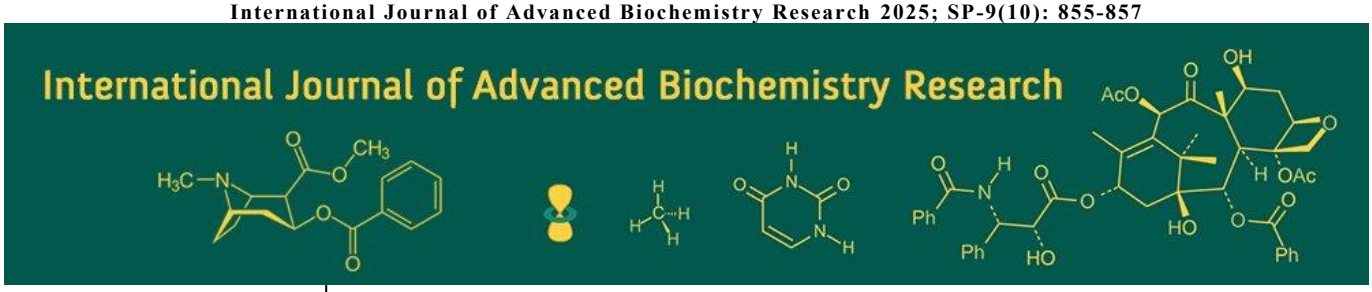

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Evaluation of physico-chemical properties of raw mango (*Mangifera indica* L.) cv. Langra in Bastar District, Chhattisgarh

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Abstract
The present investigation was carried out at the Horticultural Processing Laboratory, Krantikari Debridhur College of Horticulture and Research Station, Jagdalpur, Bastar (C.G.) during the session 2024-2025 to assess the physical and chemical properties of raw mango (*Mangifera indica* L.) cv. Langra under Bastar district. The physical parameters recorded were fruit length (10.434 cm), fruit width (7.658 cm), fruit weight (221.167 g), shape (oblong), colour (dark green) and specific gravity (1.026). The chemical composition of raw mango was also analyzed, revealing ascorbic acid content of 133.81 mg/100g, total soluble solids (12.46 °Brix), TSS/ Acid ratio (13.39%), total sugars (4.39%), reducing sugars (2.86%), non-reducing sugar (1.53%) and titratable acidity (0.939%). The findings provide a comprehensive profile of the physico-chemical characteristics of Langra mango, which may serve as a reference for its utilization in processing, value addition and nutritional studies.

Keywords: Mango, physico-chemical, analysis, titratable acidity, ascorbic acid, reducing sugar, total sugar, non-reducing sugar and TSS

Introduction
The mango (*Mangifera indica* L.) is a member of the 73 genera that make up the family Anacardiaceae, order Sapindales. Its place of origin is Indo-Burma. One of the most widely grown fruit crops in India is the mango. It is also known as the "King of Fruit." (Mumzuroglu *et al.,* 2003) [5]. It is an essential component of human nutrition because they provide vitamin A (4800 I.U.) and an adequate supply of vitamins and minerals that are the major ingredients that are required for human health.

Mango fruits are rich in protein, vitamins, minerals, organic acids, fatty acids and carbohydrates. While ripe mangos are rather high in vitamin A, vitamin B_1 and vitamin B_2, they also have considerable amounts of vitamin C (Anonymous, 2009). The ripe mangoes have been reported to include 73.0 to 86.7 percent moisture, 0.5 to 1.0 percent protein, 0.1 to 0.8 percent fat, 11.6-24.3 percent carbohydrate, 0.412 percent calcium, 0.195 percent phosphorus, 50 ppm iron, 6375 to 20750 ug/100 g β-carotene, 50 ug/100g riboflavin, 6.8 to 38.8 mg/100g ascorbic acid, 12.0-23.0°Brix TSS and 0.12-0.38 percent acidity. (Gautam *et al*., 2023) [6]. In India, the production of mango is 22663 MT and area 2394 hectares (Anonymous, 2024-25). Uttar Pradesh is leading state with 4806.65 MT of mango production followed by Andhra Pradesh (4517.93), Karnataka (1646.76), Bihar (1549.97), Maharashtra (442.35), Gujarat (997.83) and Orissa (847.72) which are the major mango growing states in India (Anonymous, 2021). Chhattisgarh state occupies an area of approximately 77.753 thousand hectares with an annual production of 473.333 thousand MT of mango (Anonymous, 2023). The Bastar covers an area of 1.31 thousand hectares with a production of 9.74 thousand MT of mango.

