



Assessment and genetic variability in garden pea (*Pisum sativum* L. var. Hortense)

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Abstract : An experiment was carried out at experimental farm of Department of Horticulture, Janta P.G. College, Bakewar, Etawah during the year 2007-08 to evaluate twenty five diverse genotypes of pea. Analysis of variance indicated highly significant difference among the genotypes for all the characters indicating the presence of wide range of variability in the genotypes. Among the entries evaluated, the genotype VRP-345 recorded maximum plant height (173.50 cm). Days to 1st flower emergence (36.90 days), days to 50% flower emergence (41.70 days), days to 1st pod set (41.80 days) and days to maturity of green pod (63.30 days) was recorded minimum in the genotype VRP-5. The number of primary branches/plant ranged from 1.20 (VRP-301) to 3.10 (VRP-38). The maximum pod length (9.29 cm) and diameter (1.38 cm) was recorded in genotype VRP-7 and VRP-8, respectively. The maximum number of pods/plant was recorded in genotype VRP-190 (47.00). The number of seeds/pod was observed in genotype VRPMR-10 (8.70) and its ranged from 5.60 to 8.70. The 100-seed weight varied from 19.98 g to 28.20 g and maximum in VRP-22. Maximum shelling percentage was recorded in genotype VRP-86 (55.84 %). The maximum green pods yield/plant was recorded in genotype VRP-38 (240.72 g) and it ranged from 74.48 to 240.72 g. VRP-5 was found the earliest flowering and fruiting genotype among all the genotypes under study. The phenotypic variance and PCV were higher as compared to genotypic variance and GCV for all the characters. Maximum GCV and PCV were recorded for plant height followed by number of pods/plant and green pod yield/plant. The highest heritability was recorded for green pod yield/plant and days to 50 per cent flower emergence and its higher value may be attributed to additive gene action. The estimate of genetic advance showed a wide range from 0.07 to 73.38 and it was highest for green pod yield/plant. High heritability coupled with genetic advance indicated that importance of the considerable additive (heritable) gene effects.

Key Words : Garden pea, *Pisum sativum* L. var. Hortense, Genotype, GCV, PCV, Heritability, Genetic advance, Variability

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INTRODUCTION

Pea is a very nutritious vegetable grown in the cool season throughout the world. It is grown as a vegetable crop for both fresh and dried seed. Pea contains high percentage of digestible protein, along with carbohydrates and vitamins. The protein concentration of peas ranges from 15.50-39.70 per cent (Davies *et al.*, 1985). Large proportion of peas are processed (canned, frozen or dehydrated) for consumption in off season. A wide range of genetic variability is available in pea, providing good a scope for improvement in yield and associated characters of pea through selection. To initiate

any effective selection programme, depends on available information on the nature and magnitude of variability present in genetic stocks, heritability and genetic advance is of considerable importance for a breeder. Therefore, an attempt was made in the present investigation to estimate the extent of variability, heritability and genetic advance by utilizing twenty five divergent pea lines.

MATERIALS AND METHODS

An experiment was carried out at experimental farm of Department of Horticulture, Janta P.G. College, Bakewar,

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Table 1: Mean performance of twenty diverse genotypes for thirteen characters in garden pea

