



PREPARATION OF FIBRE RICH BAR FROM *Syzygium cumini* SEED POWDER

Aditya Jadhav¹, Prof. Nisha Wagh², Sakina Kenwala³

¹Aditya Jadhav, Department of food technology, Parul Institute Of Applied Science, Parul University, Vadodara, Gujarat, India

²Nisha Wagh, Assistant Professor, Department of food technology, Parul Institute Of Applied Science, Parul University, Vadodara, Gujarat, India

³Sakina Kenwala, Department of food technology, Parul Institute Of Applied Science, Parul University, Vadodara, Gujarat, India

ABSTRACT

The study of development of Fibre rich bar from Jamun seed powder was carried out at Department of Food Technology, Parul Institute of Applied Sciences, Vadodara, Gujarat. The aim was carried out development of gluten free bar for celiac diseases (gluten indigestion) people. Jamun seed powder has been used for generations as a natural method for controlling heart disease, hypertension, and gastro-intestinal disorders. An effort has been made to use this nourishing jamun seed powder in value added products, this reduces waste. Jamun seed powder bar was developed using dry raw materials such as oats, flex seeds, peanuts, date paste. The raw materials were assessed for physicochemical properties such as moisture, ash, crude protein and fat content and functional parameters such as antioxidant activity, phenolic content. Jamun seed powder and oats were roasted prior the preparation. Four different formulation was used with different concentrations of date paste (20% ,40% , 60% ,80%). After preparation of bar physicochemical properties, microbiological and sensory evaluation was carried out. The bar showed 4.31% moisture content, 1.61 % Ash content , 5.40 g protein content, 15.87 g fat content, 72.81% carbohydrates content and 1.53 g fibre. As per the physic-chemical parameters obtained the bar was found to be consumed by celiac disease peoples.

Keywords: jamun seed powder, Gluten free, fibre bar, oats, antioxidants.

1.0 INTRODUCTION

The increasing social and economic importance of food products, besides the technology complexity of producing, processing, handling and accepting, these highly perishable and fragile food materials like jamun fruit, requires a more extensive knowledge of their physical properties (Rao and Steffe, 1992). Food bars/Nutri-bars or cereal bars are snacks of good sensory and nutritional characteristics due to their high carbohydrates, protein, fats and mineral contents. Increasing demand from consumers for nutritious snacks, has provoked the food manufacturers to develop food bars that provide nutrition and convenience (Nisha Wagh, 2022).

Syzygium cumini (Family Myrtaceae) is also known as *Syzygium jamun* and *Eugenia cumini*. Other common names are Jambul, Black Plum, Java Plum, Indian Blackberry, Jamblang, Jamun etc. and is used for health drinks, preserves, squashes, jellies and wine. (Warrier et al. 1996). The most common fruit is oblong and has a deep purple to bluish colour. It is found in India, East Indies, Thailand, Philippines and some other countries.

Different parts of Jamun have different properties such as anti- bacteria, anti- HIV, anti- microbial, anti- fungal etc. Jamun is also good source for maintaining blood sugar level as well in controlling diabetes. Jamun seeds are used ayurvedic medicine, in Unani and also In Chinese dishes for digestion purpose. Fruit bars have been manufactured in food industries since many years as It is one of the conservation technologies to store the fruit. Bars usually made from pulp of fruit holds on its nutrients, minerals and flavours which forms a good nutritional supplement. Fruit bars offers an advantage as it is simple and needs low production cost which also with good consumer appeal.

Jamun fruit seeds have been testified to assist various tenacities in diabetic patients, such as depressing blood glucose levels and adjourning diabetic complications including neuropathy and cataracts (Helmstadter, 2008) Jamun seeds contains Glucoside, Jamboline and Ellagic acid, which converts starch into sugar when there is excess production amount of glucose in our body. Jamun seeds have a powerful preventive impact against hyperglycemia and are the greecarbohydrate 75.4%, insoluble dietary fiber 1.32%, vitamin-C and vitamin-B complex, potassium, iron, and essential minerals. (Priyanka and Mishra, 2015).

