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Evaluation and Development of modified food product Jamun noodles by using Jamun seed powder (*Syzygium cumini* L.) for Type 2 diabetes mellitus individuals in Mumbai

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Abstract
Jamun (*Syzygium cumini* L.) is a fruit rich in antioxidant properties, flavonoids, essential oils, anthocyanins, phenolic compounds, and others. When it comes to decreasing blood glucose levels and reducing glycosuria, jamun seeds are quite beneficial. The formulated noodles were prepared with Bengal gram flour, finger millet flour, rice flour and jamun seed powder. This recipe was created by mixing noodles with varied concentrations of jamun seed powder, such as 5%, 10%, and 15%. Noodles with 10% jamun seed powder integration received the highest overall organoleptic assessment ratings out of all the various incorporations. Microbial analysis showed too low to count (TLTC) microbial growth that suggests a good shelf life of the product without the incorporation of any preservatives. It serves as a great convenience food which provide adequate nutrients intake without compromising its organoleptic properties.

Keywords: Jamun seed powder, noodle, Bengal gram flour, whole wheat flour, organoleptic properties

Introduction

Noodles are a type of pasta that are rapidly gaining popularity in India. An extrusion machine is used to create instant noodles. More than 80 nations around the world consume instant noodles, making them a well known cuisine. There is a huge market for noodles both in India and overseas due to the shifting eating patterns of children and teenagers [1]. Noodles typically made from refined wheat flour are high in carbohydrates but low in nutrients such dietary fiber, protein, minerals, and vitamins [2].

Black Jamun (*Syzygium cumini* L.) is a plant of the family Myrtaceae which is originally from Indonesia and India [3]. Fruits offer numerous health advantages due to their strong antioxidant and mineral content. Jamun is highly perishable, hence it is very challenging to store [4]. Jamun seeds are used to prepare medicines due to the presence of oxalic, tannic, Gallic acids and other alkaloids. There are secondary metabolites in jamun seed powder that act as a potent free radical scavengers [5]. The phenolic and flavonoid chemicals found in S. cumini have antioxidant and anti-inflammatory properties [6]. Jamun seeds are very helpful for lowering blood sugar levels and decreasing glycosuria. Minerals including sodium, potassium, calcium, phosphorus, manganese, zinc, and iron are found in it. Jamun seed powder also contains riboflavin, chorine, folic acid, malaic acid, vitamins C and A, chorine, and nicotinic acid. It's a fantastic choice for diabetics because of its low glycolic index [7]. Jamun seeds may have tremendous potential to be used to make safer medications for the treatment of diabetes, according to research on their ability to drop blood sugar by 30% [15]. It has a lot of mineral salts in every 100 g of fruit, there are 15 mg of calcium, 55 mg of potassium, 35 mg of magnesium, 15 mg of phosphorus, 26.2 mg of sodium, and 18 mg of vitamin C. Per 100 g of edible fruit, it offers 62 Kcal of energy. Carotene (48 mg/100 g) and folic acid (3 mg/100 g) are present in good amounts [9].

Finger millet, also known as ragi, has the highest amounts of calcium (344 mg %) and potassium (408 mg %) as compared to all the millets and grains. Compared to white rice, the country's current main grain, it has more nutritional fiber, minerals, and amino acids that contain sculpture. Despite the high nutritional profile of finger millet, current studies show that urban Indians generally consume fewer millets [10].

According to statistics of legume production for 2018, soybeans, beans, and chickpeas are the most cultivated legumes in the world [11]. The top four chickpea producers are India, Australia, Turkey, and the Russian Federation [11]. Bengal gram flour contains 22.39% protein, 57.82% carbohydrate, 10.80% total dietary fiber, and 6.69% fat (rich in polyunsaturated fatty acids), in addition to B complex vitamins and minerals according to the USDA nutrient database, hence it is considered as a good nutrient source [12].

