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## Development of herbal nectar prepared from a blend of bottle gourd, mint and lime

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### Abstract

Nectar is a type of fruit beverage which contains at least 20% fruit juice or pulp and 15% total soluble solids and is preserved by heat processing. The acidity in fruit nectars shall not exceed 1.5% as citric acid. No class II preservative like SO<sub>2</sub> or benzoic acid is permitted in fruit nectar as per Indian Food Laws. It is not diluted before serving. Fruit and vegetable nectars are beverages produced from purees, juices, or concentrates of either, blended with water and sugar, honey, syrups, or sweeteners. In this study blended nectar prepared by different ratios by using Bottle gourd juice, Mint leaf extract and Lime juice. Among them blend of (Bottle gourd juice (60): Mint leaf extract (15): Lime juice (5) : Sugar Syrup Solution (20)) noted as (T<sub>3</sub>) contain more antioxidant activity (53.58%) which was assay by DPPH method and it also rich in vitamin-C (14.30%) & protein (1.40%) as compared with control (T<sub>0</sub>) (Bottle gourd juice (75): Mint leaf extract (0): Lime juice (5) : Sugar Syrup Solution (20)). As per the sensory evaluation T<sub>1</sub> (Bottle gourd juice (70) : Mint leaf extract (5): Lime juice (5): Sugar Syrup Solution (20)) has chosen as the best product in their sensory attributes like colour & appearance, consistency, flavour & taste, overall acceptability. The microbial load is less on T<sub>3</sub> (Bottle gourd juice (60): Mint leaf extract (15): Lime juice (5): Sugar Syrup Solution (20)). This nutritive vegetable juice was utilized after blending with lime juice and mint leaf extract to adjust the acidity and increase the palatability. Thus, such kind of blended herbal nectar has potential application in enhancing health benefits and therapeutic applications.

**Keywords:** Bottle gourd, mint, lime, sugar, juice, nectar.

### Introduction

Fruits & vegetable species represented an enormous wealth of agricultural biodiversity with potential to contribute to improved incomes, food security and nutrition as well as to combat micronutrient (vitamin & mineral) deficiencies. Fruits and vegetables have conferred on them the status of functional foods (Hasler, 1998) [7]. They seem to be capable of delivering health benefits besides fulfilling physiological needs. Routine or habitual consumption of fruits and vegetables confers significant benefits to human health (Steinmetz and Potter, 1996) [13]. Plant food, especially vegetables and fruits, have been given great attention due to their health benefits now a days. In the past decade, numbers of studies have found that they are the great source of natural antioxidant (Tezcan *et al.*, 2009) [14].

The bottle gourd (*Lagenaria siceraria*) is greenish in color, bottle shaped or round shaped vegetable. Bottle gourd (*Lagenaria siceraria*) is 96.1% water, so is light on the stomach and aids digestion. It is beneficial for health in many ways. The pulp of the fruit is considered cool, diuretic, antibilious, and useful in coughs and as antidote to certain poisons (Duke, 1992; Ghule *et al.*, 2006; Ghule *et al.*, 2007) [4, 5, 6]. Decoction of leaves mixed with sugar is considered beneficial in jaundice and fruit is also used in cholera (Rahman *et al.*, 2008) [12].

Botanically, the herb belongs to the Lamiaceae family, in the genus; *Mentha*, and botanically named as *Mentha piperita*. Mint is packed with antioxidants and phytonutrients that can work wonders for our stomach. The menthol present in pudina helps the enzymes necessary for digestion. Mint leaves are packed with anti-bacterial and anti-inflammatory properties.

Lime is very well-known as a cure for scurvy, the disease which is caused from a deficiency of vitamin-C. Scientifically lime is known as *Citrus aurantifolia*. Lime juice and its natural oils are very beneficial for skin when consumed orally or applied externally. It rejuvenates the skin, keeps it shining, protects it from infections and reduces body odor due to the presence of a large amount of vitamin-C and Flavonoids. Those are both class-1 antioxidants, and have antibiotic and disinfectant properties

