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Evaluation of Mango (*Mangifera indica* L.) Cultivars on the Basis of Quality Characters of Fruit under Faizabad Condition

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A B S T R A C T

Keywords	The observations were recorded on physico-chemical characters of mango fruits. The maximum fruit length was recorded in Samarbehist Chausa, whereas the highest fruit breadth was recorded in Bombay Green. The maximum fruit weight, fruit volume, pulp weight and pulp: stone ratio and minimum stone weight were recorded in Banarasi Langra. Better quality fruits with respect to highest total soluble solids, reducing sugars and lowest acidity percentage were recorded in samarbahist Chausa. The highest ascorbic acid and total sugars were recorded in Banarasi Langra, while, the maximum non-reducing sugar was recorded in Rataul. Overall it can be concluded on the basis of quality of fruits, Bombay Green and Gulab Khas were observed as early variety whereas Dashehari, Banarasi Langra and Langra Kukori as mid-season variety and Samabahist Chausa as a late variety to be found best under Faizabad condition. These varieties possess good quality characters and superior overall the varieties under this study.
Mango, Cultivars, Peel, Pulp, Fruit, Sugar	
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Introduction

Mango (*Mangifera indica* L.) is also known as "King of fruits" and "National fruit of India". It belongs to the family Anacardiaceae. The mango is indigenous to north-east India and north Myanmar in the foot-hills of the Himalayas, and is said to have originated in the Indo-Burma region. Mango is one of the most preferred, widely distributed, and broadly grown tropical fruit in the world. Mangoes are gaining commercial importance in all over the world and assume a leading position in among the fruits. Although a tropical fruit, the mango grows equally well under semi-tropcal conditions. Due to the long history of cultivation in this subcontinent, about a thousand cultivars of mango are known to exist in India. The fruit quality is attributed to its physical characteristics, especially the color of skin and fruit's shape and size. The fruit skin is smooth, thick and commonly yellow or greenish in color when matured. The quality attributes such as colour, shape, size and flavour should be maintained in newly evolved varieties so that India can increase its presence in the international market (Thulasiram *et al.,* 2016).

All the parts of its plant have various uses in India. Both ripe and unripe mangoes are used extensively by food processing industry to

prepare a wide variety of products such as syrup, jam, squash, juice, cereal flakes and toffee etc., from ripe mango. Pickles, chutney, slices, amchur, candy, jam, jelly preserve, squash etc., from unripe mango (Meena *et al.,* 2005).

Mangoes are rich source of vitamin-A and also contains of vitamin-B, vitamin-C, calcium, iron, potassium in fair amount. Mangoes have more carotenoids than most of other fruits. Carotenoids help to reduce the risk of cancer and heart diseases. Chemical composition of mango differs with the variety and stage of maturity. A comprehensive report has been made on the chemical composition after analysis of more than 25 varieties of mango (Anonymous, 1966). According to this report, chemical constituents in mango are moisture (73.0-86.7%), carbohydrate (11.6-24.3%), protein (0.3-1.0%), fat (0.1-0.8%), minerals (0.3-0.7%) per cent, vitamin A (650-25940 I.U./100g), vitamin C (3-83 mg/100g), calcium (0.01%), phosphorus (0.02%) and iron (4.5 mg/100g).

In Uttar Pradesh, the popular commercial cultivars are grown viz. Bombay Green, Dashehari, Fajri, Langra, Safeda Lucknow, Chausa, Ratual, Amarpalli and Malihabadi. These cultivars are gaining popularity due to attractive colour, pleasant flavor, taste, sugars, less fibers and pulpiness. Through these cultivars are grown all over the country but Uttar Pradesh is the leading producer of these cultivars.

In general, the cultivars are location-specific and the commercial cultivars of one region do not do so well when grown in other areas. Uttar Pradesh is divided into 9 agro- climatic zones in which Faizabad comes under eastern plain zone, therefore, there is need to evaluate the recommend variety which can be successfully grown as well as prove to be profitable for this zone.

Materials and Methods

The experiment was carried out at Main Experimental Station, Department of Horticulture, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (U.P.) during the year 2015-16. Geographically it is situated at 26^0-47^0N latitude, 82.12^0E longitude of 113 meter above from mean sea level. This site is located in typical saline-alkaline belt of indigenous plains of eastern Uttar Pradesh. This region is characterized by sub-humid and sub-tropical climate. Approximately, 1200 mm precipitation occurs, out of which about 85 per cent is concentrated from mid-June to end of September.

