International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 2566-2568

Received: 21-07-2018
Accepted: 23-08-2018

Nayan Patel
Research Scholar, K.K Wagh College of Food Technology, Nashik, Maharashtra, India

Snehal Gaidhani
Research Scholar, K.K Wagh College of Food Technology, Nashik, Maharashtra, India

Kanchan Lengure
Assistant Professor, Department of Food and Industrial Microbiology, Nashik, Maharashtra, India

Correspondence
Nayan Patel
Research Scholar, K.K Wagh College of Food Technology, Nashik, Maharashtra, India

Development and quality evaluation of bael-pineapple-lemon ready-to-serve (RTS) beverage

Nayan Patel, Snehal Gaidhani and Kanchan Lengure

Abstract
This study aimed to develop a process for the development of ready to serve (RTS) beverages from Bael, Pineapple and Lemon. The feasibility of blending Bael and pineapple juice in combination with lemon extracts in different ratio for preparation of blended Ready-to-Serve beverage. The blended RTS was analyzed for its different physicochemical as well as sensory qualities by adopting 9 point Hedonic scale. Among different blended ratio for prepared RTS, the ratio of 60:30:10 was reached the highest sensory scores for overall acceptability.

Keywords: Ready to serve, feasibility, physicochemical, acceptability

1. Introduction
Fruits are important part of human diet. They are commercially important and nutritionally indispensable food commodity. Man has kept these commodities in his diet to provide variety, taste, interest, aesthetic appeal and to meet certain nutritional requirements. Fruits are edible products of the perennial higher plants with high water content, soft texture, sweet, sour and semi astringent flavours. Because of their exotic flavour and taste, considerable attention is paid in different parts of the world. The Fruits are consumed by man, mainly because of their organoleptic and chemical property.

Bael (*Aegle marmelos*) an important indigenous fruit of India belongs to family Rutaceae. The importance of bael fruit lies in its curative, nutritive properties, which make the tree one of the most useful medicinal plants of India. It cantains 61.5 g water, 1.8g protein, 0.39 mg fat, 1.7 g minerals, 31.8 g carbohydrates, 55 g carotene, o.13 mg thiamine, 1.19 mg riboflavin, 1.1 mg niacin and 12 mg vitamin C per 100 g of edible portion. No other fruit has such a high content of riboflavin. A fair amount of pectin is found in bael. The percentage of pectin on fresh fruit on weight basis is 2.66. Marmelosin is most probably the therapeutically active principle of bael fruit. It has been isolated as a colourless crystalline compound. (Nidhi, Gehlot, 2008) [2]

Pineapple juice contains ascorbic acid and is a good source of Vitamin C. Ascorbic acid or vitamin C fights bacterial and viral infections which is an effective antioxidant and helps the body absorb iron. Half a cup of pineapple juice provides 50 percent of an adult's daily recommended amount of vitamin C. Several essential minerals exist in pineapples, including manganese, a trace mineral instrumental to the formation of bone, as well as the creation and activation of certain enzymes. Pineapples also include copper, another trace mineral. It assists in the absorption of iron and regulates blood pressure and heart rate. (Debnath, P. Dey. P., 2012) [4]

Lemon (*Citrus limon*) is an important therapeutic plant belonging to the family of Rutaceae. Lemon juice is very rich in vitamin C, a vitamin responsible for a series of health benefits. It is a small tree and originated probably from Asia. The fruit of lemon tree is green to yellow in colour and it is used in making various foods, due to its distinctive flavour and ability to enhance flavour of certain foods. The lemon juice is a major product of lemon fruit obtained on commercial scale. It is planted mainly for its alkaloids, which are having anticancer activities and the antibacterial potential in crude extracts of different parts (viz., leaves, stem, root and flower) of Lemon against clinically significant bacterial strains has been reported.

Blending could lead to the production of delightful and delicious beverages with improve organoleptic quality and high nutritive value. Blending increases taste and flavour of fruit juices. The blending of juice may also improve aroma, taste and nutrients of the beverages. (R. L. Bhardwaj and S. Mukherjee., 2011) [7, 14]

2. Materials and Methods

2.1 Extraction of pulp from bael fruit

The ripe bael fruits were broken by striking against hard object. The fruit pulp along with its seeds and fibers was scooped with the help of a stainless steel spoon. 200 ml water was added to each one kg of bael fruit pulp. The mixture of fruit pulp and water was then kneaded, heated up to 60 to 65 ˚C temperature for 10 minute and allowed to cool. The cooled pulp was passed through muslin cloth to obtain seed and fiber free pulp. (Chand T and Gehlot R., 2006) [8, 10]

2.2 Preparation of pineapple juice

The fully riped, fresh and sound pineapple fruit were selected. The fruit were washed with water to remove dirt and dust. After peeling, the pineapple fruits were cut into the slices and core was removed. The pineapple slices were then passed through mixer and the the extracted juice was strained through muslin cloth. **(**Asgekar, M.A. 2002) [11]

2.3 Preparation of lemon juice

Fresh lemons were purchased from market. After washing lemons were cut into two halves squeezed with squeezer to obtain clear juice. (Humaira K, 2016) [9]

2.4 Preparation of Blended RTS

For preparing blended ready-to-serve (RTS) drink TSS (%) and acidity (%) in the extracted fruit pulp were analyzed. On the basis of analysis, requisite amounts of sugar and citric acid dissolved in required amount of water were added to measure quantity of bael pulp for adjustment of TSS (%) and acidity (%) in RTS drink as per treatments. The prepared RTS drink was thoroughly homogenized and filled in clean, sterilized 200 ml capacity glass bottles leaving 2-3 cm head space. The beverage filled bottles were sealed with sterilized crown corks, pasteurized in boiling water for half an hour, cooled in air and stored in cool and dry place. (Verma and Gehlot, 2006 & 2007) [8, 10]

