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Evaluation of Germplasmfor PCV, GCV and Heritability in Luffa (*Luffa cylindrica* Roem.)

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A B S T R A C T

The present investigation was carried out at Main Experiment Station, Department of Vegetable Science, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (U.P.) during summer season, to evaluate the available germplasms for yield and its component traits of 45 genotypes, with three replications in Randomized Block Design. The study revealed that the mean sum squares due to genotypes were significant for all the characters, though the wide range of genetic variability in the material. The higher magnitude of coefficient of variation at phenotypic as well as genotypic levels were observed days to anthesis first staminate flower , days to anthesis first pistillatte flower and vine length and lower value in days taken for anthesis of first staminate flower and days to first fruit harvest. The presences of high heritability with high genetic advance in per cent of mean were observed for node number to first staminate floweranthesis and vine length at last harvest during both the years exhibiting additive gene effect.

Introduction

Luffa (*Luffa cylindrica* Roem.) commonly called as sponge gourd, loofah vegetable sponge or dish cloth, having diploid chromosome number 2n = 2x = 26. The sponge gourd large amount of variation has been observed for many economically important traits. In India, wide range of variability is available in the land races or cultivars, in terms of qualitative as well as quantitative characters of sponge gourd. The fruit number and weight, uniform thickness, cylindrical fruit free from bitterness, high female: male sex ratio, earliness, non fibrous

fruit at edible stage and resistance to powdery and downy mildew. Variability in cucurbitaceous crop occurs in the form of land races, traditional cultivars, wild relatives form and related non edible wild weedy species. In India little attention has been given for the genetic improvement of sponge gourd by collecting diverse germplasm, their morphological characterization and assessing the variability parameters like coefficient of variation. The appropriate breeding methodologies may be adopted for genetic improvement of this crop for simultaneously

improvement of different characters, information regarding mutual relationship among the characters and direction of correlation analysis provides an effective means of finding out direct and indirect causes of association among causal variables. Though the literature in respect of germplasm evaluation variability and correlation studies in sponge gourd is not meager but these are based on testing of limited number of germplasm. Moreover, the results of the earlier studies on such aspects are relevant only for the materials and environments involved in the particular study and cannot be generalized. Therefore, studies on above aspects on the available germplasm under the environment where, it is to be exploited, is essential for successful utilization of germplasm resources in the development of superior varieties.

Materials and Methods

The experimental material for the present investigation comprised 30 genotypes of sponge gourd selected on the basis of genetic variability from the germplasm stock maintained at Main Experiment Station in the Department of Vegetable Science, N.D. University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during the summer season. The experiment was conducted in Randomized Complete Block Design with three replications to assess the performance of 30 genotypes of sponge gourd. The crop was planted in 3.0 m. for row length, spaced 3.0 m. apart where, 0.5m. Plant to plant spacing was maintained. The experiment was conducted during summer season of 2014 and 2015. All the recommended agronomic package and practices and plant protection measures were followed to raise a good crop. The observations were recorded on the five plants, summed up and divided by five to get mean value. The characters observed *viz.,*

node no to first staminate flower anthesis, node no to pistillate flower anthesis, days taken for anthesis of first staminate flower, days taken for anthesis of first pistillate flower, days to first marketable fruit harvest, fruit length (cm), fruit diameter (cm) average fruit weight (g), no. of fruits per plant, marketable fruit yield per plant (kg) and vine length at last harvest (m).

Statistical analysis

The average values for each genotype in each replication for the traits studied were used for further statistical analysis. A brief outline of the procedure adopted for the estimation of statistical parameters. Analysis of variance**,** the data for the component traits was analysed as per the following model given by Panse and Sukhatme (1984). The calculated 'F' values were compared with the tabulated 'F' values at 5 % level of significance. If the calculated 'F' value was higher than the tabulated, it was considered to be significant. All the characters which showed significant differences among genotypes were further subjected to the analysis for the different parameters. The phenotypic, genotypic, environmental coefficients of variation, heritability in broad sense (h^2_{bs}) and the expected genetic advance (GA) for different characters content were calculated as suggested by Burton and De Vane (1953) and Johnson *et al.,* (1955).

