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Research Article
Studies on Preparation of Ready to Serve Whey Beverage Using Whey and Bael Fruit (*Aegle marmelos*)

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Abstract

Background and Objectives: Whey is a byproduct of cheese or casein or shrikhand product. Whey is containing almost all water soluble nutrients present in milk particularly lactose, whey protein, vitamins and minerals. The present investigation was carried out to study the effect of level of juice in whey beverage and to study the acceptability of bael fruit beverage. **Materials and Methods:** Whey beverage was prepared by supplementing different levels of bael fruit pulp viz., 1, 2, 3 and 4% to the whey beverage. Whey beverage prepared without pulp served as control and was compared with the treatments. **Results:** The maximum mean sensory score was obtained to the beverage samples of treatment T0 and T1 for the taste. For the taste, sample T1 got highest (8.16) score however sample T4 got (1.58) lowest score. The overall acceptability of the treatments decreased when the level of fruit pulp increased. It also observed that when pulp level increased the score for smell also increased but reduced the taste score. It may be happened due to the taste of this fruit. **Conclusion:** From the present investigation it is concluded that the overall acceptability of all the treatments decreased when the level of fruit pulp increased. It is also observed that when pulp level increased the score for smell also increased but reduced the taste score it might be due to the bitter taste of this fruit. Therefore, when the level of pulp increased the score for the taste reduced. It is recommended that bael fruit can be effectively used for the production of this newly invented beverage.

Key words: Shrikhand, cheese, beverage, fruit pulp, ethnomedicinal, bael fruit, sensory evaluation

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Whey is a byproduct of cheese or casein or shrikhand product. Sweet whey manufactured during the making of rennet types of hard cheese like cheddar or swiss cheese. Acid whey is a byproduct, produced during the making of acid type of dairy products such as cottage cheese or strained yogurt.

Whey is the watery component removal after paneer, channa and cutting of the curd in cheese. After the drainage of curd while shrikhand making and when acid coagulated dairy products like paneer and channa are prepared. Day to day production of paneer is increasing resulting in an increased whey production is estimated at 150000 t of paneer. Whey is generally classified into 3 classes as sweet, sour or acidic. It depends on its titratable acidity and pH. Whey contain almost all water soluble nutrients present in milk particularly lactose, whey protein, vitamins and minerals[1,2].

Aegle marmelos is commonly called as bael or beal or Bengal quince or bael fruit. The trees are of great importance to the environment as they act as climatic purifier that is they release greater percentage of oxygen in comparison to other trees. Sunita and Ananya[3] studied the physico-chemical properties of bael and aloe whey blended beverages in this investigation, they reported that bael content has high nutritive value which is very beneficial for the health.

Bael tree is a sacred tree to Hindus since vedic time. All the ancient Ayurveda scholars mainly Charaka, Sushruta and Vagbhata described its immense medicinal values[4]. In ayurveda the leaves, bark, roots, fruits and seeds are extensively used in the preparation of different medicine[5,6]. Alternative medicines other than ayurveda like Unani, Siddha and Chinese medicinal system gave this plant same importance[7]. The bael fruit used in ayurvedic medicine to cure Vata and Kapha disturbances in the body. Unripe bael fruits are used in the treatment of chronic diarrhea, dysentery, peptic ulcers as a laxative and in respiratory diseases[8]. Many ethnomedicinal scientific studies in past suggest that the fruit, leaves, seeds, root and bark of this plant have a very good therapeutic effects on anti-diabetic, antiulcer, antioxidant, anti-malarial, anti-inflammatory, anticancer, radio protective, anti-hyperlipidaemic, anti-fungal, anti-bacterial, antiviral, anti-diarrheal, gastroprotective, hepatoprotective and cardio protective activities.

