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Genetic analysis for heritability and genetic advance studies in bottle gourd [*Lagenaria siceraria* (Mol) Standl.]

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Abstract
The present investigation was conducted at experimental research farm Department of Horticulture, College of Agriculture, Latur, in 2022 with a view to study the heritability and expected genetic advance of three crosses, each having P1, P2, F1, F2, BC1 and BC2 generations in a randomized block design with two replications. High to moderate heritability coupled with moderate genetic advance was estimated (table 4.6) in cross LTR-3 (Chandrapur Local) x LTR-4 (Karjat Local), days to required first female flower, node at which first female flower appeared, number of female flowers per vine; which indicated that, heritability of these traits were under the control of additive gene action. For improvement of such traits selection will be rewarding. High to moderate heritability coupled with high genetic advance was observed in the cross LTR-2 (Ahemdnagar Local) x LTR-4 (Karjat Local), for length of vine, number of branches per vine, days require to first harvest, number of fruits per plant, fruit yield per vine, fruit yield per plot and fruit yield per hecatre, which indicate that, heritability of these traits were due to additive gene action. For improvement of such traits selection will be rewarding.

Keywords: Bottle gourd, heritability, broad sense, narrow sense, genetic advance

Introduction
Bottle gourd [*Lagenaria siceraria* (Mol) Standl.] the name "Lagenaria" and "siceraria" are derived from Latin words 'Lagena' for bottle and "sicera" for drinking utensil. Bottle gourd is one of the very popular vegetable crop belongs to family cucurbitaceae with a diploid chromosome number 2n=2x=22. Bottle gourd is also known as calabash gourd, locally known as Doothi in Gujrati, Bottle squash, White flowered gourd (English name) Zucca melon, Trumpt gourd, Lauki and Ghiya (in Hindi). It is grown in both rainy and summer season and its fruits available in the market throughout the year. The fruit of bottle gourd can be used as vegetable or for making sweets (e.g.halva, kheer, pedha, and burfi) and pickles. As a vegetable it is easily digestible, even by patients. A decoction made from the leaf is a very good medicine for curing jaundice. The bottle gourd fruit has a cooling effect, it is a cardiatonic and diuretic. The pulp is good for overcoming constipation, cough, night blindness and as an antidote against certain poisons. The plant extract is used as cathartic and the seed are used in dropsy. It is mainly grown for its tender fruits and seeds which are good source of oil and protein.
Heritability indicates the effectiveness with which the selection of genotypes could be based on phenotypic performance. This could be achieved through determining heritability and genetic gain under selection. The success of selection is then governed by the degree to which the desired character is transmitted to the offsprings of the selected parents. Therefore, a reliable estimate of heritability and genetic advance can be a powerful tool in determining the breeding programme.

Material and Methods
The analysis of fourteen characters studied by the experimental material comprised of six generations *viz*., P1, P2, F1, F2, BC1 and BC2 of each of the three crosses *viz*., LTR-1 (Aurangabad Local), LTR-2 (Ahmbednagar Local), LTR-3 (Chandrapur Local), LTR-4 (Karjat Local), LTR-5 (Buldhana Local). In Randomized Block Design three different bottle gourd crosses were sown during *kharif* 2021 from the experimental material comprised of six generations *viz*., P1, P2, F1, F2, BC1 and BC2 and replicated twice. Each plot consisted two row of P1, P2, F1, BC1 and BC2 and four rows of F2.

The row to row and plant to plant distance was kept as 2 m and 1m, respectively; by following the other recommended practices raised the crop.

To test the significance of differences between treatments, the analysis of variance for Randomized Block Design (RBD) was carried out as per procedure given by Panse and Sukhatme (1967) for all metric characters under study. The broad sense heritability in percent was calculated by using formula suggested by Wright (1968) [10] and the narrow sense heritability was calculated as suggested by Warner (1952) [11]. Genetic advance (G.A.) as percent of mean was estimated according to Johnson *et al*. (1955) [12].

Result and Discussion

To find out amount of variations between generation means for various characters, the analysis of variance for randomized block design was done for each character. (Table 1) Both the crosses exhibited significant difference in all the characters. This revealed that, for effective selection for all the characters in the material under study, mean sum of square for treatment in both crosses have sufficient variation.

Heritability

High broad sense heritability (Table 2) recorded for all traits except, length of vine, days required for first female flower and days required for first harvest in cross, LTR-1 (Aurangabad Local) x LTR-5 (Buldhana Local) and in cross LTR-2 (Ahemdnagar Local) x LTR-4 (Karjat Local) high broad sense heritability recorded for all traits except days required for first female flower, number of nodes per plant, number of fruits per plant, fruit yield per vine, fruit yield per plot, fruit yield per hectar. High broad sense heritability recorded for traits, length of vine, days required for first female flower and days required for first harvest in cross, LTR-3 (Chandrapur Local) x LTR-4 (Krjat Local). Moderate broad sense heritability was recorded for the characters length of vine, days required for first harvest, days to required first female flower, in cross, LTR-1 (Aurangabad Local) x LTR-5 (Buldhana Local) and in cross, LTR-2 (Ahemdnagar Local) x LTR-4 (Karjat Local) for traits, days required for first female flower, number of nodes per plant. Moderate broad sense heritability was recorded for the characters number of branches per vine, number of nodes per plant, number of fruits per plant, fruit yield per vine, fruit yield per plot, fruit yield per hectare in cross, LTR-3 (Chandrapur Local) x LTR-4 (Karjat Local). Low broad sense heritability was found for the traits number of branches per vine, node at which first female flower appeared and number of female flowers per vine in cross, LTR-1 (Aurangabad Local) x LTR-5 (Buldhana Local), whereas, for traits, node at which first female flower appeared, number of female flowers per vine in the cross LTR-3 (Chandrapur Local) x LTR-4 (Karjat Local).

