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Full Length Research Paper

Development of Value Added Products from Banyan tree (*Ficus benghalensis*) Fruit Powder

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ABSTRACT

Food production is considered as the process in which raw materials are converted into ready-made food products for human use either at domestic or commercial level. There are large number of plant products which are used for our well-being. The banyan tree (Ficus benghalensis) is the national tree of India. It is native to the Indian subcontinent, specifically India, Pakistan and Bangladesh. For thousands of years, people used banyans as a source of medicines. Banyan has great importance from the point of view of Ayurveda and traditional medicine. Now a days, tamarind bar and candies are eaten fondly but they are not so healthy for our body. That's why in present study, we incorporate banyan fruit powder in tamarind bar and candies to make them nutritive and healthy for our body. Also, now a day's oregano is also consumed by population in high quantity as a topping of pizza, pasta, Maggi and many more Chinese and Italian food. So, I developed oregano also to enhance taste of people in healthy way. Also, the present study is an initial step towards the utilisation of ignored fruit of trees and knowing their nutritional and medicinal values.

Introduction

The banyan tree (*Ficus benghalensis*) also called Indian banyan or banyan fig, is the national tree of India. Banyan tree is native to the Indian subcontinent, specifically India, Pakistan and Bangladesh. The banyan tree is found in tropical and subtropical regions of Asia, Africa, and Australia. It prefers a warm, humid environment and can grow in a variety of soils, including sandy, loamy, and rocky substrates. In India, it is found in almost everywhere. It is grown throughout the sub- Himalayan region and in the deciduous forests. This tree can live for hundreds of years and some trees believed to be more than 1000 years old. It is a large, wide-spreading tree with distinctive physical properties that make it a distinctive part of the landscape. It can grow up to 100 feet tall and can have a trunk more than 45 feet in circumference. It has a very wide spread, with branches that can extend up to 200 feet or more in circumference. Banyan fruit is called figs as the fruits of most ficus trees are called figs. It is a small, round fruit that is usually green in colour, but turns red or orange when ripe. The fruit is filled with a sweet, jelly-like pulp that is eaten fresh, dried or made into a drink. Banyan fruit is a rich source of nutrients and provides several health benefits. This fruit is rich in vitamins A, C, and K, and contains calcium, iron, and potassium. Apart from this, carbohydrates, sugar, fiber, protein, calories, vitamins, omega 3-6 and calcium and phosphorus are also found in in banyan fruits. It is considered as a super food due to its high nutrient content and numerous health benefits. The minerals, antioxidants and analgesic properties present in banyan fruits are beneficial in many problems. It is commonly used in traditional Indian medicine to treat a variety of ailments, including diabetes, heart disease and digestive problems.

Apart from the fruit of banyan, its leaves, bark, milk, roots and seeds are also used for the treatment of many diseases in *Ayurved*. The leaves of the banyan tree are rich source of antioxidants. Banyan tree leaves and barks having skin healing properties. The banyan tree's leaves and bark also contain sterols that have anti-inflammatory properties and can help in reducing inflammation in the body. Also the bark and leaves of the banyan tree contain compounds that exhibit anti-cancer properties, particularly against breast and liver cancer. The juice of the banyan tree is known to have antiseptic and wound healing properties. It can be applied topically to heal cuts, burns, and wounds. The bark of the banyan tree has astringent properties that can prevent gum bleeding and prevent tooth decay. The banyan tree's bark has been found to reduce blood sugar levels and can be useful in managing diabetes. The tree's aerial roots are also used in skincare products to reduce skin irritation and inflammation. The milk of banyan tree is useful to cure pimples and also prevent and treat Arthritis. Roots of the banyan tree are useful to reduce hair fall. Latex of the tree

is used to deal with premature ejaculation. Root powder of banyan is used to treat and maintain female fertility. Juice collected from bark of the tree is also used to get rid of skin moles and enhances skin texture. Overall, the banyan tree is a source of natural medicine with a wide range of potential health benefits.

Methodology

Candies and oregano are some of the food products that are widely consumed now a day by the major population of India. So we developed these products incorporated with banyan fruit powder to enhance their nutritional composition. Ripe banyan fruits with no visible external cuts or spoilage were collected and washed thoroughly in running water twice to remove dirt and adhering extraneous matter. After cleaning, banyan fruits were sundried till the moisture removed. Then powder of the dried fruits was made in a mixer grinder. Banyan fruit powder is stored in air tight and sanitized container. The two products (digestive bar and imli cndy) were prepared in 4 samples:

Products ⟹ ⇓ Samples	**Digestive Bar**	**Imli Candy**
Controlled	100g	100g
Sample 1	95:5	95:5
Sample 2	90:10	90:10
Sample 3	85:15	85:15

And the third value added product from banyan fruit powder was Oregano. It was made in the comparison of market based oregano which contains lot of chemicals and flavoring agents. It was fully organic and healthy especially for our digestion and immune system.

