

CONSUMER'S PERCEPTION ON UNDERUTILIZED FRUITS: THE CASE OF BAEL FRUIT (*Aegle marmelos*)

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ABSTRACT

The paper aimed to investigate consumers' perception for Bael fruit (*Aegle marmelos*) and to explore the socio-economic and perception factors influencing sensory appeal of the bael snack. Cross sectional data were collected from 120 randomly selected individuals representing urban, semi urban and rural areas of the country using standardized survey questionnaire and. Sensory evaluation was conducted with 40 untrained panelists using line scale ranged from non-appealing:1 to very appealing: 5. The descriptive results revealed that bael fruit is readily available within the local markets of respondents which are underutilized in terms of consumption. Results showed that most of the respondents are aware about health benefits of bael fruits. 77.4% of respondents are willing to consume bael fruit if they are provided in snack form. Scores of sensory attributes revealed that 79.5% of the panelists were willing to consume the Bael cookie again and 89.7% of them stated that they would suggest the Bael cookie to other people. Hence the study shows that general consumers are aware of nutraceutical properties of bael fruits and, and there is a possibility of the production of Bael fruit pulp based functional foods.

Key words: Bael fruit (*Aegle marmelos*), underutilized fruits, bael snack, consumer perception

1. INTRODUCTION

The term "underutilized" is specified for crops that are not presently cultivated in a particular region or a country, but whose value has been proven elsewhere under similar climatic conditions, and those that are harvested from the wild. Crops which are considered as underutilized can vary depending on the area. Many of these species can tolerate different kinds of abiotic stresses and can be exploited under different situations [1].

Sri Lanka is rich in much exotic type of fruits and vegetables. However due to the commercialization of few fruit and vegetable crop species the entire country is mainly depend on handful of crop species neglecting large number of vegetables, fruits and other crop species with high nutritional and medicinal values which were grown traditionally in the past, resulting these valuable crop species are critically endangered and facing the state of speedy disappearing.

Bael (*Aegle marmelos*), locally known as Beli, is one of the underutilized fruit crop in Sri Lanka [2]. Bael fruit is very rich in vitamins, amino acids and minerals when compared to other fruits [3] and it can contribute significantly to the daily

nutrient needs of an individual. Moreover, it can be consumed as a supplement for deficiencies of other foods in an advantageous manner. In addition, studies have shown that high medicinal value of the Bael fruit is capable of reducing the effects of certain diseases including gastric ulcers, diabetes, high cholesterol, heart diseases, scurvy and respiratory problems. It also lessens the diseases involving the digestive tract including diarrhoea, cholera, haemorrhoids and constipation. Furthermore, Bael fruit is anti inflammatory and has the anti microbial property which can protect the body from harmful microbes.

However, most of the people nowadays are unaware of the nutritional value of the Bael fruit and the health benefits they can gain from consumption of Bael fruit frequently. In comparison with other fruits including mango, banana, apple etc. the demand for Bael fruit in the market is considerably low.

Many factors impact a person's food choice. These include biological factors such as changing energy demands, weight change) and socio-cultural factors including availability, prices, culture etc [4]. According to Schroeter et al., [5] fruit and vegetable consumption among college students in Arkansas was greatly influenced by

demographics, lifestyle, knowledge on health and food culture.

In comparison with the table values of mango, banana, apple and other frequently consumed fruits, bael fruit might not be popular among people, but they have unique nutritional and medicinal values. In order to develop the willingness among people to utilize these fruits, many processed products can be prepared enhancing their quality including taste and aroma and their nutritional values. Although some people are unwilling to consume Bael fruit as the edible fruit itself, they might show keen and interest on consuming it as a fruit snack or another processed product made using Bael fruit as the main ingredient. People have a preference for value added products than for consuming it as the completely edible fruit.

Therefore, this study was conducted to investigate the willingness of consuming Bael fruit among urban population of different genders, age groups, income levels and hometowns and their awareness on the benefits gained by it in order to establish a relationship between different factors influencing consumption behavior of the Bael fruit. In addition to this a sensory test was conducted to observe the preference on value added products made from Bael fruit.

2. METHODOLOGY

2.1. Study Area

The survey respondents were selected from different parts of the country which covers, urban, semi urban and rural areas. Field work of the study was conducted between March to April 2015 by the group of undergraduates of the Department of Biosystems Engineering, Faculty of Engineering, SAIMT.