The higher estimates of heritability indicates that, these traits were comparatively less affected by environment and their phenotype is good reflection of genotype and thus possessed paramount importance in making selection of superior genotype on the basis of phenotypic performance of these matric traits but in case of lower heritability, pedigree, sib or progeny test can be employed for genetic improvement. The moderate to low estimates of heritability for most of the traits including yield components indicated the preponderance of non-additive variance for yield and yield attributes in the material under study.

Genetic advance: From the present investigation in (table 2) high genetic advance was recorded for characters length of vine, number of branches per vine, number of nodes per plant, days required for first harvest, number of fruits per plant, fruit yield per vine, fruit yield per plot, fruit yield per hectare in cross, LTR-3 (Chandrapur Local) x LTR-4 (Karjat Local) and LTR-2 (Ahemdnagar Local) x LTR-4 (Karjat Local). High genetic advance was recorded for traits, number of nodes per plant, number of fruits per plant, fruit yield per vine, fruit yield per plot, fruit yield per hectare in cross, LTR-1 (Aurangabad Local) x LTR-5 (Buldhana Local). Low genetic advance was recorded for traits, length of vine, days to required first female flower, number of nodes per plant, number of female flowers per vine, fruit yield per vine in cross, LTR-1 (Aurangabad Local) x LTR-5 (Buldhana Local).

Heritability coupled with genetic advance

High to moderate heritability coupled with moderate genetic advance was estimated (table 2) in cross LTR-3 (Chandrapur Local) x LTR-4 (Karjat Local), days to required first female flower, node at which first female flower appeared, number of female flowers per vine; which indicated that, heritability of these traits were under the control of additive gene action. For improvement of such traits selection will be rewarding. High to moderate heritability coupled with high genetic advance was observed in the cross LTR-2 (Ahemdnagar Local) x LTR-4 (Karjat Local), for length of vine, number of branches per vine, days require to first harvest, number of fruits per plant, fruit yield per vine, fruit yield per plot and fruit yield per hecatre, which indicate that, heritability of these traits were due to additive gene action. For improvement of such traits selection will be rewarding. Shift in the gene frequency towards selection pressure is termed as genetic advance. Johnson *et al*. (1955) [12] found it more useful to estimate heritability values together with genetic advance in predicting the ultimate choice of best individuals by selection.

Table 1: Analysis of variance (Mean sum of squares) for six generations in two crosses for 14 characters in Bottle gourd.

Sources	d.f	Length of vine (Cm)	Number of branches per vine	Days required for first female flower	Node at which first female flower	Number of nodes per plant	Number of female flower flower per vine	Days require for first harvest	Number of fruit per vine	Fruit yield per vine (kg)	Fruit yield per plot (kg)	Fruit yield per ha (q)	Downey mildew (%)
Aurangabad Local x Buldhana Local													
Replication	1	898.38	0.03	0.02	1.45	26.70	0.18	0.01	0.17	0.00	0.26	11.02	0.04
Treatment	5	17014.65**	2.50**	18.44**	6.32**	309.25**	13.01**	48.43**	0.79**	0.47**	46.15**	1179.27**	0.37**
Error	5	1476.32	0.23	2.42	1.00	6.99	1.17	3.34	0.09	0.05	5.26	130.87	0.01
Ahemdnagar Local x Karjat Local													
Replication	1	2925.31	0.27	0.08	0.01	27.60	0.04	0.04-	0.00	0.10	10.01	262.73	0.03
Treatment	5	36265.70**	5.72**	15.74**	1.96**	39.05**	8.38**	79.19**	1.49**	0.47**	47.28**	1203.44**	0.48
Error	5	562.59	0.3	0.06	0.06	6.09	0.14	1.45	0.06	0.05	5.93	145.45	0.01

Continued…

Sources	d.f	Length of vine	Number of branches per vine	Days required for first female flower	Node at which first female flower	Number of nodes per plant	Number of female flowers flower per vine	Days required for first harvest	Number of fruit per vine	Fruit yield per vine (kg)	Fruit yield per plot (kg)	Fruit yield per hectar (q)	Downey mildew (%)
Chandrapur Local x Karjat Local													
Replication	1	10.82	0.03	6.16	0.06	57.64	0.04	6.23	0.00	0.13	12.97	319.30	0.08
Treatment	5	20368.49**	4.15**	21.66**	1.17**	323.43**	1.84**	21.82**	0.76**	0.37**	37.06**	923.07**	0.72**
Error	5	399.29	0.31	3.26	0.02	26.19	0.24	1.50	0.14	0.02	2.20	55.45	0.01

* and ** Significant at 5 and 1 per cent level, respectively* and ** Significant at 5 and 1 per cent level, respectively.