Organolaptic evaluation of products by expert panel

All the developed products were evaluated on organoleptic basis using 9 point hedonic scale (B. Shrilakshmi, 2007) by a panel of 6 judges of the Department of Foods and Nutrition, BPS Institute of Higher Learning, on the basis of colour, appearance, texture, taste, flavour, and overall acceptability.

Statistical analysis

The data was collected and further recorded in MS Excel 2016. The Mean value and standard deviation (SD) of each class of each group, for every preparation was calculated. Standard errors mean (SEM) was calculated from mean S.D. values. The data here is presented as Mean ± SEM.

Calculation of nutritive value of the products

The nutritive value (i.e. energy, protein, fibre, fat, carbohydrates, calcium, iron and many more nutrients) of the products were calculated by using the value obtained by analysis of banyan fruit by the value of raw ingredients used as given by Gopalan et al., 2007 and USDA.

Results

The aim of the present study *"Development of value added food products from banyan tree fruit powder"* was to investigate the possibility of banyan tree fruit powder in addition to improve the nutritive value of food products without detracting from their organoleptic properties. Therefore an attempt has been made to develop and formulate banyan tree fruit powder incorporated digestive bar, imli candies and oregano. These products were studied for sensory and nutritive properties. The results were subjected to statistical analysis and discussed with the help of tables, graphs and presented under the sections as below:

- ❖ Sensory evaluation of food products
- ❖ Nutritional Composition of banyan tree fruit powder
- ❖ Nutritional quality of banyan tree fruit powder incorporated products

Sensory Evaluation of banyan fruit powder incorporated Digestive Bar

The Digestive bar were prepared using imli and banyan tree fruit powder in the ratio of 95:5, 90:10 and 85:15 gram, were evaluated for sensory qualities like colour, appearance, taste, texture and overall acceptability by 6 consumers. Each member independently evaluated the Digestive Bar and assigned score on a 9 point hedonic scale for its sensory attributes. The results of the sensory evaluation of Digestive Bar prepared with banyan tree fruit powder are given in the table below:

Table 1. Mean sensory scores of banyan tree fruit powder incorporated Digestive bar.

Treatment	**Colour**	**Appearance**	**Texture**	**Taste**	**Overall Acceptability**
Control	8±0	7.8±0.4	7.8±0.4	7.8±0.4	7.9±0.3
Treatment 1($BFDB_1$)	8±0	8.2±0.4	7.8±0.4	7.8±0.4	7.9±0.3
Treatment 2($BFDB_2$)	8.3±0.51	8.3±0.51	8±1	8.2±0.75	8.2±0.72
Treatment 3($BFDB_3$)	8.3±0.81	8.3±0.81	8.2±1.16	8.2±0.98	8.2±0.94

Note: *Values are expressed at mean ± standard deviation of three determinations*

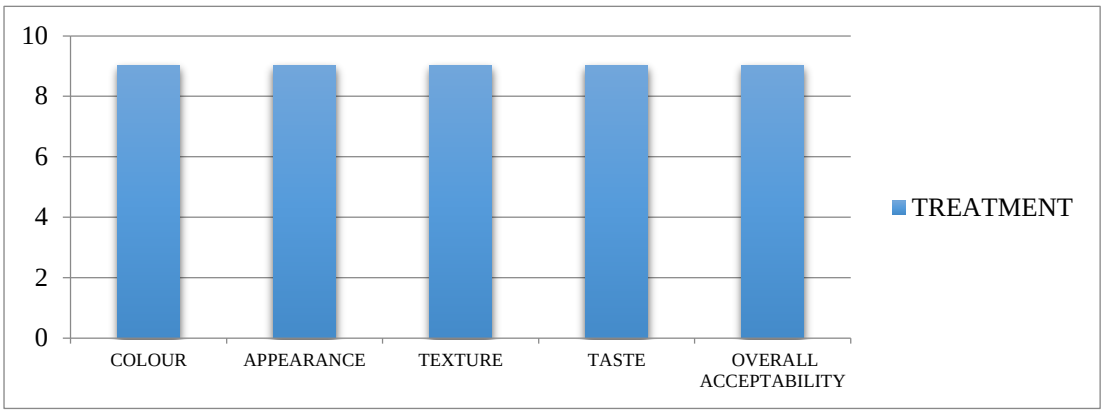

Fig. 1Bar graph showing the acceptability of digestive bar incorporated with banyan tree fruit powder

