

## **GENETIC VARIABILITY IN STRAWBERRY**

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### **ABSTRACT**

The extent of genetic variability, habitability and genetic advance as percent of mean in sixteen characters of fifteen selected germplasm of strawberry were studied. High phenotypic and genotypic coefficient of variation was recorded in fruit volume (78.87% and 75.04 %) followed by number of flowering trusses per plant, number of fruit per plant, fruit weight and percent of plant flowering, indicating the extent of variability resulting in high amount of expected genetic advance as percent of mean was observed for fruit volume. The characters percent plants flowering, fruit weight, fruit length and number of fruit per plant also shoed high habitability coupled with high genetic advance as percent of mean indicating that the selection can be made for improvement.

### **INTRODUCTION**

Strawberry (*Fragaria vesca*) is a perennial herbs, a native of temperate climate in America (Galletta et.al., 1990), but varieties are available which can be cultivated in subtropical climate. It is used as fresh fruit and nutritionally valued for a low caloric carbohydrate, low fibre content and high vitamin C. the for improving the efficiency of selection in any base population, the knowledge fo genetic variability present in it is of prime importance to the breeders. Since most of economic plant characters are polygenic in nature and highly influenced by the environment. The partitioning of total variability in to heritable and non-heritable components by using design suitable design will enable us to know whether the superiority of selection is inherited by the progenies. Keeping in view the present study was undertaken to estimate the extent of variability, genotypic and phenotypic coefficient of variation, heritability and genetic advance in diverse strawberry germplasm.

### **MATERIAL AND METHODS**

The present study was carried out during season of 1996-98 at National Bureau of Plant Genetic Resources Regional Station, Bhowali, Nainital, Uttaranchal in augmented randomized complete block design (Sapra, 1992). The farm (290 N latitude and 700 E longitude) is located an altitude of 1600 msl. The climate of Bhowali is sub-temperate with minimum and maximum temperature ranging between 7-37 °C with an average annual rainfall 1600 mm. All the cultural practices followed uniformly as recommended by (Joolfka, 1986). Data on plant height (cm), number of runners per plant, number of plantlets per plant, length of runner (cm) length of leaf peteols (cm), terminal leaf length (cm), percent of plants flowering, number of flower trusses per plant, number of flower per trusses, flower diameter (cm), flower disk diameter (cm), fruit length (cm), fruit width (cm), 5 fruit weight (g), fruit volume (ml) and number of fruit per plant were recorded. The genotype and phynotypic coefficient of variability, heritability in broad sense and expected genetic advance were worked out following standard statistical procedures.

### **RESULTS AND DISCUSSION**

The differences were found significant for all the characters in present study. The extent of variability with respect to 16 polygenic characters in different genotypes, measured in terms of range, general mean, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), environmental

coefficient of variation (ECV), along with the amount of heritability ( $h^2$ ) and the expected genetic advance as percent of mean are given in table 2. the range of variation was high for fruit volume (0.26 - 2.40), number of fruit per plant (3.66 - 18.66), percent of plants flowering (16.66 - 89.00), 5 fruit weight (18.00 - 49.60) and number of flower trusses per plant (1.66 - 4.66).

The plant height ranged from 15.83 - 26.56 cm. The number of runners per plant ranged from 2.66 - 5.00. The number of plantlets per plant, length of runners, length of leaf petiole, terminal leaf length and number of flower per trusses varied from 2.00 - 7.00, 12.83 - 30.00 cm, 134.50 - 22.13 cm, 5.50 - 8.03 cm, 3.33 - 8.66 respectively. The flower diameter, flower disk diameter, fruit length, fruit width ranged from 1.16 - 2.03 cm, 0.26 - 0.80 cm and 1.05 - 2.37 cm respectively (Table 1)

The narrow difference between phenotypic and genotypic coefficient of variation was recorded for percent of plants flowering (43.92 - 42.81 %), fruit length (43.50 - 41.83 %), 5 fruit weight (44.74 - 43.29 %) and fruit volume (78.87 - 75.04 %), indicating less environmental inheritance on the expression of these characters. Hence, it is suggested that the major contribution of genetic variability towards the total variance indicating ample scope for effective improvement.

