

Original Research Article

Studies on Genetic Variability, Heritability and Genetic Advance among Quantitative and Qualitative Characters in Bottle Gourd (*Lagenaria siceraria* Standl.)

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ABSTRACT

The present investigation was under taken on Studies on genetic variability, heritability and genetic advance among quantitative and qualitative characters in bottle gourd (*Lagenaria siceraria* Standl.). The experiment was conducted at the Horticulture Research Center, Sardar Vallabhbhai Patel University of agriculture and Technology Modipuram, Meerut (U.P) India during summer season of 2019. The experimental materials for this investigation were consists 31 diverse genotypes of bottle gourd. These genotypes were planted in Randomized Block Design with three replications. The analysis of variance revealed significant differences for all the characters. Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the characters studied. High heritability combined with high genetic advance was observed for the characters, Plant germination, vine length, internodes length, number of node per plant, number of leaf, number of primary branches, days to 1st flower initiation, days to 50% flowering, days to first fruit set, days to 1st fruit harvest, fruit length, fruit girth, number of fruit per plant, fruit weight, fruit yield per plant, duration of crop in days, seed index shows high heritability along with high genetic gain which reveals the predominance of additive gene action of these traits. The present investigation was under taken on Studies on genetic variability, heritability and genetic advance among quantitative and qualitative characters in bottle gourd (*Lagenaria siceraria* Standl.). The experiment was conducted at the Horticulture Research Center, Sardar Vallabhbhai Patel University of agriculture and Technology Modipuram, Meerut (U.P) India during summer season of 2019. The experimental materials for this investigation were consists 31 diverse genotypes of bottle gourd. These genotypes were planted in Randomized Block Design with three replications. The analysis of variance revealed significant differences for all the characters. Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) for all the characters studied. High heritability combined with high genetic advance was observed for the characters, Plant germination, vine length, internodes length, number of node per plant, number of leaf, number of primary branches, days to 1st flower initiation, days to 50% flowering, days to first fruit set, days to 1st fruit harvest, fruit length, fruit girth, number of fruit per plant, fruit weight, fruit yield per plant, duration of crop in days, seed index shows high heritability along with high genetic gain which reveals the predominance of additive gene action of these traits.

Keywords

Bottle gourd, Variability, Heritability, GCV, PCV, Genetic advance

Introduction

Bottle gourd (*Lagenaria siceraria* Standl) has a diploid chromosome ($2n=2x=22$) also known as calabash gourd or white flowered gourd plant, is a member of the Cucurbitaceae family, Cucurbitoideae sub family, and Benincaseae tribe. The family

Cucurbitaceae is comprised of 118 genera and 825 species. It is native to Africa (Whitaker, 1971). It is a highly cross pollinated crop due to its monoecious and Andromonoecious nature (Bose *et al.*, 2002). Cucurbitaceae family is economically most significant family, supplying edible and nutritious fruits to humanity (Bisognin,

2002). Plants of his family are characterized by great genetic variability in fruit shape, fruit length and texture of fruit, resulting in variability and wide range of diversity. The genetic improvement in bottle gourd depends upon the different selection parameters viz. genetic variability, heritability, genetic advance of newly introduced to genotypes. Parameters of genotypic and phenotypic coefficients of variation (GCV and PCV) are useful in detecting the amount of variability present in the available genotypes. Heritability and genetic advance help in determining the influence of environment in expression of the characters and the extent to which improvement is possible after selection. Crop improvement depends upon the magnitude of genetic variability and extent to which the desirable characters are heritable. The total variability can be partitioned into heritable and non heritable components with the help of genetic parameters like phenotypic and genetic coefficient of variation, heritability and genetic advance. Heritable variation can be effectively studied in conjunction with genetic advance. According to Singh *et al.*, (2012), inheritance pattern of various characters can be predicated by the studies on variability, heritability and genetic advance.

Materials and Methods

The present study entitled Studies on genetic variability, heritability and genetic advance among quantitative and qualitative characters in bottle gourd (*Lagenaria siceraria* Standl.) was carried out at the Horticulture Research Center, Sardar Vallabhbhai Patel university of agriculture and Technology Modipuram, Meerut (U.P) India during summer season of the year 2019. The experiment consists of 31 diverse genotypes of bottle gourd which were grown in a Randomized Block Design with three replications. Row to row distance 2.5 meter and Plant to Plant distance 1.0 meter

was maintained to raise the crop successfully by following recommended agronomic practices during period of crop growth. Observations for different traits were recorded from five randomly selected plants for all the quantitative characters viz. Plant Germination, Vine length (cm), Internodes length (cm), Number of node per plant, Number of leaf, Number of primary branches, day to 1st flower branches, day to 50% flowering, days to first fruit set, day to 1st fruit harvest, fruit length (cm), fruit girth (cm), number of fruit per plant, fruit weight (g), fruit yield per plant (kg).