The experiment on mango was conducted in Randomized Block Design (RBD) with twelve treatments were Each variety was replicated thrice and spaced at a distance of 10×10 m. Plants were of uniform in age (22 years) and received same cultural practices during the course of investigation. The Selected varieties were Dashehari, Banarasi Langra, Langra Kukori, Bombay Green, Nisar Pasand, Gulab Khas, Himsagar, Lucknow Safeda, Rataul, Gaurjeet, Samarbahist Chausa and Zardalu and used as treatments T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9, $T_{10,}$ T_{11} and T_{12} respectively.

The observations were recorded on physico-chemical characters of fruit as length of fruit (cm), breadth of fruit (cm), fruit weight (g), volume of fruit (cm^3), pulp weight (g), stone weight (g), pulp/stone ratio, total soluble solids (%), acidity (%), ascorbic acid content (mg/100g), reducing sugar (%), non-reducing sugar (%) and total sugar (%).

Results and Discussion

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

Physical characters of fruit

A careful investigation of the data showed that there was significant variation in fruit length and fruit breadth among the cultivars. The maximum fruit length was recorded in Samarbahist Chausa (9.37cm) which was at par with the Dashehari (9.17cm) followed by Zardalu (9.10cm). Whereas, the minimum fruit length was recorded in Gaurjeet (5.63cm) (Table 1).

The maximum fruit breadth was noted in Bombay Green (6.57cm) which was at par with the Banarasi Langra (6.20cm) followed by Himsagar (6.13cm). However, the minimum fruit breadth was noted in Gaurjeet (4.47cm). These results are in agreement with reports of Hoda *et al.,* (2002) and Yadav *et al.,* (2010). Although the size of fruit is a varietal character, it may be some extent influenced by the total number of fruit born on the tree, source sink relation and other factors.

Significant variation in a fruit weight and volume of fruit were recorded among different cultivars of mango. The highest fruit weight recorded in Banarasi Langra (186.67g) followed by Langra Kukori (178.67g) and Samarbahist Chausa (177.33g). While, the lowest fruit weight were noted in Gaurjeet (96g). The maximum volume of fruit recorded in Banarasi Langra ($179cm^3$) followed by Langra Kukori ($171.17cm^3$) and Samarbahist Chausa ($168cm^3$). While, the lowest fruit weight were noted in Gaurjeet ($87.33cm^3$). Which were close those reported by Kumar *et al.,* (2000); Bakshi *et al.,* (2013) and Kaur *et al.,* (2014). The variation amongst the varieties as regards to fruit weight and volume of fruit might be due to genetic variability, inherent characters, climatic adoptability and management practices in particular region. This might prove an important diagnostic character for selection of varieties for local conditions.

The statistical analysis of data indicated that significant variations in pulp weight, stone weight and pulp: stone ratio existed among different cultivars of mango. The maximum pulp weight was recorded in Banarasi Langra (135.50g) followed by Samarbahist Chausa (124.80g) and Zardalu (121.20g). Whereas, the lowest value was recorded in Gaurjeet (63.67g). Among the cultivars evaluated, the minimum stone weight was recorded in Gaurjeet (13.5g) followed by Banarasi Langra (20.33g) and Rataul (21.08g). However, the maximum value was recorded in Dashehari (28.36 g).

Cultivar Banarasi Langra (6.66) showed highest pulp: stone ratio followed by Langra Kukori (4.91) and Bombay Green (4.66). The minimum pulp: stone ratio was noticed in Lucknow Safeda (2.82). These results are partially supported the findings of Dhillon *et al.,* (2004); Siddique *et al.,* (2004); Kundu *et al.,* (2010); and Jilani *et al.,* (2014). The variation amongst the varieties as regards to pulp weight, stone weight and pulp: stone ratio might be due to the difference in agro-climatic conditions and the genotypes under study.

Chemical characters of fruit

Significant variation in TSS, acidity and ascorbic acid were recorded among different cultivars of mango. The TSS content was recorded highest in Samarbahist Chausa (20.78 $Brix^0$) followed by Banarasi Langra (19.98 $Brix^0$) and Langra Kukori (19.56 $Brix^0$). While, the lowest TSS was recorded in Rataul (16.19 $Brix^0$). Which were close those reported by Yadav *et al.,* (2010) and Singh *et al.,* (2013). The maximum acidity was recorded in Rataul (0.49%) followed by Lucknow Safeda (0.43%) and Gaurjeet (0.37%). Whereas, the minimum acidity was recorded in Samarbahist Chausa (0.24%). The similar trends are also reported by Kumar *et al.,* (2005) and Sengupta *et al.,* (2006) (Table 2).

