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STUDIES ON GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN PUMPKIN (*CUCURBITA MOSCHATA* DUCH EX. POIR.)

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ABSTRACT

The present study was planned to assess genetic variability, heritability and genetic advance among the Thirty- three genotypes of pumpkin. Analysis of variance showed that there was a high significant variation for all of the studied traits between genotypes. In the present investigation PCV was higher than the GCV for all the characters indicating the substantial modifying effect of environment in the expression of all traits studied. The highest GCV as well as PCV was observed for fruit yield per plant (kg), average fruit weight, number of primary branches, vine length and number of fruits per plant. The highest estimates of heritability (in broad sense) recorded for fruit yield hectare (79.95 %) followed by fruit yield per plant (78.93 %), and days to first staminate flower anthesis (66.47 %). Highest genetic advance (as per cent of mean) was observed for the characters fruit yield per hectare. However, it ranged from (72.32 to 3.44%) for all the characters. Therefore, selection of superior genotypes in view point of desirable morphologic traits, with high genetic distance could be selected for hybridization programme and recognition of best genotypes for different traits to produce new elite hybrids in pumpkin.
Keywords **:** Genetic variability, Genetic advance, Heritability, Pumpkin.

Introduction

Pumpkin (*Cucurbita moschata* Duch Ex. Poir) being an important Cucurbitaceous vegetable crop cultivated under tropical, sub-tropical and temperate regions all over the world. India is the center of origin of many cucurbitaceous vegetables, where the cucurbits are capable of thriving and performing well even under the hot summer. Much emphasis on alleviating vitamin A deficiency through vegetables like pumpkin, a cheaper source of carotene rich vegetable is laid by WHO (Anonymous, 2008). The study of variability is an important pre requisite in any breeding programme for improvement of the crop as well as exploitation of heterosis. Parameters of genotypic and phenotypic coefficient of variation (GCV & PCV) are useful in detecting the amount of variability present in the available genotypes. Heritability and genetic advance help in determining the influence of environment in expression of the characters and the extent to which improvement is possible after selection. The present investigation was, therefore, under taken to ascertain magnitude and extent of genetic variability, heritability and genetic advance in pumpkin have been worked out and reported.

Materials and Methods

Experiment was conducted at Main Experimental Station of Department of Vegetable Science Farm of Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya (U.P.) during summer season in randomized block design with 33 along with one check kashi harit

genotypes of pumpkin (*Cucurbita moschata* Duch. ex Poir) replicated thrice. All recommended cultural and management practices were followed to raise the healthy crop. Five competitive plants were selected randomly in each row for recording the observations on 15 parameters viz. days to first male flower anthesis, days to first female flower anthesis, days to the appearance of 50% male flowers, days to the appearance of 50% female flowers, days to first fruit harvest, node number to first male flower appearance, node number to first female flower appearance, number of primary branches per plant, vine length (cm), polar circumference of fruit (cm), equatorial circumference of fruit (cm), average fruit weight (kg), number of fruits per plant, fruit yield per plant (kg), fruit yield per hectare (q). The recorded data were analysed as suggested by Panse and Sukhatme (1954) for analysis of variance. The genotypic and phenotypic coefficient of variance was calculated as per the formula suggested by Burton (1952) and Johnson *et al*., (1995) for heritability and genetic advance.

Results and Discussion

The mean sum of square was highly significant at one percent for all traits, indicating the presence of wide variability in the genotypes (Table 1). The findings are in consonance with pandey *et al*. (2002), Sultana *et al*. (2015) in pumpkin.

Genetic variability

Genetic variability is the basic need for a plant breeder to initiate any breeding programme. Among the traits (Table 2), Similarly days to first male flower anthesis and days to first female flower anthesis also registered considerable variability between 37.67 to 53.33 and 40.00 to 57.33, days to the appearance of 50% male flowers and days to the appearance of 50% female flowers was recorded between 61.67 to 46.67 and 66.33 to 49.33, node number to first male flower appearance was recorded between 5.67 to 3.71, node number to first female flower appearance was recorded between 15.26 to 9.95, number of primary branches per plant ranging from 5.12 to 3.41, vine length ranged from 4.08 to 2.65 (m), polar circumference of fruit ranged from between 49.64 to 39.40 (cm), equatorial circumference of fruit was recorded between 57.31 to 46.64 (cm), days to first fruit harvest ranged from 67.00 to 51.00, average fruit weight ranged from 1.76 to 1.03 (kg), number of fruits per plant showed a wide range in between 3.92 to 2.73, fruit yield per plant was recorded between 6.26 to 3.37 (kg) and fruit yield per hectare was recorded between 311.72 to 168.84 (q). Hence wide range of variability for these traits was observed in the present investigation. This result is encouraging because the presence of high variability, among the traits has been an indication of better chance for improvement. Significant variability for various characters in pumpkin have been reported by various workers viz., Kumar *et al.* (2022), Ramjan *et al.* (2021).