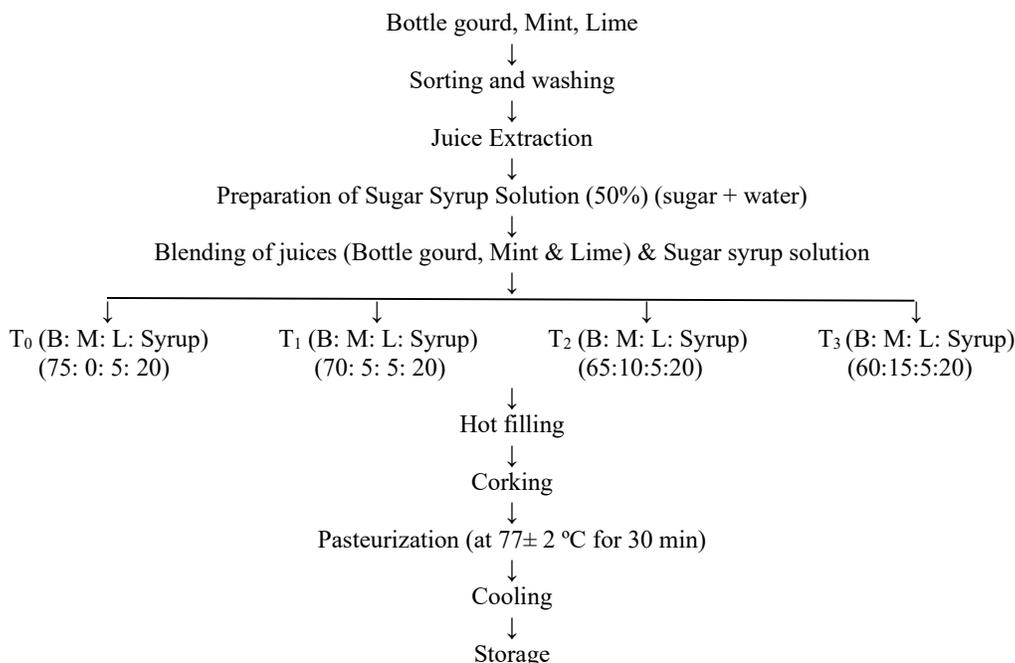
## Materials and Method

### Preparation of blended nectar

Bottle Gourd, Mint, Lime and sugar were procured from the local market of Allahabad. Bottle Gourd was washed, de-skinned, cut into pieces and extracted the juice by juicer and filtered through two layers of muslin cloth. Mint leaves were separated from stalk, cleaned, cut into small pieces, kept the

leaves in the muslin cloth, blanched in boiling water for 2 mins and the juice was extracted by mechanical juicer and filtered. Lime juice was extracted by the mechanical juice extractor. These juice blends were optimized by keeping the quantity of lime juice constant and varying the quantity of bottle gourd juice and mint leaf extract. 50% sugar syrup solution used for the blended nectar.

### Flow chart for the preparation of blended nectar



### Treatment Combination

**T<sub>0</sub>** - Blended Nectar (control) prepared from 75% Bottle gourd juice + 5% lime juice + 20% sugar syrup solution.

**T<sub>1</sub>** - Blended Nectar prepared from 70% Bottle gourd juice + 5% Mint leaf extract + 5% Lime juice + 20% sugar syrup solution.

**T<sub>2</sub>** - Blended Nectar prepared from 65% Bottle gourd juice + 10% Mint leaf extract + 5% Lime juice + 20% sugar syrup solution.

**T<sub>3</sub>** - Blended Nectar prepared from 60% Bottle gourd juice + 15% Mint leaf extract + 5% Lime juice + 20% sugar syrup solution.

### Sensory analysis

The Blended Nectar samples of different treatments prepared under this study were evaluated sensorily by the panel of 5 experienced staff members adopting 9-point hedonic scale as described by Nelson and Trout (1981) [10].

### Physico-chemical analysis

The blended nectar samples of different treatments were analyzed for their different analytical methods. Total soluble solids were determined with refractometer (0-32 °Brix) at temperature 28°C and the values were expressed as °Brix. Titrable acidity was calculated in terms of citric acid percentage was recorded in the juice samples and blended nectar samples by titrating against 0.1N NaOH according to AOAC (2000) [2] method. The total sugar content, reducing sugar and ash content was determined by the method as described by Ranganna (1986) [11]. Protein content was determined by Kjeldahl method for nitrogen estimation, using

factor of 6.38 for conversion of nitrogen into protein AOAC (2000) [2]. Ascorbic acid (Vitamin-C) was determined by the method as described by AOAC (2000) [2], pH with Digital pH meter and antioxidant activity estimation by method of Dorman *et al*; (2004) [3] DPPH (2, 2-diphenyl-1-picrylhydrazyl) was used as a source of free radical.

