

Evaluation of guava varieties for growth, yield and quality attributes in Malwa Plateau conditions of Madhya Pradesh

Manoj K. Mahour, Rajesh Tiwari* and B.S. Baghel

Department of Fruit Science, College of Horticulture, RVSKVV, Mandsaur 458 001, Madhya Pradesh

ABSTRACT

The performance of different varieties/germplasm of guava was assessed under Malwa Plateau conditions of Madhya Pradesh, viz., Dharidar, Chittidar, Apple colour, Rewa-72, Lucknow-49, Allahabad Safeda, Gwalior-27, Surkhi, Anakapalli, Godhliwala, Chaitpur, Nasik, Dharwar, Lal Guda, Smooth Green, Chitabuwala, Abuwala, Supreme Side Malta, China Red and China White. Observations with respect to growth parameters were taken during the month of June-July where as fruit characters were recorded at the time of harvesting in December-January. The plant height was maximum in Dharidar (2.99 m) and minimum in China White (1.43 m). Canopy spread of the tree in North-South and East-West directions varied from 0.93-1.30 m and 0.81-1.20 m, respectively. The range of leaf size in terms of length and width was from 5.13-15.34 cm and 1.65- 6.74 cm, respectively in different varieties. Maximum fruit size was observed in Allahabad Safeda (8.79 cm × 8.44 cm) and minimum in China Red (3.57 cm × 3.56 cm). However, fruit weight varied from 31.0 to 235.0 g depending on cultivar and it was maximum in Allahabad Safeda (235.0 g) and minimum in China Red (31.0 g). Total pulp content was maximum in Allahabad Safeda (97.74%) and minimum in China Red (85.91%). The seed content was maximum in China red (14.09%). Besides, there were significant variation with regards to yield, vitamin-C, TSS and acidity in different cultivars. However, overall performance of the different cultivars that Allahabad Safeda, Lucknow-49, Rewa-72, Dharidar, Apple Colour and Gwalior-27 are promising for cultivation in Malwa Plateau conditions of Madhya Pradesh.

Key words: Guava, cultivars, growth, yield, quality.

INTRODUCTION

The guava (*Psidium guajava* L.) is the member of the family Myrtaceae and it is one of the most important commercial fruits of India. Guava has earned the popularity as 'Poorman's apple' available in plenty to every person at very low price during the season. It is no inferior to apple for its nutritive values. It is pleasantly sweet and refreshingly acidic in flavour and emits sweet aroma. It is wholly edible along with the skin. Several delicious preserved products like jam, jelly, cheese, puree, ice cream, canned fruit and Sharbat are prepared from ripe fruits of guava. Guava juice wine and guava pulp wine are also prepared from guava fruits (Bardiya *et al.*, 2). The seeds yield 3 to 13% oil, which is rich in essential fatty acids and can be used as salad dressing. In some countries the leaves are used for curing diarrhoeas and also for dyeing and tanning. It is an excellent source of vitamin 'C' and pectin. Studies were undertaken to find out variation in growth, physico-chemical and yield characters of 20 varieties/germplasm under Malwa Plateau conditions of Madhya Pradesh, which can be further used for improvement.

MATERIALS AND METHODS

The study was carried out at Instruction *cum* Research Fruit Orchard of College of Horticulture, Mandsaur (MP) during the year 2009-10. Twenty varieties/germplasm of guava were selected for this study in 5-year-old orchard. The varieties were- Dharidar, Chittidar, Apple colour, Rewa-72, Lucknow-49, Allahabad Safeda, Gwalior-27, Surkhi, Anakapalli, Godhliwala, Chaitpur, Nasik, Dharwar, Lal Guda, Smooth Green, Chitabuwala, Abuwala, Supreme Side Malta, China Red and China White. Planting was done at the distance of 6 m × 6 m during 2006 and uniform cultural practices were provided for all cultivars. Observation with respect to growth parameter was taken during June-July, whereas observation on fruit characters were recorded at the time of harvesting. Plant height was measured with the help of ranging rod in metre. The mature fruits were taken randomly from all direction of the plants from each variety and observation was recorded with respect to fruit characteristics. Five fruits were randomly selected from the lot of harvested fruits for recording the data. The fruits were weighed and volume of fruits was determined by water displacement method. The fruit shape was recorded visually, whereas fruit size was recorded by measuring length and diameter of fruits