Sr. No.	Genotypes	Plant height (cm)	Days to 1 st flower emergence	Days to 50% flower emergence	Days to 1 st pod	Days to maturity of green pods	No. of primary branches/plant	Pod length (cm)	Pod width (cm)	No. of seeds/pod	No. of pods/plant	100-grain weight (g)	Shelling percentage	Green pod yield /plant (g)
1.	VRP-5	32.27	36.90	41.70	41.80	63.30	1.80	7.15	1.31	6.40	17.10	24.15	51.88	108.75
2.	VRP-6	50.96	39.90	45.40	44.80	65.30	2.30	8.87	1.34	6.40	17.60	20.30	52.65	121.79
3.	VRP-7	78.53	61.70	68.20	66.50	90.70	1.90	9.29	1.34	6.60	14.90	20.15	52.28	92.38
4.	VRP-8	70.20	62.50	69.00	68.80	93.80	1.30	8.89	1.38	6.50	18.10	22.20	50.55	137.56
5.	VRP-11	66.12	74.00	80.50	78.00	101.00	1.70	8.26	1.34	7.70	26.10	24.30	51.52	153.99
6.	VRP-12	66.21	69.67	66.00	64.30	88.20	1.60	8.20	1.30	6.40	19.90	21.25	53.48	123.38
7.	VRP-22	30.1	41.10	46.40	45.60	66.17	1.80	6.76	1.28	6.50	13.30	28.20	55.34	74.48
8.	VRP-38	113.30	66.30	72.30	70.70	92.30	3.10	7.75	1.35	6.60	35.40	24.20	53.82	240.72
9.	VRP-86	83.32	61.47	67.10	66.50	87.60	1.90	7.43	1.24	7.00	21.40	20.30	55.84	125.86
10.	VRP-174	83.37	57.00	63.50	62.00	84.00	1.40	7.72	1.28	6.50	16.20	22.20	52.22	116.64
11.	VRP-184	78.39	50.20	55.70	55.10	76.20	2.10	7.33	1.24	8.00	19.30	24.30	53.84	120.43
12.	VRP-190	56.69	55.50	61.50	60.50	83.50	1.80	7.84	1.34	5.70	47.00	21.15	53.15	180.90
13.	VRP-193	82.17	64.90	71.90	69.90	90.90	2.40	8.22	1.32	8.50	20.40	19.98	53.82	138.72
14.	VRP-224	75.12	75.80	83.30	80.80	103.80	1.60	7.58	1.32	5.60	18.90	22.20	52.43	123.98
15.	VRP-257	62.35	66.20	72.70	70.80	91.70	2.00	9.00	1.29	7.40	17.50	20.25	49.69	116.90
16.	VRP-301	55.55	60.80	67.30	66.10	86.80	1.20	7.84	1.35	6.10	20.70	24.35	54.73	122.54
17.	VRP-345	173.50	75.10	82.60	79.00	105.10	2.50	8.94	1.34	5.70	19.50	26.40	53.24	120.12
18.	VRP-354	101.60	57.20	64.70	63.30	84.40	2.10	8.32	1.34	5.90	22.10	24.38	52.89	140.54
19.	VRP-399	71.36	56.10	65.60	63.50	89.60	1.50	7.34	1.23	5.90	22.00	20.35	51.45	160.60
20.	VRP-403	80.32	61.10	68.10	65.70	89.10	2.20	7.50	1.16	6.80	16.20	20.30	52.65	118.20
21.	VRP-MR-9	77.67	74.40	81.40	78.80	101.70	2.10	8.99	1.36	8.50	25.20	20.15	54.16	181.44
22.	VRP-MR-10	83.71	75.60	81.60	80.67	105.00	1.90	8.45	1.34	8.70	25.60	24.20	48.72	204.95
23.	AP-3	65.14	53.90	58.40	58.50	80.80	1.83	8.24	1.29	8.10	19.40	24.05	51.49	129.59
24.	VL-7	64.73	59.40	64.97	63.60	85.40	1.60	8.41	1.27	6.20	17.50	21.20	52.38	110.25
25.	Arkel	49.52	41.50	46.03	45.80	66.50	1.30	7.27	1.30	7.20	16.33	24.48	53.33	116.64
	S.E.	0.86	1.24	0.65	0.79	1.24	0.05	0.20	0.032	0.13	0.57	0.83	0.57	1.73

Etawah during the year 2007-08 to evaluate twenty five diverse genotypes of pea. The experiment was laid out in Complete Randomized Design (CRD) with three replications. Observations were recorded from ten randomly selected plants of each genotypes in each replication for thirteen characters viz., plant height (cm), days to 1st flower emergence, days to 50 per cent flower emergence, days to 1st pod setting, days to maturity of edible green pod, number of primary branches/plant, pod length (cm), pod width (cm), number of seeds/pod, number of pods/plant, 100-seed weight (g), shelling percentages and green pod yield/plant (g). The data generated was averaged and subjected to analyze the variability through genotypic co-efficient of variation and phenotypic co-efficient of variation (GCV and PCV) and heritability as suggested was

calculated as formula given by Burton (1952) and Expected Genetic Advance (EGA) was calculated as method suggested by Johnson *et al.* (1955).

