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## Effect of storage on physio-chemical and overall acceptability of green mango-mint ready-to-serve drink

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**Abstract**

Green mango-mint RTS drink variants were developed by blending of mature unripe mango pulp and mint paste in (90:10) ratio with sugar and spices. The RTS drink variants were evaluated for changes in physio-chemical and sensory quality parameters at monthly interval for three months storage period. Total soluble solids content and acidity increased, while ascorbic acid and total carotenoids decreased significantly in green mango-mint RTS drink variants with the advancement in storage period. The overall acceptability of green mango-mint RTS drink also decreased during storage, however, the products were found acceptable even at three months storage.

**Keywords:** Mango, mint, RTS drink, chemical, sensory, parameter, storage

**Introduction**

Mango, which belongs to family *Anacardiaceae* is one of the most popular fruits in tropical regions. It has an excellent flavour and fragrance, delicious taste and high nutritional value (Alane *et al.*, 2017) <sup>[1]</sup>. According to Siddiq *et al.*, 2017 <sup>[22]</sup>, mature unripe mango contains moisture (83.46%), carbohydrates (14.98%), protein (0.82%), total fat (0.38%) and crude fibre (1.6%). It has an excellent antioxidant property as it is rich in  $\beta$ -carotene and ascorbic acid. Mango is a rich source of vitamin A, B, minerals and polyphenolic compounds and possess nutraceutical and pharmaceutical significance. Raw mango beverage (Panna) is an enormously well-known product during summer in India as a preventive and curative remedy for sunstroke, bilious, gastrointestinal and blood disorders. It is appetizing, thirst quenching, highly refreshing, easily absorbable, and healthfully far better than many synthetic drinks (Ravani & Joshi, 2011) <sup>[16]</sup>. Many products such as canned, dried, and frozen forms of mango pulp and jams, jellies, beverages, canned slices, dehydrated pulp, frozen chunks and slices, traditional pickles, and chutneys, are manufactured from mature unripe and ripe mangoes (Siddiq *et al.*, 2012) <sup>[21]</sup>.

Menthol (*Mentha arvensis*), which belongs to family Libeaceae is a common edible and aromatic perennial herb, cultivated throughout India. Its common name is *pudina*. Mentha extract can be used to prepare palatable, energy-giving, refreshing, healthy and low-cost herbal beverage. It has an excellent antioxidant, antimicrobial, cytotoxic and analgesic properties (Biswas *et al.*, 2014) <sup>[5]</sup>. Polyphenolic compounds present in mentha act as free radical scavengers and antioxidant that retard the reactive oxygen species damage on biological system (Amina *et al.*, 2016) <sup>[2]</sup>. Menthol provides the flavoring and acts as natural preservative in beverages (Yadav *et al.*, 2010) <sup>[1]</sup>. Because of its numerous important pharmacological advantages such as anti-inflammatory, antipyretic, DNA protective function, antioxidant, anti-androgenic, antimicrobial, cytotoxic, antiviral, anticancer, antiemetic, antibacterial, antiallergic, antiparasitic, sedative, anti-chlamydial, radioprotection, anti-cholinesterase, hepatoprotective, antispasmodic, acute toxicity, anti-mutagenic, cardiovascular and anti-tumour effects, mint herb has been used by the people in medicines since ancient times (Sevindik, 2018) <sup>[19]</sup>.

Spices are powerhouse of bioactive phytochemicals (Srinivasan, 2014) <sup>[23]</sup> and essential oils (GRAS status) obtained from different parts of plant contain a complex mixture of various compounds, like terpenes, alcohols, ketones, phenols, acids, aldehydes, and esters

(Tajkarimi *et al.*, 2010) [24]. Earlier spices and herbs were primarily used in foods to impart flavour and fragrance. Spices have strong antioxidative property primarily due to the presence of various phenolic compounds such as eugenol, curcumin, gingerol, carvacrol, thymol, pimento, and capsaicin and prevent against diseases like cardiovascular disorders, cancer, arthritis, asthma, and diabetes (Peter and Shylaja, 2012) [14]. The medicinal and therapeutic values of RTS beverages prepared from juices could be increased by addition of spice extracts like ginger, black pepper, mint, cardamom and cumin (Amaravathi *et al.*, 2014) [26].

A beverage prepared by blending of medicinal plants, herbs and spices with fruits and vegetables is an emerging trend in food industry (Sangma *et al.*, 2016) [18]. Some fruits are big reservoir of nutrients but poor in taste and flavour due to high acidity, astringency and bitterness and remain underutilized; therefore, their acceptability could be enhanced by blending with other fruit with improved nutrients (Bhardwaj and Pandey, 2011) [4]. Blending of mature green mango pulp and mint paste with spices is therefore a convenient and economical alternative for its utilization in the development of value added nutritious and therapeutic drink. The present research work was formulated in the view of above facts.

