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Development of Protein Rich Traditional Snack

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ABSTRACT

Several research papers have reported health benefits of *Eleusine coracana* (Finger Millet), *Cicer arietinum* (Chickpea), *Foeniculum vulgare* (Fennel Seeds) and *Cuminum cyminum* (Cumin Seeds). Although there is increase in consumer demand for healthy products, this snack belong to traditional category of snacks is modified to provide daily required protein and fiber to the consumer. The product is inspired from the famous “Bhakarwadi” snack which is consumed highly in central parts of India and it’s demand have taken the product overseas. A combination of Finger millet flour and Chickpea flour provides with good amount of dietary fiber and protein and contains no gluten. The safety and quality of the product was determined on the basis of physiochemical characterization such as Moisture Content (7.39%), Ash Content (3.03%), Total fats (16.15%), Proteins (17.8 grams), Carbohydrates (53.86 grams), Crude fiber (2.43%), Total phenols (65 mg/100g GAE), along with organoleptic analysis.

Keywords: *Bhakarwadi*, *protein-rich*, *gluten free*, *sprouts*, *finger millet*, *nutritional profile*.

1 INTRODUCTION

“BHAKARWADI” is a traditional savoury snack (proprietary food), made with fine quality and taste with the goodness of Finger Millet, Chickpea and Sprouts. This sandwich Bhakarwadi stuffed with fennel seeds and spices add nutritional value with the presence of functional ingredients. Changing dietary patterns coupled with modern lifestyles has major modifiable factors that primarily lead to type 2 diabetes, coronary heart disease, cancer, and obesity. Proteins are a class of nitrogenous organic compounds which are large macromolecules composed of one or more

long chain amino acids and are an essential part of all living organisms. They are also structural components of body tissues such as muscle, hair, enzymes and antibodies etc. Functions of protein include growth and maintenance, biochemical reactions, provides structure, maintains pH, balances body fluid, acts as messenger, boosts immunity, transports and stores nutrients and provides energy.[1]

Eleusine coracana commonly known as finger millet or Ragi is one of the important millet grown extensively in India and Africa. With regards to it, its protein content is 6-8%, fat content is 1-2% which is comparable to rice and wheat. Nutritionally it has high content of calcium, dietary fiber and phenolic compounds. It is also known for several health benefits such as anti-diabetic, anti-tumorigenic, atherosclerogenic effects and anti-oxidants.[2]

Cicer arietinum L commonly known as chickpea is an important pulse crop grown and consumed all over the world, especially in the Afro-Asian countries. It is a good source of carbohydrates and protein, and protein quality is considered to be better than other pulses. Chickpea has significant amounts of all the essential amino acids except sulphur-containing amino acids, which can be complemented by adding cereals to the daily diet.[3]

Foeniculum vulgare Mill commonly known as fennel is used to treat many bacterial, fungal, viral, and mycobacterium infectious diseases. Fennel has antibacterial activity due to compounds such as, linoleic acid, 1, 3-benzenediol, oleic acid and 2,4-undecadienal. Fennel has 5-hydroxy-furanocoumarin which has important role antibacterial activity of this plant. [4]

Vigna Radiata, commonly known as the mung bean alternatively known as moong bean, monggo, green gram or Mung. Mung beans are commonly used in cuisines across Asia. It is vegan. Its flour is gluten-free and high in protein.[5]

2 METHODOLOGIES

2.1. MATERIALS

Finger Millet flour, chickpea flour, mung dal flour, Bengal gram flour, red chilli powder, turmeric, cumin powder, carom seeds, salt, moth bean sprouts, mung bean sprouts, grated coconut, roasted sesame seeds, roasted fennel seeds, roasted star anise, roasted cinnamon, roasted bay leaves, roasted black pepper, coriander powder, dry mango powder, sugar, Nutralays pea protein.

2.2 METHODS

2.2.1. Soaking and germination:

The moth beans and mung beans were cleaned and soaked for 8 hours and kept overnight for the process of sprouting

2.2.2 Kneading dough:

The flours were roasted and transferred to a bowl. To which spices, salt and oil were added. These ingredients were kneaded together with the help of water to form dough.

2.2.3. Preparation of stuffing:

The whole spices were roasted and ground into powder using a grinder. To this ground spices, coriander powder, red chilli powder, turmeric, sugar and salt were added.

