

## **DEVELOPMENT AND QUALITY EVALUATION OF BAJRA AND FOXTAIL MILLET INCORPORATED RUSK**

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### **ABSTRACT**

Rusk is one of the oldest bakery products which is made of millet flour. It has a good shelf life and is a common snack along with tea or milk. Rusk is a hard, dry biscuit or a twice baked bread. It is sometimes used as a teether for babies. The aimed to enhance the quality of rusks by incorporating bajra (pearl millet) and foxtail millet, known for their nutritional benefits and gluten -free nature. Foxtail millet is a hearty substitutes helps lowering blood cholesterol. This study contributes to the diversification of bakery products and promotes the use of alternative grains for improve nutrition. In recent times, composite flour blending technology using whole grains from under-utilized crops like millets and pseudo cereals has gained interest. Foxtail millet (*Setaria italica*) is one such millet, known for its drought resistance and shorter growing period. This study aimed to formulate composite flour using foxtail millet along with ingredients like bajra, toned milk, brown sugar and yeast. The results revealed that the whole grain and millet-based composite flour was rich in nutrients such as protein, fat, and dietary fibre. Additionally, it contained bioactive components like total phenols and flavonoids). The flour also exhibited high free radical scavenging activity. With good protein digestibility and essential amino acids, polyunsaturated fatty acids, and monounsaturated fatty acids, this flour holds potential for developing nutritious products across all age groups.

**Key words:** Foxtail millet, bajra millet, yeast, toned milk, brown sugar.

### **INTRODUCTION**

A rusk is a hard, dry biscuit or a twice baked bread. It is sometimes used as a teethes for babies. It some cultures rusk is made of cake rather than bread. This rusk is rich in fibre, ash, protein higher proportion of protein having greater biological value. Rusk contains a significant amount of sugar. The rusk is also rich in fibber and helps for smooth digestion and improve the good health. The rusk with the foxtail millet and bajra millet rich in fibber and protein the foxtail millet is rich in vitamin B12 which is essential for maintaining a healthy health and good for skin and hair growth. (Laghima Arora et al , 2023)Foxtail millet and bajra millet-based rusks offer a nutritious twist on the traditional snack. These rusks, also known as biscotti, are made by twice-baking bread or cake. When crafted from foxtail millet, they become protein-rich with a low glycaemic index. Bajra millet-based rusks, on the other hand, are packed with iron and other essential nutrients. Incorporating these millet-based rusks into your diet can be a healthier alternative to wheat-based options. (Sindhu S et al , 2022)

Foxtail millet, a small-seeded grain, is a drought-resistant crop with a relatively short growing period. Its resilience under stressful climatic conditions and resistance to pests and diseases make it a sustainable choice for agriculture. As one of the oldest cultivated crops, foxtail millet has gained global popularity due to its nutritional and medicinal properties. (Diletta Balli et al , 2013) Rich in antioxidants, phenolics, dietary fibre, protein, fat, starch, vitamins, and minerals, it offers a promising avenue for nutritious food products. Among millets, foxtail millet is the only crop possessing rich genetic and genomic resources, and globally it is the second most cultivated millet next to pearl millet. In the context of its importance in agronomic and research terms, the present chapter summarizes the origin, domestication, phylogeny, and agro-economic importance of foxtail millet.

Bajra, also known as pearl millet, is a highly nutritious and resilient cereal grain primarily grown in arid and semi-arid regions of Africa and Asia. Known for its robust drought tolerance and ability to thrive in poor soil conditions, bajra has been a staple food for millions of people for centuries. Its small, round seeds are packed with essential nutrients, including protein, fibre, vitamins, and minerals, (JinJin Pei, et al 2022) making it an excellent food source for combating malnutrition. Beyond its nutritional value, bajra also offers significant health benefits, such as improving digestion, regulating blood sugar levels, and supporting heart health. As global interest in sustainable and health-conscious eating grows, bajra is gaining recognition as a valuable crop for both human consumption and environmental sustainability.

Brown sugar is a sucrose sugar product with a distinctive brown colour due to the presence of molasses. It is by tradition an unrefined or partially refined soft sugar consisting of sugar crystals with some residual molasses content (natural brown sugar), but is now often produced by the addition of molasses to refined white sugar (commercial brown sugar). Rich In Nutrients and Minerals: Brown sugar contains a lot of nutrients and Minerals such as calcium, iron, potassium, and antioxidants, which further protect the cells from any of the damaging as well as have you make teeth and bones stronger, regulate blood pressure, and increase the production of red cells. Weka (Gusmiarty et al , 2015)

## **Materials and methods**

### **Materials**

Foxtail millet, bajra millet, yeast, toned milk, brown sugar, pan, food processor, mixing bowl, oven, bread moulds. Rusk, a delightful baked snack, is prepared through a two-step process. Let me break it down for you:

