International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 1924-1927

Received: 11-07-2018
Accepted: 15-08-2018

Archi Gupta
Department of Horticulture, SVPUAT, Meerut, Uttar Pradesh, India

MK Singh
Department of Horticulture, SVPUAT, Meerut, Uttar Pradesh, India

Taru Dumi
Department of Horticulture, SVPUAT, Meerut, Uttar Pradesh, India

Atul prakash
Department of Horticulture, SVPUAT, Meerut, Uttar Pradesh, India

Correspondence
Archi Gupta
Department of Horticulture, SVPUAT, Meerut, Uttar Pradesh, India

Estimation of character association and direct and indirect effects in pea (*Pisum sativum* L.)

Archi Gupta, MK Singh, Taru Dumi and Atul prakash

Abstract
The associations of yield and its components offer important information in breeding plants. The study was carried out at Horticulture Research centre (HRC) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, UP during 2016-17.The experimental material comprised of 20 table pea germplasm and laid out in a Randomized Complete Block Design with three replications to determine the association of yield and its components. The association was analyzed by correlation coefficient, and further subjected by path coefficient analysis to estimate direct and indirect effects of each character on pod yield. Five competitive plants from each plot were randomly selected for recording observations for all the quantitative characters except days to 50 per cent flowering and days to maturity, which were recorded on plot basis. In present study a strong and positive association of seed yield per plant observed with Days to 50% flowering, Number of first fruiting node, Length of first fruiting node, Number of pods per plant and Number of seeds per pod at both genotypic and phenotypic level. Thus, these characters emerged as most vital component traits and associated positively with pod yield per plant. Path analysis revealed that number of pods per plant followed by length of first fruiting node and width of pod had positive direct effect on pod yield. The results of this study suggested that the these characters were important characters that should be taken into account as selection criteria in improving pod yield of the vegetable pea.

Keywords: estimation, character association, pea, *Pisum sativum*

Introduction
Pea is an important vegetable crop grown throughout India for its tender and immature seeds which is used as vegetable. It is a very common nutritious vegetable grown in cool season throughout the world. The protein concentration of peas ranges from 15.50-39.70per cent. Large proportion of peas is processed (canned, frozen or dehydrated) for consumption in off season. India is the largest producer of vegetables in the world next to China, with an area around 478 thousand ha, production 4652 thousand metric tonnes (2016-17). The low yield is the main constrain for growing Pea in India. Therefore, breeders should emphasize on yield improvement of Pea. In order to increase its yield potential, several genetic improvement methods have been employed. Seed yield being the most important and polygenically controlled complex character, is also governed by many physiological changes within the plant and influenced by many environmental factors when cultivated, hence it is not an efficient character for selection. The understanding of association of characters is of prime importance in developing an efficient breeding programme. The path coefficient analysis provides the partitioning 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.

Methods and Material
This research was carried out at Horticulture Research centre (HRC) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, UP during 2016-17.The twenty germplasm of table pea were planted in a randomized block design with three replications in rabi 2016-17. Each plot comprised one row of 1.8 m length spaced 45 cm apart with plant to plant and row to row is 10 cm. Five competitive plants from each plot were randomly selected for recording observations. The observations were recorded on ten important characters i.e. days to 50% flowering, plant height (cm), number of first fruiting node, length of first fruiting

node (cm), number of pods per plant, length of pod (cm), width of pod (cm), number of seeds per pod, pod yield per plant (g), pod yield (q/ha). In order to determine the association between yield and its components, correlation coefficients were firstly calculated from the mean values of characters. Correlation coefficients were further analyzed by path coefficient to understand the direct and indirect effects of examined characters on pod yield. The simple correlations between different characters were estimated according to Wright (1921) [9]. Path coefficient was suggested by Wright (1921) [9] and as elaborated by Dewey and Lu (1959) [2].

Result and Discussion

The genotypic and phenotypic correlation coefficients for all the characters are presented in the Table 1. The estimation of correlation coefficient revealed that, the genotypic correlation was higher in magnitude than the corresponding phenotypic correlation coefficient.

