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Studies on genetic variability for yield and quality attributes in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]

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Abstract
The estimates of phenotypic and genotypic coefficients of variation, heritability and genetic advance among yield, quality and its components characters in 36 parents and F_1's of bottle gourd were worked out from the experiment conduct over two years at Department of Vegetable Science, N.D. University of Agriculture & Technology, Kumarganj, Faizabad. High degree of variations was observed for all the characters studied. Number of primary branches per plant, T.S.S., ascorbic acid, non-reducing sugar and dry matter showed high estimates of phenotypic and genotypic coefficients of variations, heritability and genetic advance in both the years. These results indicates preponderance of additive genetic components which will be help full for further developing bottle gourd genotypes possessing high yield with better quality.

Keywords: genetic variability, Yield, bottle gourd

Introduction
Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is an important Vegetable crop in India cultivated throughout the country belongs to family cucurbitaceae, having chromosome number 2n=22. It is grown in most of the states like U.P., Bihar, West Bengal, Assam, Punjab and Gujarat. The green edible fruits are consumed for vegetable purpose. Bottle gourd is said to very useful in curing diabetes. The leaf juice is used for the treatment of blindness. The seeds are used in dropsy. Information on the magnitude of variation in the available genetic material and the part played by the environment on the available genetic material and the part played by the environment on the expression of plant characters are the prime importance for the appraisal of the rate and magnitude of possible improvement. Further, estimates of heritability and genetic advance would give the best picture of the extent of improvement excepted from selection and reliability at selection based on phenotype. The present investigation is an attempt in that direction.

Materials and Methods
In the present investigation eight diverse genotypes of bottle gourd *viz.*, Pusa Naveen (P_1), NGBG-504 (P_2), NDBG-509 (P_3), NDBG-525 (P_4), NDBG-601 (P_5), NDBG-603 (P_6), NDBG-624 (P_7) and NDBG-625 (P_8) were crossed with all possible combinations ($28F_1$s) excluding reciprocals. The F_1 hybrids and parents were evaluated during summer (*Zaid*) crop Seasons of 2008 (Y_1) and 2009 (Y_2) in randomized block design (RBD) with three replications at Department of Vegetable Science, N.D. University of Agriculture & Technology, Kumarganj, Faizabad. The experiment was conducted in single row of 3 meters length with row to row spacing of 3 meters and plant to plant spacing of 50cm apart six plants were maintained in each plot. The recommended agronomic practices were followed to raise good crops. Observations were recorded from all the six plants of each treatment and replications for days to first staminate flower opening, days to first pistillate flower opening, node number to first staminate flower, node number to first pistillate flower, days to first fruit harvest, vine length (m), number of primary branches per plant, fruit length (cm), fruit circumference (cm), fruit per plant, average fruit weight (Kg), fruit yield per plant (Kg.), T.S.S. (%), ascorbic acid (mg/100g), reducing sugars (%), non-reducing sugar (%) and dry matter (%). Heritability and

genetic advance were studied by the diallel method of numerical approach given by Mather and Jinks (1971) [2] and Johnson *et al.* (1955) [1], respectively.

Results and discussion

The analysis of variance showed significant differences due to genotypes for all the seventeen traits in both the years under studies. This indicates sufficient genetic variability to be exploited in a breeding programme and was reflected in the broad range observed for each characters presented in Table 1. The extent of variability in parents and their F_1 hybrids of bottle gourd were measured in terms of grand mean range, genotypic and phenotypic coefficient of variation over two years presented in Table-2. The parents and F_1 hybrids presented considerable diversity in fruit yield and quality attributes when grown in two years and thus showed great potential for selection of promising types.

The phenotypic and genotypic coefficients of variation (PCV and GCV), heritability in broad sense and genetic advance as per cent of mean were worked out to various morphological and quality traits (Table 2). In general, the estimates of PCV were higher than GCV for all the traits. However, low magnitude of differences was observed between GCV and PCV indicating less environmental influence. Number of primary branches per plant, fruit yield per plant, number of fruits per plant, node number to first staminate flower, vine length, non-reducing sugar, reducing sugar, TSS, dry matter and ascorbic acid exhibited the moderate to high PCV and GCV estimates in both the years (Y_1 and Y_2). High values of GCV are an indication of high genetic variability among the parents and F_1 hybrids which showed the scope of improvement of these characters through selection. The findings are in close agreement with the results of Narayana *et al.* (1996) [3] in bottle gourd and Varalakshmi *et al.* (1995) [7] in ridge gourd.

