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Germplasm evaluation, character association and genetic diversity in field pea (*Pisum sativum* L.)

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Abstract
The present investigation was taken to estimate the characters correlation coefficient along with direction and path coefficient analysis with the help of raising 20 variant varieties of field pea at *Nidharia* farm of S.M.M. Town Post Graduate College, Ballia during *Rabi* season 2017-18. The field experiment was conducted with maintaining principles of experimental designs under timely sown conditions in complete randomized block design with three replications. The data were recorded on eleven characters including yield for estimates of phenotypic and genotypic coefficient of variation. Phenotypic coefficient of variation (PCV) values were slightly higher than corresponding genotypic coefficients of variation (GCV) for all attributes revealing small effects of environment in character expression process. Results of correlation coefficients revealed that grain yield had significant and positive associations with pod length (0.580), biological yield per plant (0.700) and test weight (0.484), while, it had a negative but significant associationship with branches per plant (-0.411). The data for direct and indirect effects were estimated through path coefficient analysis and observed that biological yield per plant (1.303) had highest positive direct effect on seed yield followed by harvest index (0.821), revealing that these characters might be useful during breeding programmes as effective selection attributes for yield improvement in pea.

Keywords: Field pea, *Pisum sativum* (L), correlation coefficient, path analysis

Introduction
Pea (*Pisum sativum* L.) is a diploid species (2n=14) of family *Fabaceae*. Though in some parts of the world, it is grown for grazing purpose, yet in India it is not only consumed as good source of protein but in a variety of ways. Pea is grown all over the world and is an important pulse crop with varying area and production. In India, area under pea crop was 124.16 lakh hectares with a production of 7.8 lakh tonnes and productivity of 6.28 qt/hectare in 2015-16. Uttar Pradesh is the largest producer in the country followed by Bihar, Haryana, Punjab, etc.
It is a high protein (20%) crop with all essential amino acids important for normal activities of living organisms. The fractional composition is also favourable. The most important is it has easily water soluble fibre seed protein (36% to 87%) and green seeds (65% to 82%) along with a series of vitamins, minerals and high fibre content. Immature pods of pea have high level of active lipotropic anti-sclerotic substances like choline and inositol. Being pulse crop it enhances the soil fertility by nitrogen fixation, foliage decomposition, etc.
The major bottlenecks in pulses production in general and pea in particular are negative associationships between high production input and sustainable genotypes. Using improved production technology, breeding high yielding disease resistant and suitable plant type which may be highly responsive to inputs and insensitive to light can help to cross the yield barrier. Keeping in view the various shortcomings as well as good attributes in the existing varieties of pea, this investigation was carried out. Eleven characters were taken under the present study for estimates of variability, correlation coefficients and path coefficients analysis.
Wright (1921) [7] partitioned the value into cause and effect. It splits the correlation magnitudes into estimates of direct and indirect contribution of each character towards yield along with residual effect as per procedure illustrated by Dewey and Lu (1959) [2].

Materials and Methods
Twenty divergent strains/varieties of pea obtained from different places in the department were grown in *Rabi* 2017-18 using Randomised Block Design (R.B.D.) with 3 replications dated 7th December, 2017 at farm of S.M.M. Town P.G. College, Ballia. Each treatment was sown in a plot with distancing of 3 m X 0.30 m X 0.1 m.

The data on five randomly selected plants were taken for plant height, days to maturity, branches per plant, pod length, number of pods per plant, biological yield per plant, 100 seed weight, harvest index and seed yield per plant while, days to 50% germination and days to 50% flowering were observed on plot basis. The data were analysed by standard statistical method.

Results and Discussion

The observed variability among genotypes was estimated by analysis of variance (ANOVA). All characters exhibited significant variance except number of seeds/pod. The seed yield per plant was a most important character which was a result of the multiplicative interactions of several genes in different directions. Such genes which are responsible for characters are termed as yield components. The genetic architecture of seed yield is based on the effects produced by various yield components directly with one another. Therefore, identification of important yield components and information about associations of them with yield and also among each others are useful for developing efficient breeding strategy to evolve high yielding varieties. In this respect, the correlation coefficients between two variables or characters help us in understanding the nature and magnitude of associationship among yield and yield components. The phenotypic correlation coefficient is the cumulative effect of genetic and environmental interaction, while genotypic correlation coefficient provides a real associationship value between two characters and they are highly useful in selection of parents.