2.2. Survey Design

An initial survey was conducted to find out the consumer awareness on nutritional and medicinal value of Bael fruit and their preference for value added Bael fruit products.

The study was conducted with a general survey model using a questionnaire as the survey instrument including a series of open ended questions with responses where respondents were asked to select responses according to their knowledge and preference. Prior to the sampling survey, the questionnaire was validated by conducting a pilot study. The questionnaire composed of questions on knowledge, preference

and possibility of value addition of Bael fruit.

The data about the consumption patterns, attitudes and health knowledge on Bael fruit among people of different age limits, income levels and hometowns were recorded and analyzed. The sample of the study is composed of 120 randomly assigned individuals aged 15 or more who volunteered to participate in the survey.

2.3. Bael Snack Preparation

After a number of preliminary trials using different ingredients (data not shown) a bael snack was prepared as follows. Bael fruits (*Aegle marmelos*) were taken at fully ripened stage. Fruits were opened, all the seeds and a less amount of fibers were removed from the Bael pulp and the required weight of the thick Bael pulp was extracted from the Bael fruit. Sugar and margarine were beaten well to get a uniform texture and egg white was added to the mixture. Sugar is added to reduce the bitterness and to improve the taste of the sample. Slightly heated rice flour, wheat flour and extracted Bael pulp were added to the mixture along with a less quantity of milk powder and baking powder. All the ingredients were mixed and beaten together to obtain a uniform mixture. The required shape of the cookie which is appealing to the consumer was obtained using a nozzle. The prepared sample of cookies was baked in the oven at 165°C for 25 minutes.

2.4. Sensory evaluation of Bael snack

Sensory evaluation was done using a non-trained panel of 40 people above 15 years among the SAIMT community including the staff and students from the faculties of Engineering, Medicine and Media who volunteered to participate in the sensory test. In conducting the sensory test, completely randomized design (CRD) was used as the experimental designs and samples were completely randomized across all panelists to reduce the impact of erroneous results which might be obtained due to the sample order. The panelists were given the sample and they assessed the sensory attributes of appearance, aroma, texture, sweetness and overall opinion on the Bael cookie by scoring each of the attribute according to their degree of liking in a line scale. The line scale ranged from non-appealing:1 to very appealing: 5.

2.5. Data Analysis

The reliable data obtained through the public study were used to conduct the data analysis.

Data were analyzed using the Statistical Package Social Sciences (SPSS).

3. RESULTS

In total 106 questionnaires were selected for data analysis.

Demographic features of sampling groups:

53.8% respondents were males and 46.2% respondents were females. In the income category, 3.8% of the respondents were getting an income of less than Rs. 25,000, 24.5% were getting an income of Rs. 25,000- Rs. 49,999, 12.3% were getting an income of Rs. 50,000- Rs. 99,999, and 9.4% were getting an income of Rs. 100,000 or more and 53% did not get any monthly income at all. Among the participants, 50.9% lived in urban areas, 38% lived in semi urban areas and 13% lived in rural areas.

Availability of Bael fruit and frequency of buying:

In this research it was revealed that Bael fruit was readily available in the local markets of 57.5% of the respondents. It was found that statistically there is no relationship between the kind of area respondents live (urban, semi urban, rural) and the availability of Bael fruit in the market at 5% level of confidence ($p=0.000+$). Only 18.9% of the respondents were willing to buy Bael fruit frequently along with the other fruits in the market. The participants who were willing to buy this fruit have stated reasons for buying it including, "taste", "nutritional value", "good for health", etc. Moreover, it was found that there is a significant difference between gender, age and income of the participant and the consumption of Bael fruit at 5% level of significance. ($p=0.000+$).

Nutritional and health knowledge:

Results revealed that 96.2% of the respondents were aware of the fact that consumption of Bael fruit can reduce the effect of certain diseases. As shown in the figure 1, 28.3% of the participants had no idea of the diseases which Bael fruit has an influence on reduction. Overall, a considerable number of participants were aware of most diseases given.

Diseases which Bael fruit has the ability to reduce:

Among the other diseases which respondents have stated, there were constipation, diarrhoea and diseases in the digestive tract. No relationship was found between the gender and age of respondents with the willingness to consume Bael fruit as a snack ($p<0.005$).

