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Original Research Article

Evolution of Guava Genotypes for Bio-Chemical and Yield Parameters

P.H. Ulemale[1*], T.B. Tambe[2], S.B. Satpute[2] and D.T. Dhule[3]

Department of Horticulture, College of Agriculture, Latur- 413 512, India
Vasantrao Naik Marathawada Krishi Vidyapeeth, Parbhani Maharashtra, India
**Corresponding author*

Keywords

Genotype, Bio-chemical, Yield, Guava etc

A B S T R A C T

The present investigation was carried out on nine genotypes of guava viz., GRS_1, GRS_2, GRS_3, GRS_4, GWS_5, GWS_6, GWS_7, GWS_8 and L-49 during winter season in randomized block design with three replications of each genotype. The results were obtained for the biochemical and yield characters. The highest TSS (12.45 ^{0}Brix) and ascorbic acid content of fruit (297.93 mg/100 g) was noted in white fleshed genotype GWS_6. While the lowest TSS and ascorbic acid content was recorded in red fleshed genotype GRS_3 (9.34 ^{0}Brix and 176.79 mg/100g respectively). The maximum total sugar (8.4%) and non-reducing sugar (3.28%) content was present in white fleshed genotype GWS_6. While the lowest was found in the genotypes GWS_8 (6.42%) and GRS_1 (1.44%) respectively. Whereas, the highest reducing sugar (5.41%) and the lowest acidity (0.38%) was noted in red fleshed genotype GRS_4 and lowest reducing sugar (3.77%) and the highest acidity (0.38%) was observed in GWS_5. The highest fruit yield was observed in red fleshed genotype GRS_4 (52.9 kg/tree and 21.15 Mt/ha respectively). The lowest fruit yield per tree was found in white fleshed genotype GWS_8 (17.27 kg and 6.90 Mt/ha respectively).

Introduction

The genus *Psidium* comprises about 150 species of small shrubs and trees (Hayes, 1970). About 20 species have edible fruits of which the most commonly cultivated is the common guava (*Psidium guajava* L). belongs to family Myrtaceae is one of the most important fruit in India. It is native to tropical America which was introduced in India (Mitra and Bose, 2001) in the 17th century by Portuguese (Menzel, 1985). At present, it is the fifth most important fruit crops in India after mango, banana, citrus and apple with annual production of 2619 thousand MT from 233 thousand hector, 3.2 per cent of total fruit production (Anonymous, 2013). It is rich source of vitamin C and it contains three to four times more vitamin C as compared to fresh orange juice, along with the minerals namely iron, calcium, and phosphorus. It is used for preparation of jam and jelly due to its high pectin content. Ripe fruits are also used for manufacturing of ice cream, *sherbet*, cheese, candy, puree and toffee. Two types of wines, namely guava juice wine and guava pulp wine are also prepared from guava fruits. Leaves are source of dye and tannin and have medicinal value, being used for curing diarrhoea. However, guava is highly perishable fruit due to which growers facing serious problems after harvesting. However, it is guaranteed source of ascorbic acid,

pectin, sugars, etc. which play the role in processing. Hence, it is need to process guava on a large scale by using either red or white fleshed guava. The processed red fleshed guava might be novelty in guava industry.

Data of the genetic diversity available would assist in the selection of parents in further hybridization programmers. Screening of these genotypes can help identifying a better source of resistance to various fruit and seeds characters the genotypes show variability in its bio-chemical characteristics could be used directly in further guava improvement programme. In this context, the study of genetic divergence is of vital importance for any plant breeding programme aimed at genetic improvement and productivity of that plant species. As discussed above so consideration of this point study was conducted for selection of superior red and white fleshed guava genotypes for qualitative and yield attributes.

Materials and Methods

The experiment was conducted at Instructional-cum-Research Farm, Department of Horticulture, College of Agriculture, Latur, VNMKV, Parbhani (M.S.). During winter season of 2008-09, 2009-10 and 2010-11, on well-established four years old orchard of guava planted at 5.0 X 5.0 m. Total nine genotypes were identified for study viz., GRS_1, GRS_2, GRS_3, GRS_4, GWS_5, GWS_6, GWS_7, GWS_8 and L-49. Among them four genotypes were red fleshed (GRS) and four genotypes were white fleshed (GWS) and control. Ten fruits were randomly harvested from each plant for recording observations. Bio-chemical and yield parameters were taken in terms of The fruit bio-chemical characters was studied in terms TSS (^{0}B), acidity (%),ascorbic acid (mg/100g), total sugar (%), reducing sugar (%), non reducing sugar (%). Total soluble solid (TSS) was determined with the help of digital refractometer. Acidity was determined by titrating the juice against N/10 NaOH and expressed as per cent citric acid. Ascorbic acid content of fruit was determined with the help of the method given in A.O.A.C. 1995 and total sugar was analyzed as per method given by Lane and Eynon (1943). Reducing sugar and non reducing sugar was estimated as per method given by Ranganna (1997).