Table 2: Estimates of heritability and genetic advance for 10 characters in two crosses of Bottle gourd.

Sr. No.	Characters	Aurangabad Local x Buldhana Local			Ahemdnagar Local x Karjat Local			Chandrapur Local x Karjat Local		
		Heritability (%)		Genetic Advance	Heritability (%)		Genetic Advance	Heritability (%)		Genetic Advance
		ns	bs		ns	bs		ns	bs	
1	Length of vine (cm)	14.92	26.52	6.00	30.15	75.65	36.20	38.52	82.99	44.68
2	Number of branches per vine	29.22	13.22	21.66	33.75	68.55	31.26	18.39	33.12	51.68
3	Days required for first female flower	32.41	56.38	7.25	18	35.91	13.80	39.37	78.25	13.55
4	Node at which first female flower appeared	5.63	14.23	5.50	6.25	15.66	12.88	6.26	15.44	12.66
5	Number of nodes per plant	32.88	68.60	32.78	30.56	58.01	11.20	25.96	45.90	34.78
6	Number of female flowers flower per vine	5.98	14.85	5.56	40.58	80.14	10.56	7.92	16.82	16.65
7	Days required for first harvest	18.35	31.65	17.25	47.12	79.90	33.00	45.23	79.22	33.42
8	Number of fruit per vine	40.00	84	40.22	32.57	76.53	36.58	3.60	46	21.33
9	Fruit yield per vine (kg)	46.55	86	6.78	39.20	74.81	32.50	4.78	45	22.20
10	Fruit yield per plot (kg)	48.23	85	42.50	38.48	72.30	31.90	32.25	44	23.66
11	Fruit yield per hectar (q)	41.00	83.00	43.85	40.35	71.20	33.75	21.55	42	20.80

Where,
NS = Narrow Sense Heritability; BS = Broad Sense Heritability; GA = Genetic Advance

Conclusion

High heritability coupled with high genetic advance observed, this indicated that, heritability of this trait was due to additive gene action in controlling the traits, hence pedigree method of breeding will be a rewarding one to improve the trait under investigation. Low narrow sense heritability and high broad sense heritability indicated that this character is under influence of environment. Heritability estimates were high to moderate for the traits, suggested the greater effectiveness of selection and improvement to be expected for traits in future breeding programme as the genetic variance mostly due to the additive gene action.

References

1. Damor AS, Patil JN, Parmer HK, Vyas ND. Studies on genetic variability, heritability and genetic advance for yield and quality traits in bottle gourd [*Lageneria seceraria* (Molina)Standl.] genotypes. International Journal of Scientific Environment Technology. 2016;5(4):2301-2307.
2. Gautam DK, Yadav GC. Heritability (narrow sense) and genetic advance of for growth, yield and quality traits in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. Journal of Pharmacognosy and Phytochemistry. 2018;7(1S):98-100.
3. Kandasamy R, Arivazhagan E, Bharathi SS. Variability and heritability studies in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.). Plant Archives. 2019;19(2):3263-3266.
4. Sriom, Yadav GC. Studies on heritability and genetic advance for growth, yield and quality traits in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]. International Journal of Chemical Studies. 2020;9(1):3230-3232.
5. Majjid R. Studies on genetic variability, heritability and genetic advance in bottle gourd [*Lagenaria siceraria* (Molina) Standl.] genotypes. International journal of chemical studies. 2020;8(3):455-458.
6. Abhishek VR, Kumar J, Tomar S. Study of genetic variability, heritability and genetic advance among the character of bottle gourd. Plant Archives. 2020;20:506-509.
7. Chouhan GS, Kushwah SS, Singh OP, Sharma RK. Genetic variability and correlation analysis for fruit yield and quality traits in bottle gourd. Indian Journal of Horticulture. 2020;77(2):287-292.
8. Lal M, Ram CN, Yadav GC, Rao OP. Studies on heritability and genetic advance for the quantitative traits in Bottle gourd [*Lagenaria siceraria* L. (Moll.) Standl.]. The Pharma Innovation Journal. 2021;10(7):1582-1584.
9. Venkatraman M, Haripriya K. Genetic variability, heritability and genetic advance in bottle gourd [*Lagenaria siceraria* (molina) standl.] genotypes. Annals of Plant and Soil Research. 2021;23(2):200-203.
10. Wright JW. A new model for sea clutter. IEEE Transactions on antennas and propagation. 1968 Mar;16(2):217-23.
11. Warner WL, Abegglen JC. Occupational mobility in American business and industry, 1928-1952. University of Minnesota Press; c1955.
12. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic and environmental variability in soybeans. Agronomy journal. 1955;47(7):314-8.