3. PRODUCT FORMULATION



Fig.2: Rolled Sheet

Fig.3: Baking tray



Fig.4: Baked Prathinam Bhakarwadi

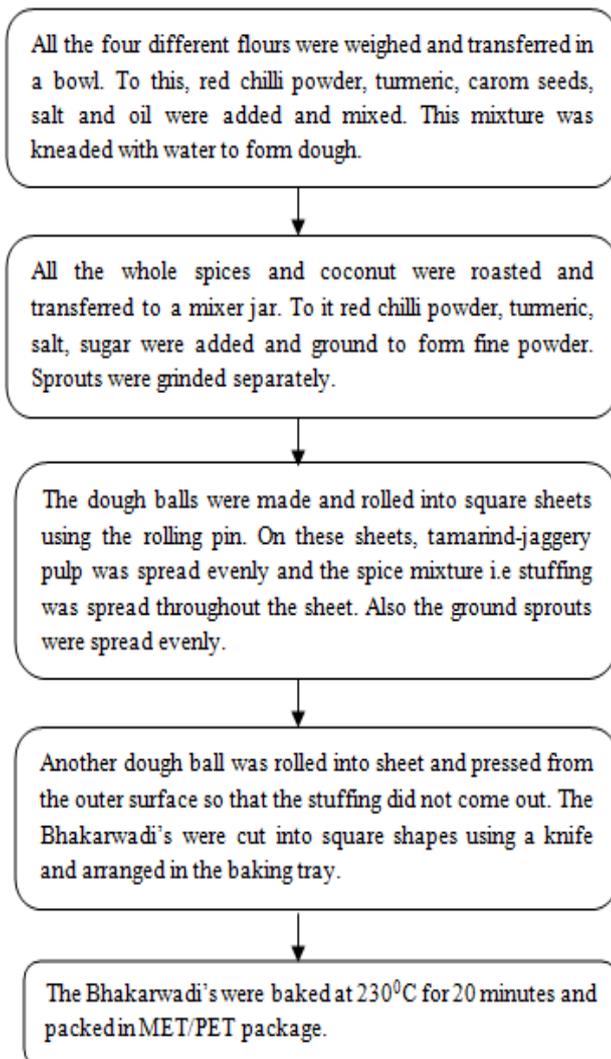


Fig.1: Standard Preparation of Prathinam Bhakarwadi

4. PROXIMATE EVALUATION:

The proximate analysis of various baked Prathinam Bhakarwadi was carried out to ascertain the level of various biochemical constituents

4.1 ESTIMATION OF MOISTURE CONTENT

Moisture content of the product was estimated by using Oven Drying Method i.e the conventional method. The crushed Bhakarwadi sample was weighed and treated under 100°C for 2 hours and 30 minutes in the Hot Air Oven. [7]

4.2 ESTIMATION OF ASH CONTENT

Ash content of the crushed Bhakarwadi sample was estimated using Muffle Furnace. The sample was weighed and incinerated to remove carbon molecules from the sample and ignited at 550°C in the Muffle Furnace for 3 hours. [8].

4.3 ESTIMATION OF PROTEIN CONTENT

The protein content of the product was evaluated by using Kjeldahl method. The Nitrogen Content of the sample was determined by Digesting, Distillation and Titration against the working standard and the amount was multiplied by a factor of 6.25. Methods described in A.O.A.C [9]

4.4 ESTIMATION OF FAT CONTENT:

Fat Content of the product was evaluated by using the Soxhlet Method. Method described in A.O.A.C Manual.

4.5 ESTIMATION OF CARBOHYDRATE CONTENT

Carbohydrates Content was determined by subtracting from 100 the sum of the values moisture, protein, fat, ash, and crude fiber.

4.6 ESTIMATION OF CRUDE FIBER

Crude Fiber was evaluated by Acid-Alkali Hydrolysis method described in A.O.A.C [10].

4.7 ESTIMATION OF GLUTEN CONTENT

Since the flour mix used had very less or no gluten content, there was no extraction of gluten obtained using the specified method. Thus, the given flour sample had no gluten in it. [11].

4.8 ESTIMATION OF ENERGY

Energy content was determined by multiplying the Crude Proteins, Crude Carbohydrates and Crude Fats by water Factors 4, 4 and 9 respectively.

5. ESTIMATION OF PHYTONUTRIENTS

The concentration of Phenols was estimated by Folin-Ciocalteu method using colorimeter. [13]

6. MICROBIAL EVALUATION OF THE PRODUCT

The determination of Microbial load was done by using Total Plate Count Method. The samples were prepared using serial Dilution Method. The sample was spread on Nutrient Agar plate for the bacterial count and Sabourauds Agar plate for the moulds and fungi count. [18]

7. SENSORY EVALUATION OF THE PRODUCT

The sensory evaluation of the product was done by using a 09-point hedonic scale for various sensory parameters such as appearance, odour, colour, taste and its overall acceptability using 30 untrained Panelists. [16]

8. RESULTS AND CONCLUSION

8.1 PROXIMATE ANALYSIS

Table.1 Result of Proximate Analysis

| Parameters | Quantity per 100g (Mean + SD) |
|--------------|-------------------------------|
| Energy | 431.99 kcal |
| Carbohydrate | 56.4 g |
| Protein | 17.8 ± 0.0 |
| Fat | 12.27±0.508 |
| Ash | 4.33 ± 0.380 |
| Moisture | 5.32 ± 0.148 |
| Crude fiber | 2.43 ±0.750 |

8.2 PHYTONUTRIENT ANALYSIS

Table.2 Result of Phytonutrient Analysis

| Parameters | Quantity per 100g (Mean + SD) |
|--------------------|-------------------------------|
| Total Phenols (mg) | 107.22 mg/100 gm GAE |

8.3 MICROBIAL ANALYSIS

The microbial load of the sample on both the Nutrient Agar and Sabourauds Agar was found to be less than 30 CFU/g.