The data was statistically analyzed by method of analysis of variance using RBD with three replications as described by Panse and Sukhatme 1985.

Results and Discussion

Bio-chemical characters

There were significant differences in TSS of different genotypes of guava. It is evident from the results the highest TSS was found in genotype GWS_6 (12.45 ^{0}Brix), followed by genotype L-49 (11.72 ^{0}Brix) and genotype GRS_4 (11.49 ^{0}Brix). The lowest TSS was observed in genotype GRS_3 (9.34 ^{0}Brix) which was followed by genotype GRS_1 (9.43 ^{0}Brix). This might have enhanced the utilization of nutrients and accumulation of more carbohydrates into the fruits, which may be responsible for developing high value for above traits. Also the prevailing agro-climatic conditions of mid-hills were more favorable for quality fruit development. Many research workers, Athani *et al.,* (2007) revealed that TSS was the highest in cultivar GR-1 and Chittidar 11.50 and 11.60 ^{0}Brix, respectively). Deshmukh *et al.,* (2013) reported that the hybrid RCGH 1 recorded highest TSS (10.83ºB) while lowest in Lalit (9.59ºB) Singh and Jain (2007). It is evident from the

results the highest acidity was found in genotype GWS_8 and GWS_5 (0.47%), However, it was at par with genotype GRS_1 (0.46%) and genotype GWS_7 (0.44%), while, the lowest acidity (0.38%) was observed in genotype GRS_4, followed by genotype GWS_6 (0.40%), L-49 (0.42%). The increased acidity can be ascribed as due to increased CO_2 and associated bicarbonate content of the sap under low temperature. Similar observations have been reported by Biradar and Mukunda (2007) found the lowest acidity (0.27 %) in T.G. Sel. 5/12 of guava (Deshmukh *et al.,* 2013).

It is evident from the results the highest content of ascorbic acid (297.93 mg/100 g) was noted in genotype GWS_6, followed by genotype GRS_4 (278.47 mg/100 g). While the lowest ascorbic acid content was recorded in genotype GRS_3 (176.79 mg/100 g), followed by genotype GRS_1 (191.97 mg/100 g). The larger variation in ascorbic acid content may be attributed as a varietal character and due to favourability of seasonal conditions. Biradar and Mukunda (2007) found the Selection 5/10 was superior in ascorbic acid content (224.20 mg/100 g). Similar findings were also reported by Singh and Jain (2007) and Sharma *et al*., (2010).

The highest total sugar content (8.4%) was observed in genotype GWS_6, which was at par with genotype GRS_4 (8.07%). While the lowest total sugar was found in the genotypes GWS_8 (6.42%), followed by GRS_1 (6.60%). This was probably due to low rate of respiration under lower temperature. Similar observations have been reported by Deshmukh *et al.,* (2013) the highest total sugar was recorded in RCGH 1 (8.07%) followed by RCGH 7 (8.05%) while minimum in RCGH 4 (6.42 %) followed by Lalit (6.58 %). Total sugar (8.27 %) in A.C. Sel. 6/10 of guava was found by Marak and Mukunda (2007). Asrey *et al.,* (2007) studied guava cultivar Allahabad Safeda and found total sugar (7.50 %).

It is evident from the results the highest reducing sugar was noted in genotype GRS_4 (5.41%). However, it was at par with genotypes GRS_2 (5.26%) and GRS_1 (5.16%). The lowest reducing sugar was observed in GWS_5 (3.77%), followed by genotype GWS_8 (4.28%). it was observed that due to varied climatic condition of Maharashtra as compared to other part of the country. Reducing sugar (4.46%) in A.C. Sel. 6/10 of guava was found by Marak and Mukunda (2007).