Materials and Methods
The Horticultural Processing Laboratory, Krantikari Debridhur College of Horticulture and Research Station Jagdalpur, Bastar (C.G.) - 494001 was the site of the laboratory trial.

Physical characteristics of raw mango

Fruit length (cm)

Five fruits were randomly chosen from each plant, measured using a vernier caliper from the top of the fruit that the calyx end to the base of the fruit and the average fruit length was expressed in centimeters (cm).

Fruit width (cm)

The same five fruits that were used to measure fruit length were also used to measure fruit breath which was done using a vernier caliper to measure fruit breadth at its widest point. The average fruit width was then stated in centimeters (cm).

Fruit weight (g)

With the aid of an electric weighing balance, the same five randomly chosen fruits from various local mango variety were weighed independently. Calculated and expressed as an average fruit weight in grams.

Fruit shape

Fruit shape as mentioned in mango descriptors (IPGRI, 2006).

Fruit colour

The colour of the fruits at various stages was identified based on visual basis. Fruits were noted to be green, light green, yellow, greenish yellow, and yellow with red blush.

Specific gravity

The weight of five randomly selected fruits was recorded. These fruits were put in a glass jar with water, and a measuring cylinder was used to determine how much water was added. The specific gravity was calculated as per the formula given below:

$$\text{Specific gravity} = \frac{\text{Total weight of fruits}}{\text{Total volume of replaced water by fruits}}$$

Chemical characteristics of raw mango

Titratable acidity

A known quantity of liquid sample pulp was titrated against 0.1 N NaOH solution using phenolphthalein as an indicator (A.O.A.C., 1975) [1]. A known sample and 20-25 ml of distilled water were combined in a mortar and pestle. After transferring it to a 100 ml volumetric flask, the volume was adjusted and filtered. With phenolphthalein serving as an indicator, a known volume of aliquot (10 ml) was titrated against 0.1 N sodium hydroxide (NaOH) solution (Ranganna, 1997) [10]. The results were expressed as percent anhydrous citric acid.

$$\text{Acidity} = \frac{\text{Titre} \times \text{Normality of NaOH} \times \text{Equivalent Weight of Acid} \times 100}{\text{Volume of sample taken} \times 1000}$$

Ascorbic acid

The ascorbic acid was determined by 2, 6 dichlorophenol indophenol dye method of Johnson (1948) [8] as described by Ranganna (1997) [10]. Three percent metaphosphoric acid (HPO3) was added to a known volume of sample to create a final volume of 100 ml, which was subsequently filtered. A known amount of aliquot was titrated to a pink colour end point using 0.025 percent 2, 6-dichlorophenol indophenol dye. After accounting for the dye factor, the sample's ascorbic acid content was determined and expressed as mg Ascorbic acid per 100 grams of fruit pulp. (Association of Vitamin Chemist, 1966).

$$\text{Ascorbic acid (mg/100g)} = \frac{\text{Titer value} \times \text{Total vol. made up} \times 100}{\text{Standard reading} \times \text{Vol. taken} \times \text{Wt. of sample taken}}$$

Total soluble solids (°Brix)

Total soluble solids (T.S.S.) were determined with the help of Hand Refractometer (Atago Japan, 0 to 33 °Brix) and value was corrected at 20°C with the help of temperature correction chart (A.O.A.C., 1975) [1].

TSS/ Acid ratio

The TSS/acid ratio was calculated using the earlier described methods to obtain the ratio of total soluble solids (°Brix) to the titratable acidity (%).