The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) in all the characters studies. The fruit volume showed maximum phenotypic and genotypic of variation 78.87 % and 75.04 % followed by number of flower trusses per plant (54.08 and 36.68 %), number of fruit per plant (47.54 and 37.19 %), 5 fruit weight (44.74 and 43.29 %), percent of plant flowering (43.92 and 42.81 %), fruit length (43.50 and 41.83 %) and flower disk diameter (42.73 and 22.93 %). the highest PCV (78.87 %) and GCV (75.04 %) associated with high heritability (90.51 %), resulting in high amount of expected genetic advance PCV (13.86 %) and GCV (9.50 %) associated with high to moderate heritability (46.94 %) and low genetic advance (13.39) as percent of mean was recorded for plant height.

Robinson (1966) has categories the estimates of heritability as low (5-10 %), medium (10-30 %) and high (30 and above). Following this classification, The heritability estimates obtained high for all the characters except number of runners per plant, number of plantlets per plant terminal leaf length, number of flower per trusses and flower disk diameter. The percent of plants flowering exhibited highest heritability (95.02 %) followed by 5 fruit weight (93.62 %), fruit length (92.45 %) fruit volume (90.51 %), fruit width (67.10 %) and number of fruit per plants (61.21 %). Such high heritability estimates have been found help in selection of superior genotypes, on the basis of phenotypic estimates along with genetic advance is more useful than the heritability value alone for the best individual. Present study revealed that the characters fruit volume, percent of plants flowering, fruit weight, fruit length and number of fruit per plant showed high heritability coupled with high genetic advance as percent of mean. The characters fruit width, length of leaf petiole, plant height, number of flower trusses per plant, flower diameter and length of runners showed high heritability coupled with low genetic advance. The characters flower disk diameter, terminal leaf length, number of flower per trusses, number of plantlets per plant and number of runners per plant indicate medium heritability associated with low genetic advance as percent of mean.

In general, the characters which indicated high heritability with high genetic advance as percent of mean are genetically controlled, by additive gene action (Panse, 1957) and can be improved through mass selection, progeny selection, family selection or any other modified selection procedures. The characters exhibited high and moderate heritability along with low genetic advance as percent of mean can be improved by intermating the superior genotype of the segregating population developed from multiple crosses and desirable gene can be accumulated in the lines.

Thus from the present study it may be concluded that characters viz. fruit weight, fruit volume, fruit length, number of fruit per plant, percent of plants flower and fruit width will be effective to bring rapid improvement in strawberry.

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Table 1 Performance of different germplasm of Strawberry for some quantitative characters.