Flow diagram for preparation of Blended RTS Beverage

Mixing of fruit pulp/juice (Bael: Pineapple: Lemon)
↓
Analysis of TSS (%) and acidity (%) in bael fruit pulp
↓
Preparation of sugar syrup as per treatment
↓
Straining and cooling of sugar syrup
↓
Mixing it with fruit pulp
↓
Homogenization
↓
Bottling
↓
Sealing and pasteurization
↓
Cooling
↓
Labelling
↓
Storage

2.5 Formulation of RTS beverages

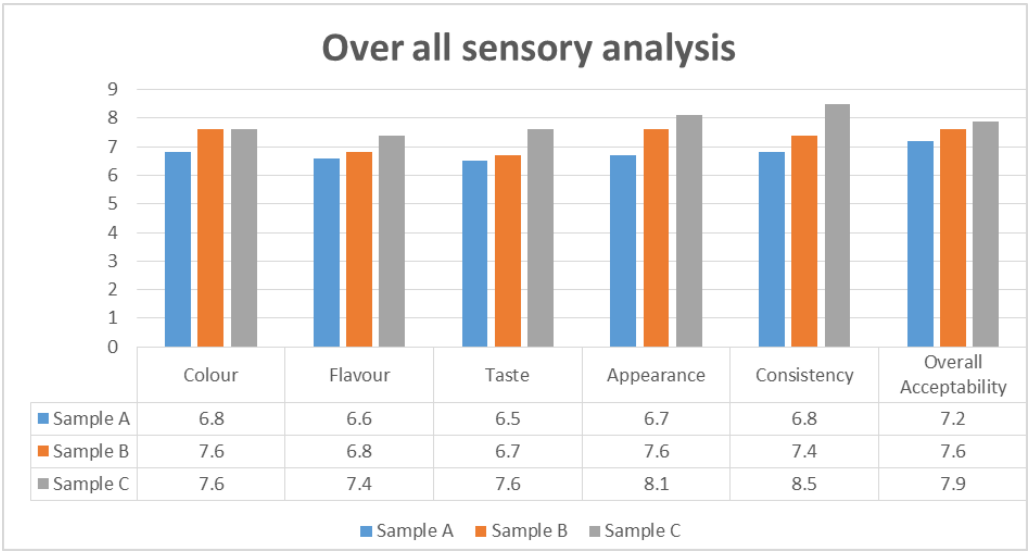
Table 1: Formulation of RTS beverages

Sr. No.	Ingredient	Sample 1	Sample 2	Sample 3
1	Bael	40	55	60
2	Pineapple	50	40	30
3	Lemon	10	5	10

3. Results and discussion

3.1 Sensory Evaluation of Blended RTS

Sensory evaluation of the sample was carried out by trained sensory panel member using nine point's hedonic scale. Attributes like taste, colour, appearance, flavour and overall acceptability was scored based on its intensity scaled. 9-Point Hedonic Scale has been used for the purpose. The sensory score given by the panel have been evaluated for the sensory result. The result of sensory analysis are given below in graph. Sample C was selected on the basis of Sensory analysis.



Graph: Sensory Analysis

3.2 Chemical Analysis
The chemical parameters viz. total soluble solid, titrable acidity, pH, ascorbic acid and tannin, TSS were measured by laboratory analysis.

3.2.1 Titratable Acidity
The percent titratable acidity was estimated by simple acid / alkaline titration method as described in A.O.C.C (1984). 20ml RTS solution was taken pipette in a 100ml flask in which distilled water was added to make a volume up to 100ml and shaked, 25ml of the diluted RTS solution was taken by pipette and transferred into a 250 ml beaker in which 3 drops of Phenolphthalein indicator was added and titrated with 0.1N NaOH solution till the pink colour end point was reached. End point readings were recorded and the percentage acidity was calculated by the following formula (Ranganna, 1986).

3.2.2 Determination of pH
The pH values were determined with the help of an electronic pH meter (Thermo Scientific, 2 stars), Acidity of various samples was determined by titrating against 0.1 N NaOH by using phenolphthalein indicator according to A.O.A.C (1995) method.

3.2.3 Total soluble solids (TSS)
Total soluble solids of the sample were calculated with the help of Erma hand refractometer and values are corrected to 20 ^{0}C with the help of temperature correction chart (AOAC, 1995).

3.2.4 Ascorbic Acid
The ascorbic acid content was estimated as per Assay method given by Ranganna (1986).

Table 2: Results of Chemical Analysis

Sr. No.	Particulars	Value
1	Energy	40 Kcal
2	Vitamin C	28 mg
3	TSS	10^0 Brix
4	pH	4.4
5	Acidity	0.3 %

4. Conclusion
The fresh fruit has limited shelf life therefore, it is necessary to utilize the fruit for making different products to increase its availability over an extended period and to stabilize the price during the glut season. Blending of different fruit pulp/juice not only increases the palatability but also improves the quality of beverages. Moreover, there is always a demand from the consumer all over the world for new product, which should be nutritious and delicacy flavoured. The objectives of blending may include increase in acceptability of product by providing good taste and flavour and up gradation of nutritional quality. The bael and pineapple fruit blended RTS could be prepared with an acceptable quality. Keeping in view to standardize and evaluate the recipe for bael, pineapple and lemon blended RTS.

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