Total sugar

Using the same procedure, which involved reducing with 40% sodium hydroxide after acid hydrolysis of an aliquot of deleaded sample with 35% hydrochloric acid the total sugars were calculated. In order to titrate this filtrate against the standard Fehling's combination (Fehling's A and B), methylene blue was utilized as an indicator to brick red finish point (Ranganna, 1997) [10].

$$\text{Total sugars (\%)} = \frac{\text{Factor x Dilution}}{\text{Weight of pulp taken}} \text{ X } 100$$

Reducing sugar

The reducing sugars were estimated by using Lane and Eynon (1923) [9] method with modification suggested by Ranganna (1997) [10]. A known weight (5 g) of the sample was mixed with distilled water and the solution was delead with potassium oxalate (22%) and lead acetate (45%) to precipitate out any extraneous material. By titrating this lead-free extract against the conventional Fehling's mixture (Fehling's A and B) and utilizing methylene blue as an indication to a brick red end point, the reducing sugars were estimated.

$$\text{Reducing sugars (\%)} = \frac{\text{Factor x Dilution}}{\text{Titre reading x Weight of pulp taken}} \times 100$$

Non reducing sugar

A formula is used to determine non-reducing sugar,

Non-reducing sugar (%) = Total sugar (%) - Reducing sugar (%)

Results and Discussion

Physico-chemical characteristics of raw Mango

The physical and chemical characteristics of the raw mango. The physico-chemical characteristics were studied *viz.,* fruit shape, fruit length (cm), fruit width (cm), fruit weight (g), total soluble solids (°Brix), titratable acidity (%), ascorbic acid (mg/100g), total sugar (%), reducing sugar (%) and non-reducing sugar (%) were observed and presented in Table 1 and 2.

Physical characteristics of raw Mango: The data recorded on physical properties of mango is presented in Table 4.1.

The observed such as fruit length (cm), fruit breadth (cm), fruit weight (g), fruit shape, fruit colour and fruit specific gravity were recorded 10.434, 7.658, 221.167, Oblong shape, vibrant green and 1.026 respectively.

Table 1: Physical characteristics of raw mango

S. No.	Parameters	Average
1	Fruit Length (cm)	10.434
2	Fruit Breadth (cm)	7.658
3	Fruit Weight (g)	221.167
4	Fruit Shape	Oblong
5	Fruit Colour	Dark Green
6	Fruit Specific gravity	1.02

Chemical characteristics of raw mango

The data recorded on chemical properties of mango is presented in Table 4.1. The observed such as acidity (%), ascorbic acid (mg/100g), TSS (°Brix), TSS/Acid ratio, total sugar (%), reducing sugar (%) and non-reducing sugar (%) were recorded 0.93%, 133.81 mg/100g, 12.46 °Brix, 13.39, 4.39%, 2.86% and 1.53% respectively.

Table 2: Chemical characteristics of raw mango

S. No.	Parameters	Average
1	Titratable acidity (%)	0.93
2	Ascorbic acid (mg/100g)	133.81
3	TSS (°Brix)	12.46
4	TSS/Acid ratio	13.39
5	Total sugar (%)	4.39
6	Reducing sugar (%)	2.86
7	Non-reducing sugar (%)	1.53

Conclusion

The physico-chemical evaluation of raw mango revealed that the fruits possess desirable morphological traits, with an average length of 10.43 cm, breadth of 7.66 cm, and weight of 221.17 g, exhibiting an oblong shape, dark green Colour, and a specific gravity of 1.02. Chemically, the fruits were characterized by moderate titratable acidity (0.93%), high ascorbic acid content (133.81 mg/100 g), and a total soluble solids value of 12.46 °Brix, resulting in a TSS/acidity ratio of 13.39. The sugar profile indicated a predominance of reducing sugars (2.86%) over non-reducing sugars (1.53%), with a total sugar content of 4.39%. These results suggest that the raw mango fruits possess good nutritional potential, with high vitamin C and balanced sugar-acid composition, making them suitable for both fresh consumption and processing into value-added products.

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