### Microbial analysis

The blended nectar samples of different samples were analyzed for different microbial parameters such as standard plate count, yeast and mould count and coliform count. Standard Plate Count (SPC) was determined by adopting standard procedure using Standard Plate Count Agar (SPCA) media as mentioned by Amin (1997) [1]. The yeast and mould count of blended nectar sample were taken as per described in IS: 5403 (1969) [8] using Potato Dextrose Agar (PDA). The coliform count of blended nectar samples was determined as per procedure described in IS: 5550 (1970) [9] using Mc Conkey's Agar.

### Statistical analysis

Data obtained from the organoleptic, physico-chemical and microbial analysis were statistically analyzed by using analysis of variance-two way classification, critical difference. The significant effect of treatment was judged with the help of F' (Variance Ratio). F-cal values were compared with the table value of F at 5% level of significance. If calculated value exceeds the table value, the affect is considered to be significant. The significance was tested at 5% level.

**Cost estimation of manufacturing Blended Nectar**

The cost estimation (Rs./Liter) of the product was worked out by taking into account the prevailing market rates of the ingredients used for preparation of Blended Nectar.

**Results and Discussion**

**Sensory Evaluation of Blended Nectar**

The score of colour & appearance, consistency, flavour & taste as well as the overall acceptability of different types of Blended Nectar were compiled in Table 1. It was observed that the colour and appearance score of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> sample of blended nectar was 6.58, 8.30, 7.68 and 7.02 percent respectively. The consistency score of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and

T<sub>3</sub> was 6.61, 8.02, 7.68 and 7.48 respectively. The flavour and taste score of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> is 6.68, 8.36, 7.62 and 7.30 respectively. The overall acceptability score of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> blended nectar was 6.65, 8.34, 7.74 and 7.21 respectively. The result of this experiment shows that organoleptic properties of herbal nectar prepared from a blend of bottle gourd, mint and lime was higher than that of control blended nectar. The highest sensory evaluation shown for colour & appearance, consistency, flavour & taste as well as the overall acceptability is for blended nectar prepared by using 70% Bottle gourd juice + 5% Mint leaf extract + 5% Lime juice + 20% sugar syrup solution with the score 8.30, 8.02, 8.36 and 8.34 respectively.

**Table 1:** Summary of the results of sensory evaluation of different blended nectar samples (Mean)\*.

Parameters	Types of Blended Nectar				S.Ed ±	C.D. at 5%	Result
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>			
Colour & Appearance	6.58	8.30	7.68	7.02	0.16	0.34	Significant
Consistency	6.61	8.02	7.68	7.48	0.22	0.47	Significant
Flavour & Taste	6.68	8.36	7.62	7.30	0.20	0.44	Significant
Overall Acceptability	6.65	8.34	7.74	7.21	0.09	0.20	Significant

\*Average of five trials.

**Physico-Chemical Properties of Blended Nectar**

The total soluble solids (%), vitamin-C (%), pH, acidity (%), antioxidant activity, protein (%), total sugar (%), reducing sugar (%) and ash (%) of different types of blended nectar were compiled in Table 2. Total soluble solids (%) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> blended nectar was 15.80, 15.60, 15.41 and 15.20 respectively. Vitamin-C (% ascorbic acid) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 10.15, 12.62, 14.08 and 14.30 respectively. pH of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 4.51, 4.55, 4.61 and 4.67 respectively. Acidity (%) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 0.56, 0.54, 0.52 and 0.49 respectively. Antioxidant activity of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was

49.77, 51.03, 52.30 and 53.58 respectively. Protein (%) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 0.59, 0.83, 1.14 and 1.40 respectively. Total sugar (%) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 12.63, 12.11, 11.97 and 10.58 respectively. Reducing sugar (%) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 2.39, 2.10, 1.70 and 1.20 respectively. Ash (%) of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 0.84, 0.79, 0.75 and 0.69 respectively. It was observed that the vitamin-C, pH, antioxidant activity and protein of blended nectar were significantly increased but a significantly decreasing trend was observed in the total soluble solids, acidity, total sugar and ash content of blended nectar with increasing level of the mint combination.

