



## Development of healthy fibrous brownies

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### ABSTRACT

Due to modernization, sedentary lifestyle and unhealthy food habits has led to problems in recent times. A lot of gastrointestinal disorders arise due to unhealthy food. Disorders like indigestion, loose stools, diverticulosis, colon cancer, obesity and diabetes. Phoenix dactylifera (dates), Avena sativa (oats) & Ipomoea batatas (sweet potatoes) was used in preparation of brownies. This brownie was analyzed with respect to their physical, biochemical and sensory properties. The quality of the brownie was determined on the basis of physiochemical characterization such as- moisture content (28.37%), ash content (1.5%), total carbohydrate content (40.12g), fat content (5.36%), protein content (18.34g), dietary fiber content (6.35 g), Energy(282.08Kcal) including organoleptic analysis including the attributes such as colour, odour, taste, texture, mouth feel and overall acceptability. Microbiological testing and shelf life studies were also carried out and a sustainable packaging for the product was also developed

**Keywords:** Dates, Oats, Sweet Potato's, Gastrointestinal disorders, Diverticulosis

### 1. INTRODUCTION

In recent days' unhealthy lifestyle and food intakes has been a major cause of health issues as well as the nutrient deficiency hence a need for a new food product that meet the taste buds, eating habits as well as modern lifestyle is needed. Nutraceutical product means a substance that has some physiological benefit other than our daily nutrition for prevention curing or suppressing health diseases and is made of food or non-food substances. The various categories under nutraceutical are prebiotics probiotics herbal tablets, powders high fiber foods and many more. Nutraceutical is a new emerging concept in food and health industry with its new food formulations that satisfy the modern human wants. People are consuming less dietary fiber than it is recommended and gastro intestinal problems like constipation, diarrhea peptic ulcers ingestion are arising. The relationship between dietary fiber and risk of cardiovascular disease (CVD) has been studied and there is a considerable epidemiological evidence indicating an inverse association between dietary fiber intake and CVD risk [1].

Keeping this idea in mind among the backed products, brownies are chosen to be enriched with sweet potato, dates, oats are popular among kids and adults. Brownies are flat and boxed baked that is usually consumed as a dessert can be either fudgy or cakey, depending on the individual preference. All the three ingredients are loaded with dietary fiber and many vitamins and minerals like iron, dates have proven to have beneficial effects on reproductive process of both male and female [2]. Sweet potatoes are good source of antioxidants, vitamin C, and calcium has low glycemic index and have additional value as a food for diabetics [3], oats have anti-inflammatory and ant proliferation effects [2]. This brownie is both adults and children can enjoy a modern healthy twist to traditional brownie.

### 2. METHODOLOGIES

#### 2.1 Materials

Table 1: List of Ingredients

Ingredients	Quantity (100gms )
Sweet potato	10 g
Oats	32 g
Dates	55 g
Cocoa powder	3g
Chia seeds	1g
Vanilla essence	2ml