The efficacy of selection not only depends on the magnitude of variability present in a trait but also on the extent of heritability of the desirable characters. Estimates of high heritability for ascorbic acid, dry matter, T.S.S. number of primary branches per plant and non-reducing sugar in both year (Y_1 and Y_2). Whereas, for reducing sugar and vine length in year (Y_1) and for fruit yield per plant, fruit length, days to first staminate and pistillate flower opening and days to first fruit harvest in year (Y_2). High heritability can be attributed due to the greater role of additive and additive x additive gene action, which can be exploited by following the selection in these traits. These results confirm the findings of Sahni *et al.* (1987) [5], Varalakshmi *et al.* (1995) [7] and Panse and Sukhatme (1957) [4]. Estimates of heritability computed along with genetic advance are more useful than heritability alone. High heritability coupled with high genetic advance were noted for number of primary branches per plant, ascorbic acid and TSS in both the years (Y_1 and Y_2). This indicates the less influence of environment on these traits. So the improvement could be made through selection. These findings are in accordance with those of Singh *et al.* (2005) [6] and Wani *et al.* (2008) [8].

It could be concluded that sufficient genetic variability present for all the characters studied, Hence, the best genotypes can be used in further breeding programs for improving the specified traits. High heritability along with high genetic advance might be due to additive gene action. High estimates of phenotypic and genotypic coefficient of variation, heritability and genetic advance for characters like number of primary branches per plant, ascorbic acid and T.S.S. suggested that selection based on phenotypic values of these characters will be more effective for improvement.

Table 1: ANOVA (mean squares) for a set of 8 x 8 diallel cross in bottle gourd over two years (Y_1, Y_2)

Source of Variation	Years	d.f.	Days to first staminate flower opening	Days to first pistillate flower opening	Node number to first staminate flower	Node number to first pistillate flower	Days to first fruit harvest	Vine length (m)	Number of primary branches per plant	Fruit length (cm)
Replications	Y_1	2	3.78	14.41**	0.74	1.83	11.68*	0.027	0.29	1.80
	Y_2	2	5.68*	7.92**	1.70	0.42	12.63**	0.77	4.55	2.12
Genotypes	Y_1	35	14.38**	16.56**	3.83**	2.88**	15.51**	1.84**	23.81**	25.93**
	Y_2	35	16.99**	17.34**	4.20**	5.35**	23.70**	1.24**	24.29**	31.82**
Error	Y_1	70	1.87	1.84	0.69	0.77	3.08	0.12	1.76	2.63
	Y_2	70	1.30	1.63	0.65	0.95	2.24	0.29	1.92	1.82

Table 1: Contd.....

Source of Variation	Years	d.f.	Fruit circumference (cm)	Number of fruits per plant	Average fruit weight (kg)	Fruit yield per plant (kg)	T.S.S. (%)	Ascorbic acid (mg/100g)	Reducing sugar (%)	Non-reducing sugar (%)	Dry matter (%)
Replications	Y_1	2	2.47**	0.26	0.006	0.051	0.17**	0.05	0.002	0.003	0.02
	Y_2	2	1.67*	0.15	0.016	0.44*	0.02	0.07*	0.002	0.004	0.04
Genotypes	Y_1	35	1.72**	1.64**	0.020**	2.28**	0.51**	2.19**	0.11**	0.025**	0.50**
	Y_2	35	2.19**	1.34**	0.020**	2.50**	0.58**	1.92**	0.20**	0.040**	0.45**
Error	Y_1	70	0.49	0.27	0.005	0.23	0.035	0.043	0.006	0.002	0.023
	Y_2	70	0.51	0.15	0.005	0.14	0.029	0.019	0.02	0.003	0.016

*, ** Significant at 5 per cent and 1 per cent probability levels, respectively

Table 2: Estimates of mean, range, coefficient of variation, heritability and genetic advance in bottle gourd over two years (Y_1, Y_2)

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		
		1	2	3	4	5	6	7
Days to first staminate flower opening	Y_1	45.49	42.53 to 46.80	41.83 to53.49	5.46	4.49	69.00	7.67
	Y_2	44.62	41.55 to 47.57	40.54 to 52.94	5.73	5.13	80.10	9.46
Days to first pistillate flower opening	Y_1	48.21	44.63 to 52.40	44.90 to55.93	5.39	4.60	72.70	8.07
	Y_2	47.22	45.18 to50.60	41.19 to56.63	5.55	4.85	76.30	8.73
Node number to first staminate flower	Y_1	9.92	7.26 to 12.27	8.28 to 11.90	13.31	10.31	60.00	16.43
	Y_2	9.42	7.19 to 11.15	7.89 to 12.57	14.38	11.56	64.60	19.11
Node number to first pistillate flower	Y_1	13.94	13.39 to15.17	12.00 to16.03	8.73	6.00	47.30	8.54
	Y_2	13.60	11.07 to16.48	11.37 to16.10	11.43	8.90	60.60	14.26
Days to first fruit harvest	Y_1	60.25	57.83 to 64.53	56.67 to 63.07	4.46	3.38	57.30	5.26
	Y_2	58.68	56.33 to 65.33	54.33 to 68.33	5.22	8.56	76.20	8.20
Vine length (m)	Y_1	6.27	5.12 to 7.70	4.17 to 7.69	13.35	12.06	81.70	22.49
	Y_2	5.60	4.85 to 6.07	4.60 to 7.37	13.90	10.01	51.90	14.82
Number of primary branches per plant	Y_1	14.99	11.31 to 18.00	10.22 to 21.55	20.15	18.09	80.60	33.42
	Y_2	16.05	11.50 to 19.00	11.17 to 21.50	19.07	17.01	79.50	31.28
Fruit length (cm)	Y_1	45.37	39.40 to 46.47	41.50 to 50.90	7.11	6.14	74.70	10.93
	Y_2	46.30	40.33 to 45.44	40.94 to 52.33	7.43	6.83	84.60	12.94

