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Physico-chemical characteristics of bottle gourd fruit, mint leaves and lime fruit

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Abstract
Bottle gourd (*Lagenaria siceraria*) belongs to the Cucurbit family (cucumber, squash, etc.). Bottle gourd is also known as *Calabash*, *Doodhi*, and *Lauki* in different parts of India. The edible portion of lauki is a fair source of ascorbic acid, beta carotene and good source of vitamin B complex, pectin and dietary soluble fibres. It is also a good source of carbohydrates, minerals, amino acid and vitamins. It is a summer season crop but grown in India round the year for its tender fruit. The tender fruits are used for vegetable, sweets, rayta, halwa, tutti-frutti and its dried shells are used for making musical instrumentsIt is well known that bottle gourd is helpful in constipation, premature graying of hair, urinary disorders and insomnia which reflect significant health-promoting properties. Data show that average fruit weight and yield of pulp of bottle gourd fruits were 617.16 g and 74.05 g/kg fruit. Yield of paste of mint leaves was 78.57% and 39.26%. Total soluble solids (TSS), ascorbic acid and acidity of the bottle gourd pulp had 4%, 0.175, 7.84 (mg/100g) respectively, whereas total phenols and total chlorophyll were found to be 263.3mg/100ml 182.9 mg/100ml respectively.

Keywords: Bottle gourd, Mint, lime, Physico-chemical, characteristics

Introduction
The vast diversity of fruit and vegetable species holds great potential in enhancing economic prosperity, ensuring food security, and addressing nutritional deficiencies, including micronutrients like vitamins and minerals. These foods are recognized as functional foods, suggesting that they not only meet basic physiological requirements but also offer health benefits. Regular consumption of fruits and vegetables has been associated with considerable positive impacts on human health (Hasler, 1998; Steinmetz and Potter, 1996) [7, 12].

In contemporary times, there is significant focus on the nutritional advantages of plant-based foods, particularly vegetables and fruits. Over the last decade, numerous research studies have highlighted their role as excellent natural sources of antioxidants (Tezcan *et al*., 2009) [13]. The bottle gourd (*Lagenaria siceraria*), characterized by its greenish color and distinctive bottle or round shape, has garnered attention. With a water content of 96.1%, this vegetable is gentle on the stomach and supports digestion, offering various health

The fruit's pulp is recognized for its cooling, diuretic, anti-bilious properties and is considered effective for coughs and as an antidote to specific poisons (Duke, 1992; Ghule *et al*., 2006; Ghule *et al*., 2007) [4, 5, 6]. A mixture of leaf decoction with sugar is believed to be advantageous for jaundice, and the fruit is utilized in treating cholera (Rahman *et al*., 2008).

Mint, scientifically known as Mentha viridis L. and commonly referred to as "Pudina," is a member of the Lamiaceae family. Mint leaves contain essential vitamins and minerals crucial for overall health maintenance. It has been reported to alleviate symptoms of indigestion, heartburn, and irritable bowel syndrome by relaxing intestinal muscles. Additionally, mint acts as a potent antioxidant, shielding the body against the development of cancerous cells, serving as an effective blood cleanser, and contributing to the resolution of skin disorders like acne (Aflatuni *et al*., 2005) [1].

Lime is widely recognized for its effectiveness in treating scurvy, a condition resulting from a vitamin C deficiency. Scientifically referred to as Citrus aurantifolia, lime juice and its natural oils offer significant skin benefits, whether consumed internally or applied externally. These contribute to skin rejuvenation, impart a radiant appearance, provide protection against infections, and mitigate body odour. This is attributed to the abundant presence of vitamin C and flavonoids, both classified as potent antioxidants with antibiotic and disinfectant properties.

Materials and Methods

Extraction and storage of mature green mango pulp and mint paste The present study was conducted at the Centre of Food Science and Technology, CCS HAU, Hisar during 2021-2022. Bottle gourd was procured from Department of Vegetable Science, COA, CCSHAU, Hisar mint and lime were procured from local market, Hisar for collecting pulp for analysing its physicochemical characteristics.

Analysis

The collection of bottle gourd pulp adhered to standardized procedures. Fresh tender mint twigs, including green leaves, were meticulously washed, air-dried, and finely ground in a blender. Lime fruits were washed, and their juice was extracted using a hand squeezer, filtered, and stored for subsequent analysis. Physicochemical parameters of fresh bottle gourd pulp, mint paste, and lime juice were evaluated, encompassing fruit weight (g), pulp yield (%), pH, total soluble solids (%), total sugars (mg/100g), reducing sugars (%), acidity (%), pectin (%), ascorbic acid (mg/100g), (µg/100g), total chlorophyll (mg/100g), total phenols (mg/100g), antioxidant activity (%), and browning.