### Materials and Methods

The present investigation was carried out in CFST, CCSHAU, Hisar during 2018-19. Pulp of mature green mango and mint paste was collected as per standard procedure (Fig. 1 and 2). Mature unripe mango fruits

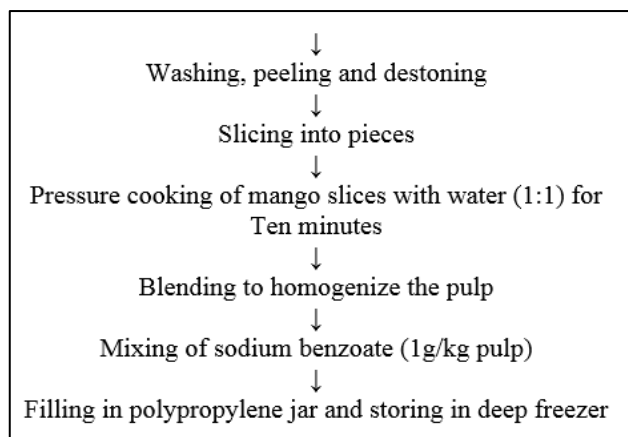


Fig 1: Flow sheet for processing of green mango pulp

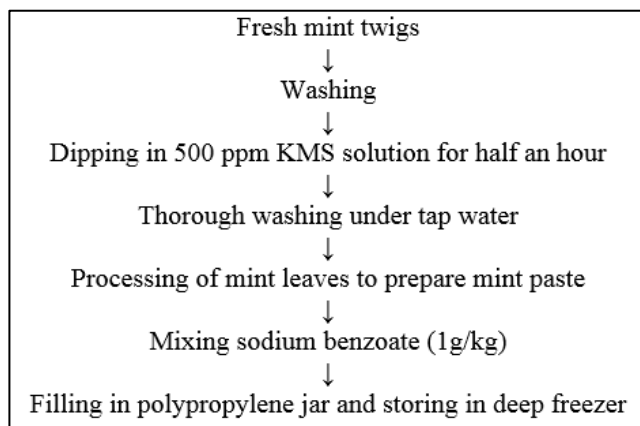


Fig 2: Flow sheet for processing of mint

Based on sensory evaluation of all the blended products (100:0; 95:5, 90:10,85:15, 80:20) the RTS drink variant

prepared with green mango pulp and mint paste (90 mango:10 mint blend) was selected for development and evaluation of green mango-mint RTS drink variants. Sweet and spiced green mango-mint RTS drink variants were prepared by using one kg blended pulp (90 green mango:10 mint) by following the standardized recipe (20% pulp and 12% TSS was adjusted). Spiced RTS drink variant was prepared by using many spices (2% common salt, 2% rock salt, 2% black salt, 4% chat masala, 0.1% roasted cumin powder, 0.05% small cardamom powder and 0.075% black pepper powder). The product was finally homogenized and filled into pre-sterilized glass bottles of 200 ml capacity. After sealing, RTS drink was pasteurized and stored at room temperature.

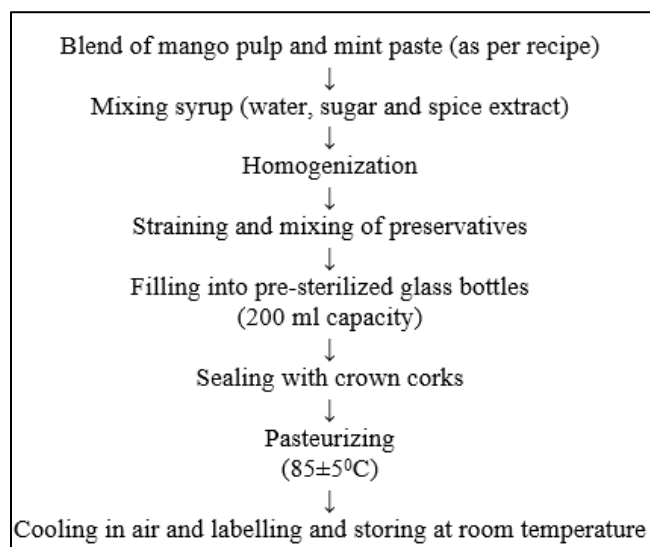


Fig 3: Flow sheet for preparation of RTS drink

Green mango-mint RTS drink variants were analyzed for changes in chemical, microbial and sensory parameters at monthly interval for three months. Acidity, ascorbic acid and non-enzymatic browning were determined according to methods described by Ranganna (2014) [15]. Total carotenoids were determined spectrophotometrically as per method described by Rodriguez-Amaya (2004) [17]. Protein content was estimated using micro-Kjeldhal method (AOAC, 2005) [3]. The overall acceptability of green mango-mint RTS drink was based on mean scores obtained for all the sensory characters *i.e.*, colour and appearance, taste, aroma and mouthfeel. The characters with mean scores of 6 and above were considered acceptable (Ranganna, 2014) [15]. For treatments, three replications were taken and the results were statistically analyzed using completely randomized design. The critical 5 per cent difference value was used for making comparison among different treatments during storage.

