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Physico-chemical characteristics of mature green mango fruit and mint leaves

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Abstract
The mature green mango fruits variety Ramkela and mint leaves were evaluated for various physico-chemical characteristics. Data show that average fruit weight and yield of pulp of mature green mango fruits were 203.00 g and 62.33 g/kg fruit. Yield of paste of mint leaves was 79.27%. Total soluble solids (TSS), total sugars, reducing sugars and acidity were analyzed to be 8.03 and 2.0%, 2.46 and 0.67%, 0.82 and 0.26% and 1.86 and 0.032%, whereas total carotenoids, total chlorophyll and total phenols were found to be 0.183 and 15.85 mg/100 g, 1.48 and 172.90 mg/100 g and 14.7 and 328.4 mg/100 g, respectively.

Keywords: Green mango fruit, mint leaves, physico-chemical, characteristics

Introduction
Mango (*Mangifera indica* L.) belongs to family Anacardiaceae. It originated from South-East Asia and is one of the most important tropical fruit crops, having high socio-economic status, being as 'king of fruits'. Mango ranks second after banana producing 185.05 million tons of annual output from an area of 22.16 million hectares with an average productivity of 7.3 MT (Saxena *et al.*, 2015) [12]. The fruits have strong aroma with intense peel colouration, distinguished by an attractive fragrance and high nutritional value due to higher concentrations of β -carotene, vitamin A, C, B6 (pyridoxine) and minerals, such as calcium, iron, potassium, copper and phosphorous. According to Ribeiro and Schieber (2010) [10], mango fruit contains moisture (84.38%), total carbohydrates (14.67%), protein (0.55%), fat (0.10%) and is extremely rich in dietary fibre (1.60%), total phenolic content (9.0 to 208 mg/100 g) and ascorbic acid (9.79 to 180 mg/100 g). Carotenoids are compounds of considerable dietary significance not only as precursors of vitamin A, but also as molecules that participate in cell defence and consumer appeal due to the visual colour providing to food (Jadhav *et al.*, 2009) [5]. It protects against colon, leukemia and prostate cancer. Owing to its exotic flavour, attractive fragrance, beautiful colour, delicious taste and nutritional properties, the mango fruit is widely accepted by consumers in the international market (Sivakumar *et al.*, 2011) [14]. Mango fruits are consumed fresh as well as processed into a number of products in food industry *viz.*, mango nectar, ready-to-serve drink, squash, juice, jam, cheese, toffee, leather, pickles, ice-cream and mango slices in sugar syrup. Mango fruit beverages are highly nutritive, refreshing, thirst quenching, appetizing, readily digestible and nutritionally far superior to other synthetic and aerated drinks. Flavour is the most significant property for the acceptability of fruit drinks/beverages (Deka *et al.*, 2005) [3]. Mint (*Mentha arvensis*), a common edible and aromatic perennial herb, cultivated throughout India, belongs to family Libeaceae. Its common name is pudina. Mint extract can well be utilized for preparation of palatable, healthy, soothing, energetic, refreshing, nutritious and low cost herbal beverages. Menthol present in mint leaves oil is highly effective against various skin infections, such as skin irritations, itching, burns, inflammations, pain relief, allergy reduction, scabies and ringworm (Malik *et. al.*, 2012) [8].

Unripe mango fruit has historically been used in preparation of pickle, chutney, dried mango powder and aam-panna. Today, the market acceptance pattern has fully shifted towards these products, so it is the need of hour to emphasize on the value enhancement by fortifying novel ingredients to make a highly valued product.

Blends of pulp/juice from two or more fruits and specific herbs could be utilized profitably for processing, which separately may not otherwise have beneficial characteristics such as colour, flavour, aroma, taste, mouthfeel and overall acceptability of its processed products. Blending of unripe mango and mint could be an economic option to consume these profitably. Taking into account, the medicinal and nutritional significance of mature green mango fruit and mint leaves, the work was carried out to study physico-chemical characteristics of mature green mango fruits and mint leaves for its further utilization and processing into various value added products either individually or by blending in different proportions.