The fruit is having medicinal value when it has ripened. The ripe fruit is having aromatic characteristic and astringent characteristic which helps construction of skin, coolant and laxative. When the fruit is unripe or half-ripe fruit have a astringent characteristic, digestive stomachic which improves appetite and it also helps to fight against scurvy. By considering the importance of whey and bael fruit it was decided to prepare Ready To Serve (RTS) by using the whey and bael fruits. The present investigation was carried out to study the effect of level of juice in whey beverage and to study the acceptability of bael fruit beverage.

MATERIALS AND METHODS

Study area: This study was conducted in January, 2018 at Department of Dairy Science, Maharashtra Udaygiri College, Udgir district, Latur, Maharashtra, India. Considering the initial investigation on the effects of different levels of bael fruit pulp, the study was conducted on the sensory quality of this product with 3 levels of bael fruit pulp. The levels of these variables that resulted in most of the liked product on the basis of sensory evaluation were selected. Good quality of milk, citric acid, sugar and bael fruit were purchased from the local market of Udgir district, Latur, Maharashtra, India.

Extraction of bael juice: The bael fruit juice was extracted as per the method used by Singh and Nath[9] with slight modifications. The freshly ripe bael fruits were collected (1000 g) and washed thoroughly in running tap water. Fruits were peeled with the help of stainless steel knife, cut into 2 half pieces, then removed the hard shell of bael fruit. After that sieved and removed the seed and fibre. The pulp filled in bottle and capped then kept the bottle filled with pulp at room temperature.

Method of preparation: Whey beverage was prepared as per the method described by Landge and Gaikwad[10] with slight modification. The flow diagram of preparation of bael fruit is show in Fig. 1.

Details of manufacture: Fresh milk was procured from the local market of Udgir with 3.5% fat and 8.5% Salid Not Fat (SNF). Whey beverage was prepared by supplementing different levels of bael fruit juice viz., 1, 2, 3 and 4% to the whey beverage. Whey beverage prepared without pulp served as control and was compared with the treatments.

Mixed the bael juice and whey juice then added sugar, citric acid and water for preparing strained syrup then added the preservative that is sodium benzoate at the rate of 100 ppm syrup with sodium benzoate (preservative) pasteurized in water bath at 60°C for 5 min. Pasteurized syrup cooled at room temperature and filled the bottle of 200 mL capacity with pasteurized syrup and stored until further use.

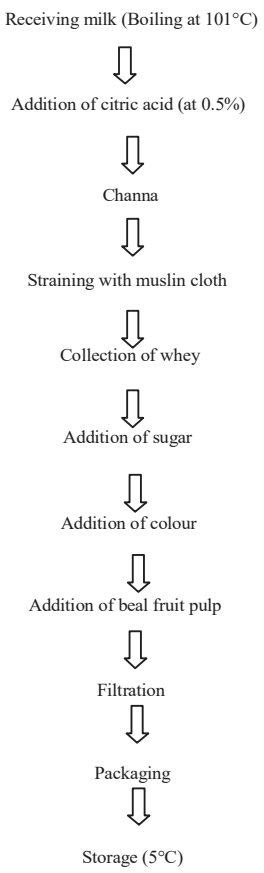

Fig. 1: Flow diagram of preparation of bael fruit

Table 1: Process combinations (Bael fruit level %)

Process combination	Level of pulp (%)
T0	0
T1	1
T2	2
T3	3
T4	4

T0: 0% pulp, T1: 1% pulp, T2: 2% pulp, T3: 3% pulp and T4: 4% pulp

Process combination: For the present investigation, following process combinations were used to standardize the product as shown in Table 1.

Sensory evaluation: Sensory evaluation of fresh samples was done by a panel of 6 semi trained judges, based on a 9 point hedonic scale, wherein 9 denoted extremely desirable and 1 denoted extremely undesirable. Water was provided for oral rinsing between the samples.

For present study, stainless and aluminum utensils were used such as; aluminum open pan (karahi), stainless steel plate's khunti, tray, spoons and glass like beaker, measuring cylinder and glass rod etc.

The scores for qualitative data such as colour and appearance, flavour, body and texture, sweetness and the overall acceptability given by different judges were tabulated.