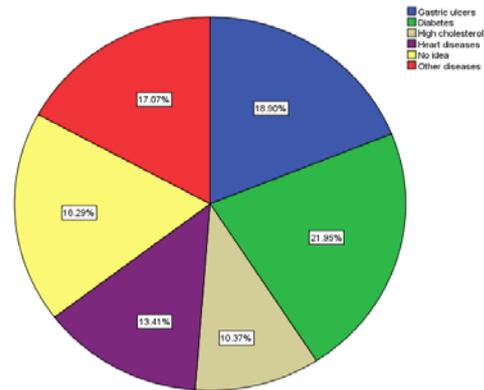


Figure 1: Awareness of medicinal value of Bael cookie

Willingness among respondents to consume Bael fruit snacks:

Among the respondents, 77.4% were willing to consume Bael fruits if they were provided as snacks. There was a significant difference between the monthly income and willingness among participants to consume Bael fruits as snacks ($p=0.024$) at 5% level of significance. When consider the gender and age also there were no statistical relationships with the willingness to consume Bael fruit as snacks ($p<0.05$).

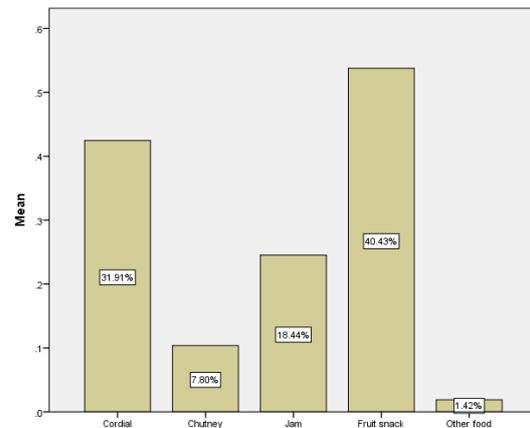


Figure 2: Preference for Bael fruit-value added products

Sensory evaluation:

Mean scores for the sensory evaluation as given by the 40 non-trained panelists for the Bael cookie is shown in the figure 3.

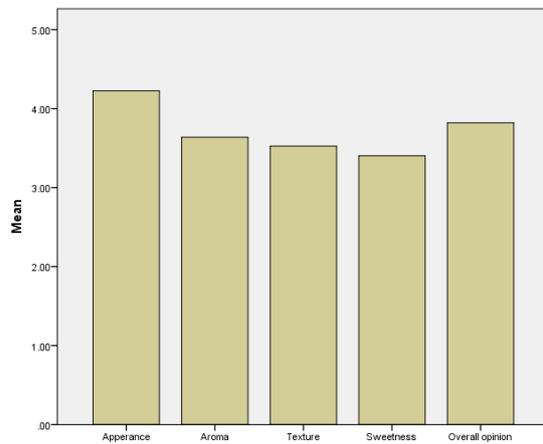


Figure 3: Sensory variation for the Bael cookie

Kruskal-Wallis analysis of scores for sensory evaluation of Bael fruit cookie showed the significant relationships and differences between appearance, aroma, texture, sweetness and overall opinion on the cookie along with the panelists' willingness to consume it again. From the study, it was revealed that appearance and overall opinion were significantly different from the willingness of the panelists to consume the Bael cookie again. Moreover, there was a significant relationship between aroma, texture and sweetness of the Bael cookie and the willingness to consume it again among the panelists.

Table 2: Probability values for each of the sensory attributes

Sensory attribute	p value
Appearance	0.047
Aroma	0.162
Texture	0.069
Sweetness	0.193
Overall opinion	0.027

To sum up, following the sensory evaluation, 79.5% of the panelists were willing to consume the Bael cookie again and 89.7% of them stated that they would suggest the Bael cookie to other people.

Suggestions for the Bael cookie:

According to the non-trained panellists, it was suggested that the sweetness of the Bael cookie should be further increased to reduce the bitterness of the Bael fruit pulp. In addition, the texture was suggested to be improved by increasing the softness of the cookie.

4. CONCLUSION

Based on the results of the study, it can be suggested that although Bael fruit is readily available in the market, it is considered as an underutilized fruit because consumption among people is considerably low. Most people are also aware of the nutritional and the medicinal value of this fruit and are willing to consume it if provided as snacks. Hence, the consumption of Bael fruit among people can be improved by introduction of value added products such as Bael cookie made from Bael fruit. The results of the sensory evaluation show the possibility of production of a Bael cookie in the standard required quality. The Bael cookie can be considered as a functional food because of the higher nutritional content and the medicinal value of the Bael fruit. Modifications should be carried out to improve the sweetness, softness and the nutritional quality of the product further.

5. REFERENCES

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