Only Jamun flesh is utilized but large amount of Jamun seed being discarded every year. So, it will be a unique technique to prepare different value added products by mixing JSP and other ingredients for cakes, cookies, biscuits, bar preparation. (Mushtari Akter Marufa, etal 2019. The main aim of this research is utilize the waste obtained from jamun, to develop a nutritious bar by incorporating various ingredients like- rolled oats, honey, date paste, flex seeds, dry fruit, white and dark chocolate.

Oats are rich in carbohydrates (68%), fats (6%), protein (13%). It contains Vitamin B and pantothenic acid and several dietary fibre and minerals. Oats have soluble fibre which helps in lowering cholesterol. Honey is mainly made up of monosaccharide fructose and glucose Honey is added in bar as a sweetner as well as stabilizer. Date is being added in the form of paste which also acts as a natural sweetner and also adds on vitamins , fibre and carbohydrate to the bar. Flex seeds are added as a supplement in the bar as it prevents various disease such as constipation, diabetes, heart attack etc. Flex seeds are also nutritionally rich in antioxidant, fibre, protein. Dry fruits like almonds, cashew, raisins are being added nuts have since it has high amount of healthy fat and promotes a healthy heart , rich in antioxidants and prevent problems related to digestion. White and dark chococolate compound is coated around the bar to give better flavour to the bar. Also it is a nutritious, gluten-free bar from jamun seed powder, oats and flaxseed with honey as a binding agent

Our final product can be consumed by people who have gluten intolerance, celiac diseased people since it's the only diet taken by these people and can be consumed by all age groups. Honey oats, flex seeds are added as its highly nutritious and all the three can be easily digested. After the preparation of the bar , the physico-chemical characteristic (protein, fat, carbohydrates)of raw material and gluten-free bar will be evaluated, also its moisture and ash contented will be determined and its shelf life will be estimated in different packaging materials.

2.0 Materials and methodology

The present study on development of fibre rich bar by using jamun seed powder was carried out was carried out in the Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara. This section enlists the material used and elaborates the processing techniques, organoleptic evaluation and analytical procedure following during the research.

2.1 Materials

A. Raw materials used in the study

The ingredients used in preparation of bar were Jamun seed powder, Rolled oats, flex seeds, date paste, cashew, almonds, raisins, ghee was taken from local market of Vadodara.

B. Chemicals and Glassware's

Sufficient glassware and chemicals for analytical grade are available in the department of Food Analysis and Food Processing lab, Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara

C. Processing Equipment

Any equipment used for storing, transporting or changing any materials is referred to as process equipment.. Equipment required for the preparation of bar are: Weighing balance, heating medium, grinder, microwave, molds, and other utensils were obtained from Food Processing Lab, Department of Food Technology, Parul Institute of Applied Sciences, Parul University, Vadodara.

2.2 Methods.

- **Preparation of date paste**

Good quality of Black dates were selected since black dates has slightly more sweetness than normal dates. After selection seeds were removed from the dates and soaked in hot water for 20 mins. After soaking it was grinded to obtain thick paste.

- **Weighing and Mixing**

All the Ingredients that is date paste, rolled oats, jamun seed powder, dry fruits, flex seeds were weighed for the formulation of bar using weighing balance and then mixed altogether

- **Preparation of Bar**

After mixing it was put in mould for shaping and kept in refrigerator for 20 minutes. After that it was dipped in melted chocolate for giving outer covering and again refrigerated for 20 minutes for setting of chocolate.

Table 1. Formulation of Fibre rich bar

Sr no	Ingredients	T0	T1	T2	T3
1	Date Paste	70	70	60	55
2	Oats	15	15	20	25
3	Jamun seed powder	-	10	15	12
4	Dry fruits	5	5	5	5
5	Flex seeds	5	5	5	5

3.0 Proximate Analysis

Jamun seed powder, rolled oats, date paste, dried fruits (Almonds, cashews, pistachio, black raisins), flaxseeds were used and prepared bars were analyzed for proximate composition including moisture, ash, protein, fat, carbohydrate, and calories content as per the standard procedure given by (AOAC 2005)

1. Moisture content

Moisture content was estimated adopting AOAC (1990) method. The following equation was used to measure moisture content.