emprasm	Plant height (cm)	Number of runner/plant	Number of plantlets /plant	Length of runners (cm)	Length of leaf petiole (cm)	Terminal Leaf length (cm)	Percent of plants flowering	No. of Trusses /plant	No. of flower/trusses	Flower diameter (cm)	Flower disk diameter (cm)	Fruit length (cm)	Fruit width (cm)	5 fruit weight (g)	Fruit Volume (ml)	No. of fruit/plant
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
IC-319092	26.56	5.00	4.00	30.00	22.13	7.46	58.33	58.33	4.66	6.00	2.03	0.83	2.08	49.60	1.33	18.66
IC-319093	24.30	4.00	5.00	21.16	21.00	7.13	39.00	39.00	3.00	6.33	2.33	0.76	2.37	32.66	1.86	14.33
IC-319094	22.20	4.00	4.33	26.50	20.83	8.03	37.66	37.66	2.66	8.33	2.03	0.50	1.82	37.50	0.60	13.66
IC-319095	21.93	2.66	4.00	23.33	22.00	7.63	53.00	53.00	1.66	8.66	1.63	0.50	1.60	21.66	0.26	7.66
IC-319096	22.66	3.00	4.33	12.83	17.50	6.13	83.66	83.66	2.33	5.00	1.50	0.43	1.38	21.50	0.40	9.00
IC-319097	22.86	3.00	7.00	16.50	19.23	5.83	70.00	70.00	2.83	6.66	1.90	0.50	1.60	20.76	0.40	9.00
IC-319099	23.26	3.00	4.00	18.16	19.33	6.96	89.00	89.00	1.66	5.66	1.63	0.60	1.41	20.00	0.46	7.00
IC-319100	26.00	3.00	4.66	23.00	19.76	7.23	75.00	75.00	2.66	6.33	1.56	0.36	1.33	21.53	0.46	13.66
IC-319101	23.30	3.33	3.00	22.00	20.50	6.90	61.66	61.66	2.66	5.66	1.30	0.46	1.19	19.96	0.53	10.00
IC-319102	22.13	3.66	3.33	18.50	17.50	7.16	73.33	73.33	2.00	5.66	1.30	0.26	1.32	20.66	0.49	9.33
IC-319103	25.83	3.66	4.33	21.00	18.83	7.70	31.66	31.66	1.90	5.00	1.50	0.46	1.54	35.16	0.56	6.66
IC-319104	24.16	2.66	5.00	23.66	20.33	6.23	48.66	48.66	2.00	4.33	1.36	0.50	1.12	18.00	0.66	7.00
IC-319105	15.83	3.00	3.66	20.00	17.33	5.50	41.66	41.66	2.66	3.33	1.16	0.26	1.05	17.33	0.46	6.00
IC-319106	20.90	4.00	2.66	21.66	16.66	6.26	15.00	15.00	3.66	3.66	1.40	0.43	1.69	18.53	0.66	8.00
IC-319108	24.16	4.00	2.00	21.83	13.50	7.33	16.66	16.66	2.33	4.33	1.73	0.40	1.40	18.10	0.60	3.66
Range	15.83-26.56	2.66-5.00	2.00-7.00	12.83-30.00	13.50-22.13	5.50-8.03	16.66-89.00	16.66-89.00	1.66-4.66	3.33-8.66	1.16-2.03	0.26-0.80	1.05-2.37	18.10-49.60	0.26-1.86	3.66-18.66
SEM	1.34	0.52	0.79	2.45	1.17	0.55	2.90	2.90	0.47	1.18	0.19	0.10	0.13	1.56	0.14	1.63

**Table 2. Coefficient of Variation, heritability and genetic advance for difference\ characters in strawberry**

Characters	Range	General mean	SEM	Coefficient of variation			h <sup>2</sup> (%)	GA	GA as a % of mean 13.39
				PCV (%)	GCV (%)	ECV (%)			
Plant height (cm)	15.83 – 26.56	23.07	1.34	13.86	9.50	10.10	46.94	3.09	13.39
Number of runner/plant	2.66 – 5.00	3.46	0.52	28.38	11.31	26.03	15.90	0.32	9.24
Number of plantlets/plant	2.00 – 7.00	4.08	0.79	39.60	20.80	33.69	27.60	0.92	22.54
Length of runners (cm)	12.83 – 30.00	21.41	2.45	24.95	15.11	19.85	36.70	4.03	18.82
Length of leaf petiole (cm)	13.50 – 22.13	19.09	1.17	14.82	10.34	10.61	48.69	2.83	14.82
Terminal leaf length (cm)	5.50 – 8.03	6.90	0.55	15.62	7.21	13.86	21.32	0.47	6.81
Percent of plants flowering	16.66 – 89.00	52.95	2.99	43.92	42.81	9.79	95.02	45.53	85.90
No. of Trusses/plant	1.66 – 4.66	2.08	0.47	54.08	36.68	39.73	46.01	1.07	51.44
No. of flower/trusses	3.33 – 8.66	5.66	1.18	39.82	16.57	36.20	17.33	0.80	14.13
Flower diameter (cm)	1.16 – 2.03	1.62	0.19	26.02	16.34	20.25	39.44	0.34	20.98
Flower disk diameter (cm)	0.26 – 0.80	0.48	0.10	42.73	22.93	36.05	28.81	0.12	25.00
Fruit length (cm)	1.28 – 3.58	1.94	0.13	43.50	41.83	11.95	92.45	1.62	83.50
Fruit width (cm)	1.05 – 2.37	1.53	0.13	26.37	21.60	15.13	67.10	0.55	35.94
5 fruit weight (g)	18.00 – 49.60	23.93	1.56	44.74	43.29	11.29	93.62	20.65	86.29
Fruit volume (ml)	0.26 – 1.86	1.02	0.14	78.87	75.04	24.39	90.51	1.50	147.05
No. of fruit per plant	3.66 – 18.66	9.57	1.63	47.54	37.19	29.60	61.21	5.74	59.97