
RESEARCH ARTICLE

Studies on genetic variability in pea (*Pisum sativum* L.)

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Abstract

Genetic variability was studied in fifty germplasms accessions of pea (*Pisum sativum* L.). Wide range of phenotypic variability, genotypic coefficient of variation, heritability and genetic advance were observed in all the characters indicated large amount of variability among the genotypes for these traits. High heritability was accompanied by high genetic advance in plant height, seed yield per plant, number of pods per plant and days to maturity showing existence of additive gene action and selection may be effective. While, 100-seed weight, seeds per pod and days to flowering had high heritability with low genetic advance indicating, existence of non additive gene effect.

Key words: Pigeonpea, germplasm, heritability, grain yield

Introduction

The systematic breeding programme involves the steps like creating genetic variability, practicing selection and utilization of selected genotypes to evolve promising varieties. The large spectrum of genetic variability among combining genotypes offers a better scope for selection. Qamar *et al.*, (1993) referred that plant height, number leaves and branches were the most important characters and selection may be done on the basis of these characters in forage pea. Estimates of heritability and genetic advance will play an important role in exploiting future research projections of pea improvement. Javaid *et al*., (2002) evaluated the local and exotic pea germplasm for earliness and grain yield through simple selection and suggested that elite genotypes can be used in hybridization program for pea improvement. So breeder has to make constant search for few and diverse genetic stocks for stabilizing yield. In the present study the extent of variability available in all fifty germplasms of pea and the scope of selection through heritability and genetic advance were attempted.

Material and methods

The experimental materials consisting of fifty germplams accessions of pea obtained from NBPGR, New Delhi. The experiment was carried out during *rabi* 2005 in Randomized Block Design with three replications. Each genotype was represented by two rows of 4.5 m length spaced at 45 cm between rows and 15 cm between plants. Five plants in each treatment were randomly selected for collecting data on days to flowering, days to maturity, plant height (cm), number of branches per plant, number of pods per plant, pod length (cm), number of seeds per pod, seed yield per plant (g) and weight of 100-seeds (g). The genetic coefficient of variation, heritability in broad sense and expected genetic advance were calculated

according to formulae suggested by Burton and De Vane (1953), Hanson et al. (1956) and Johnson *et al*., (1955), respectively.

Results and discussion

The analysis of variance for all characters showed significant differences indicating, presence of wide genetic variability among genotypes studied. The range, mean, coefficient of variation, heritability and genetic advance for all the characters are presented in Table 2. A wide range of variation was observed in plant height at harvest, number of pods per plant, seed yield per plant and days to maturity. Other characters *viz.*, days to flowering, 100-seed weight and number of branches per plant showed comparatively moderate range of variation.

Table 1: Analysis of variance for nine characters in pea

Sr. No.	Characters	Mean sum of square		
		Replications	Treatments	Error (150)
1.	**Days to flowering**	23.65	57.90*	10.06
2.	**Days to maturity**	24.62	203.32*	18.02
3.	**Plant height at harvest**	169.62*	1420.75*	31.81
4.	**No. of branches/ plant**	0.510	20.22*	0.920
5.	**No. of pods /plant**	137.68*	180.56*	11.13
6.	**Pod length**	10.12	17.33*	10.80
7.	**No. of seeds / pod**	0.05	2.82*	0.167
8.	**100-seed weight**	1.37*	37.07*	0.14
9.	**Seed yield / plant**	99.49*	124.51*	7.03

*, ** Significant at 5 % and 1 % level

The magnitude of phenotypic and genotypic coefficient of variation ranged between 7.96 to 30.85 and 7.00 to 30.67 for nine characters studied, respectively. The character 100-seed weight recorded highest PCV and GCV followed by seed yield per plant, pod length, number of branches per plant and plant height at harvest suggesting, presence of good amount of variability for these traits. Similar results were obtained by Gupta *et al*., (1983) and Ramesh *et al*., (2002). The magnitude of PCV and GCV were low in days to maturity and days to flowering indicating narrow range of variation for these characters and provides very least scope for selection. In general the magnitudinal difference between PCV and GCV were minimum for all the characters studied indicating, less influence of environment on these characters expression.

All the characters except, pod length showed high heritability. The 100-seed weight (98.84) recorded highest heritability followed by plant height (93.57 cm), number of branches per plant (87.49), seed yield per pod (84.07) and number of pods per plant (83.53) indicating the role of additive gene effects and selection based on these characters would be more convenient. Selection based on heritability alone may mislead the selection process. Therefore genetic advance and heritability were taken into consideration during the selection programme (Johnson *et al*., 1955).

It was observed that plant height (42.87) had highest genetic advance followed by days to maturity (14.24), number of pods per plant (14.14) and seed yield per plant (11.86). In the present investigation, high heritability coupled with high genetic advance in plant height at harvest, seed yield per plant, number of pods per plant and days to maturity. These results coincide with those obtained by Singh *et al*., (1986), Dubey and Lal (1988), Beswana and Tewatia (1994) and Dixit (1998).

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Table 2: Components of genetic variation in germplasm lines for various characters

Sr. No.	Characters	Range	General mean	PCV	GCV	Heritability (h^2)	Genetic advance
1.	Days to flowering	45.37- 59.67	52.21	9.76	7.64	61.29	6.44
2.	Days to maturity	100.33-127.67	112.17	7.96	7.00	77.41	14.2438
3.	Plant height (cm)	44.47-128.53	88.89	25.02	24.20	93.57	42.8761
4.	No. of branches/ plant	6.47-14.53	10.39	26.09	24.41	87.49	4.8883
5.	No. of pods/ plant	27.07-57.73	44.12	18.63	17.03	83.53	14.1493
6	Pod length (cm)	3.43-8.13	5.03	28.00	27.85	16.78	1.2456
7.	No. of seeds/ pod	3.20-6.47	4.65	22.03	20.20	84.07	1.7765
8.	100-seed weight (g)	6.0-19.53	11.44	30.85	30.67	98.84	7.1854
9.	Seed yield /plant (g)	10.85-41.01	22.39	30.35	27.94	84.77	11.8692

PCV: Phenotypic coefficient of variance, GCV : Genotypic coefficient of variance