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Genetic variability studies for qualitative attributes in bottle gourd (*Lagenaria siceraria* L.)

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Abstract
The present investigation was carried out to estimate phenotypic and genotypic coefficient of variation, heritability (broad sense) and genetic advance per cent of mean for 4 qualitative attributes in 21 different genotypes of bottle gourd during Kharif 2018 at Instructional-Cum-Research Farm, Department of Horticulture, College of Agriculture Latur, Vasantrao Naike Marathwada Krishi Vidyapeeth (M.S.). Significant differences among the genotypes were observed for all the characters under study. The PCV and GCV values were high for Carbohydrate, Protein and T.S.S. High heritability and high genetic advance were observed for characters like ascorbic acid, carbohydrate, protein and T.S.S.

Keywords: GCV, PCV, Heritability, Genetic advance

Introduction
Bottle gourd (*Lagenaria siceraria* L.) is one of the most popular vegetables of the family, Cucurbitaceae. It can be grown in both summer and rainy season, but it can't tolerate cold (Rastogi and Arrya 1998).
Bottle gourd is a very common nutritious vegetable grown throughout the world
Cucurbitaceous family is economically most significant family, supplying edible and nutritious fruits to humanity (Bisognin, 2002) [2]. Fruits are used as sweets, pickles (especially on hills), kofta, petha, halwa, Kopoorkand, Paratha and Rayata. The fruits contain vitamin C (11 mg), thiamine (0.044 mg), riboflavin (0.023 mg), niacin (0.33 mg), mineral matters (0.05%), carbohydrates (2.9%), fats (0.5%) protein (0.2%) and moisture (96.3%) and its different parts possess large number of medicinal properties (Desai and Musmade, 1998) [4]. It is easily digestible and which is used extensively as vegetable and also recommended during convalescence and juice is recommended for heart and Diabetic Patients. The seed are triangular or rectangular shaped with grey to whitish colored, having higher essential amino acid and micronutrient as compared to fruits, Excepts calcium, zinc, cobalt and chromium.
There is an urgent need for genetic improvement to develop high yielding cultivars. The study of genetic variability, heritability and genetic advance for yield and its components may be helpful in selection of some useful materials from the existing population. The magnitude of genetic variability existing in crops species, as it provides the basic knowledge of effective selection the total variance i.e. phenotypic variance present in the population genetic variance to the total variance, which is known as heritability. However, the genetic advance predicts the amount of gain expected by imposing a particular intensity of selection. Therefore, for deciding the methodology to be followed the information on these parameters is important. Selection of individuals is made on the basis of phenotype to bring about improvement in the characters in desirable direction. The measurement of this expected improvement is the genetic advance which depends on the genetic variability, magnitude effect of the environment and interaction of component of variability genetic diversity and the intensity of selection. Genetic advance under selection depend upon (i) the phenotypic variability among different plants or females in the base population (ii) the heritability of the character under selection, and (iii) the intensity of selection.

Materials and Methods
An experiment was carried out at Instructional-Cum-Research Farm, Department of Horticulture, College of Agriculture Latur during the year 2018 to evaluate twenty one diverse genotypes of bottle gourd. The experiment was laid out in Randomized Block Design (RBD) with two replications. Observations were recorded from five randomly selected plants of each genotype in each replication for four qualitative attributes *viz.*, ascorbic acid, carbohydrate (%), protein (%), T.S.S (%) The data generated was averaged and subjected to analyze the variability Genotypic and phenotypic coefficients of variation were estimated by the formulae

as suggested by Burton and DeVane (1953) [3]. PCV and GCV values were categorized as low (0-10%), moderate (10.1-20%) and high (>20) values as indicated by Sivasubranian and Menon (1973) [12].

Heritability in broad sense was calculated by the formula as suggested by Allard (1960) [1]. Heritability was classified as suggested Robinson *et al.* (1949) [9] into low (0-30%), moderate (30.1-60%) and high (>60%). The Genetic advance (GA) resulting from selection of five per cent superior individuals was worked out as suggested by Allard (1960) [1]. The GAM% was categorized into low (0–10%), moderate (10.1–20%) and high (>20%) as suggested by Johnson *et al.* (1955) [7].