$$\text{Moisture \%} = \frac{\text{Initial weight (W1)} - \text{final weight(W2)}}{\text{Initial weight (W1)}} \times 100$$

2. Ash content

Ash content was determined using (AOAC 2005) procedure. It used muffle furnace for determining the ash percent

$$\text{Ash \%} = \frac{\text{Weight before heating} - \text{Weight after heating}}{\text{weight of sample}} \times 100$$

3. Determination of Protein content: Protein content was determined by Micro-Kjeldhal method.

- **Digestion:** 200mg of the defatted ground sample was precisely weighed, and then a small amount of the catalyst $\text{K}_2\text{SO}_4:\text{CuSO}_4:\text{HgO}$ red (91:8.2:0.8g) was added. The sample was then transferred to the digestion flask, where it was digested for a couple of hours at 450°C with 5ml of concentrated H_2SO_4 until the substance became colourless.
- **Neutralization and Distillation:** Digested sample was diluted to the 50ml in volumetric flask and made final volume to 50ml with distilled water. Then the 5ml of aliquot was neutralized with 30% HCL and 40% of NaOH containing 5g of sodium thiosulphate. Distillation was carried and liberated ammonia was absorbed in 2% boric acid solution containing methyl red as indicator
- **Titration:** The ammonia that had been gathered was titrated against 0.01N H_2SO_4 . The titer reading was recorded, nitrogen was calculated using the procedure below, and protein percentage was determined by multiplying by 6.25. A blank sample was also performed concurrently.

$$\text{Crude Protein \%} = \frac{(\text{Sample titre} - \text{Blank titre}) \times 0.0014 \times 6.25}{\text{Sample weight}} \times 100$$

4. Crude Fat: Soxhlet was used to analyse the bar's fat content. A sample of 5g was measured and taken in a thimble.

The extraction cups were weighed after being dried in an oven at 130°C for 15 minutes. After cooling the extraction cups, 70ml of petroleum ether was added. The apparatus was preheated, and once the desired temperature was reached, the extraction cups were fastened to the apparatus and set to boil for 30 minutes, rise for 20 minutes, and then recover solvent for 10 minutes. The recovered ether was collected, and the estimated amount of fat in the extraction cups.

$$\text{Fat} = \frac{(\text{W2} - \text{W1})}{\text{W}} \times 100$$

5. Carbohydrate

The total carbohydrate content of sample was calculated by subtracting the protein, fat, ash and moisture from 100 (Pearson, 1976)

$$\% \text{ Carbohydrate} = 100 - (\% \text{ Moisture} + \% \text{ Ash} + \% \text{ Fat} + \% \text{ Protein})$$

6. Crude fibre:

- Measure out 2 to 3 g of the defatted, dry sample. When the acid concentration reaches 5%, add 50 ml of acid and 150 ml of distilled water until the concentration decreases. Then, add 200 ml of boiling sulphuric acid solution concentration (1,25%) to the flask.
- Attach the condenser, and after one minute, bring the mixture to a boil. If necessary, add antifoam. Boil for precisely 30 minutes, stirring the flask occasionally to clear any particles that have adhered to the edges and keeping the volume of the solution constant by adding hot distilled water.
- Filter paper and boiling water are used to line the Buchner funnel. Likewise, after the boiling process is complete, take the flask out, let it a minute to rest, and then carefully filter the liquid inside using suction or vacuum. Less than 10 minutes should be allotted for filtering. Boiling water should be used to wash the filter paper.
- By utilising a retort with 200 ml of boiling NaOH solution, transfer the residue to the flask, and cook for 30 minutes as in step (ii). base solution is useful for analysing the nitrogen components of proteins and producing saponification with fat.
- After giving the hydrolyzed mixture a minute to rest, carefully filter it in the filtration crucible that has been preheated with boiling water.
- Wash the leftover material three times with petroleum ether, then three times with boiling water, the HCl solution, then boiling water again. Place the crucible in a 105°C oven for 12 hours, then let it cool in the dryer.
- Quickly weigh the crucible with the residue inside (do not handle them) and place in the crucible furnace at 550° C for 3 hours. Leave to cool in a dryer and weigh them again

$$\text{Crude fibre content (\%)} = 100 \frac{A - B}{C}$$

Where: A = weight of crucible with dry residue (g)