8.4 SENSORY ANALYSIS

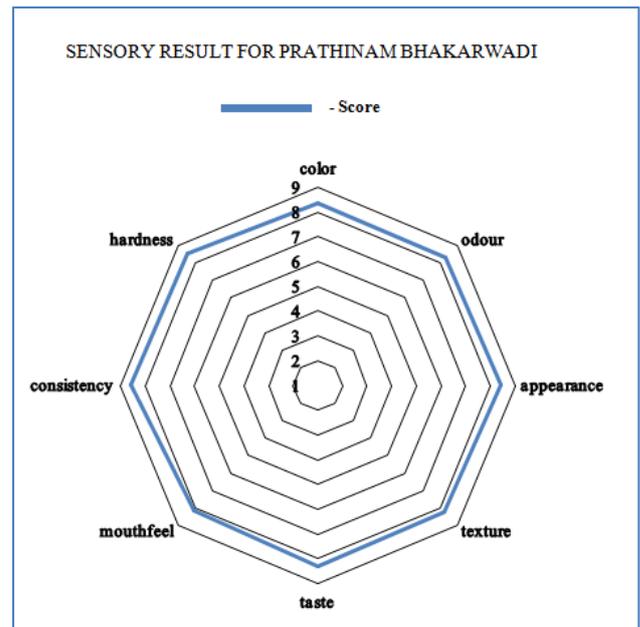


Fig.5: Sensory Result of Bhakarwadi (Radar Chart)

9. FOOD LABELING AND PACKAGING

9.1 PACKAGING MATERIAL

The packaging of the product- Prathinam Bhakarwadi was done using Metalized Polyester Film. Polyethylene Terephthalate(PET) films are durable, heat resistant films with very good oxygen barrier properties. When PET films are laminated with metal foil (MET PET), it will increase the film's oxygen-water barrier and block out UV rays. The packets were sealed with the help of sealing machine. [14]



Fig.5: Metalized Polyester Package

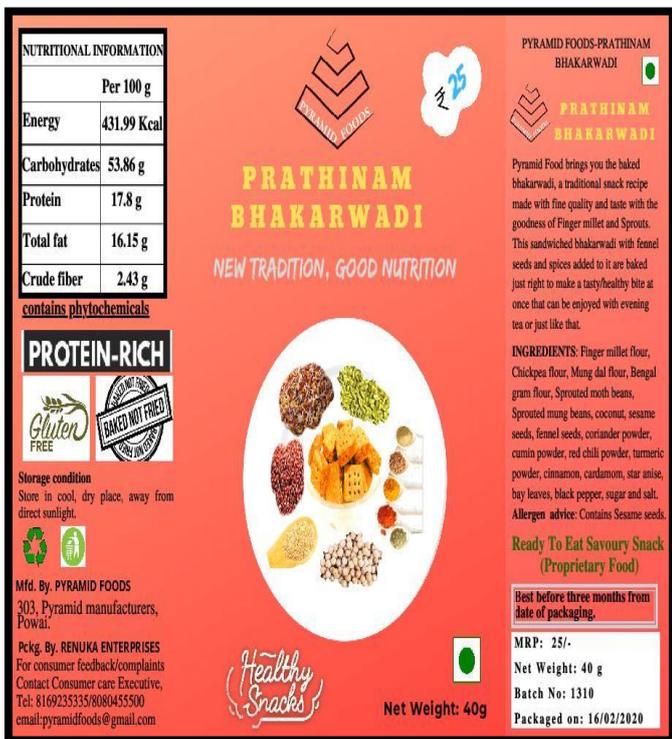


Fig.6: Front and Back label of PrathinamBhakarwadi

9.2 FOOD LABELING

As per the packaging and labeling norms in India and globally, a food label should include the following key features...

- Name of the food product
- Lot or Batch identification
- Name and address of manufacturer
- Warning or Advisory statements
- Ingredient list
- Best before date
- Manufacturing date
- Directions to use and storage
- Nutritional information
- Net weight or volume
- Veg or Non-Veg Logo [14]

10. CONCLUSION

On the account of above observations, the product is protein rich as the protein content was found to be **17.8g** in 100g which complies to the requirement of FSSAI guidelines. Since there is limited availability and variety in healthy snack products, the formulated product could be the choice of every category of consumers, including vegans. It could also be the choice of gluten sensitive population. Prathinam Bhakarwadi could be a value added munchies to the population who are health conscious at the same time crave for snack too.

11. FUTURE PROSPECTS

The fiber content and antioxidant study can be conducted. Also minerals can be estimated. The product can also be launched in market.

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