RESULTS AND DISCUSSION

The analysis of variance showed highly significant differences among the genotypes for all the characters studied. This indicated substantial amount of variability among the genotypes studied for almost all the characters. A wide range of variation (Table 1 and 2) was observed for plant height from 30.11 cm (VRP-22) to 173.50 cm (VRP-345) followed by green pod yield/plant 74.48 g (VRP-22) to 240.72 g (VRP-38), days to maturity of edible green pod 63.30 (VRP-5) to 105.10

Table 2: Estimate range, general mean, MSS value for different characters in pea

Sr. No.	Characters	MSS (g) df=24	Error df=48	SE±	C.V.	Range		General mean
						Minimum	Maximum	
1.	Plant height (cm)	2314.25**	1.11	0.86	1.42	30.11	173.50	74.10
2.	Days to 1 st flower emergence	382.31**	2.30	1.24	5.54	36.90	75.80	59.56
3.	Days to 50% flower emergence	425.55**	0.64	0.65	1.21	41.70	83.30	65.83
4.	Days to 1 st pod set	379.97**	0.94	0.79	1.50	41.80	80.80	64.46
5.	Days to maturity of edible green pod	444.57**	2.31	1.24	1.74	63.30	105.10	86.91
6.	No. of primary branches/plant	0.55**	0.0039	0.051	3.32	1.20	3.10	1.87
7.	Pod length (cm)	1.51**	0.06	0.20	3.04	6.76	9.29	8.03
8.	Pod width (cm)	0.0074**	0.0015	0.032	2.95	1.16	1.38	1.30
9.	No. of seeds/pod	2.63**	0.026	0.13	2.36	5.60	8.70	6.83
10.	No. of pods/plant	148.31**	0.493	0.57	33.24	13.30	47.00	21.13
11.	100-grain weight (g)	15.33**	1.04	0.83	4.52	19.98	28.20	22.60
12.	Shelling percentage	8.82**	0.48	0.57	1.31	48.72	55.84	52.78
13.	Green pod yield/plant (g)	3824.25**	4.51	1.73	1.57	74.48	240.72	135.25

*and ** Indicate significance of values at P= 0.05 and 0.01, respectively

Table 3 : Estimate of genotypic and phenotypic variance, GCV and PCV, heritability, genetic advance and genetic advance as Per cent of mean for different characters in pea

Sr. No.	Characters	Genotypic variance	Phenotypic variance	GCV (%)	PCV (%)	Heritability (%)	Genetic advance	Genetic advance (as % of mean)
1.	Plant height (cm)	771.05	772.16	37.48	37.50	99.90	57.16	77.14
2.	Days to 1 st flower emergence	126.67	128.97	18.89	19.06	98.20	22.98	38.58
3.	Days to 50% flower emergence	141.30	141.94	18.06	18.10	99.60	24.43	37.11
4.	Days to 1 st pod set	126.34	127.28	17.44	17.50	99.30	23.07	35.78
5.	Days to maturity of edible green pod	147.42	149.73	13.97	14.08	98.50	24.82	28.55
6.	No. of primary branches/plant	0.182	0.1861	22.68	22.93	97.90	00.87	46.52
7.	Pod length (cm)	0.483	0.543	8.64	9.16	88.90	1.35	16.81
8.	Pod width (cm)	0.0020	0.0035	3.40	4.51	56.90	0.07	5.38
9.	No. of seeds/pod	0.868	0.894	13.62	13.82	97.10	1.89	27.67
10.	No. of pods/plant	49.27	49.77	33.22	33.39	99.49	14.46	68.43
11.	100-grain weight (g)	4.76	5.80	9.66	10.67	82.00	4.07	18.00
12.	Shelling percentage	2.78	3.26	3.16	3.42	85.30	3.17	6.00
13.	Green pod yield/plant (g)	1273.25	1277.76	26.38	26.43	99.60	73.38	54.25