*Corresponding author's E-mail: rt_jnkvv@yahoo.com

with the help of Vernier callipers. Pulp per cent was calculated by dividing weight of fruit with its seed weight. The TSS of pulp was determined with the help of refractometer. Acidity was estimated by simple acid-alkali titration method suggested by AOAC (1). However the quality parameters such as, reducing sugar, non-reducing sugar, total sugars and ascorbic acid contents were analysed by using standard methods suggested by AOAC (1). The statistical analysis was done according to methods given by Snedecor and Cochran (11).

RESULTS AND DISCUSSION

Data pertaining to plant height (Table 1) revealed that it was maximum in Dharidar (2.99 m) followed

by Apple Colour (2.96 m), Anakapalli (2.94 m) and Chittidar (2.91 m), whereas minimum was recorded in China White (1.43 m). Maximum canopy spread in North-South direction was recorded in Chittidar (1.30 m) followed by Nasik (1.29 m) and Apple Colour (1.27 m) where as minimum was found in Surkhi (0.81 m) followed by Lal Guda (0.86 m) and China White (0.93 m). Canopy spread in East-West direction varied from 0.68 m to 1.20 m. The maximum spread in East-West direction was noted in Chittidar (1.20 m) followed by Dharidar (1.17 m) and Nasik (1.16 m) and minimum was observed in Surkhi (0.68 m) followed by Lal Guda (0.80 m) and Chaitpur (0.81 m). Leaf length and width was varied from 15.34 to 4.88 cm and 6.74 to 1.65 cm, respectively depending on cultivars with maximum

Table 1. Mean vegetative growth parameters of different guava germplasm.

Variety	Plant height (m)	Canopy spread (m)		Leaf size (cm)	
		N-S	E-W	Length	Width
Dharidar	2.99	1.26	1.17	13.39	5.90
Chittidar	2.91	1.30	1.20	09.44	3.90
Apple Colour	2.96	1.27	0.99	10.89	4.10
Rewa-72	2.35	1.10	0.97	12.01	4.98
Lucknow-49	2.36	1.10	0.96	11.91	4.89
Allahabad Safeda	2.37	1.15	1.04	12.73	5.62
Gwalior-27	2.40	1.12	0.92	11.40	4.85
Surkhi	2.24	0.81	0.68	10.39	4.15
Anakapalli	2.94	1.21	1.11	12.39	5.01
Godhliwala	2.50	1.06	0.96	12.89	5.19
Chaitpur	2.08	0.90	0.81	12.35	4.67
Nasik	2.65	1.29	1.16	13.88	5.30
Dharwar	2.71	1.03	0.90	12.73	5.45
Lal Guda	1.89	0.86	0.80	11.80	5.20
Smooth Green	2.77	1.05	0.91	15.34	6.74
Chait Abuwala	2.06	0.96	0.82	12.99	4.81
Abuwala	2.22	1.03	0.98	10.47	4.24
Supreme Side Malta	2.42	1.11	0.92	14.83	5.87
China Red	1.87	1.03	0.99	05.13	1.82
China White	1.43	0.93	0.92	04.88	1.65
Mean (x)	2.40	1.08	0.96	11.59	04.72
SD (σ)	0.41	0.14	0.13	02.60	01.20
CV (%)	17.08	12.96	13.54	22.43	25.42
SE	0.09	0.03	0.03	00.58	00.27
UCL	2.60	1.15	1.02	12.84	05.29
LCL	2.21	1.01	0.90	10.34	04.14

leaf length in Smooth Green (15.34 cm), followed by Supreme Side Malta (14.83 cm) and Nasik (13.88 cm) and minimum under China White (4.88 cm) followed by China Red (5.13 cm) and Chittidar (9.44 cm) and maximum leaf width in Smooth Green (6.74 cm) followed by Dharidar (5.90 cm) and Supreme Side Malta (5.87 cm) and minimum under China White (1.65 cm) followed by China Red (1.82 cm) and Chittidar (3.90 cm). Variation of plant growth characters in different cultivars/germplasm is a genetic feature of individual genotype.

