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VARIABILITY AND GENETIC PARAMETER ANALYSIS IN PEA (Pisum Sativum L.)

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ABSTRACT

In the present investigation 63 pea genotypes (18 parents and 45 F_{1s}) were planted in a randomized block design with three replications. The objective was to ascertain genetic variability. Analysis of variance revealed highly significant differences for all the ten characters studied, indicating wide spectrum of variation among the genotypes. Moderate to high levels of genotypic coefficient of variability and genetic advance accompanied with high heritability was observed for number of pods plant $^{-1}$, biological yield, seed yield plant $^{-1}$, plant height, 100-seed weight, harvest index, number of seeds per pod, pod length, days to 50% flowering and days to maturity which suggests that these traits would respond to selection owing to high variability and transmissibility. On the basis of Genotypic coefficient of variation (GCV), Phenotypic coefficient of variation (PCV) heritability and genetic advance, characters biological yield, number of pods plant^{-1}, 100-seed weight and harvest index should be selected for improving the seed yield in pea.

KEYWORDS: *Pea, Seed, Crop, Biological Yield, Pods Plant, Insect Pests.*

INTRODUCTION

Pea is a major winter annual pulse crop of temperate regions of the world and was originally cultivated in the Mediterranean basin (Smartt, 1990). Its adaptation to relatively cool conditions has enabled its cultivation to spread beyond the area of initial domestication into Europe, Africa and Asia. In tropical areas, it is cultivated during the cold months. It is mostly grown in Uttar Pradesh, Madhya Pradesh, Bihar, Assam and Orissa which together account for about 95 per cent of the total area and production of pea in India.

Unfortunately, the yield of pea is low in India, although the sink potential in pea is good but its realization is poor due to (i) non-availability of adequate quality seeds of improved varieties of pulses, (ii) pulses are traditionally grown on poor and marginal lands, (iii) susceptibility to many diseases and insect pests. The genetic improvement for yield in crop plants, frequently utilises the selection and hybridization techniques. The success through this approach generally depend on the basic information concerning the extent of genetic variability, heritability and genetic advance.In India little effort has been made to study the variability in pea. Present investigation was carried out with the objective of studying the variability, heritability and genetic advance in order to identify the potential parents that can be used for commercial seed production.

MATERIALS AND METHODS

The experimental material consisted of 63 genotypes (18 parents and 45 F_{1s}) of pea. All the 63 genotypes were grown in a randomized block design with three replications. The distance within line and between lines was maintained 10 cm and 50 cm, respectively. The

standard package of practices were followed to raise a good crop. Observations were recorded on ten randomly competative selected plants of each genotype in both the parental and F_1 generation.

Analysis of variance, genotypic and phenotypic coefficients of variability, heritability (broad sense), genetic advance analysis were done by standard procedures.

RESULTS AND DISCUSSION

Data was recorded on ten quantitative characters viz. Plant height, days to 50% flowering, days to maturity, pod length, number of pods plant $^{-1}$, number of seeds per pod, 100-seed weight, biological yield, seed yield plant $^{-1}$, harvest index (Table 1).

The analysis of variance carried out for ten quantitative characters (Table 2) showed that all the 63 genotypes of pea exhibited highly significant differences for all the ten characters, which indicated wide spectrum of variation among the genotypes.

Estimates of GCV and PCV were moderate/high in order of their magnitude for the characters number of pods plant $^{-1}$, biological yield, seed yield plant $^{-1}$, plant height, 100-seed weight, harvest index and number of seeds per pod (Table 2). Low estimates of GCV and PCV were recorded for the characters pod length, days to 50% flowering and days to maturity. In general the estimates of PCV were higher than the estimates of GCV for all the characters which indicate the presence of environmental influence. Many workers have also recorded a considerable amount of variability earlier (Kaul and Kumar, 1980; Tikkoo *et al.*, 1998; Sardana *et al.*, 2007).