Table 1 : Analysis of variance for yield and yield attributing characters in pumpkin

S.NO.	Characters	Source of variation		
		Replication	Treatment	Error
		d. f. 2	d. f. 32	d. f. 64
1.	Days to first male flower anthesis	5.82	45.53**	4.17
2.	Days to first female flower anthesis	23.39	47.74**	6.11
3.	Days to the appearance of 50% male flowers	19.18	42.05**	8.37
4.	Days to the appearance of 50% male flowers	32.74	43.04**	10.78
5.	Days to first fruit harvest	35.43	47.15**	9.28
6.	Node number to first male flower appearance	0.398	1.012**	0.179
7.	Node number to first female flower appearance	3.48	6.09**	0.70
8.	Number of primary branches per plant	0.054	0.723**	0.151
9.	Vine length (m)	0.027	0.366**	0.116
10.	Polar circumference of fruit (cm)	8.59	25.08**	4.91
11.	Equatorial circumference of fruit (cm)	2.23	24.83**	2.99
12.	Average fruit weight (kg)	0.005	0.115**	0.022
13.	Number of fruits per plant	0.017	0.269**	0.061
14.	Fruit yield per plant (kg)	0.013	1.984**	0.101
15.	Fruit yield per hectare (q)	203.48	4823.16**	230.39

** Highly Significant.

Table 2 : Estimates of variability, heritability, expected genetic advances per cent

S. NO.	Characters	Range			Variability		Heritability in the broad sense	Genetic advance as % of Mean
		Min.	Max.	Mean	PCV %	GCV %		
1.	Days to first male flower anthesis	37.67	53.33	46.39	7.60	6.20	66.47	10.41
2.	Days to first female flower anthesis	40.00	57.33	50.27	7.56	5.74	57.66	8.98
3.	Days to the appearance of 50% male flowers	46.67	61.67	55.27	7.03	4.70	44.59	6.46
4.	Days to the appearance of 50% male flowers	49.33	66.33	59.35	6.99	4.28	37.45	5.39
5.	Days to first fruit harvest	51.00	67.00	60.84	6.75	4.52	44.94	6.25
6.	Node number to first male flower appearance	3.71	5.67	4.68	12.56	8.72	48.24	12.48
7.	Node number to first female flower appearance	9.95	15.26	12.56	10.62	8.27	60.70	13.27
8.	Number of primary branches per plant	3.41	5.12	4.11	12.53	8.22	43.03	11.11
9.	Vine length (m)	2.65	4.08	3.45	11.79	6.47	30.16	7.32
10.	Polar circumference of fruit (cm)	39.40	49.64	45.20	6.61	4.44	45.12	6.15
11.	Equatorial circumference of fruit (cm)	46.64	57.31	53.16	5.10	3.93	59.34	6.24
12.	Average fruit weight (kg)	1.03	1.76	1.42	14.22	9.59	45.54	13.34
13.	Number of fruits per plant	2.73	3.92	3.25	9.83	6.28	40.74	8.25
14.	Fruit yield per plant (kg)	3.37	6.26	4.64	14.88	13.22	78.93	24.20
15.	Fruit yield per hectare (q)	168.84	311.72	230.64	14.70	13.14	79.95	24.20

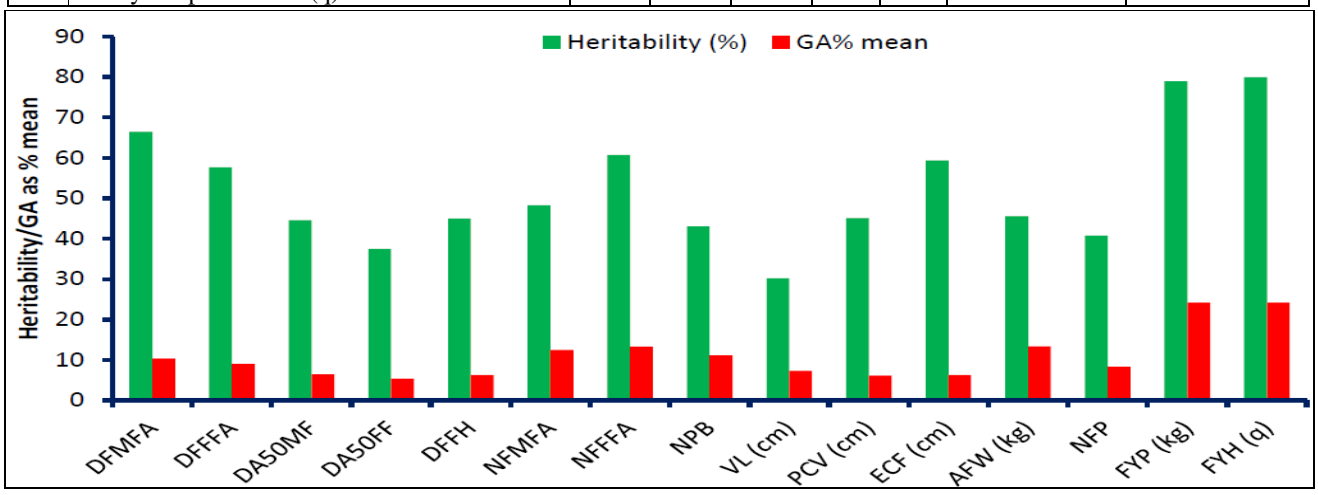

Fig. 1 : Bar graph showing Heritability (%) and Genetic Advance as % mean for quantitative traits in pumpkin genotypes.

