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Variability studies in red flesh guava (*Psidium guajava* L.) genotypes for growth, yield and quality attributes

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ABSTRACT : Nine red flesh guava genotypes *viz.*, FRSG-R_1, FRSG-R_2, FRSG-R_3, FRSG-R_4, FRSG-R_5, FRSG-R_6 FRSG-R_7, FRSG-R_8 and Lalit showed wide range of variation with respect to plant growth, yield and quality traits of fruit. However, the genotype FRSG-R_4 was found to be significantly superior in height of tree while, genotype Lalit was significantly superior in plant spread. The genotype Lalit had significantly higher weight of pulp and pulp percentage of fruit. The genotype Lalit had significantly higher TSS, ascorbic acid, total sugar and non-reducing sugar while, the genotypes FRSG-R_2 had the highest reducing sugar. On the basis of different characteristics, genotypes FRSG-R_6 and Lalit were found to be suitable for further improvement.

KEY WORDS : Guava genotypes, Variability, Yield, Quality characters

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Guava (*Pisidium guajava* L.) belongs to the family Myrtaceae is one of the important fruit crop of India. Besides India, it is grown widely throughout the tropics of the world. Because of its better adoptability, guava is eulogized as 'the apple of tropics'. Guava fruit is rich in 'vitamin-C' and minerals like calcium, iron and phosphorus with pleasant aroma. It is popular fruit of India due to its delightful taste, flavor and easy availability. Guava can resist water logged condition to a greater extent than the other fruit crops and also withstand maximum temperature upto 45^0 C. Due in part to its ability to grow on a variety of soils and across a range of climates, guava has become invasive. Plant growth, yield and physico-chemical attributes are important parameters to study the variability among the different fruit crops. The present study was undertaken for evaluation of different characters of red flesh guava genotypes and variability among them.

RESEARCH METHODS

Nine genetically diverse red fleshed guava genotypes viz. FRSG-R_1, FRSG-R_2, FRSG-R_3, FRSG-R_4, FRSG-R_5, FRSG-R_6 FRSG-R_7, FRSG-R_8 and Lalit, were evaluated with respect to growth, yield and quality traits of fruit at Fruit Research Station Aurangabad, Marathwada Krishi Vidyapeeth Parbhani (M.S.) on well established fourteen years old orchard of guava planted at 6.0 x 6.0 m in winter season of year 2011-12. Observation was made on growth characters such as height of plant (m), spread of plant (m), girth of stem (cm) and yield contributing characters *viz.*, size of fruit (cm), volume of fruit (ml), weight of pulp (g), weight of seed per fruit (g), number of fruit per plant, weight of fruit (g) and yield (kg/plant) and physical and chemical charcters like colour of fruit skin, colour of pulp, shape of fruit, T.S.S. (°Brix), acidity (%), ascorbic acid (mg / 100 g pulp), total sugar (%), reducing sugar (%) and non reducing sugar (%). The average values for each trait were worked out from the data of these fruits, which were then subjected to statistical analysis by method of analysis of variance using Randomized Block Design.

RESEARCH FINDINGS AND DISCUSSION

Data showed (Table 1, 2 and 3) that genotypes differed significantly with respect to their growth, yield and physico-chemical attributes. It is evident from the results (Table 1) that genotype FRSG-R_4 had the maximum height of tree (4.29 m), followed by genotype FRSG-R_1 (4.25 m) with minimum in genotype FRSG-R_7 (2.70 m). The maximum height of tree might be due to the capacity of the plant root zone to absorb more nutrient matter causes vigorous growth. Smita (2005) reported similar finding. The plant spread recorded highest in genotype Lalit (4.01and 4.57m) while, genotype FRSG-R_3 recorded the lowest value (1.70 and 1.80m). This difference might be also due to individual growth behavior of different genotypes (Dubey *et al*., 2000). Stem girth varied from 30.34 cm in genotype Lalit to 57.00 cm in genotype FRSG-R_5. Among all nine genotypes, maximum number of fruits per tree was recorded by genotype FRSG-R_7 (350.00), followed by genotype FRSG-R_6 (335.00) and minimum number of fruits per plant was recorded in genotype Lalit (138.33). Findings of Smita (2005) support present results. The maximum weight of fruit was recorded in Lalit (106.61 g) and the minimum weight of fruit was found in genotype FRSG-R_7 (32.35 g). The highest yield per plant was recorded in genotype Lalit (14.94 kg/plant) while, lowest fruit yield per plant was found in genotype FRSG-R_2 (5.93 kg/plant). The higher yield was due to maximum spread of the plant produced more number of fruits per plant with greater size of fruit. Singh (2003) and Smita (2005) reported similar variations among the different genotypes of guava studied.