Table 2. Mean sensory scores of banyan tree fruit powder incorporated imli candies

Treatment	Colour	Appearance	Texture	Taste	Overall Acceptability
Control	8.2±0.4	8±0.63	8±0.89	8.2±0.08	8.08±0.2
Treatment 1($BFIC_1$)	8.3±0.52	8.2±0.4	7.7±0.52	8±0.63	8.04±0.09
Treatment 2 ($BFIC_2$)	8.5±0.54	8.3±0.82	8.3±0.82	8.5±0.55	8.4±o.16
Treatment 3 ($BFIC_3$)	8.5±0.55	8.3±0.82	8.2±0.99	8.7±0.52	8.4±0.22

Note: *Values are expressed at mean ± standard deviation of three determinations*

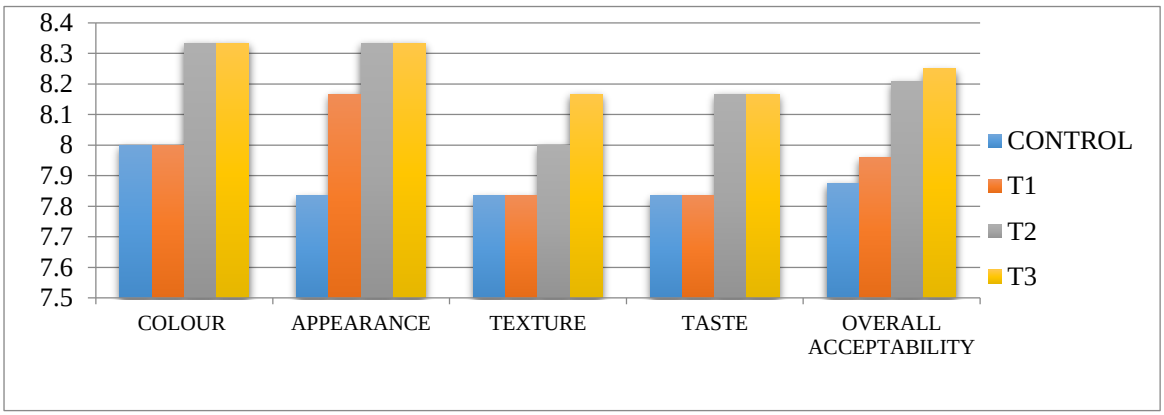

Fig. 2 Bar graph showing the acceptability of imli candy incorporated with banyan tree fruit powder

Table 3. Mean sensory scores of banyan tree fruit powder incorporated oregano

Colour	Appearance	Texture	Taste	Overall acceptability
9±0	9±0	9±0	9±0	9±0

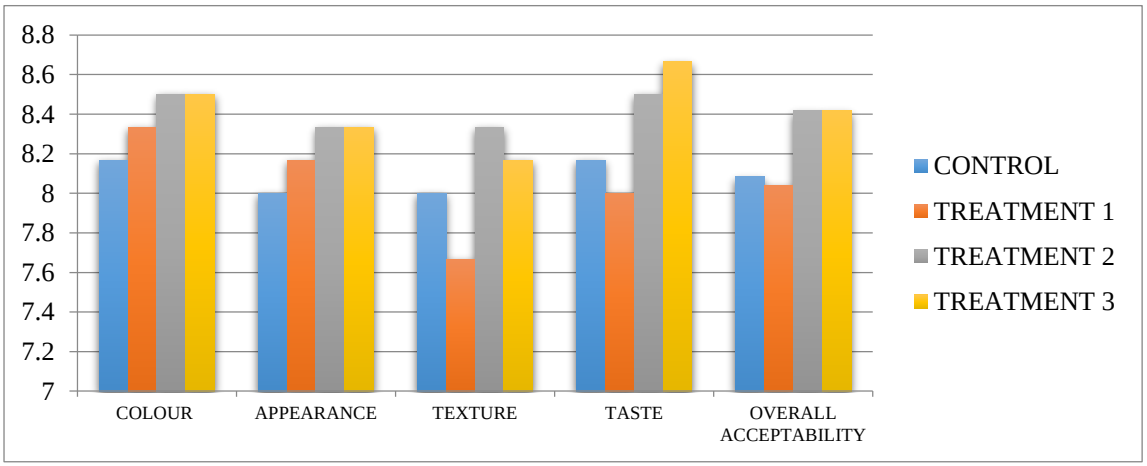

Fig. 3 Bar graph showing the acceptability of oregano incorporated of banyan tree fruit powder