The maximum non-reducing sugar content was present in genotype GWS_6 (3.28%). However, it was at par with L-49 (3.17). The least non-reducing sugar was present in genotype GRS_1 (1.44%), followed by genotype GRS_3 (2.18%). it was observed that due to varied climatic condition of Maharashtra as compared to other part of the country. Similar findings were also reported by Marak and Mukunda (2007).

Yield characters

The highest fruit yield per tree was observed in genotype GRS_4 (52.9 kg). However, it was at par with genotype L-49 (47.74 kg) and GWS_6 (47.21 kg). The lowest fruit yield per tree was found in genotype GWS_8 (17.27 kg) and it was followed by genotype GRS_1 (18.17 kg). The higher yield was due to more number of fruits per plant. Deshmukh *et al.,* (2013) recorded the fruit yield was recorded significantly highest RCGH 1 (39.05 kg/plant). Athani *et al.,* (2007) revealed that cultivar SR-2 recorded higher fruit yield (42 kg/tree). Babu *et al.,* (2007) reported the highest yield was recorded in Allahabad Safeda (20.40 kg/tree) followed by Sardar guava (19.50 kg/tree) and Selection-1 (18.80 kg/tree) (Table 1).

Table.1 Performance of various guava genotypes in respect to bio-chemical and fruit yield characters

Treatments	Genotypes	Pooled mean							
		TSS (^{0}Brix)	Acidity (%)	Ascorbic acid (mg/100g)	Total sugar (%)	Reducing sugar (%)	Non reducing sugar (%)	Yield (kg/tree)	Yield (Mt/ha)
T_1	GRS_1	9.43	0.44	191.97	6.60	5.16	1.44	18.17	7.26
T_2	GRS_2	9.93	0.43	199.66	7.6	5.26	2.33	29.04	11.61
T_3	GRS_3	9.34	0.46	176.79	7.03	4.73	2.18	25.13	10.05
T_4	GRS_4	11.49	0.38	278.47	8.07	5.41	2.66	52.9	21.15
T_5	GWS_5	11.38	0.47	218.50	6.42	3.77	2.64	20.09	8.03
T_6	GWS_6	12.45	0.40	297.93	8.4	5.11	3.28	47.21	18.88
T_7	GWS_7	11.29	0.46	238.97	7.58	4.84	2.73	27.28	10.91
T_8	GWS_8	10.40	0.47	201..65	6.42	4.28	2.24	17.27	6.90
T_9	L-49	11.72	0.42	247.38	7.54	4.44	3.17	47.74	19.09
	S.Em. $\pm$	0.19	0.01	3.12	0.16	0.12	0.08	2.29	0.91
	C.D. at 5%	0.54	0.04	8.63	0.44	0.33	0.22	6.34	2.52

Yield per hectare had significant differences among the genotypes of guava. The highest yield was observed in genotype GRS_4 (21.15 Mt/ha), which was at par with genotype L-49 (19.09 Mt/ha) and GWS_6 (18.88 Mt/ha). The lowest yield was noted in genotype GWS_8 (6.90 Mt/ha) and it was followed by genotype GRS_1 (7.26 Mt/ha). The higher yield was due to more number of fruits per plant. Many research workers, Reddy *et al.*, (1999) observed the highest total yield in L-49 (277.92 q/ha) and closely followed by Allahabad Safeda (238.12 q/ha). Similar study was conducted by Deshmukh *et al.*, (2013).

In conclusion, present investigation was found significant variation for bio-chemical characters like TSS, acidity, ascorbic acid, total sugar, reducing sugar and non-reducing sugar, among nine genotypes of guava. The highest TSS (12.45 ^{0}Brix), ascorbic acid content of fruit (297.93 mg/100 g), total sugar (8.4%) and non-reducing sugar (3.28%) content was present in white fleshed genotype GWS_6. Whereas, the highest reducing sugar (5.41%) and the lowest acidity (0.38%) was noted in red fleshed genotype GRS_4.

A perusal of data indicated that fruit yield attributes significantly differed among the genotypes. The highest fruit yield per tree (52.9 kg) and yield (21.15 Mt/ha) were observed in genotype GRS_4. However, it was at par with genotype L-49 (47.74 kg and 19.09 Mt/ha respectively). Among those guava genotypes studied, GRS_4 of red fleshed and GWS_6 of white fleshed genotypes including L-49 are found to be suitable for further improvement.

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