The results (Table 2) revealed variation in colour of fruit. The fruits of genotype FRSG-R_1 and FRSG-R_8 yellowish green, FRSG-R_2 and FRSG-R_6 yellow, FRSG-R_4 and FRSG-R_7 were whitish green in colour whereas, FRSG-R_5 greeenish and Lalit showed whitish yellow coloured fruits. This might be caused due to the genetical differences among the genotypes of guava. Similar study was conducted by Singh and Singh (2000) and Smita (2005). Among nine genotypes, light pink colour of pulp was observed in genotypes FRSG-R_1, FRSG-R_2 and FRSG-R_5, while genotype FRSG-R_4, FRSG-R_6 and Lalit were medium pink coloured and genotypes FRSG-R_3, FRSG-R_7 and FRSG-R_8 noted dark pink colour of

Table 1 : Performance of various red flesh guava genotypes for growth and yield characters

Genotypes	Height of plant (m)	Spread of plant (m)		Stem girth (cm)	Number of fruits/plant	Weight of fruit (g)	Yield/ plant (kg)
		N-S	E-W				
FRSG-R_1	4.25	2.16	2.30	42.28	224.60	40.45	8.96
FRSG-R_2	4.10	2.75	3.23	47.40	169.0	35.31	5.93
FRSG-R_3	3.43	1.70	1.80	41.66	293.33	33.33	9.79
FRSG-R_4	4.29	3.16	3.36	38.67	296.65	34.65	10.10
FRSG-R_5	4.10	2.06	2.58	57.0	170.0	42.60	7.03
FRSG-R_6	3.33	3.26	3.46	35.32	335.0	44.69	14.64
FRSG-R_7	2.70	2.03	2.16	40.30	350.0	32.35	11.26
FRSG-R_8	3.81	3.0	2.53	49.0	160.0	44.56	6.76
Lalit	3.81	4.01	4.57	30.34	138.33	106.61	14.91
Mean	3.76	2.68	2.89	42.44	237.44	46.06	9.93
S.E.+	0.28	0.33	0.32	3.97	22.52	5.44	0.92
C.D. (P=0.05)	0.85	1.01	0.97	11.88	67.42	16.28	2.76

Table 2 : Performance of various red flesh guava genotypes for physical characters of fruits

Genotypes	Length of fruit (cm)	Breadth of fruit (cm)	Weight of pulp (g)	Pulp content (%)	Volume of fruit (ml)	Weight of seed per fruit (g)	Colour of pulp	Colour of fruit	Shape of fruit
FRSG-R_1	4.96	5.23	24.72	61.20	41.66	2.46	Light pink	Yellowish green	Ovate
FRSG-R_2	4.30	4.10	21.86	65.73	38.55	2.08	Light pink	Yellow	Round
FRSG-R_3	4.40	4.10	21.33	64.30	35.69	2.10	Dark pink	Whitish yellow	Ovate
FRSG-R_4	5.23	2.93	24.66	71.56	33.29	1.72	Medium pink	Whitish green	Pyriform
FRSG-R_5	5.20	3.09	30.67	73.96	44.36	1.84	Light pink	Greenish	Pyriform
FRSG-R_6	6.16	4.96	32.60	73.03	48.40	2.26	Medium pink	Yellow	Pyriform
FRSG-R_7	3.66	3.96	20.84	64.88	35.67	2.43	Dark pink	Whitish green	Round
FRSG-R_8	6.10	4.83	31.25	69.83	48.65	2.32	Dark pink	Yellowish green	Pyriform
Lalit	6.0	5.86	95.10	84.18	107.00	3.35	Medium pink	Whitish yellow	Round
Mean	5.11	4.34	33.65	69.85	48.14	2.28	-	-	-
S.E.+_	0.24	0.31	4.43	1.49	3.53	0.08	-	-	-
C.D. (P=0.05)	0.72	0.93	13.27	4.48	10.59	0.25	-	-	-