Fruit size is an important component of yield. The data on fruit size in terms of length and diameter of fruits shows significant variation among genotypes

(Table 2). The fruit length ranged from 3.57 to 8.79 cm. and maximum fruit length was observed in Allahabad Safeda (8.79 cm) followed by Nasik (7.94 cm), Lucknow-49 (7.54 cm), Smooth Green (7.38 cm) and Chittidar (7.11 cm), whereas minimum fruit length was observed in China Red (3.57 cm) followed by China White (3.63 cm), Godhliwala (5.27 cm), Chaitpur (5.61 cm), Lal Guda (5.63 cm), Abuwala (6.07 cm) and Surkhi (6.08 cm). The fruit diameter ranged from 3.56 to 8.44 cm. Maximum fruit diameter was noted in Allahabad Safeda (8.44 cm) followed by Rewa-72 (7.30 cm), Lucknow-49 (7.29 cm), Dharidar (7.24), Supreme Side Malta (7.00 cm) and Chait Abuwala (6.96 cm) whereas minimum fruit diameter

Table 2. Yield and yield attributes of different guava cultivars.

Variety	Fruit size (cm)		Fruit wt. (g)	Pulp content (%)	Seed content (%)	Seed/pulp ratio	Pulp thickness (cm)	Yield/tree (kg)
	Length	Diameter						
Dharidar	7.06	7.24	220.00	95.53	4.47	1:21.4	1.64	35.31
Chittidar	7.11	6.69	160.40	97.42	2.58	1:37.8	1.69	19.41
Apple Colour	6.15	6.91	158.40	95.60	4.40	1:21.8	1.81	20.75
Rewa-72	6.92	7.30	202.00	96.36	3.64	1:27.2	1.70	29.29
Lucknow-49	7.54	7.29	224.40	96.70	3.30	1:29.4	1.35	40.39
Allahabad Safeda	8.79	8.44	235.00	97.74	2.26	1:43.3	1.40	39.95
Gwalior-27	6.83	6.79	158.40	95.60	4.40	1:22.8	1.46	19.96
Surkhi	6.08	5.06	082.42	91.35	8.64	1:10.6	0.94	07.25
Anakapalli	6.18	6.95	204.60	94.04	5.96	1:15.6	1.53	28.64
Godhliwala	5.27	5.81	108.72	92.80	7.20	1:13.0	1.05	09.49
Chaitpur	5.61	5.71	114.50	94.68	5.32	1:17.6	1.34	10.65
Nasik	7.94	6.29	160.80	95.10	4.90	1:19.6	1.50	16.88
Dharwar	6.22	6.25	132.00	94.40	5.60	1:17.6	1.58	09.77
Lal Guda	5.63	6.18	121.20	95.63	4.37	1:22.0	1.22	12.73
Smooth Green	7.38	6.67	191.20	96.00	4.00	1:24.0	1.29	19.50
Chait Abuwala	6.55	6.96	179.60	96.10	3.90	1:24.7	1.48	31.25
Abuwala	6.07	6.42	144.80	95.90	04.10	1:23.4	1.68	16.22
Supreme Side Malta	6.82	7.00	169.20	95.62	04.38	1:21.9	1.65	29.27
China Red	3.57	3.56	031.00	85.91	14.09	1:06.1	0.75	03.66
China White	3.63	3.73	034.20	88.79	11.21	1:08.0	0.67	03.21
Mean (x)	06.37	06.36	151.64	94.56	05.44	21.39	01.38	20.18
SD (σ)	01.23	01.14	56.07	02.83	02.83	08.77	00.31	11.21
CV (%)	19.31	17.92	36.98	02.99	52.39	41.00	22.46	55.55
SE	00.28	00.25	12.54	00.63	00.63	01.96	00.07	02.51
UCL	06.96	06.91	178.57	95.92	06.79	25.60	01.54	25.56
LCL	05.78	05.82	124.72	93.21	04.08	17.18	01.24	14.80

