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Path analysis for quality traits in field pea (*Pisum sativum* L.)

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ABSTRACT

The present experiment was conducted during November 2014–March 2015. The experiment was done to estimate the variability and character association of different qualitative characters on seed yield of 29 field pea genotypes in a randomised complete block design (RCBD). The analysis of variance revealed that the sufficient variability was present in the material studied for almost all the qualitative characters. Among the different quality parameters the moderate genotypic coefficient of variation was for swelling index. Among the quality parameter, high heritability coupled with high genetic advance was not recorded for any quality character indicating non-significant additive genetic variance in genetic control of these traits. The correlation analysis revealed that seed yield plant^{-1} exhibited a significant positive association with protein at genotypic level. Path coefficient analysis for seed yield and its components showed that protein content had the negligible positive direct effect on seed yield. Direct selection for quality characters would likely not be effective in increasing or decreasing seed yield in field pea.

Key words: Character association, Field pea (*Pisum sativum* L.), Genetic advance, Genetic variability, Path analysis, Quality traits.

Field pea (*Pisum sativum* L.) is one of the most important legume crop of India. It is the second most important food legume worldwide after *Phaseolus vulgaris*. Peas are a rich source of protein having essential amino acids particularly lysine. This is considered the cheapest source of protein in diet. The crop is grown in higher altitudes in tropical areas with temperature ranging between 7-30°C. There is need of field pea having good quality of seed for the multiple purposes with high yield. And breeding programme depends upon the thorough knowledge of genetic variability, heritability and type of gene action involved in the inheritance of characters for improvement of desirable traits.

The experimental material consisted of 29 (13 tall and 16 dwarf) field pea genotypes. The experiment was conducted in randomized complete block design with three replications at the college of Agriculture, IGKV, Raipur. The row to row and plant to plant spacing were 30 cm and 10 cm, respectively and plot size of 4.8 m^2 (4m x 1.2m). The crop was grown with recommended agronomical package of practices were followed. Random samples of five plants from each genotype from each plot were used for recording observations. Observations for the five characters i.e. seed yield per plant were recorded in field and quality traits *viz*., protein content (%), dal recovery(%), swelling capacity and swelling index were taken in the laboratory. Quality parameters were worked out by using the method suggested by Williams *et al*. (1983). Heritability in broad sense (h^2bs) was calculated as per the formula suggested by Hanson *et al*. (1956). The prediction regarding magnitude of heritability in broad sense was made as suggested by Robinson (1966) as low (<50%), moderate (50-70%) and high (>70%). The magnitude of genetic advance as percentage of mean was categorized as suggested by Johnson *et al*. (1955) as high (> 30%), moderate (30% - 10%) and low (< 10%). The expected genetic advance was calculated by the formula given by Johnson *et. al*.(1955). Correlation coefficient analysis was done as per formula suggested by Miller *et. al*.(1958) and Path analysis was done as suggested by Wright (1921) and further elaborated by Dewey and Lu(1959).

Analysis of variance (Table-1) shows that there was considerable genetic variability in the material chosen for investigation. The phenotypic coefficient of variation (PCV) was slightly higher than genotypic coefficient of variation (GCV) (Table-2). Among the different quality parameters the moderate genotypic and phenotypic coefficient of variation were observed for swelling index whereas these values were low for swelling capacity per seed, protein content and dal recovery. High heritability coupled with high genetic advance was not recorded for any quality charcter whereas, high heritability and moderate heritability coupled with low genetic advance was recorded for dal recovery and protein content indicating non-significant additive genetic variance in genetic control of these traits. Therefore direct selection would be more effective in improving these traits. Correlation coefficient analysis (Table-3) revealed that in

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Table 1: Analysis of variance for quality parameters in field pea

Source of variation	D.F.	Mean squares of the characters				
		Protein content (%)	Dal recovery (%)	Swelling capacity seed^{-1} (ml)	Swelling index	Seed yield plant^{-1}
Replication	2	1.363	0.750	0.00024	0.011	14.84**
Genotype	28	2.565**	9.141**	0.00039**	0.077**	3.869**
Error	56	0.481	0.406	0.00012	0.019	0.952

**,* Significant at 1% and 5% level of probability respectively.

Table 2: Mean performance and genetic parameters of variation for seed parameters in field pea

Characters	Mean	Range		GCV (%)	PCV (%)	h^2_{bs} (%)	GA	GA as % of mean
		Min.	Max.					
Protein content (%)	20.028	17.787	21.817	4.162	5.414	59.109	1.320	6.591
Dal recovery (%)	79.026	75.833	81.500	2.159	2.305	87.717	3.292	4.165
Swelling capacity seed^{-1}	0.229	0.193	0.253	4.173	6.381	42.764	0.013	5.621
Swelling index	1.378	1.100	1.597	10.069	14.293	49.632	0.201	14.613
Seed yield plant^{-1}	5.894	4.417	8.627	16.730	23.536	50.523	1.444	24.496

Table 3: Inter-relationship of seed yield and quality parameters in field pea.