However, a single whole grain cannot provide with all the essential nutrients. Different grains can be selected based on their nutritional composition and combined to produce flours to get more wholesome and balanced food. Therefore, the objective of this study was to develop noodles using multigrain flour mainly from basic ingredients like jamun seed powder, finger millet powder, Bengal gram flour, spices, water and salt.

Materials and Methods

For the preparation of noodles combine Bengal gram flour, finger millet flour, rice flour and jamun seed powder in their respective levels by adding optimum water. All these ingredients were mixed to get a dough-like consistency. The prepared dough was extruded by the hand extruder through suitable shaped dies. The product was then fried in oil until it turned dark brown in color. After frying they were cooled and packed in polyethylene bags and stored under ambient temperature.

Treatment Details

T1 – Noodles flour (Control)
T2 – Noodles flour + 5% of Jamun seed powder
T3 – Noodles flour + 10% of Jamun seed powder
T4 – Noodles flour + 15% of Jamun seed powder

The formulated noodles were prepared with specified amount of jamun seed powder as mentioned in above treatments. Organoleptic evaluation of jamun seed incorporated noodles were carried out by the semi-trained panel judges of forty numbers including the staff and postgraduate nutrition students, Department of Post Graduate Studies - MSc in Clinical Nutrition and Dietetics, Dr. BMN college of Home Science, Mumbai. The jamun seed incorporated noodles were placed for onset evaluation. The specific sensory characteristics of noodles *viz*., crunchiness, shape, quality with other general characteristics *viz*., color, aroma, taste, mouth feel and over all acceptability were evaluated using a rating scale. The mean Scores given by judges were used for statistical analysis.

Table 1: Standardization of jamun seed incorporated multigrain flour noodles

Ingredients	T1 (Control)	T2	T3	T4
BGF (g)	-	50	50	45
FMF (g)	-	25	20	20
RF (g)	100 (Maida)	20	20	20
JSP (g)	-	5	10	15
Salt (g)	1	1	1	1
Water (ml)	10	10	10	10
Oil (ml)	15	15	15	15

BGF - Bengal gram flour, FMF- Finger millet flour, RF - Rice flour, JSP - Jamun seed powder

Sensory evaluation of noodles

Acceptance was tested by sensory evaluation using a 9-point hedonic scale at the Department of Postgraduate Studies MSc in Clinical Nutrition and Dietetics, Dr. BMN College of Home Science, Mumbai. Product with different treatments was coded with three-digit number and is analyzed by different subjects in our college faculty and students. They were provided with standard evaluation sheets and asked to score the product based on nine-point hedonic scale for color, texture, flavor, taste, appearance and overall acceptability. To avoid overlapping of taste of other treatments they were provided with water to rinse mouth and scored from 1-9 with 1 being I dislike extremely i.e., very bad and 9 being I like extremely i.e., the product is excellent in that particular attribute.

Microbial analysis

The technique used to determine the microbial load in each sample was done by pour plate method. From the first dilution, 1 ml of the sample was pipetted into another sterile diluents containing 9 ml to obtain 10^{-2} dilution. The samples were diluted serially up to 10^{-6} .0.1 ml of appropriate dilution was then inoculated into sterile Petri dishes and molten nutrient agar was added and it was left to solidify. The samples were in three replicates and incubated at 37 °C for 24 h. The counts for triplicate cultures were recorded after 24hrs.