Table 3 : Performance of various red flesh guava genotypes for chemical characters of fruits

Genotypes	TSS (^{0}Brix)	Acidity (%)	Ascorbic acid (mg/100g)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)
FRSG-R_1	9.20	0.47	192.86	6.65	5.44	1.21
FRSG-R_2	10.16	0.43	187.93	7.08	5.91	1.17
FRSG-R_3	9.13	0.48	159.36	5.67	4.34	1.33
FRSG-R_4	9.66	0.43	169.96	6.42	4.87	1.55
FRSG-R_5	9.83	0.44	173.33	6.43	5.16	1.27
FRSG-R_6	10.73	0.42	194.37	6.81	5.58	1.23
FRSG-R_7	8.86	0.47	177.27	5.81	4.34	1.47
FRSG-R_8	10.13	0.41	179.58	6.65	5.33	1.32
Lalit	11.56	0.42	285.12	7.36	5.68	1.68
Mean	9.90	0.44	191.09	6.54	5.18	1.36
S.E. $\pm$	0.26	0.01	10.60	0.22	0.32	0.23
C.D. (P=0.05)	0.78	0.04	31.75	0.66	0.96	0.69

pulp. The intensity of pink colour is depending on content of lycopene in fruit. Similar observations have been reported by Smita (2005).

Round shape was observed in fruits of genotypes FRSG-R_2 FRSG-R_7, Lalit, while pyriform shaped fruits in genotypes FRSG-R_4, FRSG-R_5, FRSG-R_6, FRSG-R_8 and oval shape were in FRSG-R_1 and FRSG-R_3. The highest length of fruit was recorded in genotype FRSG-R_6 (6.16cm) and lowest in genotype FRSG-R_7 (3.66cm). The highest breadth of fruit was found in genotype Lalit (5.86cm) and least value in genotype FRSG-R_4 (2.93cm).

The highest weight of pulp was recorded in genotype Lalit (95.10g), while the lowest in genotype FRSG-R_7 (20.84g). It may be due to the less number of seeds and minimum size of seed. The highest pulp per cent recorded in genotype Lalit (84.18%) and the lowest value was recorded for genotype FRSG-R_1 (61.20%). The higher pulp per cent was due to the more pulp area or bigger size of fruit. Tandon *et al*. (1983) found similar results.

The highest volume of fruit for red flesh was recorded in genotype Lalit (107ml) while the lowest value in genotype FRSG-R_4 (33.29 ml).This study is in close conformity with the findings of Dhillon *et al.* (1987) and Singh and Singh (2000). The perusal of the data on weight of seeds per fruit had shown a wide range of variation from 1.72 to 3.35 g among the genotypes. Similar variation was noted by Tandon *et al.* (1983).

The chemical analysis of fruit (Table 3) in terms of T.S.S. (°Brix), acidity (%), ascorbic acid (mg / 100 g pulp), total sugar (%), reducing sugar (%), non reducing sugar (%) revealed that the highest TSS was recorded in Lalit (11.56 ^{0}Brix), followed by genotype FRSG-R_6 (10.73^{0}Brix). The lowest (8.86 ^{0}Brix) TSS was noted in genotype FRSG-R_7. Singh (2003) reported similar variation in TSS among the genotypes of guava. The maximum acidity in genotype FRSG-R_3 (0.48%) while, minimum acidity was observed in genotype FRSG-R_8 (0.41%). The results evaluated shows that the highest ascorbic acid (285.12 mg/100g) in Lalit and lowest ascorbic acid (159.36 mg/100 g) was in FRSG-R_3 genotype. The maximum total sugar in genotype Lalit (7.36%), followed by genotype FRSG-R_2 (7.08%) and genotype FRSG-R_3 (5.67%) recorded lowest value. The highest reducing sugar was observed in genotype FRSG-R_2 (5.91%) followed by genotype Lalit (5.68%) and the lowest reducing sugar was observed in genotypes FRSG-R_3 and FRSG-R_7 (4.34%). The highest non-reducing sugar content in genotype was present in Lalit (1.68%) and the lowest non-reducing sugar was present in genotype FRSG-R_2 (1.17%). These findings are similar with those of Singh and Singh (2000). In the present investigation, it was observed that physico-chemical characteristics of fruits differed due to differences in genetic makeup of the genetypes.

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