Table.1 Data regarding physical attributes of different mango cultivars

Treatments	Fruit length (cm)	Fruit Width (cm)	Fruit weight (cm)	Volume of fruit (cm³)	Pulp weigh (g)	Stone weight (g)	Pulp : stone ratio
Dashehari	9.17	5.40	169.00	161.33	114.17	28.36	4.02
Banarasi Langra	9.07	6.20	186.67	179.00	135.50	20.33	6.66
Langra Kukori	8.87	6.10	178.67	171.17	118.67	24.16	4.91
Bombay Green	8.10	6.57	176.00	167.83	115.50	24.83	4.65
Gulab Khas	7.20	4.77	129.83	120.17	81.50	22.17	3.68
Nisar Pasand	7.43	5.60	147.83	139.17	92.77	25.06	3.70
Himsagar	7.03	6.13	151.50	141.3	106.67	23.83	4.48
Lucknow Safeda	7.17	4.53	120.83	111.50	68.63	24.33	2.82
Rataul	7.47	5.57	146.67	137.67	86.83	21.83	3.98
Gaurjeet	5.63	4.47	96.00	87.33	63.67	13.50	4.72
Samarbahist Chausa	9.37	5.70	177.33	168.00	124.80	27.53	4.53
Zardalu	9.10	5.43	167.33	158.83	121.20	26.33	4.60
S.Em. ±	0.13	0.13	3.61	3.10	2.05	1.06	0.10
C.D. at 5%	0.39	0.40	10.60	9.11	6.01	3.11	0.29

Table.2 Data regarding chemical attributes of different mango cultivars

Treatments	TSS (%)	Acidity (%)	Ascorbic acid (mg/100g)	Reducing sugars (%)	Non - reducing sugar (%)	Total sugars (%)
Dashehari	18.28	0.29	34.98	3.01	12.04	15.05
Banarasi Langra	19.98	0.26	74.28	3.68	11.86	15.54
Langra Kukori	19.56	0.27	66.31	3.53	11.68	15.21
Bombay Green	18.73	0.31	45.97	3.17	11.95	15.12
Gulab Khas	17.89	0.36	33.41	2.80	10.94	13.74
Nisar Pasand	18.68	0.34	30.16	2.79	11.30	14.09
Himsagar	18.59	0.35	22.61	2.66	12.58	15.24
Lucknow Safeda	17.17	0.43	31.19	2.19	12.10	14.29
Rataul	16.19	0.49	66.84	2.10	13.08	15.18
Gaurjeet	17.28	0.37	41.53	2.45	12.66	15.11
Samarbahist Chausa	20.78	0.24	26.09	3.98	11.03	15.01
Zardalu	19.22	0.28	27.89	3.33	11.27	14.60
S.Em. ±	0.22	0.02	1.26	0.13	0.19	0.27
C.D. at 5%	0.65	0.05	3.71	0.39	0.56	0.79

The ascorbic acid was recorded highest in Banarasi Langra (74.28 mg/100g) followed by Langra Kukori (66.31 mg/100g) and Rataul (49.30 mg/100g). Whereas, the cultivar Himsagar (22.61mg/100g) had lowest ascorbic acid. Similar results were documented by Gautam *et al.,* (2003); Singh *et al.,* (2003) and Dutta *et al.,* (2004).

However, the higher and lower values for TSS, acidity and ascorbic acid showed inheritance, which is quite helpful in finding the suitable elite types as per requirements. This might prove an important diagnostic character for selection of varieties for local conditions.

The statistical analysis of data clearly indicated that different cultivars had significant variation in reducing sugars, non-reducing sugar and total sugars of fruit.

The maximum reducing sugars was recorded in Samarbahist chausa (3.98%) which was at par with the Banarasi Langra (3.68%) followed by Langra Kukori (3.53%). However, the minimum value was recorded in Rataul (2.10%).

The highest non-reducing sugar content was estimated in cultivar Rataul (13.08%) which was statistically at par with the Gaurjeet (12.66%) followed by Himsagar (12.58%). Whereas, the minimum value was recorded in Gulab Khas (11.03%). Among the cultivars evaluated, the maximum total sugars were recorded in Banarasi Langra (15.54%) which was at par with the Himsagar followed by Langra Kukori (15.24%) and Bombay Green (115.21%). While, the minimum value was recorded in Gulab Khas (13.74%). The present findings are strongly agreed with the results reported by Shivanandam *et al.,* (2008); Naz *et al.,* (2014); Rana *et al.,* (2015). The variation in reducing sugars, non-reducing sugar and total sugars among varieties might be due to variation in genetic variability, inherent characters and climatic adoptability in particular region.

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