Nutritional composition of banyan tree fruit powder

Banyan fruit is a rich source of nutrients and provides several health benefits. This fruit is rich in vitamins A, C, and K, and contains calcium, iron, and potassium. It is considered as a super food due to its high nutrient content and numerous health benefits. The minerals, antioxidants and analgesic properties present in banyan fruits are beneficial in many problems. It is

commonly used in traditional Indian medicine to treat a variety of ailments, including diabetes, heart disease and digestive problems. Banyan fruits have antioxidant, analgesic, properties, which are beneficial in the treatment of many diseases in the body. Apart from this, carbohydrates, sugar, fiber, protein, calories, vitamins, omega 3-6 and calcium and phosphorus are also found in in banyan fruits. According to California Fig Advisory Board, every 100 g of banyan fruit powder contains:

Table 4. Nutritional composition of banyan tree fruit powder

Energy	250 kcal
Carbohydrate	63.87 g
Sugar	47.92 g
Dietary fiber	9.8 g
Fat	0.93 g
Protein	3.30 g
Thiamine (vitamin B1)	0.085 mg
Riboflavin (vitamin B2)	0.082 mg
Niacin (vitamin B3)	0.619 mg
Pantothenic acid (vitamin B5)	0.434 mg
Vitamin B6	0.106 mg
Folate (vitamin B9)	9µg
Vitamin C	1.2 mg
Vitamin A	142 IU
Vitamin E	0.11 mg
Vitamin K	4.7µg
Magnesium	68 mg
Zinc	0.55 mg
Calcium	162 mg
Iron	2.03 mg
Potassium	680 mg

Calculation of nutritive value of the products

Nutritional quality of the developed food products is calculated in order to check whether the products are nutritionally enhanced with the incorporation or not. The developed food products (digestive bar, Imli candy and Oregano) are calculated for macronutrients such as energy, fat, protein, fibre and carbohydrate. Also, some of the micronutrients calculated were: - Vitamin A, vitamin B complex, vitamin C, vitamin E, vitamin K, calcium, iron, phosphorus, zinc, magnesium and potassium. The nutritive value (i.e. energy, protein, fibre, fat, carbohydrates, calcium, iron and many more nutrients) of the products were calculated by using the value obtained by analysis of banyan fruit by the value of raw ingredients used as given by Gopalan et al., 2007 and USDA.

Table 5. Nutritional composition of digestive bar incorporated with banyan tree fruit powder (Macronutrients)

Treatments	Energy(Kcal)	Fibre (g)	Protein(g)	Fat(g)	Carbohydrate (g)
Control	635.6	6.47	4.09	12.11	132.61
Treatment 1 ($BFDB_1$)	636.15	6.7	4.12	12.13	132.67
Treatment 2 ($BFDB_2$)	636.7	6.94	4.15	12.15	132.74
Treatment 3 ($BFDB_3$)	637.25	7.18	4.18	12.17	132.8

Table 6. Nutritional composition of Digestive Bar incorporated with Banyan Fruit Powder (Micronutrients)

Treatments	Vitamin C (mg)	Vitamin A (IU)	Calcium (mg)	Iron (mg)	Potassium (mg)	Magnesium (mg)
Control	9.51	168.21	185.38	17.07	660.14	238.3
Treatment 1 ($BFDB_1$)	9.39	173.81	189.78	17.03	662.74	237.1
Treatment 2 ($BFDB_2$)	9.28	179.41	194.18	16.99	665.34	235.9
Treatment 3 ($BFDB_3$)	9.16	185.01	198.58	16.95	667.94	234.7

Table 7. Nutritional composition of imli candy incorporated with Banyan Tree Fruit Powder (Macronutrients)

Treatments	Energy (Kcal)	Fibre (g)	Protein (g)	Fat (g)	Carbohydrate (g)
Control	675.6	6.47	4.09	12.11	145.91
Treatment 1 ($BFIC_1$)	676.15	6.7	4.12	12.13	145.97
Treatment 2 ($BFIC_2$)	676.7	6.94	4.15	12.15	146.04
Treatment 3 ($BFIC_3$)	677.25	7.18	4.18	12.17	146.1

