

Studies on Genetic Variability in Different Genotypes of French Bean (*Phaseolus vulgaris* L.)

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ABSTRACT- Genetic variability studied for eleven characters viz., number of leaves, branches, clusters, pods, pod length (cm), seed per plant, plant height (cm), 100 seed weight (g), days to flower, maturity and yield per plant (g) in group of forty two genotypes of French bean (*Phaseolus vulgaris* L.) revealed highly significant difference for all the characters. High heritability not only guideline for breeding improvement must to associate with genetic advance expressed a wide range of variability for all the traits. Heritability estimated and expected genetic advance was high for the number of leaves (95.46 < 97.00), branches (45.85 > 14.00), clusters (89.45 < 92.00), pods (92.84 < 99.00), pod length (88.94 < 99.00), seeds per plant (92.20 > 32.00), plant height (96.41 < 106.00), 100 seed weight (99.22 > 72.00), days to flower (94.82 > 32.00), maturity (56.26 > 13.00) and yield per plant (80.13 < 140.00) suggested that these are more useful traits in varietal improvement programme.

Key-words: French bean (*Phaseolus vulgaris* L.), Genetic Variability, Heritability, Phenotypic coefficient of variation, Genotypic coefficient of variation

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INTRODUCTION

French bean (*Phaseolus vulgaris* L., $2n=2x=22$) is an important legume crop to be used as green pod vegetable, known by various names as snap bean, string bean, garden bean, fresh bean or dry seeds known as dry bean^[1]. Domestication of wild common beans independently in Meso-America and two major gene pools reported to be cultivated from wild forms^[2]. Effective and efficient utilization of germplasm of population in a crop improvement is must study the individual economic characters of a genotype to explore the genetic variability of a crop study envisages that it improves the quality and quantity of economic yield of the crop covering a wide range of variability of any breed. Genetic variability helps in formulating efficient breeding programme^[3].

MATERIALS AND METHODS

During the present study forty two genotypic strains of French bean (*P. vulgaris* L.) were collected from different ecozones of Uttarakhand and grown in the Vegetable Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand during 2010. In a randomized block design with three replications each seed were dibbled 15 cm within the rows i.e. seed to seed distance and 50 cm row to row distance. Five plants observation recorded on each single row plot pertaining to the number of leaves, branches, clusters, pods, seeds, plant height, pod length, 100 seed weight (g), days to mature and seed yield (g). The mean values of five plants for each above mentioned characters were statistically analyzed. Accordingly heritability, genetic advance, genotypic and phenotypic coefficient of variation were calculated in accordance of different methods^[4,5].

RESULTS AND DISCUSSION

The present study was undertaken to find out the value of range, mean, mean sum of squares and coefficient of variation along with the phenotypic and genotypic coefficient of variation, heritability and genetic advance (Table 1 & 2). The study revealed the significant differences between the varieties for all the eleven characters at the 1 percent level of probability and standard error in respect of the number of branches, pod length and 100 seed weight expressing that these characters were least affected by environmental influence.

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High standard error observed in number of seeds per plant followed by days to maturity expressing high environment influence in the expression of these characters. Genetic variation is expressed by the genotypic coefficient of variation for comparing the amount of genetic component of variability observed in several characters. Highest genotypic coefficient of variation 70.93 percent exhibited by days taken to maturity.

The coefficient of variability alone does not express the heritable components of variation. Equally important of heritability enable the plant breeders to base selection on phenotypic performance for improvement of characters. Hence, heritability observed for all the characters, which exhibited high heritability. Heritability ranged from 45.85 percent for number of branches to 99.22 percent for 100 seed weight and for other characters it observed varied from 56.26 to 96.41 percent. Hundred seed weight, plant height, number of leaves, days to flower, number of pods and seeds expressed comparatively higher heritability's imitating the presence of additive gene action in the expression of these characters. Almost all the characters in French

bean (*P. vulgaris* L.) exhibited high heritability but the highest heritability observed at length of internodes and days of the first pod picking [7]. High heritability must to associate with genetic advance. In selection heritability value and genetic advance is more useful than heritability alone [5]. Number of pods, pod length, number of leaves, 100 seed weight and yield had high heritability and genetic advance, express better amenability for improvement. High heritability observed for all traits during the present study, but their genetic gain was not observed high in all the cases indicating that these characters were subjected to certain degree of non heritability components of variability. In the days to flower and the number of seeds per plant, high heritability was not observed associated with high genetic advance, thus limiting the scope for further improvement. High heritability and genetic advance for all the characters of pod yield and yield contributing, viz., days to 50 percent flowering, days to maturity, plant height, number of pods per plant, pod length, number of seeds per plant and 20 seed weight of 31 bean genotypes were experimented and observed in field of Bangladesh [6].

Table 1: Phenotypic variability in French bean (*P. vulgaris* L.)

	Plant Height (cm)	No. of leaves	No. of branches	No. of clusters	No. of pods	Pod length (cm)	No. of seeds per plant	100 seed weight (g)	Days to flower	Days to maturity	Yield per plant (g)
Range	33-161	12-65	3-5	5-32	6-37	8- 16	23-262	12- 58	31-57	81-113	6-42
Mean	64.1	25.9	4.7	11.3	15.9	12.0	67.8	32.2	42.0	93.6	18.3
SEM+	4.56	1.93	0.32	1.30	1.56	0.49	9.82	0.71	1.10	5.04	2.63
MSS	4510.7	634.9	0.91	118.3	259.7	16.2	9427.2	510.5	179.6	312.0	245.3
CV	10.1	10.5	11.2	16.2	13.9	5.8	20.5	3.1	3.7	7.6	20.7

** Significant at 1 % level of probability

Table 2: Phenotypic and Genotypic coefficient of variation, heritability and genetic advance in French bean (*P. vulgaris* L.)

	Plant Height (cm)	No.of leaves	No.of branches	No. of clusters	No. of pods	Pod length (cm)	No. of seeds per plant	100 seed weight (g)	Days to flower	Days to maturity	Yield perplant (g)
PCV	59.13	49.48	15.18	50.00	51.99	17.53	73.83	35.16	16.28	11.51	46.50
GCV	52.16	48.35	10.28	47.29	50.09	16.53	70.93	35.02	15.86	8.63	41.62
H	96.41	95.46	45.85	89.45	92.84	88.94	92.20	99.22	94.82	56.26	80.13
GA (%)	106	97	14	92	99	99	32	72	32	13	140

PCV= Phenotypic coefficient of variation, GCV= Genotypic coefficient of variation, GA= Genetic advance in percentage, H= Heritability in broad sense

CONCLUSIONS

Number of pods, pod length, number of leaves, 100 seed weight and yield had high heritability and genetic advance, express better amenability for improvement. High heritability observed for all traits during the present study, but their genetic gain was not observed high in all the cases indicating that these characters were subjected to certain degree of non heritability components of variability. In the days to flower and number of seeds per plant, high heritability was not observed associated with high genetic advance, thus limiting the scope for further improvement.

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