was observed in China Red (3.56 cm) followed by China White (3.73 cm), Surkhi (5.06), Chaitpur (5.71), Godhliwala (5.81 cm) and Lal Guda (6.18 cm). The maximum average fruit weight was recorded in variety Allahabad Safeda (235.00 g) followed by Lucknow-49 (224.40 g), Dharidar (220.00 g), Anakapalli (204.60 g) and Rewa-72 (202.00 g), whereas minimum fruit weight was recorded in China Red (31.00 g) followed by China White (34.20 g), Surkhi (82.42 g), Godhliwala (108.72 g), Chaitpur (114.50 g) and Lal Guda (121.20 g). Although the size of the fruit is a varietal character it may be in some extent influenced by the total number of fruits born on the tree, soil moisture, source sink relation and other factors.

The physical composition of fruits differed significantly among varieties/germplasm. The variety Allahabad Safeda gave the highest pulp percentage followed by Chittidar, Lucknow-49, Rewa-72, Chait Abuwala and Smooth Green, whereas, the variety China Red had the lowest pulp percentage followed by China White, Surkhi, Godhliwala, Anakapalli and Dharwar with average mean 94.56. The variety China Red have highest seed percentage followed by China White, Surkhi, Godhliwala, Anakapalli and Dharwar, whereas Allahabad Safeda contain the lowest seed percentage. The maximum seed:pulp ratio was recorded in Allahabad Safeda followed by Chittidar and Lucknow-49 whereas, the least ratio was found in China Red followed by Surkhi and Godhliwala. Highest yield per tree was obtained from Lucknow-49 (40.39 kg) followed by Allahabad Safeda (39.95 kg), Dharidar (35.31 kg), Chaitabuwala (31.25 kg), Rewa-72 (29.29 kg), Supreme Side Malta (29.27 kg) and lowest yield per tree was observed in China White (3.21 kg). The variation amongst the varieties/germplasm as regards to number of fruits per plant, average fruit weight and yield per plant might be due to genetic variability, inherent characters and climatic adaptability in a particular region, which might prove an important diagnostic character for selection of varieties/germplasm for local conditions. In many varieties number of fruit increased but fruit yield decreased. This may be due to distribution and diversion of available food material in more number of fruits. Varietal variations for physical characters have also been reported by Chatterjee *et al.* (3), Sharma *et al.* (7), Reddy *et al.* (6), Singh (9), Patel *et al.* (5), Gohil *et al.* (4), Singh and Jain (10), and Singh *et al.* (8).

The data presented in Table 3 indicates that TSS, acidity, reducing sugar, non reducing sugar, total sugars and ascorbic acid contents showed significant variation among genotypes. The acidity percentage in fruits of different varieties/germplasm was ranged