Ghee	1 tsp
Baking powder	1tsp
Baking soda	1tsp

## 2.2 Method

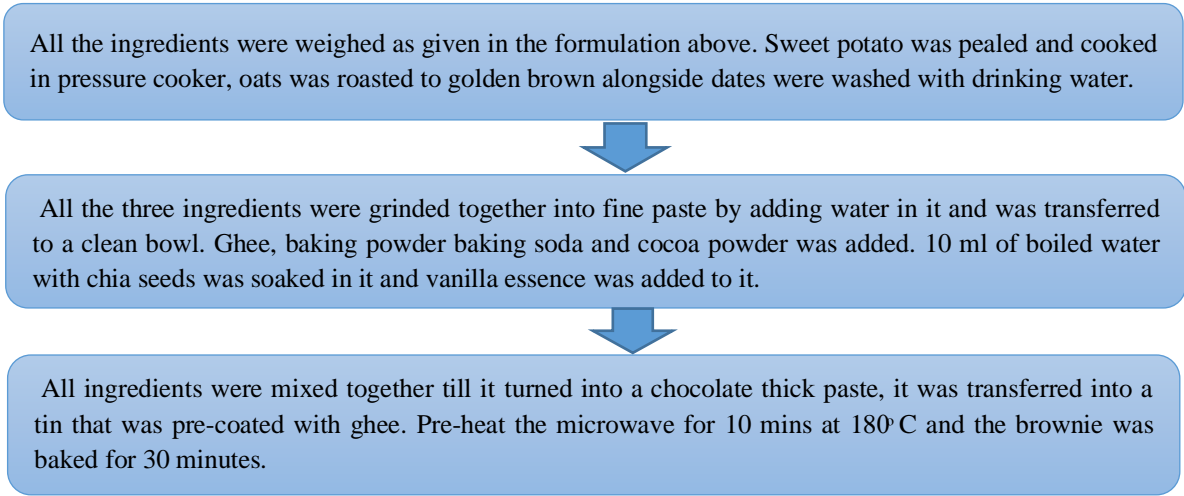


Fig. 1: A flowchart depicting standard method of preparation

## 3. FINAL PRODUCT FORMULATION



Fig. 2: Healthy Fibrous Brownie

## 4. PROXIMATE EVALUATION OF THE PRODUCT

Using different methods carried out proximate analysis of the product. [7]

### 4.1 Evaluation of Moisture Content

Using Oven Drying Method i.e. the conventional method evaluated moisture content of the product. The sample was weighed and treated at 100°C for 3 hours in the Hot Air Oven. [7]

### 4.2 Evaluation of Ash Content

Ash content of the product was evaluated by using Muffle Furnace. The sample was weighed and incinerated to remove the carbon molecules from the product and ignited at 550°C in the muffle furnace. [7]

### 4.3 Evaluation of Fat Content

Fat content of the product was evaluated by using the Soxhlet method. Crude fat was determined using the Soxhlet extractor and Petroleum ether as a solvent. Method described in A.O.A.C Manual. [7]

### 4.4 Evaluation of Protein Content

The protein content of the product was evaluated by using Biuret method. Method described in A.O.A.C Manual. [8]

### 4.5 Evaluation of Carbohydrate Content

Carbohydrates content was determined by using weight difference method subtracting the sum of the values of moisture, protein, fat and ash from 100. [9]

**4.6 Evaluation of Energy Content**

Energy content was determined by multiplying the crude proteins, crude carbohydrates and crude fats by water factors 4, 4 and 9 respectively.

**4.7 Evaluation of Total Dietary Fiber**

Method described in A.O.A.C Manual evaluated dietary fiber content. [7]

**5. MICROBIAL EVALUATION OF THE PRODUCT**

Using Total Plate Count Method did the determination of microbial count. The samples were prepared using serial dilution method. The sample was spread on Nutrient agar plate and Sabouraud’s agar plate for the bacterial count and fungal count respectively. [10]

**6. SENSORY EVALUATION OF THE PRODUCT**

Using a 9- Point Hedonic Scale for various parameters such as appearance, odour, colour, taste, consistency and its overall acceptability using 30 untrained panelists did the sensory evaluation of the product. [11]

**7. SHELF LIFE STUDIES OF THE PRODUCT**

The shelf life study was carried out at refrigerated conditions and room temperature.

**8. RESULTS**

**8.1 Evaluation of Proximate Analysis**

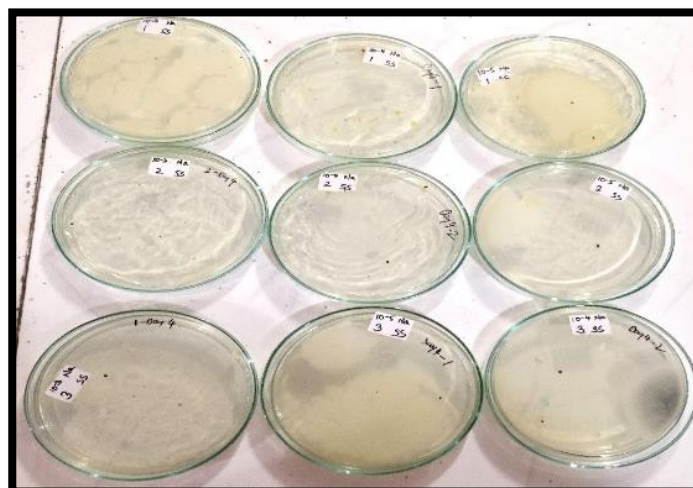
**Table 2: Result of proximate analysis**