Table 2: Contd.....

		1	2	3	4	5	6	7
Fruit circumference (cm)	Y_1	24.20	23.38 to 25.12	23.23 to 26.40	3.91	2.64	45.50	3.68
	Y_2	24.38	23.10 to 25.95	23.52 to 26.03	4.24	3.07	52.50	4.59
Number of fruits per plant	Y_1	5.22	3.96 to 6.03	4.28 to 6.86	16.41	12.96	62.30	21.07
	Y_2	5.25	3.96 to 5.85	4.42 to 6.39	14.09	12.04	73.00	21.14
Average fruit weight (kg)	Y_1	1.12	0.98 to 1.19	0.94 to 1.31	9.09	6.30	48.00	8.93
	Y_2	1.15	0.89 to 1.20	1.03 to 1.29	8.82	6.10	47.80	8.69
Fruit yield per plant (kg)	Y_1	5.80	4.21 to 6.84	4.51 to 8.15	16.54	14.26	74.30	25.34
	Y_2	6.02	4.36 to 6.93	4.89 to 7.68	15.96	14.74	85.30	28.07
T.S.S. (%)	Y_1	3.74	3.10 to 4.20	3.03 to 5.07	11.85	10.72	81.80	20.05
	Y_2	3.95	3.18 to 4.40	3.20 to 5.00	11.72	10.89	86.40	20.76
Ascorbic acid (mg/100g)	Y_1	7.99	6.90 to 9.40	6.40 to 9.40	10.90	10.58	94.30	21.15
	Y_2	8.06	6.96 to 9.41	6.50 to 9.40	10.03	9.88	97.00	20.10
Reducing sugar (%)	Y_1	1.78	1.49 to 2.20	1.41 to 2.20	11.66	10.76	85.20	20.22
	Y_2	1.98	1.68 to 2.30	1.60 to 2.50	14.25	12.27	74.20	21.72
Non-reducing sugar (%)	Y_1	0.81	0.59 to 0.80	0.68 to 1.00	12.36	10.92	78.10	19.75
	Y_2	0.85	0.72 to 1.00	0.66 to 1.09	14.50	12.97	80.00	23.53
Dry matter (%)	Y_1	3.72	3.25 to 4.50	3.00 to 4.60	11.52	10.75	87.10	20.69
	Y_2	3.87	3.10 to 4.30	3.23 to 4.50	10.35	9.82	90.00	19.12

References

1. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybean. Agron. J 1955;47:314-318.
2. Mather K, Jinks JL. Biometrical genetics: the study of continuous variation, 2nd eds. Champan and hall London 1971.
3. Narayana R, Singh SP, Shrama DK, Rastogi KB. Genetic variability and selection parameters in bottle gourd. Indian J Hort 1996;45:53-58.
4. Panse VG, Sukhatme PV. Genetics and quantitative characters in relation to plant breeding. Indian J Genet 1957;17:312-328.
5. Sahni GP, Singh RK, Saha BC. Genotypic and phenotypic variability in ridge gourd (*Luffa acutangula* Roxb.). Indian J Agri. Sci 1987;57(9):666-668.
6. Singh NP, Narayan P, Dubey AK, Srivastava JP. Studies on combining ability, heritability and genetic advance in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] In: Abstract Book of National Seminar on Cucurbits Sept. G.B. Pant University of Agriculture and Technology, Pantnagar 2005;101:22-23.
7. Varalakshmi B, Rao PV, Reddy YN. Genetic variability and heritability in ridge gourd (*Luffa acutangula*) Indian J Agric. Sci 1995;65:606-610.
8. Wani KP, Ahmad N, Hussain K. Gene action studies in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. Indian J Agric, Sci 2008;78(3):258-260.