**Table 2:** Summary of the results of physico-chemical evaluation of different blended nectar samples (Mean)\*.

Parameters	Types of Blended Nectar				S. Ed ±	C.D. at 5%	Result
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>			
Total soluble solids (%)	15.80	15.60	15.41	15.20	0.02	0.05	Significant
Vitamin-C (% ascorbic acid)	10.15	12.62	14.08	14.30	0.07	0.15	Significant
pH	4.51	4.55	4.61	4.67	0.03	0.06	Significant
Acidity (%)	0.56	0.54	0.52	0.49	0.02	0.04	Significant
Antioxidant activity (%)	49.77	51.03	52.30	53.58	0.25	0.54	Significant
Protein (%)	0.59	0.83	1.14	1.40	0.03	0.07	Significant
Total sugar (%)	12.63	12.11	11.97	10.58	0.02	0.04	Significant
Reducing sugar (%)	2.39	2.10	1.70	1.20	0.02	0.04	Significant
Ash (%)	0.84	0.79	0.75	0.69	0.04	0.08	Significant

\*Average of five trials.

**Microbial evaluation of Blended Nectar**

The standard plate count (×10<sup>3</sup>cfu/ml), yeast and mould (cfu/ml) and coliform of different types of blended nectar were compiled in Table 3. SPC of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> blended nectar was 20.60, 17.00, 16.80 and 16.40 respectively. Yeast

and mould of T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> was 4.20, 3.60, 3.40 and 3.20 respectively. Coliform were not detected in any of the blended nectar samples, which is an indicative that the blended nectar samples were free from coliform and hence, safe for consumption.

**Table 3:** Summary of the results of microbial evaluation of different blended nectar samples (Mean)\*.

Parameters	Types of Blended Nectar				S.Ed. ±	C.D. at 5%	Result
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>			
SPC (×10 <sup>3</sup> cfu/ml)	20.60	17.00	16.80	16.40	1.00	2.18	Significant
Yeast & Mould (cfu/ml)	4.20	3.60	3.40	3.20	0.44	0.95	Significant
Coliform	Nil	Nil	Nil	Nil	-	-	-

\*Average of five trials.

### Cost structure of Blended Nectar

All the ingredients required for preparation of Blended Nectar were rated as per prevailing market prices (2015-2016). The cost of one liter Blended Nectar of treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> was Rs. 49.50, 57.00, 64.50 and 72.00 respectively.

### Conclusion

In consideration of the experimental results obtained during the present analysis, it may be concluded that the Blended Nectar can be successfully prepared by using Bottle gourd juice, Mint leaf extract, Lime Juice and Sugar. Blended Nectar along with Bottle gourd juice, Mint leaf extract, Lime Juice and Sugar of treatment T<sub>1</sub>(Bottle gourd juice (70) : Mint leaf extract (5): Lime juice (5): Sugar Syrup Solution(20)) is best in organoleptic characteristics among all treatments and received highest score in organoleptic evaluation (colour & appearance, consistency, flavour & taste, overall acceptability). In T<sub>3</sub>(Bottle gourd juice (60) : Mint leaf extract (15): Lime juice (5): Sugar Syrup Solution(20)) has high antioxidant activity (53.58%), vitamin-C (14.30%) & protein (1.40%) as compared with T<sub>0</sub> (Bottle gourd juice 75: Mint leaf extract (0): Lime juice (5) : Sugar Syrup Solution (20)) whereas T<sub>2</sub>(Bottle gourd juice (65) : Mint leaf extract (10): Lime juice (5): Sugar Syrup Solution(20)) has moderate amount of antioxidant activity (52.30%), vitamin-C (14.08%) & protein (1.14%). The order of the cost is as follows T<sub>3</sub>>T<sub>2</sub>>T<sub>1</sub>>T<sub>0</sub>. The cost affordable estimation for the sample is as follows T<sub>0</sub> (49.50 Rupees/lit), T<sub>1</sub> (57.00 Rupees/lit), T<sub>2</sub> (64.50 Rupees/lit), T<sub>3</sub> (72.00 Rupees/lit).

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