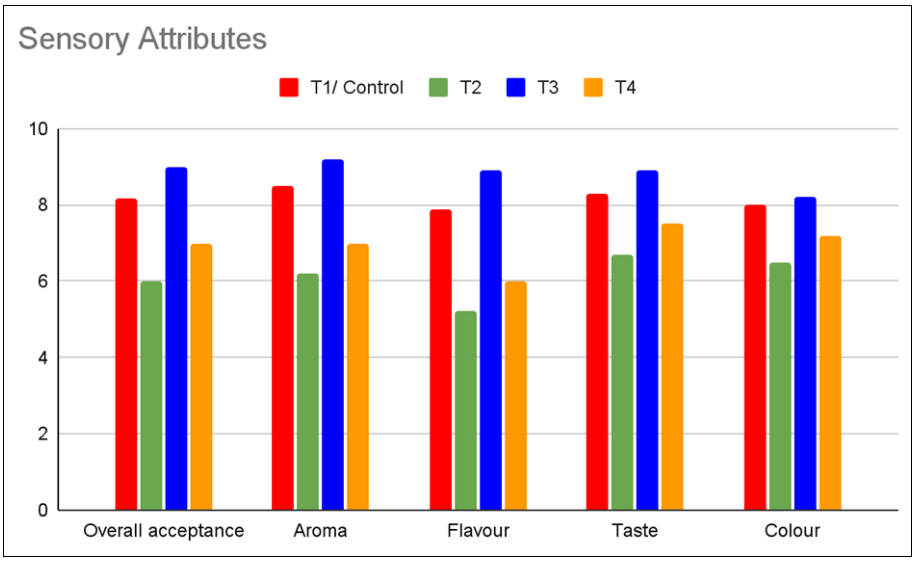
Results and Discussion

Microbial analysis showed growth that was too low to count on all the plates. This shows that the product has a good shelf life as microbial load was less without addition of any preservatives. The Organoleptic properties of noodles were evaluated visually, placatory, gustatory, olfactory, and overall acceptability. The overall acceptability and 9 point rating scale score was higher for the 10% incorporation of jamun seed powder. The figure of prepared noodles and microbial analysis of the product is shown in the figure 1 and 2 respectively.

Table 2: Effect of jamun seed powder incorporation on the sensory evaluation of cooked noodles

	Sensory characteristics				
Noodle Treatment details	Color	Taste	Flavor	Aroma	Overall acceptance
T1/ control	8	8.3	7.9	8.5	8.17
T2	6.5	6.7	5.2	6.2	6
T3	8.2	8.9	8.9	9.2	9
T4	7.2	7.5	6	7	7

Values are the mean ±standard deviation



Graph 1: sensory evaluation of jamun seed powder incorporated multigrain noodles

Fig 1: Jamun seed noodles

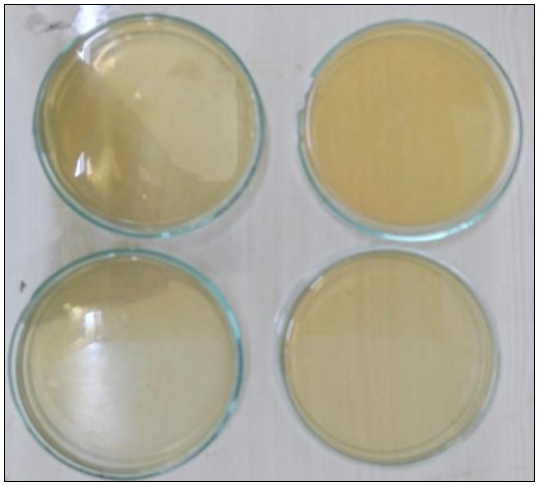


Fig 2: Mic robial analysis results

Conclusion

Thus in the light of the scientific data of the present investigation, it is concluded that the noodles prepared with the incorporation of Bengal gram flour, finger millet flour, rice flour and jamun seed powder at different concentration levels, were analyzed for their cooking qualities and sensory acceptability. Among those Sample T3 was found to be more acceptable with respect to mentioned quality parameters. The present study showed that the incorporation of Bengal gram flour, finger millet flour and rice flour and jamun seed powder in noodles is techno-economically feasible and commercial exploitation can be done. Development of such type of products is also advantageous for consumers seeking alternative products containing healthy ingredients. In this manner, a stable and consistent scientific foundation may be reached in order to provide the consumer with a good product. Therefore, this nutrient-rich noodle will be a good source of RTE food for kids, teens, athletes, and those with diabetes.

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