(VRP-345), days to 1st flower emergence 36.90 (VRP-5) to 75.80 (VRP-224), days to 50 per cent flower emergence 41.70 (VRP-5) to 83.30 (VRP-224) and days to 1st pod set ranged from 41.80 (VRP-5) to 80.80 (VRP-224) and it was observed that days to 1st flower emergence, days to 50 per cent flower emergence, days to 1st pod set and days to maturity of edible green pod minimum time was taken by genotype VRP-5. under study, this genotype was found earliest. The number of pods/plant ranged 13.30 (VRP-22) to 47.00 (VRP-190). The number of primary branches/plant ranged from 1.20 (VRP-301) to 3.10 (VRP-38). Pod length and pod width ranged from 6.76 cm (VRP-22) to 9.29 cm (VRP-7) and 1.16 cm (VRP-403) to 1.30 cm (VRP-8), respectively. Number of seeds/pod ranged from 5.60 (VRP-224) to 8.70 (VRP-10). 100-seed weight ranged from 19.98 g (VRP-193) to 28.20 g (VRP-22) and shelling percentage ranged from 48.72 per cent (VRP-10) to 55.84 per cent (VRP-86). Kumar *et al.* (1998), Shah and Lal (1998), Singh and Dhillon (2004) and Mehta *et al.* (2005) also reported wide range of variation for plant height, days to flowering, days to pod setting, pods/plant, pod length, days to maturity, 100-seed weight and green pod yield.

In general, phenotypic co-efficients of variation (PCV) were higher than genotypic co-efficient of variation (GCV) for all the characters (Table 3). The GCV was lowest for shelling percentage (3.16) and highest for plant height (37.48). The higher GCV were found for number of pods/plant (33.22), green pod yield (26.38) and number of primary branches/plant (22.68). The PCV was lowest for shelling percentage (3.42) and highest for plant height (37.50). The higher values of PCV was recorded for the characters number of pods/plant (33.39), green pod yield (26.43) and number of primary branches/plant (22.93) indicating the substantial amount of environmental effect in the expression of the all the traits and indicating high level of variation which provide ample scope for effective improvement. These results are in agreement with finding of Singh and Dhillon (2004) and Gupta *et al.* (2006). Pod width and shelling percentage showed less co-efficient variation at phenotypic and genotypic level. Genetic variability is effective in partitioning the real genetical differences. Higher genotypic co-efficient of variation, more the chances of improvement in that character. GCV would be more useful for assessing the variability (Allard, 1970).

The magnitude of heritability ranged from 56.90 (pod width) to 99.90 (plant height). High heritability for characters controlled by polygene might be useful to plant breeder for making effective selection. The above findings are in accordance with those of Kumar *et al.* (1998), Singh and Dhillon (2004) and Gupta *et al.* (2006). In present study the highest estimates of heritability coupled with higher genetic advance were obtained for characters, green pod yield/plant, plant height, days to maturity of edible green

pod, days to 50 per cent flowering and number of pods/plant. It shows that genotypic variance for their characters are probably due to high additive genetic effect (Panse, 1957). Therefore, the selection based on phenotypic performance of these characters would be useful for achieving desired results. These results are in conformity with Gupta *et al.* (2006), Singh and Singh (2006). High heritability along with low to moderate value of genetic advance was observed for rest of the characters indicating that these characters controlled by the non-additive (non-heritable) genes or quantitative traits having high influence of environment. Thus, these characters should be considered during selection for higher yield in garden pea (Singh *et al.*, 2003).

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