from 0.16 to 2.75%, but the maximum acidity was found in Dharwar (2.75%) followed by China White (0.67%), Rewa-72 (0.56%), while minimum acidity was observed in Surkhi (0.16%). The TSS of pulp of fruits of different varieties/germplasm of guava ranged from 4.0 to 11.50°Brix, the maximum TSS was found in Anakapalli (11.50°Brix) followed by Apple colour (10.00°Brix) and Allahabad Safeda (9.00°Brix) whereas, the minimum TSS was found in Dharwar (4.00°Brix). The total sugars in pulp of fruits of different varieties/germplasm ranged from 5.4 to 8.2%, but the maximum total sugars was found in Apple Colour (8.2%) followed by Abuwala (7.9%), China Red (7.9%), Godhliwala (7.8%) and Surkhi (7.8%), whereas, the minimum total sugars was found in Chittidar (5.4%). The reducing sugar of different varieties/germplasm range from 2.5 to 4.4% and maximum reducing sugars was found in Abuwala (4.4%) followed by Allahabad Safeda (4.3%) and China Red (4.2%), whereas, minimum reducing sugar was found in Dharwar (2.5%) and Rewa-72 (2.5%). The non-reducing sugar of different varieties/germplasm ranges from 1.9 to 4.6%, but the maximum non reducing sugar was found in Surkhi (4.6%) followed by Godhliwala (4.4%) and Rewa-72 (4.3%), whereas the minimum non-reducing sugar was found in Chittidar (1.9%). The ascorbic acid of different varieties/germplasm ranges from 125.0 to 280.8 mg/100 g pulp, but the maximum ascorbic acid was found in Lucknow-49 (280.8 mg/100 g pulp) followed by Allahabad Safeda (272.1 mg/100 g pulp) and Dharidar (270.7 mg/100 g pulp), whereas, the minimum ascorbic acid was found in Dharwar (125.0 mg/100 g pulp). The higher and lower values for all these characters showed inheritance, which is quite helpful in finding the suitable elite types as per requirements. The over all superiority of Allahabad Safeda and Lucknow-49 might be due to genetic make up which got favourable microclimate in Malwa Plateau to express the characteristics. Findings confirmed fact that Allahabad Safeda and Lucknow-49 varieties possess good quality characters and superior over all variety/germplasm under this study. These results are in agreement with the findings of Chatterjee *et al.* (3), Sharma *et al.* (7), Reddy *et al.* (6), Singh (9), Patel *et al.* (5), Gohil *et al.* (4), Singh and Jain (10), and Singh *et al.* (8).

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Table 3. Quality attributes of different guava cultivars.

Variety	Acidity (%)	TSS (°Brix)	Total sugars (%)	Reducing sugar (%)	Non reducing sugar (%)	Ascorbic acid (mg/100 g pulp)
Dharidar	0.26	06.50	6.9	3.1	3.8	270.7
Chittidar	0.30	05.50	5.4	3.5	1.9	242.3
Apple Colour	0.53	10.00	8.2	4.1	4.1	240.5
Rewa-72	0.56	05.50	6.8	2.5	4.3	220.7
Lucknow-49	0.54	08.00	5.7	2.8	2.9	280.8
Allahabad Safeda	0.29	09.00	6.5	4.3	2.2	272.1
Gwalior-27	0.41	07.50	7.3	3.2	4.1	250.0
Surkhi	0.16	05.00	7.8	3.2	4.6	260.9
Anakapalli	0.36	11.50	6.5	3.5	3.0	213.3
Godhliwala	0.42	04.50	7.8	3.4	4.4	191.2
Chaitpur	0.44	06.50	6.7	3.8	2.9	255.0
Nasik	0.52	07.50	6.3	3.3	3.0	169.1
Dharwar	2.75	04.00	5.9	2.5	3.4	125.0
Lal Guda	0.26	05.60	6.0	3.3	2.7	176.5
Smooth Green	0.42	08.40	7.1	3.6	3.5	233.9
Chait Abuwala	0.19	04.90	7.2	4.0	3.2	204.4
Abuwala	0.52	05.40	7.9	4.4	3.5	255.9
Supreme Side Malta	0.36	06.80	6.7	2.9	3.6	260.7
China Red	0.47	06.60	7.9	4.2	3.7	260.4
China White	0.67	08.50	6.6	3.4	3.2	262.2
Mean (x)	00.52	06.86	06.86	03.45	03.40	232.28
SD (σ)	00.53	01.90	00.77	00.54	00.69	039.92
CV (%)	101.92	27.70	11.22	15.65	20.29	017.19
SE	00.12	00.42	00.17	00.12	00.16	08.920
UCL	00.77	07.77	07.23	03.71	03.73	251.44
LCL	00.27	05.95	06.49	03.19	03.07	213.11

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