Results and Discussion

Genotypic and phenotypic coefficient of variation

The results revealed (Table 1) that the phenotypic coefficient of variation (PCV) were higher than genotypic coefficient of variation (GCV) for all the characters studied. The high genotypic coefficient of variation (GCV) (>20%) was observed for fruit yield per plant (36.23), number of primary branches (28.21), vine length (26.11), number of nodes per plants (25.94), Internodes length (25.39), number of leaf (23.15) and seed index (21.39). The moderate genotypic coefficient of variation was recorded for fruit length (17.53), number of fruits per plant (17.17), fruit girth (15.07) and plant germination (12.15). However days to first fruit set (6.84), days to first fruit harvest (6.44), days to 50% flowering (5.43), days to first flower initiation (5.05) and duration of crop in days (1.13) exhibited the low genotypic coefficient of variation (<10%). High phenotypic coefficient of variation (PCV) (>20%) was observed for fruit yield per plant (38.42), number of primary branches (29.73), vine length (27.56), number of nodes per plants (26.95), Internodes length (26.53), and number of leaf (23.73). The

moderate phenotypic coefficient of variation was found for fruit length (19.65), number of fruit per plant (19.42), fruit girth (16.45) and plant germination (15.33), However, days to first fruit set (7.44), days to first fruit harvest (7.35), days to 50% flowering (6.62), days to first flower initiation and duration of crop (1.78) exhibited the low phenotypic coefficient of variation (<10%). The GCV was found to be less than PCV for all traits studied which indicated that these characters were having interaction with environment to some extent. The difference among the genotypic coefficient of variance and phenotypic coefficient of variance value for different characters indicated that the influence of environment in expressing the variability with traits. If the difference least, mean the environment is much affecting in the variable performance of the characters. But if the difference is more it means there is much influence of environment in the expression of the traits. Koffi (2009), Jain and Singh (2016) also reported the similar results.

Heritability in broad sense (H^2 bs)

The data presented in Table 1 revealed that the broad sense heritability ranged from 40.03 % to 95.24 % for duration of crop and number of leaves respectively compared the character like seed index (94.93), number of nodes per plant (92.61), internodes length (91.63%), number of primary branches (90.03), vine length (89.74%), fruit yield per plant (88.92%), days to first fruit set (84.57%), Fruit girth (83.89%), Fruit weight (80.62%), fruit length (79.60%), number of fruits per plant (78.20%), days to first fruit harvest (76.76%), days to 50% flowering (67.24%), plant germination (62.86%), showed high heritability (>60%). whereas, days to first flower initiation (51.04%) and duration of crop in days (40.03) revealed moderates heritability (30-60%). The

genotypic variance estimated from a single test contained interaction of environmental variance with genetic variance in addition to genetic variance resulting in the upward bias in the estimates of broad sense heritability. The higher estimates of heritability obtained in the study may be due to the fact that the experiment was conducted only at a single location for one year. Thus, the genotypic variance estimated from a single test contained interaction of environmental variance with genetic variance in addition to genetic variance resulting in the upward bias in the estimates of broad sense heritability. Such findings were also reported by Husna (2011), Jat (2014) and Koppad (2015).

Genetic advance in percentage of mean

The data presented in table 1 revealed that the high genetic advance mean percentage (> 20 %) was observed for fruit yield per plant (70.38), number of primary branches (55.13), number of nodes per plants (51.42.), vine length (50.94), Internodes length (50.07), number of leaf (46.55) seed index (42.92), fruit length (32.22), number of fruits per plant (31.28), fruit girth (28.43). Moderate (10-20%) was observed for fruit plant germination (19.85), days to first fruit set (12.95), days to first fruit harvest(11.63), However >10% was exhibited for days to 50% flowering (9.16) days to first flower imitation (7.44) and duration of crop in days (1.47). It has been found that geographical distribution and genetic diversity as estimated by the D^2 static could be directly related in the number of crop plant with different breeding system. Genetic drift and selection in different environment could cause greater diversity than geographical distance. Human selection under wide agro-ecological conditions has enriched the diversity in several crop plants. These findings are in support with the findings of Damor (2017), Tirumalesh (2016) and Rajawat (2017).

Table.1 Genetic variability of 31 genotypes of bottle gourd for 17 characters

Genotypes	Max	Heritability (%)	GA	GA as % mean	GCV (%)	PCV (%)
Plant Germination	11.40	62.86	1.51	19.85	12.15	15.33
Vine length (Cm)	354.93	89.74	132.02	50.94	26.11	27.56
Internodes Length (cm)	14.55	91.63	4.06	50.07	25.39	26.53
Number of node per plant	36.80	92.61	11.17	51.42	25.94	26.95
Number of leaf	40.60	95.24	13.83	46.55	23.15	23.73
Number of primay branches	10.27	90.03	3.24	55.13	28.21	29.73
Days to 1st flower initiation	79.13	51.04	4.81	7.44	5.05	7.07
Days to 50% flowering	84.80	67.24	6.80	9.16	5.43	6.62
Days to first fruit set	92.47	84.57	10.36	12.95	6.84	7.44
Days to 1st fruit harvest	97.17	76.76	9.94	11.63	6.44	7.35
Fruit length (Cm)	35.40	79.60	9.03	32.22	17.53	19.65
Fruit girth (Cm)	33.80	83.89	7.52	28.43	15.07	16.45
Number of fruit per plant	11.53	78.20	2.76	31.28	17.17	19.42
Fruit weight(g)	1140.67	80.62	270.78	29.30	15.84	17.64
Fruit yield per plant(Kg)	20.14	88.92	5.95	70.38	36.23	38.42
Duration of crop in days	132.40	40.03	1.86	1.47	1.13	1.78
Seed index (gm)	22.95	94.93	6.02	42.92	21.39	15.33

On the basis of mean performance of 31 genotypes of bottle gourd, it was concluded that analysis of variance significant difference was recorded for all the quantitative and qualitative traits indicating presence of large amount of variability in the genotypes. it could be conclude that PCV and GCV were high for Fruit yield per plant (Kg) which indicated that high degree of variability in this character and suggested that possibility of yield improvement through selection of this trait.

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