

Genetic Variability in Ascorbic Acid and Carotenoids Content in Indian Bitter Gourd (*Momordica charantia* L.) Germplasm

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Bitter gourd (*Momordica charantia* L.) is one of the important vegetables among the cultivated cucurbits. The crop is widely cultivated through out the tropics. The origin of this important crop is probably India with a secondary centre of diversity in China (2). India is endowed with a wide range of diversity in this crop; hence, there is a vast opportunity for genetic improvement. The immature fruits are good source of iron, vitamin A, B, C, and inexpensive source of proteins and minerals (7) and the nutritive values of bitter gourd fruits vary with the varieties. The small-fruited (*Momordica charantia* var. *muricata*) types are found to be more nutritious than the large-fruited (*Momordica charantia* var. *charantia*) types (6). The systematic evaluation of bitter gourd genotypes based on ascorbic acid and carotenoids content in bitter gourd is either lacking or scanty. Therefore, a study was made to evaluate bitter gourd germplasm with high ascorbic acid and total carotenoids content besides several other traits.

A total of thirty eight accessions of bitter gourd collected and maintained at the Division of Vegetable Science, Indian Agricultural Research Institute, New Delhi were grown in a randomized block design with three replications during March to July 2004. The recommended agronomic practices were adopted for optimum growth of the crop. Most of the economically important fruit and plant characters were also observed during the cropping period. The predominant sex form was monoecious; however, two very promising gynoecious lines and two predominantly female flowering types were included in this study. Number of fruits per plant varied from 7.07 to 47.07 and weighted from 10.47g to 136.41g each. Fruit length ranged from 3.26 cm to 28.72 cm with

diameter from 2.55 cm to 5.98 cm and flesh thickness of 0.31 cm to 2.08 cm. The color of the fruit was from milky white to dark green. Fruit surface also showed different conformations i.e. continuously ridged to almost smooth. For analysis of ascorbic acid and carotenoids, fruits were picked at commercial edible stage. Ascorbic acid was determined by titrating a known weight of sample with 2,6-dichlorophenol-indophenol dye using metaphosphoric acid as stabilizing agent (1). Total carotenoids were determined by a modified method of one described by Ranganna (5).

Data were averaged and statistically analysed. The analysis of variance indicated highly significant differences among the genotypes for ascorbic acid and carotenoid content. This suggests that there is a considerable amount of variation among the genotypes. Mean, range, phenotypic (PCV) and genotypic (GCV) coefficient of variation is presented in Table 1. The variability estimate revealed that the phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all quantitative characters studied but the difference between PCV and GCV for ascorbic acid and total carotenoid content was insignificant which indicated that these quality traits are least affected by environment. The above findings were in agreement with the results obtained by Jaiswal *et.al.* (3). The range of ascorbic acid content was 60.20 mg to 122.07 mg/100 g of fresh weight with a population mean of 82.14mg/100g of fresh weight (Fig. 1). Similarly, total carotenoid content ranged from 0.205mg to 3.2mg with a population mean of 1.6mg/100g of fresh weight (Fig. 2). The highest amount of ascorbic acid was found in genotype DBTG-3 (122.07mg) followed by DBTG-8 (120.53mg), DBTG-6