B = weight of crucible with ash (g)

C = weight of sample (g)

7. Antioxidants Activity

In order to measure the DPPH radical scavenging activity, the method described by (Mir et al) was slightly modified. The formula was used to translate the results into % inhibition.

$$\text{DPPH Inhibition percentage (\%I)} = \frac{A_0 - AS}{A_0} * 100$$

Where AS is the absorbance in the presence of the sample, and A0 is the absorbance of the control

3.2 Microbial Parameter

In food products quality analysis, microbial examination is the perfect quality assessment protocol performed. The microbial quality of prepared cereal bar was determined. In the present study different microbial parameters such as Total Plate Count, Yeast and Mould were examined also the samples were examined during the storage at ambient temperature. Microbial examinations were carried out as per the methods given by APHA, (1992).

3.2.1 Determination of Total Plate

- In order to prepare the nutrient agar medium, 28g of nutrient agar was dissolved in 1000ml of distilled water using heat. It was sterilised in an autoclave for 20 minutes at 1200 C and 15 pounds of pressure with its mouth covered with cotton.
- Nine sterile test tubes were taken and numbered for the preparation of the sample solution (serial dilution). Each tube received 9ml of distilled water. The test tubes were sterilised in an autoclave at 121° C for 15 minutes under 15 pounds of pressure. Cotton plugs were used to seal the test tubes. Serially, 1ml of the sample was added to 9ml of distilled water in a sterile test tube.
- Plaques were prepared by sterilising pipettes and Petri plates using an autoclave or a hot air oven (dry heat treatment) (moist heat treatment). The laminar airflow cabinet's ultraviolet light was turned on for 30 minutes while sterilised petri dishes were brought inside. The working surface was cleaned with 70% alcohol when the UV light was turned off after 30 minutes and the blower was turned on. 1ml of the samples were then added to the plates after they had been appropriately labelled.
- Each plate was filled with 15 to 20 ml of molten medium. To stop germs from contaminating the plate, this was done close to a flame. For solidification, the plates were vigorously spun. Following that, the plates were kept in the incubator for 48 hours at 37° C, and the plates were taken out to be checked for colonies

3.2.2 Determination of Yeast and Mould count

- Preparing of potato dextrose agar medium: It was heated to properly dissolve the 39g of Potato dextrose agar medium that was added to 1000ml of distilled water. The mouth was sealed with a cotton plug, and it was sterilised in an autoclave at 1210° C for 15 minutes under 15 pounds of pressure.
- Making a sample solution (serial dilution) We took 9 sterilised test tubes and numbered them appropriately. Each tube received 9ml of distilled water. The test tubes were sealed with cotton plugs and sterilised in an autoclave at 1210°C for 15 minutes under 15 pounds of pressure. A sterile test tube containing 9ml of distilled water had successive additions of 1ml of sample added to it.
- Plaques were prepared by sterilising pipettes and Petri plates using an autoclave or a hot air oven (dry heat treatment) (moist heat treatment). In a laminar air flow cabinet, sterilised petri dishes were placed, and an ultraviolet light was turned on for 30 minutes. The working surface was cleaned with 70% alcohol when the UV light was turned off after 30 minutes and the blower was turned on. One millilitre of the samples was then added to the indicated plates. Each plate was filled with 15 to 20 ml of molten medium. This was done close to a flame to avoid microbial contamination of the plate. For solidification, the plates were vigorously spun. After 48 hours at 370°C in the incubator, the plates were removed to reveal the colonies. The former colonies on the plate were enumerated.

