

## Efficiency of selection procedures for improvement in yield and its attributes in vegetable pea (*Pisum sativum* L.)

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**ABSTRACT:** Efficiency of selection procedure viz., pedigree, random bulk and single seed descent method for yield and its attributes in pea was studied in F<sub>3</sub> generation involving sixteen crosses. Significant differences were observed among the breeding methods for all the traits in all the crosses except for days to flowering. The pedigree selection method was found effective for improvement of characters viz., early flowering, 100-seed weight, pod length, number of pods per plant, green pod weight per plant and short plant height. Random bulk method was better for improvement of 100 green pod weight and number of pods per plant while, all the three selection methods were equally effective for improvement in number of seeds per pod.

**Key words:** Pedigree method, random bulk, single seed descent, selection procedures, vegetable pea,

Legume vegetables are valuable source of protein, vitamins and minerals in our daily diet. Among legumes, *Pisum sativum* L. commonly known as garden pea occupies a unique place for its use as vegetable. Moreover, for developing superior genotypes a breeder is more likely to be concerned with the production of transgressive segregants from different crosses through breeding methods (Deshmukh *et al.*, 2004). According to Mitra and Mehra (2001) in order to formulate a sound breeding programme, it is essential to have information on valid comparison of different alternate breeding methods. The information on the advancement of generations in vegetable pea is available, however the information on comparison of different selection procedures employed at a time is meagre. Hence, a study was conducted to compare the efficiency of selection methods viz., pedigree, random bulk (RB) and single seed descent (SSD) method in respect of mean, range and variability for yield and its component characters in F<sub>3</sub> generation of sixteen crosses.

### MATERIALS AND METHODS

The experimental material consisted of sixteen crosses of vegetable pea. The initial F<sub>2</sub> population of 100 plants, grown during rabi season of 2002 - 03 at Vegetable Research Centre of GBPUAT, Pantnagar under each replication in each crosses, as advanced to F<sub>3</sub> generation following three different selection methods was evaluated during rabi season 2003-04. In pedigree five percent selection pressure was exercised in F<sub>2</sub> population and five superior plants were visually selected and progeny rows of individual plants were planted as F<sub>3</sub> families, with RB method seeds harvested from all the F<sub>2</sub> individual plants were composited and from this samples were taken to raise F<sub>3</sub> generation while in SSD method the single pod from each space planted F<sub>2</sub> plant was collected and the seeds were composited to raise F<sub>3</sub> generation.

**Table 1: List of sixteen crosses used in study**

S.No	Cross Name	S.No	Cross Name	S.No	Cross Name	S.No	Cross Name
1	PSM-3x MatarAgeta	5	Early Felthum First xMatarAgeta	9	HUVP- 3 x Arkel	13	VL-7x PSM-4
2	PMR- 34 x MatarAgeta	6	PMR-43x Arkel	10	NDVP- 250 x Arkel	14	NDVP- 250x PSM-4
3	KS-168x MatarAgeta	7	AP-1x Arkel	11	PSM- 3 x PSM-4	15	STOPx PSM-4
4	HUVP-3x MatarAgeta	8	Bonneville x Arkel	12	Bonneville x PSM-4	16	Early Felthum First x PSM-4

The F<sub>3</sub> progenies of the 16 crosses were sown in complete family block design with two replications by allotting crosses to main plots and selection method, to subplots. The data was recorded on all fifty plants in each replication under each method for yield and yield components and subjected to analysis of variance and estimation of range and mean for each method to evaluate the efficiency of different selection methods in pea.

## RESULTS AND DISCUSSION

The analysis of variance showed that breeding methods differed significantly (Table 2) for all the traits in all the crosses except for days to flowering indicating the differential response of three breeding methods in changing the population mean for yield and its components during advancement of generations. Similar observations were made by Mitra and Mehra (2001) in grass pea.