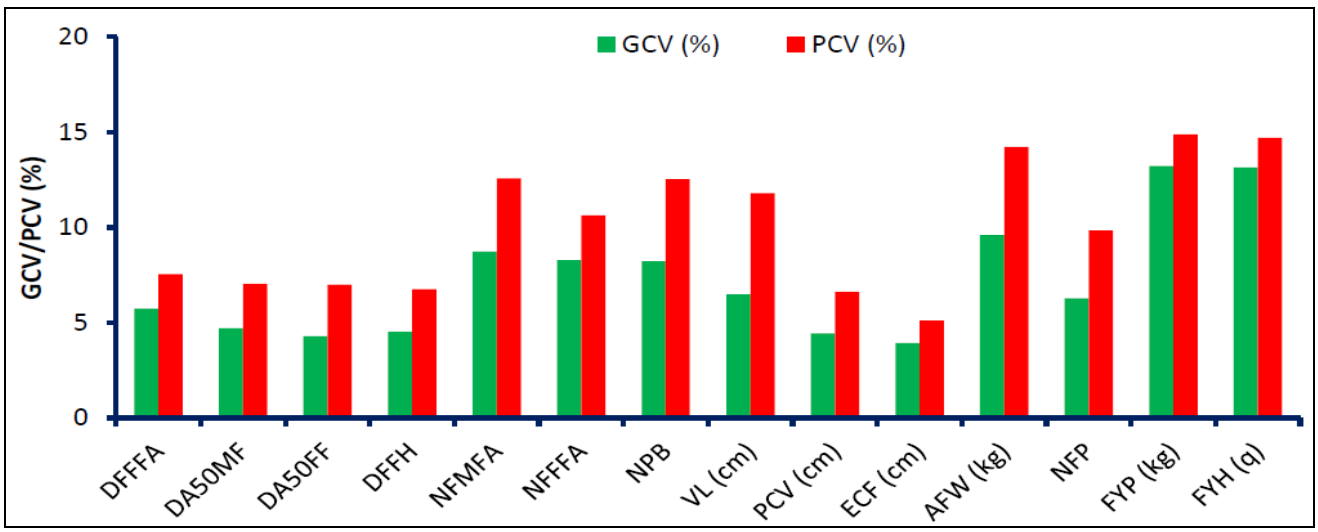

Fig. 2: Bar graph showing Genotypic Coefficient of Variation (GCV) and Phenotypic Coefficient of Variation (PCV) for different traits in pumpkin genotypes.

Genotypic and phenotypic coefficient of variation

In the present investigation the phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the characters (Table 2), indicating the substantial modifying effect of environment in the expression of all traits studied. Hence, selection based on phenotypic performance will be more reliable. These results corroborate the view of Yadav *et al.* (2022), Kumar *et al.* (2020) in pumpkin. The highest genotypic coefficient of variation was observed for fruit yield per plant(kg), fruit yield per hectare (q), average fruit weight (kg). High GCV is an indication of greater range of variability among the population and the scope of improvement of these characters through simple selection. Similar findings pertaining to different traits including the characters like average fruit weight, number of primary branches and fruit yield per hectare in pumpkin Lakshmi *et al*. (2002), Rai *et al.* (2023). Whereas the highest phenotypic coefficient of variation was observed for fruit yield per plant (kg), fruit yield per hectare (q), average fruit weight (kg). High PCV is an indication of the existence of wide scope of selection for the improvement of the traits from a considerable amount of variability present. The above findings stood parallel with fruit yield per plant and average fruit weight in pumpkin Ingole *et al.* (2021), Ezin *et al*. (2022).

Result presented in (table 2), revealed that the heritability estimates in broad sense were of lower magnitude except the characters fruit yield per hectare (79.95%), and fruit yield per plant (78.93%). The range was in between 30.16 per cent to 79.95%. The moderate heritability character node number to first female flower appearance (60.70), equatorial circumference of fruit (59.34%), first female flower anthesis (57.66%). Low heritability characters include number of fruits per plant (40.74%), days to the appearance of 50% female flowers (37.45%), vine length (30.16%). High heritability indicated the effectiveness of selection based on phenotypic performance but does not necessarily mean a high genetic advance for the particular trait.

The mean sum of squares for all the characters studied was found to be significant, indicating the variation for the characters under study.

Genotypic coefficient of variation in general were greater in magnitude than the corresponding phenotypic ones, High values of GCV and heritability estimates supplemented with greater genetic gains are also indicative of additive gene effects regulating the inheritance of such traits therefore these characters reflect greater selective value and offer ample scope for selection and phenotypic coefficient of variation was lessened under the influence of environment.

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