Sensory Evaluation

Jamun seed powder bar was evaluated by 3 panelists. The sample were evaluated for appearance, colour, texture, taste and overall acceptability

Scores to Be Given As Follows

1. Liked extremely – 9
2. Liked very much – 8
3. Liked moderately – 7
4. Liked slightly – 6

5. Neither liked nor disliked – 5
6. Disliked slightly – 4
7. Disliked moderately – 3
8. Disliked very much – 2
9. Disliked extremely – 1

4.0 Results and Discussion

The parameters like content, protein content, fat content, carbohydrates, ash, moisture content were evaluated for bar and presented in Table 4.1

Table4.1: Proximate analysis of fibre rich bar

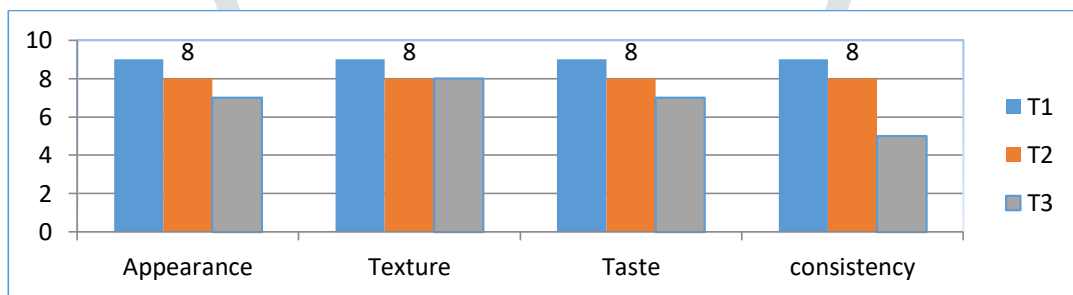
Sr no	Parameter	Per 100 g
1	Protein	5.40 g
2	Fat	15.87 g
3	Carbohydrates	72.81 g
4	Ash	1.61 %
5	Moisture	4.31 %
6	Crude fibre	1.53 g
7	Antioxidant detected	Anthocyanins

Organoleptic evaluation of fibre rich bar

Sensory evaluation acceptance tests was performed for Jamun seed powder bar which was formulated by addition of Date paste, Rolled oats, Jamun Seed powder, flex seeds, dry fruits in different proportions to know the acceptability of products prepared. The acceptance scores were assigning for varies sensory parameter like colour, flavour, taste, texture, appearance and overall acceptability.

Table 4.2 : Organoleptic evaluation of fibre rich bar

Sr. no	Parameter	T1	T2	T3
1	Appearance	9	8	7
2	Texture	9	8	8
3	Taste	9	8	7
4	Consistency	9	8	7
5	Overall acceptability	9	8	7



Sensory Analysis

It was observed that higher acceptability was given to T1 because it showed acceptable results in appearance, texture, taste, consistency. So based on sensory analysis T1 was finalized for further analysis.

1. Moisture content

After thoroughly drying the empty dish, 5g of the sample was weighed and ground in the dish to determine its moisture content. The dish was then dried in an oven for four hours at 105 degrees Celsius. After cooling in the desiccator to a consistent weight, it was weighed once more. Moisture content was estimated from the weight loss that resulted.

2. Ash content

The amount of ash in food indicates the total mineral content. The ash content of bar was determined using muffle furnace in which 5g of sample was weighed into pre-weighed crucible and it was heated at low flame till all the material was completely charred (smokeless) and cooled. The sample was then maintained at 550° C in the muffle furnace for approximately 4 hours. It was again cooled in desiccator and weighed. The procedure was repeated until two consecutive weights were constant. The ash percent was calculated by

knowing the difference between the initial and final weight. Ash content of cereal bar was found $1.34 \pm 0.04\%$, the results were in conformity with the results of Mendes et al. (2013).

Determination of Protein content:

Protein content of cereal bar was good (5.40). Oats which was the main ingredient of the bar, generally have high protein content. Protein estimation was done by Kjeldahl's method in three steps: Digestion, Distillation and titration

Fat content

The fat result obtained in this study was 15.87 g. The addition of chocolate alters the product's fat composition. When compared to other constituent ingredients, chocolate and flex seeds has a significant fat content. Particularly in long-duration sports with moderate intensity, like endurance, the body's fat serves as an energy source (Rismayanthi, 2015).

Carbohydrate

Flex seeds, Jamun seed powder and dry fruits have a higher concentration of carbohydrates than other ingredients, according to nutrient analysis, the carbohydrate content is found to be 78.21 g. Dry fruits have a high concentration of carbs and a low glycemic index, making them a possible source of energy.