The table 1 clearly depicts that for almost all the characters phenotypic correlation coefficients were slightly less than their corresponding genotypic one. The seed yield per plant was more positively significant for biological yield, pod length and test weight, while a significant but negative high magnitude of associationship was noted between seed yield and branches per plant. The important positive associations were also observed between days to germination with branches per plant and days to maturity; days to flowering with plant height, days to maturity and biological yield; plant height with maturity, branches per plant, number of pods per plant and biological yield; days to maturity with branches per plant, number of pod per plant and biological yield; branches per plant with number of pods per plant; pod length with test weight and harvest index; number of pods per plant with biological yield and test weight with harvest index. On the other hand contrary to these associations negative and significant correlation coefficient were observed between days to germination and days to flowering as well as plant height. Days to flowering had negative and significant associationship with harvest index while plant height with pod length, test weight and harvest index also had similar result. Another similar direction was noted between days to maturity and pod length, test weight and harvest index. Branches per plant with pod length, test weight and harvest index; pod length with number of pods per plant, number of pods per plant with harvest index resulted in negative and significant associationship. And at last negative and significant association was reported between biological yield and harvest index. The correlation coefficient values if significant are a result of pleiotropic and linkage effects due to presence of pleiotropic and interlinked genes on same chromosome. Positive association is the result of coupling and negative association is due to repulsion. Any associationship may be breakdown in next generation as segregating or generation mean due to breakage of earlier established correlation coefficients through crossing over or biparental matings. So the observation of a particular correlation in a direction may get an alternate way in next generation. Similar results have been reported by Shinde *et al.* (1998), Singh *et al.* (2002), and Tyagi *et al.* (2002) [4, 5, 6].

As written earlier, three characters *viz*. biological yield per plant and test weight had positive association with seed yield per plant while branches per plant had negative associationship. The biological yield had greatest direct effect on seed yield (1.303), (table 2) with other indirect positive effects of days to flowering, plant height, days to maturity, branches per plant, etc while three attributes i.e. days to germination, pod length, test weight and harvest index showed negative indirect effects. The test weight had negative direct effect (-0.595) but positive correlation coefficient was observed due to indirect effects of plant height, days to maturity, branches per plant, pods per plant, biological yield and days to germination along with negative indirect value for harvest index. The negative association between branches per plant with seed yield was partitioned into direct effect (-0.935) with another indirect negative values for biological yield, pods per plant, days to flowering and days to germination. While on the other hand, plant height, days to maturity, pod length, test weight and harvest index had shown indirect positive effects. A high magnitude of residual effect (1.024) was estimated in path analysis.

The insight view of the correlation and path analysis results that breeder should consider biological yield, test weight, branches per plant, days to maturity with reference to days to germination with dwarf plant size and more number of pods per plant would be beneficial for yield improvement. This is supported by the findings of Katoch (2016) [3] and Devi *et al.* (2017) [1].

Table 1: Genotypic and Phenotypic Correlation Coefficient for eleven characters in pea (*Pisum sativum* L.)

Characters	Days to 50% germination	Days to 50% flowering	Plant height (cm)	Days to maturity	Branches per plant	Pod length(cm)	No of pod per plant	Biological yield per plant(g)	Test weight	Harvest index(%)	Seed yield per plant (g)
Days to 50% germination	r_g r_p	-0.602** -0.530**	-0.438** -0.425**	0.284* 0.264*	0.401** 0.370**	-0.110 0.096	0.252 0.229	-0.170 -0.168	-0.139 -0.110	0.154 0.116	-0.020 -0.009
Days to 50% flowering		r_g r_p	0.565** 0.507**	0.395**/ 0.321*	0.026 -0.007	-0.228 -0.192	0.144 0.124	0.336** 0.277*	-0.203 -0.205	-0.513** -0.361**	-0.065 -0.079
Plant height			r_g r_p	0.503** 0.475**	0.451** 0.429**	-0.703** -0.660**	0.680** 0.650**	0.505** 0.478**	-0.503** -0.460**	-0.938** -0.645**	-0.175 -0.157
Days to maturity				r_g r_p	0.689** 0.629**	-0.704** -0.621**	0.727** 0.642**	0.300* 0.273*	-0.491** -0.433**	-0.635** -0.413**	-0.133 -0.101
Branches per plant					r_g r_p	-0.806** -0.746**	0.759** 0.706**	0.105 0.118	-0.902** -0.825**	-0.766** -0.459**	-0.411** -0.290*