Characters	Level	Dal recovery (%)	Swelling capacity seed-1	Swelling index	Seed yield plant^{-1}
Protein content (%)	G	0.132**	-0.135	-0.334**	0.317**
	P	0.247*	-0.167	-0.283**	0.176
	E	0.101	-0.204	-0.226*	0.006
Dal recovery (%)	G		0.374**	-0.777**	0.156
	P		0.283**	-0.491**	0.06
	E		0.204	0.087	-0.18
Swelling capacity seed^{-1}	G			-0.135	-0.329**
	P			0.380**	-0.195
	E			0.823**	-0.079
Swelling index	G				-0.331**
	P				-0.178
	E				-0.025

Table 4: Genotypic path coefficient showing direct and indirect effects of different characters on seed yield plant^{-1} in field pea

Characters	Protein content (%)	Dal recovery (%)	Swelling capacity seed^{-1}	Swelling index	r_{yx}
Protein content (%)	**0.016**	-0.015	0.046	0.120	0.317**
Dal recovery (%)	0.052	**-0.048**	-0.126	0.278	0.156
Swelling capacity seed^{-1}	-0.023	-0.018	**-0.337**	0.048	-0.329**
Swelling index	-0.056	0.037	0.046	**-0.358**	-0.331**

Diagonal values are direct effects

Residual effect = 0.7252

r_{yx} : Genotypic correlation coefficient of quality parameters with seed yield plant^{-1}.

the present study, swelling capacity seed^{-1} had highly significant positive association with swelling index at phenotypic level. Basaiwala, (2006) and Ghosh *et. al*.(2006) also found correlation for swelling capacity with swelling index. Protein content exhibited significant positive association with seed yield at genotypic level; and also with dal recovery at genotypic and phenotypic level. Similar results were also found by Dama, *et. al.* (2010) Raturi *et. al.* (2014) and Chittapur *et. al.* (2015) for protein content with seed yield. Swelling capacity seed^{-1} and swelling index had significant negative association with seed yield per plant at genotypic level only. It was revealed from the result that seed yield had significant positive association with protein content in field pea. Path coefficient analysis (Table 4) revealed that protein content had the negligible positive direct effect on seed yield. Therefore there is no significant effect on selection of any quality trait for improvement of seed yield per plant.

REFERENCES

Basaiwala, P. (2006). Genetic analysis of seed yield and seed parameters in field pea (*Pisum sativum* L.). M.Sc. (Ag.) Thesis I.G.A.U., Raipur.

Chittapur, R. and Biradar, B. D. (2015). Association studies between quantitative and qualitative traits in rabi sorghum. *Indian J. Agr. Res.* **49**(5): 468-471.

Dama, S. K., Tyagi, N. K. and Singh, P. B. (2010). Interrelationship and path analysis for seed yield and its component characters under eight environments in pea (*Pisum sativum* L.). *Legume Res.*, **33** (2): 87-94.

Dewey, D. R. and Lu, K.H. (1959). A correlation and path coefficient analysis of components of crested wheat grass seed population. *J. Agric. Sci.* **515**-518.

Ghosh, A. And Panda, S. (2006). Pattern of variability ,character association and path analysis for grain quality in mumgbean [*Vigna radiata* (L).Wilczek]. *Legume Res*., **29** (2): 114-117.

Hanson, G. H., Robinson, H. F. and Comstock, R. E. (1956). Biometrical studies of yield in segregation population of Korean Lespedeza. *Agron. J*.,**48**: 262- 263.

Johnson, H. W., Robinson, H. F. and Comstock, R. E. (1955). Estimates of genetic and environment variability in soybean. *Agron. J.*, **47:** 315-318.

Miller, D. A., Williams, J. C., Robinson, H. F. and Comstock, K. B. (1958). Estimations of genotype and environmental variance and covariance in upland cotton and their implication in selection. *Agron. J.* **50**: 126-131.

Raturi A., S.K. Singh, Sharma V. and Pathak R. (2014). Genetic variability and interrelationship among qualitative and quantitative traits in mungbean *Legume Res.*, **37**(1): 1-10.

Robinson, H. S. (1966). Quantitative genetics in relation to breeding on the central of mendalism. *Indian J. Genet*. **26**: 171-187.

William, P.C., H. Nakkoul and K.B. Singh, (1983). Relationship between cooking time and some physical characters in chickpea (*Cicer arietinum* L.). *J. Sci. Food Agric.*, **34**: 492–496.

Wright, S. (1921). Correlation and causation. *J. Agric. Res.*, **20**: 257-787.