Crude fibre

Crude fibre in the bar was found to 1.53 g, it is found because of jamun seed powder which normalises bowel motions. Dietary fibre also makes our stool softer and make digestion easy, it also lowers cholesterol levels.

Antioxidant activity

The ability of bioactive chemicals to defend the body from negative effects brought on by reactions and processes involving free radicals and other oxidising agents can be assessed by looking at their antioxidant capacity. To measure antioxidant activity in this study, we used the widely used DPPH test and anthocyanin was found as a antioxidant.

Microbial analysis of fibre bar

- **Total plate count (TPC) of fibre-bars:** TPC is usually done to check number of micro organism present in food. Fibre bar with T1 formulation had TPC of (4.91 Log₁₀ cfu/g)
- **Yeast and mould count**
Potato dextrose agar was used for detection of yeast and mould count and kept for 25-30°C for 3 to 4 days after incubation 300 colonies were found.

5.0 Conclusion:

It can be concluded from above results that from all the formulations containing different concentrations of Jamun seed powder, date paste, flex seeds, roasted dry fruits, rolled oats T1 was found to be the best among all the different treatments. Nutri-bar with T1 formulation contain 4.31% moisture, 1.61 % ash, 5.40 g protein, 15.87 g fats, 72.81 g carbohydrates, 1.53 g crude fibre and antioxidant such as anthocyanin was found. When compared with (Monika Sood, etal) results were quite similar but fat content in our product was higher as compared because of usage of chocolate. The prepared fibre-bar can provide sufficient amount of carbohydrate to the body. In

addition, compared to other snacks, this product may be produced at low cost in the industry. The study also demonstrated that dates and jamun seed powder with good organoleptic and nutritional value can be used to produce a nutritious snack. A significant number of nutrients, including carbohydrates, lipids, protein, dietary fibre, and minerals, may be found in these bars. It could be a good idea to substitute healthy foods with unhealthy ones.

REFERENCES

1. Helmstädter A. (2008) *Syzygium cumini* (L.) skeels (Myrtaceae) against diabetes- 125 years of research. *The Pharmacy*, 63:91-101.
2. Mendes NSR, Gomes-Ruffi CR, Lage ME, Becker FS, Melo AAM, Silva FA, Damiani C (2013) Oxidative stability of cereal bars made with fruit peels and baru nuts packaged in different types of packaging. *Food Sci Technol* 33:730–73
3. Mir, S.A., Wani, S.M., Ahmad, M., Wani, T.A., Gani, A., Mir, S.A., Masoodi, F.A. (2015) Effect of packaging and storage on the physicochemical and antioxidant properties of quince candy. *J Food Sci Tech.*; 52(11): 7313-7320.
4. Monika Sood, Julie D Bandral and Manmeet Kaur, Monika Sood, Julie D Bandral and Manmeet Kaur,(2018) *Journal of Pharmacognosy and Phytochemistry*; 7(3): 1411-1416
5. Mushtari Akter Marufal , Pabitra Chandra Das2 , Abdullah Iqbal1*, 2019 , Utilization of Jamun seed powder in composite cake formulation, *Journal of Bangladesh Agricultural University, J Bangladesh Agril Univ* 17(4)
6. Nisha M Wagh, Prof. HanmantBodhankar, Prof. Todkar Ashish. 2022. Development of Nutri-bar Using Quinoa.
7. Pearson D.(1976) *The chemical analysis of foods*. Longman Group Ltd.; Priyanka, A.A.M. and Mishra, A. A. 2015. Development and quality evaluation of Jamun powder fortified biscuits using natural sweeteners. *International Journal of Science, Engineering and Technology*, 3(3): 796–801.
8. Rao MA, Steffe JF (1992). *Viscoelastic Properties of Foods*. London: Elsevier Appl. Sci., pp.535-539
9. Rismayanthi C. Sistem Energi dan Kebutuhan Zat Gizi yang Diperlukan untuk Peningkatan Prestasi Atlet. *Jurnal Ilmu Keolahragaan*. (2015) ;11(1):109-121mi
10. Warriar P, Nambiar V, and Ramankutty C. 1996. *Indian Medical Plants*,” Vol. 5, Orient Longman Ltd., Hyderabad, pp. 225-228.