Results and Discussion

The result (Table 1) obtained in the present investigation indicated that the genotypes evaluated differed significantly for all the fourteen traits. Thus, suggested existence wide range of variability in the germplasm studied. The phenotypic variance of each character was partitioned into genotypic and environmental comfier in order components. The phenotypic and genotypic coefficient of

variations were estimated to assess the existing variability are present in table 2. In general the phenotypic coefficient of variability was higher than genotypic coefficient of variability which indicated that environment influenced considerably in expression of these traits. The higher magnitude of coefficient of variation at phenotypic as well as genotypic levels were observed for node number to first staminate flower anthesis and vine length at last harvest during both the years and node number to first pistillate flower anthesis in case of Y_2 moderate value for number of nodes per vine at last harvest, number of primary branches per vine at last harvest, fruit length of marketable fruits, average fruit weight marketable fruit yield per plant during both the years while only phenotypic coefficient of variation moderate value were observed in days to anthesis of first staminate flower and inter nodal length whereas the rest of the characters showed lower value of phenotypic as well as genotypic coefficient of variability result obtained in present investigations are in agreement with the finding of Mohanty (2000) in sponge gourd and Singh (2006) in bitter gourd.

Table.1 Analysis of Variance for fourteen characters in sponge gourd

Source of Variation	Years	d.f.	Node number to first staminate flower anthesis	Node number to first pistillate flower anthesis	Days taken for anthesis of first staminate flower	Days taken for anthesis of first pistillate flower	Days to first fruit harvest	Number of Node per vine at last harvest	Inter Nodal Length (cm)
Replicates	Y_1	2	0.582	0.567	0.563	3.478	2.936	0.276	0.836
	Y_2	2	0.168	1.374	2.876	27.878	36.914	14.397	0.004
Treatments	Y_1	44	19.505**	23.312**	79.058**	67.270**	72.615**	289.433**	3.471**
	Y_2	44	21.172**	27.061**	81.126**	71.279**	71.360**	270.531**	3.941**
Error	Y_1	88	0.219	0.552	8.872	9.307	23.720	23.062	0.363
	Y_2	88	0.285	0.836	9.198	8.824	13.694	23.547	0.350

Source of Variation	Years	d.f.	Vine length (m) at last harvest	Number of primary branches per plant	Fruit length (cm) of marketable fruits	Fruit diameter (cm)	Number of fruits per plant	Average fruit weight (g)	Marketable fruit yield per plant (kg)
Replicates	Y_1	2	0.078	0.345	0.827	0.006	2.800	330.774	0.176
	Y_2	2	0.123	0.003	0.113	0.009	4.093	363.284	0.139
Treatments	Y_1	44	4.116**	5.757**	94.943**	0.579**	99.400**	3213.739**	1.724**
	Y_2	44	4.267**	5.869**	95.200**	0.313**	88.648**	3237.729**	1.851**
Error	Y_1	88	0.143	0.298	6.625	0.064	4.728	165.555	0.071
	Y_2	88	0.143	0.291	7.648	0.069	4.350	153.570	0.065

Table.2 Estimates of mean, range, coefficient of variation, heritability and genetic advance in sponge gourd over two years (2014 and 2015)

Characters	Years	Grand mean	Range of mean values		Coefficient of variation			Heritability in Broad sense (%)	Genetic advance in per cent of mean
			Parents	Crosses	PCV	GCV	ECV		
		1	2	3	4	5	6	8	9
Node number to first staminate flower anthesis	Y_1	7.69	4.73 to 15.33	4.77 to 13.43	33.51	32.95	6.08	97	66.75
	Y_2	7.81	4.17 to 15.53	4.70 to 13.10	34.48	33.80	6.84	96	68.25
Node number to first pistillate flower anthesis	Y_1	11.51	7.10 to 18.23	7.57 to 18.23	24.79	23.93	6.46	93	47.60
	Y_2	11.59	7.10 to 20.43	7.03 to 19.23	26.70	25.51	7.89	91	50.21
Days taken for anthesis of first staminate flower	Y_1	36.23	28.50 to 48.47	27.37 to 49.80	15.68	13.35	8.22	73	23.42
	Y_2	36.38	29.53 to 49.53	28.87 to 46.90	15.83	13.46	8.34	72	23.57
Days taken for anthesis of first pistillate flower	Y_1	39.99	34.37 to 50.33	32.47 to 48.73	13.38	10.99	7.63	67	18.60
	Y_2	39.89	34.73 to 48.43	31.83 to 48.50	13.65	11.44	7.45	70	19.75
Days to first Fruit harvest	Y_1	53.91	47.50 to 62.50	44.13 to 64.20	11.73	7.49	9.03	41	9.85
	Y_2	54.30	46.63 to 63.53	45.53 to 65.00	10.57	8.07	6.81	58	12.71
Number of Nodes per Vine At Last harvest	Y_1	55.41	41.23 to 75.63	40.47 to 71.40	19.09	17.01	8.67	79	31.21
	Y_2	55.05	39.37 to 72.63	40.40 to 70.60	18.69	16.48	8.81	78	29.94