Pedigree method showed comparatively higher population mean and wider range than RB and SSD method for the characters viz., 100 seed weight, pod length, green pod weight per plant and desirable lower mean value for days to flowering and plant height. Number of pods per plant was higher and almost same in both RB and pedigree methods. While, RB method showed higher mean and range for 100 pod weight per plant. These findings are in agreement with Arsyad *et al.* (1994). RB and SSD methods showed earliness in first green picking. However, all the three methods showed equal range and almost same mean for number of seeds per pod similar to the finding of Mitra and Mehra (2001) and Byron and Orf (1991). The overall results revealed superiority of pedigree method over other the two methods proving that even low intensity selection for yield among F<sub>2</sub> derived families is effective in producing better segregants. Urrea and Singh (1994) and Zhu *et al.* (1997) have also reported similar results. These findings

**Table 2: Analysis of variance of F<sub>3</sub>s for 9 characters**

Source of variation	df	Days to 1st flowering	Days to first green pod picking	100-green pod weight (g)	100 green seed weight (g)	Number of seeds per pd	Pod length (cm)	Number of pods per plant	Pod weight /plant (g)	Plant height (cm)
Replication	1	0.99	37.0	869.7	33.6	0.005	0.019	0.66	42.9	30.4
Main plot factor (A) or cross	15	1457.6**	2066.0**	129626.9**	276.6**	2.6**	1.7**	57.8	1067.9**	8050.1**
Error (a)	15	11.8	46.4	173.3	1.2	0.004	0.02	0.10	3.73	1.41**
Subplot factor (B) or selection method	6	25.7	981.8**	3161.3**	21.7**	0.65**	0.09**	78.7**	374.5**	34.8**
A x B	90	36.9**	221.4**	1888.1**	15.1**	0.46**	0.12**	11.7**	196.1**	64.8**
Error (b)	96	14.4	45.8	25.8	0.6	0.004	0.008	0.11	1.94	1.9
Total	223									

\*\*Significant at 1 percent probability

**Table 3: Comparison of pedigree, random bulk and single seed descent method on the basis of range and mean**

Character	Pedigree method		Random bulk method		Single seed descent method	
	Range	Mean	Range	Mean	Range	Mean
Days to first flowering	38.4-76.3	52.35	39.9-67.8	54.20	41.7-69.1	54.80
Days to first green pod picking	76.0-126.0	87.60	76.0-86.0	81.60	76.0-86.0	81.60
100-green pod weight (g)	385.0-710.0	567.00	388.0-755	569.40	388.0-684.0	546.40
100 seed weight (g)	40.6-64.3	51.78	40.9-56.7	49.50	41.4-54.0	47.90
Number of seeds per pod	5.0-7.0	6.50	5.0-7.0	6.40	5.0-7.0	6.50
Pod length (cm)	7.6-9.5	8.62	7.7-9.0	8.35	7.9-9.0	8.38
Number of pods per plant	5.0-19.8	11.90	6.8-19.9	11.85	6.8-18.6	11.70
Weight of green pods /plant (g)	19.3-78.9	56.65	28.6-72.9	47.80	34.2-74.2	48.70
Plant height (cm)	39.2-127.4	67.90	49.4-134.4	74.40	44.1-133.0	73.20

**Table 4: Estimates of different genetic parameters for 12 characters in vegetable pea.**

Characters	Range	Gm ± Sem	Heritability %	Genetic advance (GA)	Genetic advance as percentage of mean
Days to first flowering	38.4-76.3	55.5 + 2.6	88.4	20.05	36.13
First flowering node	7.2-16.8	11.3 ± 0.25	98.3	5.50	48.67
Days to 1st green pod picking	76.0-126.0	88.9 + 4.8	83.5	28.70	32.28
Plant height (cm)	38.2-134.4	73.4 ± 0.96	99.6	49.10	66.89
100-green pod weight (g)	385.0-755.0	552.1 + 4.8	99.5	201.20	36.44
100 green seed weight (g)	40.6-64.3	49.4 + 0.58	97.4	10.20	20.65
Number of seeds per pod	5.0-7.0	6.4 ± 0.05	98	1.36	20.31
Shelling (%)	30.8-58.0	43.5 ± 0.8	95.8	10.90	25.06
Pod length (cm)	7.6-9.5	8.3 ± 0.07	94.7	0.80	9.64
TSS (°Brix)	11.5-14.0	12.7 ± 0.12	92.6	1.20	9.45
Number of pods per plant	5.0-19.9	9.5 + 0.23	98.9	6.70	70.53
Pod weight /plant (g)	19.3-78.9	43.6 + 1.0	98.6	25.90	59.40

were also in accordance with Casali and Tigchelaar (1975) who through computer simulation studies found that pedigree selection method was effective for characters with high heritability.

## CONCLUSION

All the three selection methods viz. pedigree, RB and SSD were effective for improvement in number of seeds per plant. RB method showed improvement in 100 green pod weight and number of pods per plant. The pedigree method was efficient in improvement of early flowering, 100 seed weight, pod length, number of pods per plant, green pod weight per plant and short plant height. Thus, showed superiority of pedigree method over RB and SSD methods of selection.

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