The heritability was estimated for all the ten characters and the estimates of heritability were high for all the characters, ranging from 0.71 for seed yield plant $^{-1}$ to 0.92 for plant height and number of pods plant $^{-1}$ thus indicating the effectiveness with which selection of genotypes can be done on the basis of its phenotypic performance. Thus the material under study appears to be promising as characters with high heritability estimates are comparatively less affected by the environment and these estimates, thus enable breeder to base his selection reliable on phenotypic expression of these characters in individual plants.

The genetic advance showed wide range from 1.05 for pod length to 35.59 for plant height. High genetic advance was observed for the characters biological yield and plant height, whereas moderate genetic advance was observed for seed yield plant $^{-1}$, number of pods plant^{-1}, days to 50% flowering and harvest index. However, low estimates of genetic advance was observed for the characters 100-seed weight, days to maturity, pod length and number of seeds per pod. Low estimates of genetic advance expected in next cycle of selection further leads to conclude that the improvement in self fertilized crops is only possible through suitable hybridization programme followed by appropriate selection (Patel *et al.*, 1974). Johnson *et al.* 91955) advocated that heritability values as well as estimates of genetic advance should be considered more useful than heritability alone while making selection.

The high heritability estimate was associated with high predicted genetic advance for plant height, days to 50% flowering, seed yield plant $^{-1}$, number of pods plant $^{-1}$, biological yield and harvest index which is encouraging since selection based for these characters being of additive in nature, is likely to be more efficient for their improvement. As such phenotypic selection for these traits is likely to be effective for selection.

Table-1 :Agro-morphological characters recorded in pea

S. No.	Character	Character description
	Quantitative descriptors	
1.	Plant height (cm)	Measured from the ground to the tip of the plant at maturity (average of 10 random plants)
2.	Days to 50% flowering	Recorded from date of sowing to the appearance of first flower in 50% of the plants in a row
3.	Days to maturity	Recorded as the number of days from sowing to maturity
4.	Pod length (cm)	Recorded at complete pod formation stage (average of 10 random plants)
5.	Seeds/pod	Recorded on matured pods (average of 10 random pods)
6.	100-seed weight (g)	Weight of 100 random seeds (average of 5 random samples)
7.	Biological yield	Recorded at the time of maturity as the total biomass of the plant excluding root
8.	Seed yield $^{plant-1}$ (g)	Average of 5 random plants at maturity
9.	Harvest index	Harvest index was computed by using the formula : Harvest index = [Seed yield/Biological yield] x 100

Table-2 : Analysis of variance for ten characters

Source of variation	d.f.	Plant height (cm)	Days to 50% flowering	Days to maturity	Pod length (cm)	No. of pods plant-1	No. of seeds per pod	100-seed weight (g)	Biological yield	Seed yield	Harvest index
Replication	2	0.875	0.062	0.035	0.097	0.761	0.002	2.746	0.656	0.457	2.437
Treatment	62	900.098**	108.590**	65.202**	1.006**	182.035**	0.941**	58.654**	459.489**	139.981**	178.410**
Error	124	11.542	0.951	0.051	0.640	14.400	0.270	16.970	10.680	13.890	16.370

**, ** significant at 1% and 5%, respectively*

Table 3 :Estimation of genotypic and phenotypic coefficient of variation, heritability and genetic advance for ten characters in pea

Character		Mean	GCV	PCV	Heritability	GA	GA % (mean)
1.	Plant height	67.35	25.70	26.75	0.92	35.59	52.92
2.	Days to 40% flowering	88.44	6.20	6.81	0.83	12.37	13.99
3.	Days to maturity	116.64	4.00	4.59	0.87	09.60	8.23
4.	Pod length	6.50	8.62	9.46	0.83	1.05	16.15
5.	No. of pods plant-1	23.27	32.33	33.73	0.92	15.80	67.89
6.	No. Of seeds per pod	4.22	13.06	13.63	0.91	1.09	25.82
7.	100-seed weight	21.27	20.54	21.43	0.91	8.62	40.52
8.	Biological yield	39.74	31.00	33.11	0.87	25.29	63.63
9.	Seed yield	19.02	30.73	36.27	0.71	13.80	72.55
10.	Harvest index	47.56	16.14	16.06	0.91	15.60	32.80

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