Treatments	Vitamin C (mg)	Vitamin A (IU)	Calcium (mg)	Iron (mg)	Potassium (mg)	Magnesium (mg)
Control	3.91	165.17	122.18	8.28	636.94	110.3
Treatment 1 ($BFIC_1$)	3.79	170.77	126.58	8.24	639.54	109.1
Treatment 2 ($BFIC_2$)	3.68	176.37	130.98	8.20	642.14	107.9
Treatment 3 ($BFIC_3$)	3.56	181.97	135.38	8.16	644.74	106.7

Table 8. Nutritional composition of imli candy incorporated with Banyan Tree Fruit Powder (Micronutrients)

Energy(kcal)	Fat(g)	Protein(g)	Fibre(g)	Carbohydrates g)
237.11	5.72	9.45	19.9	49.22

Table 9. Nutritional composition of oregano incorporated with Banyan Tree Fruit Powder (Macronutrients)

Vitamin C(mg)	Calcium(mg)	Iron(mg)	Potassium(mg)	Magnesium(mg)
26.39	888.57	39.7	920.82	181.09

Conclusion

Digestive bar, imli candies and oregano were incorporated with banyan fruit powder at different levels. Every developed digestive bar, imli candies and oregano with the controls of both were subjected to evaluate by the consumers using 9 point hedonic scale. The nutritional calculations for all the products were done and the comparison between the most acceptable products other than controls were also analysed.

Sensory Characteristics

- Digestive bar were prepared by adding BFP at 5, 10 and 15%. The digestive bar prepared by incorporating 10% of banyan fruit powder showed the best scores for colour (8.3±0.51), appearance (8.3±0.51) taste (8.2±0.75) and overall acceptability (8.2±0.72) whereas the digestive bar incorporated with 15% of banyan fruit powder showed best scores for texture (8.2±1.16).
- Imli candies were prepared by adding BFP at 5, 10 and 15%. The imli candies prepared by incorporating 10% of banyan fruit powder showed the best scores for colour (8.5±0.54) and texture (8.3±0.82). And the imli candies prepared by incorporating 15% of banyan fruit powder showed the best scores for taste (8.7±0.52). Whereas the both 10 and 15% incorporated imli candies showed the best scores for appearance i.e. (8.3±0.82).
- Oregano incorporated with banyan fruit powder showed same scores for colour, appearance, texture and taste i.e. 9±0 each. The overall rating for oregano was 9±0.
- When the mean scores of digestive bar, imli candy and oregano were compared, it was found that oregano is more acceptable than digestive bar and imli candy. After that imli candy scored more scores than digestive bar.

Nutrient composition

- When the macronutrient scores of digestive bar were compared, it was found that the amount of energy in the form of calories increased. Also the fibre, protein, fat and carbohydrate content after incorporation of BFP increased to approximately 0.23g, 0.03g, 0.02g and 0.06g respectively per 5g increase in incorporation of banyan fruit powder. In case of micronutrient content of digestive bar, it is concluded that the amount of vitamin A, calcium and potassium increased by 5.6 IU, 4.4mg and 2.6mg respectively per 5g increase in incorporation of BFP.
- When the macronutrient scores of imli candy were compared, it was found that the amount of energy in the form of calories increased. Also the fibre, protein, fat and carbohydrate content after incorporation of BFP increased to approximately 0.23g, 0.03g, 0.02g and 0.06g respectively per 5g increase in incorporation of banyan fruit powder. In case of micronutrient content of imli candy, it is concluded that the amount of vitamin A, calcium and potassium increased by 5.6 IU, 4.4mg and 2.6mg respectively per 5g increase in incorporation of BFP.
- Banyan fruit oregano contains appropriate amount of macronutrients i.e. 237.11 kcal of energy, 5.72 g of fats, 9.45g of protein, 19.9g of fibre and 49.22g of carbohydrates. It is packed with some micronutrients also i.e. 26.39mg of vitamin C, 888.57mg of calcium, 29.7mg of iron, 920.82mg of potassium and 181.09mg of magnesium.

Based on the sensory scores it can be concluded that other than control samples the most desirable products was oregano. And between digestive bar and imli candy, the most desirable product was imli candy. And overall conclusion of scores of digestive bar and imli candy showed that the most desirable products were those having 10% and 15% BFP incorporation. Enrichment of digestive bar, imli candy and oregano with banyan fruit powder enhances their nutritional attributes by adding beta carotene, fibre, potassium, vitamin c, protein, calcium and magnesium. With taste these products are also best in preventing many diseases.

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