Fruit weight and pulp yield were determined through direct weighing on an electronic balance, with five randomly selected fruits replicated thrice for accuracy. Total soluble solids (TSS) were gauged at room temperature using a hand refractometer (0-32%) and expressed as a percentage of TSS. The pH of fresh bottle gourd pulp, mint paste, and lime juice was measured using a digital pH meter, with samples diluted at a 1:10 ratio for pH determination in the case of fruit pulp and mint. Total and reducing sugars were quantified following the Hulme and Narain method (1931). Browning in fresh fruit pulp was assessed using the Ranganna method (2014) [9]. Acidity, ascorbic acid, and pectin (As calcium pectate) in fresh bottle gourd pulp and mint were analyzed based on the procedures outlined by Ranganna (2014) [9]. Antioxidant activity was determined using the stable 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical method as per Shimada *et al*. (1992) [11]. Total carotenoids were examined using the Rodriguez-Amaya method (2004) [10], and total phenols were estimated following the methods provided by Amorium *et al*. (1997) [2]

Results and Discussions

Results presented in (table1) the fruit weight of bottle gourd was 617.16 gm per fruit and pulp yield 74.05%. The bottle gourd fruit pulp had TSS 4%, acidity 0.175%, pH 5.87, ascorbic acid 7.84 mg/100 g, total chlorophyll 182.9 µg/100 g, total phenols 263.9 mg/100 g, total sugars 3.24mg/100 g, reducing sugars 1.28mg/100 g, pectin 0.184% and browning 0.459. Comparable results were recorded by Vaidya (2013) [14] TSS found to be 4.2%, total phenolic content has much lower than present result i.e.6.5 mg/100ml and whereas antioxidant activity was somewhat higher than present result i.e. 91% Baljeet (2012) [3] recorded the similiar results in bottle gourd fruit pulp. The mint had TSS 2%, acidity 0.168%, pH 5.87, ascorbic acid 4.28%, total chlorophyll 220.3 mg/100g, total phenol 328.3 mg/100g, browning 0.785 and antioxidant activity 74.68%. Zanwar (2018) [15] for the mint sample -TSS was recorded as 3%, acidity was similar to present mint sample i.e. 0.092%, ascorbic acid recorded was 3.5% but chlorophyll content little bit higher difference i.e. 237 mg/100 g. The lime had TSS 7.20%, acidity1.43%, pH2.60, ascorbic acid 27.32%, total chlorophyll 0.196 mg/100g, total phenol 396.8 mg/100 g, browning 0.667 and antioxidant activity 88.13%. Vaidya (2013) [14] for the lemon sample TSS found to be 7.4%, total phenolic content has much lower than present result i.e.3.5 mg/100ml and whereas antioxidant activity lower than present result i.e. 61%

Table 1: Physico-chemical characterstics of bottle gourd pulp, mint paste and lime juice

Sr. No.	Parameters	Bottle gourd fruit	Mint leaves	Lime fruit
1	Fruit wt. (g)/leaves wt.(g/kg twigs)	617.16±11.21	774.5±7.4	53.45±5.29
2	pulp/paste/juice weight (g/kg)	794.5±62.75	785.7±4.5	35.14±0.10
3	Yield of pulp/paste/juice (%)	74.5±5.15	78.57±0.45	39.26±0.44
4	Total soluble solids (%)	4.00±0.05	2.30±0.57	7.20±0.92
5	pH	5.87±0.18	6.85±0.07	2.60±0.13
6	Acidity (%)	0.175±0.02	0.168±0.01	1.43±0.05
7	Total sugars (%)	3.24±0.42	0.65±0.08	5.64±0.14
8	Reducing sugars (%)	1.28±0.19	0.24±0.08	2.04±0.01
9	Pectin (%)	0.184±0.08	7.16±0.05	6.04±0.04
10	Ascorbic acid (mg/100 g)	7.84±2.70	4.28±0.39	27.32±1.83
11	total phenols (mg/100 g)	263.3±0.14	328.4±2.50	396.8±2.98
12	Total chlorophyll (mg/100 g)	182.9±0.42	220.3±0.78	0.196±0.06
13	Antioxidant activity (%)	71.47±0.29	74.68±0.21	88.13±0.95
14	Browning (OD at 440 nm)	0.459±0.03	0.785±0.06	0.667±0.09

The values are mean ± SD of three replicates except fruit weight, which is mean ± SD of ten fruits replicated thrice

Conclusion

Nature has bestowed upon humanity the gift of bottle gourd, a remarkable vegetable rich in essential components crucial for maintaining good health. The consumption of bottle gourd has been linked to numerous health advantages, positioning it as a natural safeguard against diseases. Incorporating bottle gourd into our daily diet can enhance overall health and well-being. Consequently, there is a necessity to create innovative functional dairy products that align with consumer preferences for health, such as utilizing vegetable sources with phytochemicals and natural ingredients.

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