Pod Length						r_g r_p	-0.660** -0.571**	-0.010 0.005	0.695** 0.619**	0.773** 0.559**	0.580** 0.527**
Number of pods per plant							r_g r_p	0.656** 0.607**	-0.630** -0.587**	-0.829** -0.544**	0.172 0.141
Biological yield per plant								r_g r_p	-0.034 -0.035	-0.568** -0.459**	0.700** 0.593**
Test weight									r_g r_p	0.7738** 0.482**	0.484** 0.370*
Harvest Index										r_g r_p	0.176 0.409**

r_p= Phenotypic Correlation Coefficient ** Significant at 1% level.
r_g = Genotypic Correlation Coefficient * Significant at 5% level.

Table 2: Direct and Indirect effects at genotypic level of different quantitative characters on yield in pea (*Pisum sativum* L.)

Characters	Days to 50% germination	Days to 50% flowering	Plant height (cm)	Days to maturity	Branches per plant	Pod length (cm)	No. of pods per plant	Biological yield per plant (g)	Test weight	Harvest Index (%)	Seed yield per plant (g)
Days to 50% germination	-0.488	0.294	0.214	-0.139	-0.196	0.053	-0.123	0.083	0.068	-0.075	-0.020
Days to 50% flowering	0.043	-0.072	-0.041	-0.028	-0.002	0.016	-0.010	-0.024	0.015	0.037	-0.065
Plant height (cm)	0.378	-0.488	-0.864	-0.435	-0.390	0.607	-0.587	-0.436	0.435	0.811	-0.175
Days to maturity	0.023	0.032	0.040	0.080	0.055	-0.056	0.058	0.024	-0.039	-0.051	-0.133
Branches per plant	-0.375	-0.024	-0.422	0.644	-0.935	0.753	-0.710	-0.099	0.843	0.715	-0.411*
Pod length (cm)	0.108	0.225	0.695	0.696	0.797	-0.989	0.653	0.010	-0.687	-0.764	0.580*
No. of pods per plant	0.096	0.055	0.260	0.278	0.290	-0.252	0.382	0.251	-0.241	-0.317	0.172
Biological yield per plant (g)	-0.221	0.438	0.658	0.390	0.137	-0.013	0.855	1.303	-0.044	-0.740	0.700*
Test weight	0.083	0.121	0.299	0.292	0.537	-0.414	0.375	0.020	-0.595	-0.461	0.484*
Harvest index (%)	0.126	-0.421	-0.771	-0.522	-0.629	0.635	-0.681	-0.466	0.636	0.821	0.176

Residual Effect = 1.0243

References

1. Devi Shilpa, Kumar Manish, Thakur Kuldeep, Bharat NK, Dogra RK, Nagar Arvind. Variability, correlation and path analysis in pea (*P. sativum* L.) Chem Sci Rev Lett. 2017;6(21):555-560.
2. Dewey DR, Lu KH. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agro. J. 1959;51:515-518.
3. Katoch Viveka, Singh Prem Devi, Mayanglambam Bilashini, Sharma Akhilesh, Sharma GD, Sharma JK. Study of genetic variability, character association, path analysis and selection parameters for heterotic recombinant inbred lines of garden peas *(Pisum sativum* var. *Hortense* L.). Legume Research. 2016;39(2):163-169.
4. Shinde KG, Lawahcle KE, Patil BT, Nirmal SV. Correlation studied in pea (*Pisum sativum* L.). Advance in Pl. Sci. 1998;11(2):177-180.
5. Singh, Dharmendra, Mishra VK. Genetic of yield and yield components in pea (*Pisum sativum* L.). Legume Res. 2002;25(3):219-221.
6. Tyagi MK, Srivastava CP. Genetic variability and correlations among yield and yield characters over two environments in pea. Indian J Agric. Res. 2002;36(1):53-56.
7. Wright S. Correlation and causation. Agri. Res. 1921;20(2):557-558.