(115.13mg), DBTG-9 (108.43mg), DBTG-7 (100.67mg) and DBTG-4 (92.15mg). The genotype, DBTG-8 recorded maximum total carotenoids content (3.2mg) followed by DBTG-9 (3.0mg), DBTG-101 (2.9mg), DBTG-6 (2.8mg), DBTG-4 (2.7mg) and DBTG-2 (2.6mg). Among the above mentioned genotypes, DBTG-3, DBTG-8, DBTG-6 and DBTG-101 were small fruited genotypes (*Momordica charantia* var. *muricata*) those were found superior with respect to nutritional property. Among the small-fruited genotypes, DBTG-8 was found to be highly promising for its better nutritional qualities long with higher fruit yield. In large fruited group (*Momordica charantia* var. *charantia*), the genotype DBTG-4 was observed to be most promising with respect to fruit yield, fruit length, fruit diameter, flesh thickness and high ascorbic acid and total carotenoid content. It was very interesting to note that some of the white-fruited genotypes like, Pusa Do Mausami (White), Preethi and DBTG-10 contain very less amount of total carotenoids (less than 0.5mg/100g). It might be due to the fact that, these genotypes contain less chlorophyll, which may have contributed to less carotenoid synthesis (4). It is concluded that genotypes with higher ascorbic acid and carotenoid content may be utilized for quality improvement of bitter gourd. These materials are now being utilized for the genetic study and the inbreds are maintained in the Institute.

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Table 1. Total carotenoid and ascorbic acid content of 6 most important genotypes based on average values

Characters	Ascorbic acid (mg/100g)	Total carotenoids (mg/100g)
Range	92.15-122.07	2.6-3.2
Population mean	82.14	1.6
GCV	19.75	48.62
PCV	19.87	48.64
CD at 5%	2.99	0.03
High value genotypes	DBTG-3, DBTG-8, DBTG-6, DBTG-9, DBTG-7, DBTG-4	DBTG-8, DBTG-9, DBTG-101, DBTG-6, DBTG-4, DBTG-2

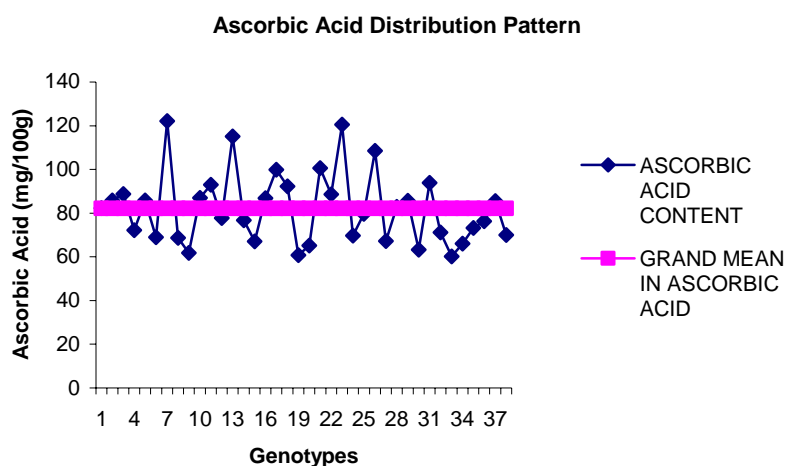


Fig1. Ascorbic acid distribution pattern among the 38 genotypes based on average values

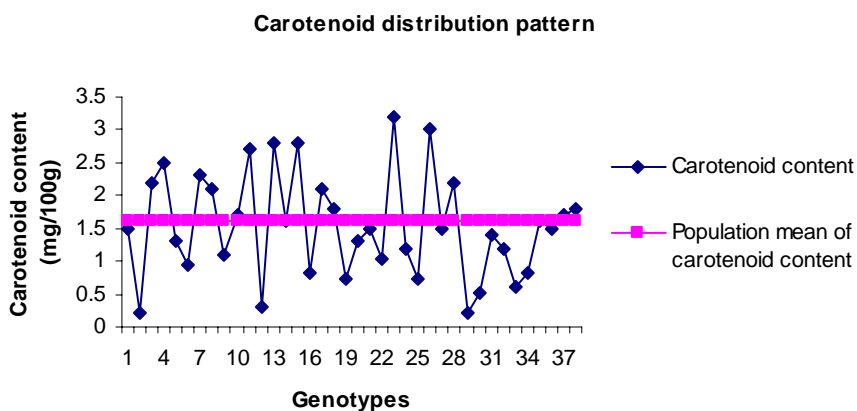


Fig2. Total carotenoid distribution pattern among the 38 genotypes based on average values