Parameters	Results (per 100g)
Energy	282.08Kcal
Carbohydrate	40.02g
Protein	18.34g
Moisture	28.37%
Ash	1.5%
Fat	5.36%
Dietary Fiber	6.35%

**8.2 Evaluation of Microbial Analysis**

**Table 3: For Nutrient Agar Plate**

Dilution	Set 1	Set 2	Set 3	CFU /ml
10 <sup>-3</sup>	19	2	5	< 30
10 <sup>-4</sup>	9	3	3	< 30
10 <sup>-5</sup>	3	2	1	< 30



**Fig. 3: Nutrient Agar Plate**

Table 4: For Sabouraud’s Agar Plate

Dilution	Set 1	Set 2	Set 3	CFU /ml
10 <sup>-3</sup>	9	1	3	< 30
10 <sup>-4</sup>	4	-	2	< 30
10 <sup>-5</sup>	2	21	2	< 30

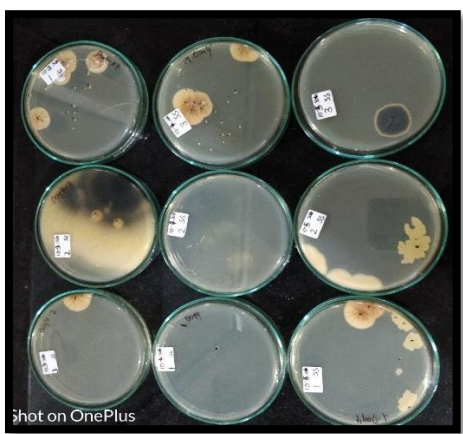


Fig. 4: Sabouraud’s Agar Plate

The microbial load of the sample on both the Nutrient Agar and Sabouraud’s Agar was found to be less than 30 CFU/ml.

8.3 Evaluation of Sensory Analysis

Table 5: Sensory Evaluation

Attribute	Rating score
Colour	7.9
Odour	7.7
Appearance	7.1
Texture	7.3
Taste	7.2
Mouthfeel	7.1

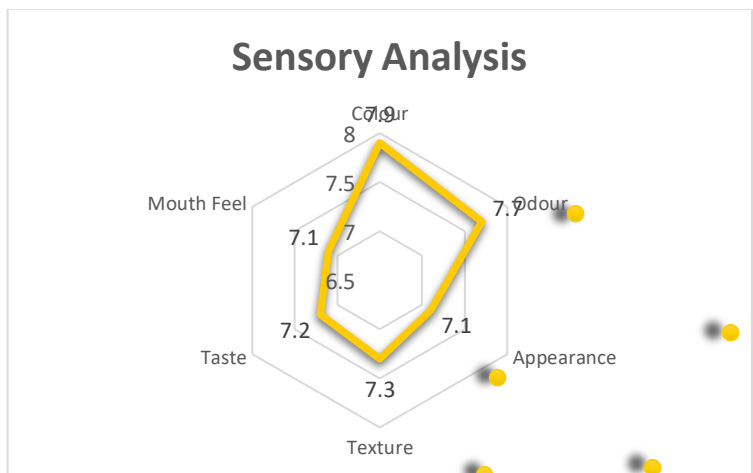


Fig. 5: Sensory evaluation result (Radar diagram)

#### 8.4 Shelf Life Study

The shelf life study was conducted for the period of 3 days. Within this period there was no change in the organoleptic properties of the product. However slight increase in the moisture content was observed towards the end of 3<sup>rd</sup> day. Hence it can be concluded that the product has an optimum shelf life of 3 days.