Results and Discussion

The analysis of variance indicated significance higher amount of variability among the genotype for four qualitative attributes studies *viz*., ascorbic acid, carbohydrate, protein and T.S.S given in Table 1. Similar findings reported by, Rambhau *et al*., (2017) [14] and Thakur *et al*., (2017) [13].

The phenotypic coefficient of variation ranged from 13.63% for ascorbic acid to 39.70% for T.S.S. The maximum value of phenotypic coefficient of variation were found in Carbohydrate (21.88%), protein (22.55%) and T.S.S (25.76%) in Table 2, indicated that these characters would respond to selection process. The result is in confirmation with finding of Yadav and Kumar (2011), Sharma and Sengupta (2013), Mandal *et al*., (2015) and Kumar *et al*., (2018). The rest of character such as ascorbic acid (13.83%) exhibited moderate phenotypic coefficient of variation. The result is in confirmation with finding of Singh *et al*., (2014) [10], Rambabu *et al.,* (2017)

The genotypic coefficient variation ranged from acorbic acid 13.05% to T.S.S 24.57%. The high value of genotypic coefficient of variation were found for protein (20.11%) and T.S.S (24.57%) Table 2. The high values of GCV suggested greater phenotypic genotypic variability among the genotypes and responsiveness of the attributes for making further improvement by selection and also the moderate variability recorded in carbohydrate (19.26%), and ascorbic acid (13.05%) which indicated the moderate variability due to environment effect. The result is in confirmation with finding Harika *et al*., (2012) [6] Singh *et al*., (2014) [10], Sithole *et al*., (2015) [11] and Rambabu *et al.,* (2017).

Genotypic variance to the total phenotypic variance. The most important function of heritability in the genetic studies of metric characteristics is its predictive role in expressing the reliability of phenotypic value as a guide to breeding value Falconer (1989) [5].

Heritability in broad sense estimates were highest for ascorbic acid (89.00%), carbohydrate (77.50%), protein (79.50%) and T.S.S (94.50%) Table 2. High heritability indicated that, through the character is least influenced by the environment effect. The selection for improvement of such character may not be useful because broad sense heritability is based on total genetic variance. The result is in confirmation with finding of Harika *et al*., (2012) [6], Singh *et al*., (2014) [10] and Rambabu *et al.,* (2017)

The Genetic advance were ascorbic acid (25.36%), carbohydrate (24.95%), protein (36.95%) and T.S.S (49.16%) This indicated that, genetic advance is high it shows that character is governed by additive genes and selection will be rewarding for improvement such traits. Similar finding reported by Harika *et al*., (2012) [6] Singh *et al*., (2014) [10] and Rambabu *et al.,* (2017)

Table 1: Analysis of variance for qualitative attributes studied in bottle gourd.

Sr. No	Character	Mean of sum square		
		Replication	Treatment	Error
1	Ascorbic Acid	0.005	1.600**	0.090
2	Carbohydrate (%)	0.010	0.330	0.030
3	Protein (%)	0.002	0.010	0.002
4	T.S.S(%)	0.000	0.690**	0.010

Table 2: Mean, range and different genetic parameters in bottle gourd.

Sr. No	Characters	General Mean	Range	PV	GV	PCV (%)	GCV (%)	h^2 (%)	Genetic advance	GA Over mean (%)
1	Ascorbic acid (gm)	6.66	5.17-7.92	0.84	0.75	13.83	13.05	89.00	1.68	25.36
2	Carbohydrate (%)	0.48	0.32-0.67	0.14	0.18	21.88	19.26	77.50	0.16	24.95
3	Protein (%)	1.92	1.13-2.95	0.02	0.01	22.55	20.11	79.50	0.71	36.96
4	T.S.S (%)	2.25	1.12-3.74	0.35	0.33	25.76	24.57	94.50	1.16	49.19

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