within a plot showed flowering. The branches arising from the crown or basal node were counted from each of the five randomly selected plants and were averaged. The pod width was counted from each of the six selected plants with Vernier Calliper and average pod width per plant was calculated. Number of seed bearing pods counted at harvesting stage (average of 5 random plants). Pod length of five pods was separately measured in centimeters. Total quantity of seed obtained from each of the selected plants was separately weighed in grams with an electric balance and averaged.

RESULTS AND DISCUSSION

Yield is a polygenic and complex trait. The selection on the basis of this character i.e. yield, is often misleading. Interrelationship and association of different traits among each other is very important for an efficient selection. Correlation coefficients of different yield related traits are presented in table 1. In this study , days to flowering, pods per plant , pod length and pod weight per plant showed positive and significant correlation with yield, similar results has been reported by Ramesh *et al.* (2002) The inter association study of yield related traits indicated the extent of relationship of these traits among each other. A critical examination of results revealed that genotypic correlation coefficients were higher than phenotypic coefficients, so phenotypic coefficients were not included in table.

The study showed that number of branches per plant had positive and significant correlation with pod length and pod weight per plant while it had negative correlation with days to flowering, pods per plant and pod width. Similar results have been obtained by (Kumaran, *et al.*, 1995). Number of first flowering node is an index of earliness. Days to flowering exhibited positive and significant correlation with pods per plant, pod width and yield (Bourion, *et al.*, 1998). However, Days to flowering had negative correlation with pod length, pods per plant and pod weight per plant. This non significant correlation indicates that any change in these traits would have no effect on yield. Pods per plant had positive correlation with pod weight per plant and days to flowering while it had negative correlation with pod length and pod weight per plant (Chaudhary and Sharma, 2010).

Pod length had positive and significant correlation with pod weight per plant and branches per plant while it had negative correlation with pod width, days to flowering and pods per plant. Pod weight per plant had positive correlation with all traits except days to flowering and pods per plant.

Table 1. Genotypic correlation among yield and its components of pea.

Traits	**Branches per plant**	**Days to flowering**	**Pods per plant**	**Pod length**	**Pod width**	**Pod weight per plant**	**Seed yield per plant**
Branches per plant		-0.45	-0.8153	1.1108*	-0.0602	0.7454*	-0.3009
Days to flowering			0.8758*	-0.711	0.4505*	-0.2381	0.7533*
Pods per plant				-1.3538	0.9578*	-0.0631	0.4329*
Pod length					-0.5743	0.2764	0.0517
Pod width						0.5823*	0.2594
Pod weight per plant							0.3840*

Path coefficient

Yield contributing traits like branches per plant, pod weight per plant and pod length had high substantial direct effect on seed yield per plant (table 2). Similar results had been reported by Joshi and Narsinghani (1992). The high indirect effect of pod length through branches per plant on grain yield was observed. The moderate indirect effect of pod weight per plant through branches per plant, pods per plant through pod length (Chaudhary and Sharma, 2010),

pods per plant through days to flowering, days to flowering through pod length (Sharma *et al.* 2003) and pod width through pods per plant was recorded and were found similar with Verma (1993)

In conclusion, from correlation and path coefficient analysis study, it was clear that days to flowering was most responsible factor for grain yield per plant followed by pods per plant and pod weight per plant. Thus selection based on days to flowering should be preferred in genotypes to select high yielding types.

Table 2. Direct and indirect effects of yield components on yield in pea.

	Branches per plant	**Days to flowering**	**Pods per plant**	**Pod length**	**Pod width**	**Pod weight per plant**
Branches per plant	**2.1298**	-0.3975	-0.4550	-0.9849	-0.0029	-0.9630
Days to flowering	-0.9585	**0.8833**	0.4888	0.6305	0.0215	0.3076
Pods per plant	-1.7363	0.7735	**0.5581**	1.2005	0.0458	0.0816
Pod length	2.3657	-0.6280	-0.7556	**-0.8867**	-0.0274	-0.3571
Pod width	-0.1283	0.3979	0.5346	0.5092	**0.0478**	-0.7523
Pod weight per plant	1.5875	-0.2103	-0.0352	-0.2451	0.0278	**-1.2920**

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