### Results and Discussion

The data shown in Table 1 demonstrates an increasing trend in total soluble solids of green mango-mint RTS drink variants for three months storage. The increase in total soluble solids of the products during storage may be attributed to hydrolysis of polysaccharides into monosaccharide and soluble disaccharides (Panghal *et al.*, 2017) [13]. Similar results have been reported by Alane *et al.* (2017) [1] and Lakhanpal and Vaidya (2015) [9]. However, slight increase in TSS content is desirable to preserve good juice quality during storage (Bhardwaj and Pandey, 2011) [4]. The acidity in green mango-mint RTS drink variants increased significantly during storage; however, spiced green mango-mint RTS drink variant

had slightly higher acidity as compared to other RTS drink variants. Higher acidity of RTS drink variants might be due to the formation of acidic compounds by degradation or oxidation of reducing sugars, polyphenols, formation of organic acid by ascorbic acid and conversion of protein to amino acids by the breakdown of peptide bond (Mishra and Sangma, 2017) [10]. Similar trends increase in acidity during storage have been reported by Yadav *et al.* (2010) [27] in whey based banana herbal beverage and in pineapple beverage by Munasinghe and Dilrukshi, (2018) [12].

Ascorbic acid content declined sharply in RTS drink variants during storage. The decrease in ascorbic acid of the products could be due to oxidation of ascorbic acid to dehydro-ascorbic acid with the passage of time. Hirdayani, (2015) [7] also observed the decrease in ascorbic acid during storage period probably due to the fact that ascorbic acid being sensitive to oxygen, light and heat so that it could quickly be oxidized in presence of oxygen by both enzymatic and non-enzymatic catalysts. Similar findings were reported by Hamid and Thakur (2017) in mulberry appetizer and Hemalatha *et al.*,

(2018) [6] in cape gooseberry RTS beverage. Total carotenoids in RTS drink variants decreased significantly during storage and the results are in conformity with the findings of Tandon *et al.*, (2010) [25]. It might be due to thermo-labile, thermo-sensitive and epoxide forming nature of carotene. Similar results were reported by Kathiravan *et al.* (2015) [8] in beetroot-passion fruit blended RTS drink. Overall acceptability scores of green mango-mint RTS drink variants decreased significantly during three months storage. Nevertheless, even after three months storage, the products remained acceptable. Significant Increase in acidity, decrease in ascorbic acid content, loss of volatile aromatic compounds and formation of furfural leads to deterioration of sensory attributes that impede the organoleptic quality of RTS drinks (Mishra and Sangma, 2017) [10]. The decrease in sensory scores during storage was also observed by Yadav *et al.* (2010) [27] in herbal banana beverage. RTS drink prepared by green mango and mint in ratio (90:10) with addition of spices was, however, found most acceptable even after three months of storage period.

**Table 1:** Effect of storage on physio-chemical and organoleptic quality of green mango- mint RTS drink variants

	Storage period (months)	TSS (%)	Acidity (%)	Ascorbic acid (mg/100g)	Total carotenoid (mg/100 g)	Total chlorophyll (mg/100g)	Protein (g/100g)	Fat (g/100g)	Dietary fibres (g/100g)	Non-enzymatic browning	Overall acceptability (score out of 9)
Sweet RTS (90 Mango: 10 Mint)	0	12.0	0.253	11.15	0.341	3.697	0.181	0.029	0.221	0.022	8.0
	1	12.2	0.267	9.88	0.268	2.163	0.175	0.027	0.214	0.041	7.7
	2	12.4	0.282	8.57	0.203	2.030	0.165	0.019	0.202	0.057	7.5
	3	13.2	0.293	6.66	0.189	1.790	0.151	0.015	0.196	0.066	7.2
Spiced RTS (90 Mango: 10 Mint)	0	12.0	0.257	11.17	0.344	3.733	0.187	0.03	0.225	0.022	8.1
	1	12.2	0.268	10.05	0.274	2.220	0.177	0.029	0.217	0.040	8.0
	2	12.8	0.285	8.68	0.210	2.140	0.165	0.019	0.207	0.049	7.8
	3	13.3	0.296	6.74	0.196	1.827	0.152	0.016	0.203	0.055	7.6
CD at 5%	Mean	12.5	0.272	9.11	0.253	2.45	0.169	0.023	0.211	0.044	7.74
	Treatment	0.031	0.002	0.018	0.002	0.016	0.001	0.001	0.007	0.001	0.111
	Storage	0.044	0.003	0.025	0.002	0.023	0.001	0.001	0.007	0.002	0.157
	Treatment × Storage	0.062	N/A	0.035	N/A	0.033	0.002	N/A	N/A	0.003	N/A

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