Materials and Methods

The present study was conducted in Centre of Food Science and Technology, CCS HAU, Hisar during 2018-19. Mature green mango fruits variety Ramkela and mint twigs were procured from local market, Hisar for collecting pulp and paste to analyze its physico-chemical characteristics. Mango fruits were selected randomly, weighed and replicated thrice for recording observations.

Fruit weight and pulp weight were calculated by direct weighing with an electronic balance. Initial weight of fruits was recorded on top pan electronic balance. These mango fruits were peeled off, destoned and sliced and blended well to obtain pulp. Pulp was weighed on top pan electronic balance. Pulp weight was calculated by the following formula:

Pulp weight of mature green mango (g) = [Initial weight of fruit (g) – {weight of peel (g) + weight of stone (g)}]

Total soluble solids (TSS) were estimated by hand refractometer (0-32%) at ambient temperature and the values were expressed as per cent.

Total sugars and reducing sugars were estimated by the method of Hulme & Narain (1931) [4]. Acidity, ascorbic acid and pectin (as calcium pectate) in fresh fruits were analyzed by the methods of Ranganna (2014) [9]. Total carotenoids were analyzed by Rodriguez-Amaya method (2004) [11], while total phenols were estimated using methods given by Amorium *et al*. (1997) [1]. Crude protein was estimated using micro-Kjeldhal method (AOAC, 2005) [2] with KELPLUS nitrogen estimation system.

Results and Discussion

Mature green mango fruits and mint leaves were analyzed for various physico-chemical characteristics. Fruit weight and pulp yield in mango fruits were 203.0 g and 62.33 g/kg fruit, and yield of paste in mint leaves was 79.27%. Total soluble solids, total sugars, reducing sugars and acidity in mature green mango fruit and mint leaves were 8.03 and 2.0%, 2.46 and 0.67%, 0.82 and 0.26%, 1.86 and 0.032%, respectively. Ascorbic acid, total carotenoids, total chlorophyll and total phenols in mature green mango fruits and mint leaves were 85.29 and 4.60 mg/100 g, 0.183 and 15.85 mg/100 g, 1.48 and 172.90 mg/100 g, 14.7 and 328.40 mg/100 g, respectively. Mature green mango fruits had 2.03% pectin.

Comparable results were observed by Xess *et al*. (2018) [15] and Lakhanpal and Vaidya (2015) [6] in mango fruit. Shobana and Rajalakshami (2010) [13] recorded 2.493% ascorbic acid, 5.83% of total sugars, 3.43% non-reducing sugars and 2.41% reducing sugars in unripe green mango fruit. Similarly, Madalageri *et al.* (2017) [7] recorded average fruit weight 200.9 g and protein content (0.77%) in mango pulp.

Table 1: Physico-chemical characteristics of mature green mango fruit and mint leaves*

Sr. No.	Parameters	Green mango fruit	Mint leaves
1.	Fruit weight (g)	203.0±5.29	-
2.	Yield of pulp/paste (%)	62.33±1.26	79.27±1.12
3.	TSS (%)	8.03±0.058	2.00±0.00
4.	Acidity (%)	1.86±0.01	0.032±0.001
5.	pH	2.24±0.05	5.95±0.07
6.	Total sugars (mg/100 g)	2.46±0.10	0.67±0.08
7.	Reducing sugars (mg/100 g)	0.82±0.06	0.26±0.07
8.	Total carotenoids (mg/100 g)	0.183±0.01	15.85±0.19
9.	Total chlorophyll (mg/100 g)	1.48±0.08	172.90±0.70
10.	Pectin (%)	2.03±0.15	-
11.	Protein (%)	0.71±0.04	4.46±0.15
12.	Ascorbic acid (mg/100 g)	85.29±0.36	4.60±0.14
13.	Total phenols (mg/100 g)	14.7±0.61	328.40±2.50

*The values are mean ± S.D. of three replicates

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