Statistical analysis: The data thus obtained was analyzed as per one way ANOVA by Snedecor and Cochran[11].

RESULTS AND DISCUSSION

The maximum mean sensory score was obtained (Table 2) to the beverage samples of treatment T0 and T1 for the taste. For the taste, sample T1 got highest (8.16) score however sample T4 got (1.58) lowest score. It is observed from the present investigation that the pulp level affect the smell score, score reduced when the pulp level increased. The maximum mean sensory score for color was awarded by the panelist to the T1 sample (8.5), however T4 got lowest score it might be due to the appearance of deep color with bitter in taste, same findings were also reported by Singh and Nath[9] and Koy and Singh[12]. Out of all the samples the appearance for sample T2 showed high (8.5) score however T3 showed lowest (7.0) score, it is also observed that sample T2 showed good color, but bitter in taste. Overall acceptability of T1 sample awarded with the maximum mean sensory score (8.80), however T3 got lowest (5.50) score. Present investigations are in agreement with that of Divya and Kumari[13] and Singh *et al.*[14].

The mean sensory score given by the panelists to the bael fruit beverage sample prepared at different treatments given in Table2. The maximum mean sensory score was obtained to the product sample of treatment T0 and T1 combination for the smell, taste, color, appearance and over all acceptability out of all these combinations. The sample T1 got highest score as compared to the other combinations, however sample T4 got lowest score compared to other combinations. From present investigation, it is observed that the overall acceptability of the treatments decreased when the level of fruit pulp increased. It also observed that when pulp level increased the score for smell also increased but reduced the taste score. It may be happened due to the taste of this fruit. Same findings were also reported by Sunita and Ananya[3] and Singh and Nath[9]. The present investigation corroborated with Landge and Gaikwad[10] who reported that utilization of whey for the conversion into best beverage would be one of the important ways to utilize it. In dairy industry million liter of whey is released as waste material. This whey can be used to prepare healthy drink by using

Table 2: Effect of level of bael fruit pulp on the sensory quality of beverage

	Attributes				
Treatments	Taste	Smell	Color	Appearance	Overall acceptability
T0	8.05±0.28	8.58±0.34	8.05±0.20	0.8±0.49	0.08±0.33
T1	8.16±0.75	7.50±0.68	7.66±0.91	7.5±0.66	8.80±0.10
T2	6.05±0.46	6.83±0.51	5.25±0.64	8.5±0.87	7.05±0.25
T3	3.66±0.17	6.08±0.50	4.08±0.33	0.7±0.53	5.05±0.37
T4	1.58±0.47	4.16±0.65	2.75±0.28	7.5±1.01	6.58±0.61

Mean±SD are of three replications, T0: 0% pulp, T1: 1% pulp, T2: 2% pulp, T3: 3% pulp and T4: 4% pulp

such fruits. Therefore from waste to best, a healthy drink can be produced. As well as, it will also help to generate revenue to the manufacturer from waste material.

CONCLUSION

The overall acceptability of all the treatments decreased when the level of fruit pulp increased. It is also observed that when pulp level increased, the score for smell also increased but reduced the taste score it might be due to the bitter taste of this fruit. Therefore, when the level of pulp increased, the score for the taste reduced. From the present investigation, it is concluded that the bael fruit beverage could be prepared using the fruit pulp. The proportion of fruit pulp may be taken as 1 g pulp and 99 mL of whey for the preparation of bael fruit beverage. This combination was superior for its organoleptic quality. It is also recommended that bael fruit can be effectively used for the production of this newly invented beverage.

SIGNIFICANCE STATEMENT

This study discovered the whey beverage prepared from whey and bael fruit that can be beneficial for the people suffering various diseases.

This study will help the researchers to uncover the critical areas of utilization of whey beverage and using of bael fruit that many researchers were not able to explore. Thus, a new theory on preparation of main product from byproduct may be arrived at.

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