		1	2	3	4	5	6	7	8
Inter Nodal Length (cm)	Y_1	7.31	4.00 to 8.90	5.20 to 10.37	16.19	13.93	8.25	74	24.69
	Y_2	7.35	4.40 to 9.30	4.70 to 10.50	16.93	14.89	8.05	77	26.99
Vine length (m)	Y_1	4.20	2.20 to 6.20	2.20 to 6.10	28.84	27.39	9.01	90	53.61
	Y_2	4.13	1.80 to 6.40	2.03 to 6.07	29.84	28.40	9.15	91	55.69
Number of Primary Branches per Vine At Last harvest	Y_1	6.02	4.33 to 9.10	4.03 to 8.83	24.18	22.41	9.06	86	42.81
	Y_2	5.97	4.10 to 8.50	4.03 to 8.83	24.58	22.86	9.04	86	43.79
Fruit length (cm) of marketable fruits	Y_1	29.30	15.30 to 38.40	20.17 to 42.83	20.50	18.52	8.79	82	34.47
	Y_2	30.00	13.30 to 37.80	21.33 to 41.93	20.23	18.01	9.22	79	33.02
Fruit Diameter (cm)	Y_1	2.84	2.17 to 4.10	2.10 to 3.87	17.07	14.56	8.91	73	25.59
	Y_2	2.91	2.10 to 3.87	2.47 to 3.63	13.31	9.79	9.01	54	14.85
Number of fruits per plant	Y_1	23.54	12.33 to 33.60	13.30 to 38.37	25.59	23.86	9.24	87	45.84
	Y_2	23.40	12.30 to 30.50	14.43 to 37.07	24.34	22.65	8.91	87	43.42
Average fruit weight (g)	Y_1	167.88	96.23 to 220.33	112.93 to 242.70	20.48	18.99	7.66	86	36.27
	Y_2	161.99	108.93 to 205.87	104.17 to 247.00	21.22	19.79	7.65	87	38.03
Marketable fruits yield per plant (kg)	Y_1	3.40	1.64 to 3.76	2.29 to 5.01	23.1	21.83	7.81	89	42.35
	Y_2	3.28	1.62 to 3.64	2.15 to 5.17	24.73	23.49	7.75	90	45.95

Heritability estimate which provides the assessment of transmissible genetic variability to total variability happens to the most important basic factor in determining the genetic improvement and response to selection. The estimates of high heritability (Table 2) was observed for node number to first staminate flower anthesis, node number to first pistillate flower anthesis, number of nodes per per vine at last harvest, vine length (m) at last harvest, number of primary branches per vine at last harvest, fruit length of marketable fruits, marketable fruit yield per plant (kg) and average fruit weight (g), whereas low to moderate magnitude of heritability for remaining traits. The high heritability coupled with high genetic advance was observed for node number to first staminate flower anthesis and vine length at last harvest. The high heritability along with moderate genetic advance observed for node number to first pistillate flower anthesis, number of primary branches per vine at last harvest, number of fruits per plant, average fruit weight and marketable fruit yield per plant. The above mentioned findings are in agreement with earlier reports (Prasuva and Rao, 1988 in cucumber; Indiresh, 1982; Abdul Vahab, 1989; Rajput *et al.,* 1996 and Singh, 2006 in bitter gourd; Bindu *et al.,* 2002 in pumpkin and Hawlader *et al.,* 1999 in bottle gourd, Singh *et al.,* 2002 in ridge gourd).

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