In the present investigation, correlation coefficient was computed among ten characters. Pod yield q/ha revealed the positive and significant correlations with days to 50% flowering, number of first fruiting node, length of first fruiting node, number of pods per plant and number of seeds per pod at both genotypic and phenotypic level. Thus, it can be inferred that selection based on any one of these characters either alone or in combination, will result in identifying high yielding strains. Similar result were reported by Togay *et al*., (2008) [8], Saeed *et al*., (2013) [4]; Selvi *et al*., (2016) [5]. Days to 50% flowering showed positive and significant correlation with length of first fruiting node, number of pods per plant, number of first fruiting node, pod yield q/ha, pod yield per plant, plant height and width of pod. The plant height showed positive and highly significant correlation with length of first fruiting node, number of pods per plant number of first fruiting node, pod yield q/ha and pod yield per plant and length of pod, whereas Number of first fruiting node was obtained positive and significant correlation with number of pods per plant, length of first fruiting, pod yield q/ha, pod yield per plant, length of pod, number of seeds per pod and width of pod. The length of first fruiting node showed positive and significant correlation with number of pods per plant, pod yield q/ha and pod yield per plant and width of pod. Similarly, the number of pods per plant was given positive and significant correlation with pod yield q/ha, pod yield per plant, number of seeds per pod, length of pod. The length of pod was exhibited positive and significant correlation with width of pod, number of seeds per pod and width of pod exhibited positive and significant correlation with pod yield q/ha, pod yield per plant and number of seeds per pod. In context of number of seeds per pod showed positive and significant correlation with pod yield q/ha and pod yield per plant, while pod yield q/ha was exhibited positive and significant correlation with pod yield per plant. These indicate that by improving these traits, pod yield in pea can be improved. These results were close in conformity with findings of Sharma *et al.*, (2002) [6], Pal and Singh (2012) [3].

In the present investigation path coefficient analysis was done for characters using genotypic and phenotypic correlation coefficient and pod yield q/ha was taken as dependable variables sown in Table 2 and 3. In order to see that the causal factor and so as to identify the components which are responsible for producing pod yield q/ha. In general the genotypic direct as well as indirect effects were slightly higher in magnitude as compared to corresponding phenotypic direct and indirect effects. The highest positive direct effect on pod yield was observed for number of pods per plant followed by length of first fruiting node and width of pod. In other hand, positive indirect effect was observed via various characters like days to 50% flowering via number of seeds per pod, plant height via number of seeds per pod and width of pod, number of first fruiting via number of pods per plant, width of pod and length of first fruiting node, length of first fruiting node via days to 50% flowering, number of pods per plant, plant height, number of first fruiting node and width of pod, number of pods per plant via length of first fruiting node, number of first fruiting node, days to 50% flowering, plant height, number of seeds per pod and length of pod, length of pod node via length of pod, days to 50% flowering, length of first fruiting node, number of first fruiting node and number of seeds per pod, width of pod via length of pod, length of first fruiting node, number of seeds per pod, number of first fruiting node and days to 50% flowering, number of seeds per pod via plant height, length of first fruiting node and days to 50% flowering. Similar results were earlier reported by Chaudhary *et al*., (2010) [1], Tofiq *et al*., (2015) [7] and Selvi *et al*., (2016) [5]. Hence by improving number of pods per plant, days to 50% flowering, width of pod, the pod yield in pea might be improved. Those traits were influenced pod yield via other traits, should also be given importance while improving the pod yield in pea.

Conclusion

It may be concluded that from the correlations, the traits like days to 50% flowering, number of first fruiting node, length of first fruiting node, number of pods per plant and number of seeds per pod were correlated to each other and helpful in increasing in pod yield

Path coefficient analysis showed highest positive direct effect on pod yield for number of pods per plant followed by length of first fruiting node and width of pod. By improving number of pods per plant, width of pod and length of first fruiting node, pod yield in pea might be improved.

Table 1: Estimation of correlation coefficient for genotypic (G) and phenotypic (P) coefficient among 10 characters in pea

Genotypes		Days to 50% flowering	Plant height (cm)	Number of first fruiting node	Length of first fruiting node (cm)	Number of pods per plant	Length of pod (cm)	Width of pod (cm)	Number of seeds per plant	pod yield q/ha	Pod yield per plant (gm)
Days to 50% flowering	G	1.000	0.442**	0.553**	0.753**	0.560**	0.009	0.304*	-0.217	0.470**	0.471**
	P	1.000	0.436**	0.484**	0.742**	0.553**	0.010	0.255*	-0.192	0.467**	0.468**
Plant height(cm)	G			0.411**	0.641**	0.436**	0.032	-0.174	-0.288*	0.229	0.230
	P			0.369**	0.639**	0.434**	0.030	-0.138	-0.260*	0.229	0.230
Number of first fruiting node	G				0.625**	0.685**	0.261*	0.055	0.216	0.529**	0.530**
	P				0.563**	0.607**	0.226	0.091	0.185	0.473**	0.474**
Length of first fruiting node (cm)	G					0.715**	-0.004	0.177	-0.217	0.621**	0.622**
	P					0.712**	-0.008	0.140	-0.200	0.619**	0.620**