### 9. FOOD LABELLING AND PACKAGING

#### 9.1 Packaging Material

Aluminum standing pouches were used for product packaging. Aluminum pouches are sturdy and offer maximum resistant to dust, oxygen, chemicals, water, moisture and other agents that tend to destroy the quality of stored products. Its barrier function against the migration of moisture, oxygen and other gases and volatile aroma as well as against the impact of light is generally higher than any plastic laminate material. Aluminum pouches offer lightweight packaging and thus are travel friendly. Moreover, they come with a bottom gusset and occupy less storage space. [12]



Fig 6: Aluminium Pouches

#### 9.2 Labeling.

A product label is the only way of communicating with each and every consumer. Certain information is mandatory on food label as per the regulatory requirement of the country. As per labeling norms in India (FSSAI, FSSR) and globally, a food label should include the following key features:

- Name of the food product
- List of ingredients
- Nutritional information
- Specific claims
- Net weight or volume
- Batch or lot identification
- Manufacturing date
- Best before date
- Maximum Retail Price of the Product
- Storage conditions
- Directions to use
- Declaration of additives
- Veg or Non-Veg logo
- FSSAI logo
- Name and address of manufacturer

Label for 'Healthy Fibrous Brownie' was done as per the requirements specified in FSSAI and FSSR. [12]



Fig. 7: Front Label



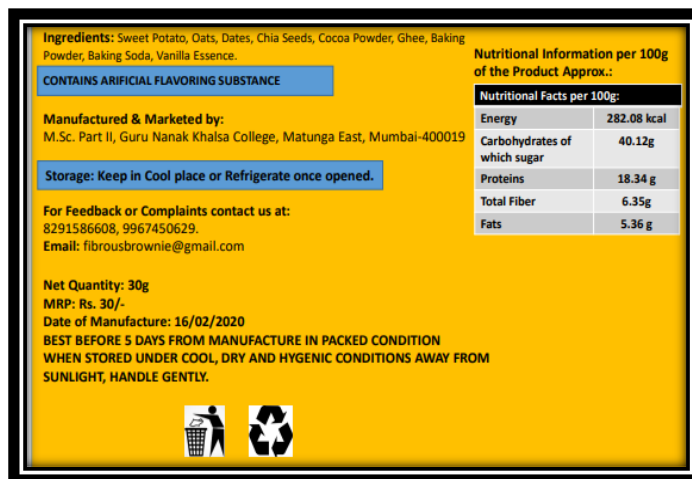


Fig. 8: Back Label

## 10. CONCLUSION

Product development of nutraceutical product enriched with dietary fiber was done using sweet potato, dates and oats. Proximate analysis for various physiochemical characters were done using various methods. Following are the values obtained after carrying out proximate analysis (per 100gms of brownie).

Energy: 282.06kcal, Carbohydrates: 40.12gms, Protein: 18.34gms, fats: 5.36%, Dietary Fiber: 6.32gms.

Further testing like microbial analysis studies confirmed that the product is safe for consumption. Sensory evaluation helped in determining the consumer acceptance of product. Packaging ensured product safety. Shelf life studies ensured product stability for about 3 days. Sweet potato, dates and oats are not much consumed as for desert fibrous brownie is a modern twist to traditional brownies adding high fiber to it. Brownie is loved by everyone therefore we choose brownie as our product development. The product development has assigned in understanding a lot of aspects that are practiced by food industry in order to get their idea into the market, right from conducting a literature survey to carrying out multiple trials to achieve a novel product.

## 11. ACKNOWLEDGEMENT

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The work and analysis was carried out in Nutraceutical Department Laboratory of G.N. Khalsa College with all required infrastructure and instruments.

Also thanks to my parents who supported me a lot while completing this research work.

## 12. FUTURE PROSPECTS

As the product has lot of potential considering the upcoming consumer needs as there is no commercially available brownie having these products. By adding certain preservatives the shelf life of the products can be increased. A proper study of antioxidants can be carried out for further nutritional study as oats and dates contain many antioxidants. The product can also be launched in the market.

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