Number of pods per plant	G						0.024	-0.031	0.375**	0.925**	0.926**
	P						0.017	-0.031	0.340**	0.921**	0.922**
Length of pod (cm)	G							0.492**	0.298*	-0.001	-0.001
	P							0.382**	0.242	-0.007	-0.007
Width of pod (cm)	G								0.090	0.141	0.142
	P								0.065	0.115	0.116
Number of seeds per pod	G									0.387**	0.386**
	P									0.348**	0.349**
Pod yield q/ha	G										1.000**
	P										1.000
Pod yield per plant (g)	G P										1.000**
											1.000

Residual effect = 0.0037

Table 2: Path coefficient analysis at genotypic level on pod yield q per ha

Characters	Days to 50% flowering	Plant height (cm)	Number of first fruiting node	Length of first fruiting node (cm)	Number of pods per plant	Length of pod (cm)	Width of pod (cm)	Number of seeds per pod	R with pod yield q/ha
Days to 50% flowering	-0.250	-0.061	-0.029	-0.183	0.818	-0.001	0.111	0.065	0.471**
Plant height(cm)	-0.110	-0.138	-0.022	-0.155	0.637	-0.004	-0.064	0.086	0.230
Number of first fruiting node	-0.138	-0.057	-0.052	-0.152	1.002	-0.028	0.020	-0.064	0.530**
Length of first fruiting node(cm)	-0.188	-0.088	-0.033	-0.242	1.044	0.000	0.065	0.065	0.622**
Number of pods per plant	-0.140	-0.060	-0.036	-0.173	1.461	-0.003	-0.011	-0.112	0.926**
Length of pod (cm)	-0.002	-0.004	-0.014	0.001	0.036	-0.109	0.180	-0.089	-0.001
Width of pod (cm)	-0.076	0.024	-0.003	-0.043	-0.046	-0.053	0.366	-0.027	0.142
Number of seeds per pod	0.054	0.040	-0.011	0.053	0.548	-0.032	0.033	-0.298	0.386**

Residual effect = 0.0037

Table 3: Path coefficient analysis at phenotypic level on pod yield q per

Characters	Days to 50% flowering	Plant hight (cm)	Number of first fruiting node	Length of first fruiting node (cm)	Number of pods per plant	Length of pod (cm)	Width of pod (cm)	Number of seeds per pod	R with pod yield q/ha
Days to 50% flowering	-0.121	-0.085	-0.047	0.007	0.645	0.000	0.048	0.020	0.468**
Plant height(cm)	-0.053	-0.194	-0.036	0.006	0.506	-0.001	-0.026	0.027	0.230
Number of first fruiting node	-0.059	-0.072	-0.097	0.006	0.708	-0.010	0.017	-0.019	0.474**
Length of first fruiting node(cm)	-0.090	-0.124	-0.054	0.010	0.831	0.000	0.026	0.021	0.620**
Number of pods per plant	-0.067	-0.084	-0.059	0.007	1.167	-0.001	-0.006	-0.035	0.922**
Length of pod (cm)	-0.001	-0.006	-0.022	0.000	0.020	-0.044	0.072	-0.025	-0.007
Width of pod (cm)	-0.031	0.027	-0.009	0.001	-0.036	-0.017	0.187	-0.007	0.116
Number of seeds per pod	0.023	0.051	-0.018	-0.002	0.397	-0.011	0.012	-0.104	0.349**

References

1. Chaudhary H, Verma MK, Sofi AA. Genetic variability, heritability and genetic advance for yield components in garden pea. Pantnagar Journal of Research. 2010; 8(2):195-197.
2. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. Argon. J. 1959; 51:515-518.
3. Pal AK, Singh S. Correlation and path analysis in garden pea (*Pisum sativum* L.) Prog. Agric. 2012; 7(1/2):102-104.
4. Saeed MA, Khan JA, Saeed AN. Character association and path analysis in pea (*Pisum sativum* L.). International Journal of biology and biotechnology. 2013; 46(4):333-34.
5. Selvi BS, Rajangam J, Suresh J, Muthuselvi R. Character association and path analysis studies for yield and its

components in pea (*Pisum sativum* L.*)*. Electronic Journal of Plant Breeding. 2016; 7(3):750-757.
6. Sharma A, Kalia P. Genetic analysis for pod yield and its contributing traits in garden pea (*Pisum sativum* L.). Veg. Sci. 2002; 29(2):106-109.
7. Tofiq SE, Abdulkhaleq DA, Amin TNH, Azez OK. Correlation and path coefficient analysis in seven field pea (*Pisum sativum* L.) genotypes created by half diallel analysis sulaiman region for F2 generation. 2015; 5:2231-4490.
8. Togay N, Togay Y, Yildirim B, Dogan Y. Relationships between yield and some yield components in Pea (*Pisum sativum* ssp arvense L.) genotypes by using correlation and path analysis, African Journal of Biotechnology. 2008; 7(23):4285-4287.
9. Wright S. Correlation and Causation. J Agri. Res. 1921; 20:557-585.