### **Methods:**

#### 1. Pre-mixing of Ingredients:

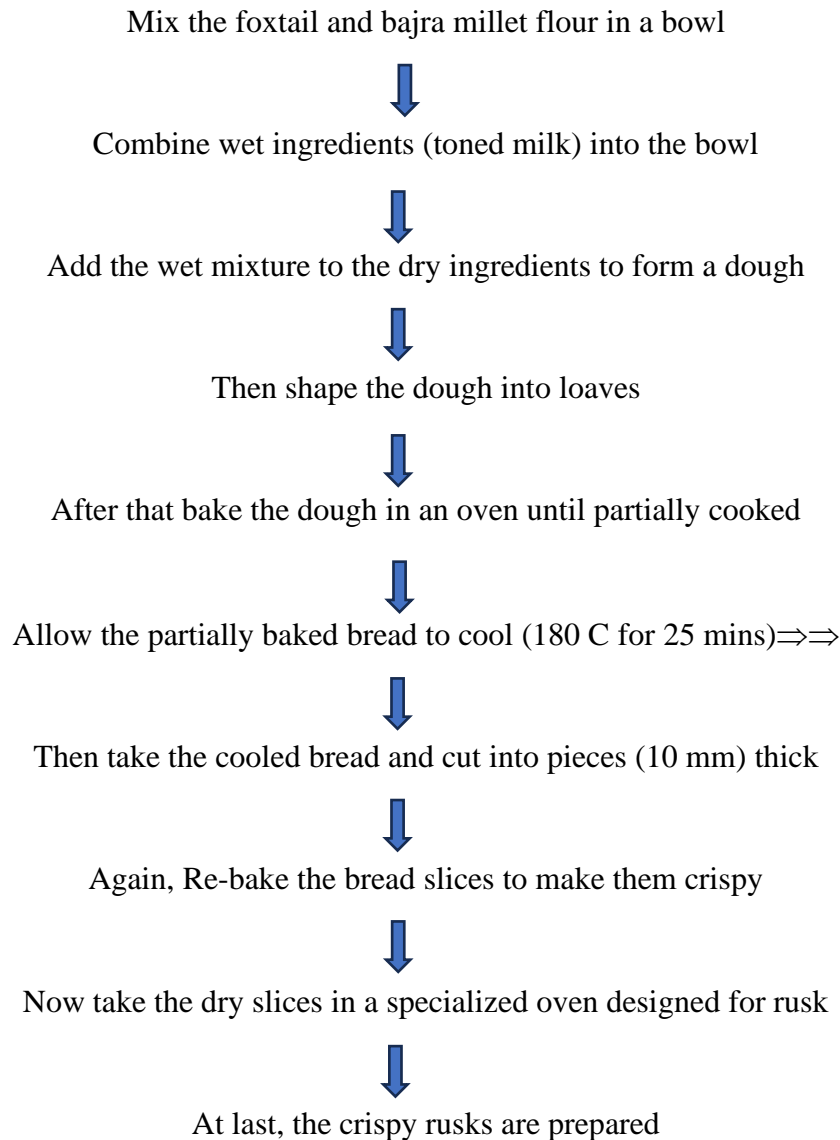
- Combine the dry ingredients (such as foxtail millet flour, bajra millet flour, brown sugar and yeast) in a clean mixing bowl.
- In another bowl, mix the wet ingredients (like toned milk) - Transfer the wet mixture to the dry ingredients and stir until you form a soft dough resembling biscuit dough.

#### 2. \*Baking Process:

- Divide the dough into pieces and place them into moulds for proofing.

- First baking: Bake the dough until partially cooked.
- Allow the partially baked bread to cool.
- Second baking: Slice the bread into pieces (around 10 mm thick) and grill them.
- Dry the slices in an oven designed specifically for this purpose.
- The final product, crispy and flavourful rusk, is then tightly packed for supply

### **Preparation of rusk**



**Fig 2: Rusk**

**Table.1 Different formulation tested for millet-based rusk**

S.NO	SAMPLE	TREATMENT-1	TREATMENT-2	TREATMENT-3
1	Foxtail millet	25gm	30gm	30gm
2	Bajra millet	15gm	15gm	20gm
3	Toned milk	30ml	20ml	30ml
4	Brown sugar	25gm	30gm	20gm
5	Yeast	5gm	4gm	3gm

### Physio chemical analysis

#### Titratable acidity

Preparation of Sample:

Take a known volume of the sample (usually 10-50 mL) and transfer it into an Erlenmeyer flask. If the sample is very acidic, you might need to dilute it with distilled water to bring the titration within a measurable (*Ana Claudia Berenhauser et al*, 2017). Add 2-3 drops of phenolphthalein indicator to the sample. Phenolphthalein is colour less in acidic conditions and turns pink in alkaline conditions, making it useful for detecting the endpoint of the titration. Fill a burette with the standard NaOH solution. Record the initial volume of NaOH in the burette. Slowly add the NaOH solution from the burette to the sample while continuously swirling the flask to mix. By using a magnetic stirrer, place the flask on the stirrer and turn it on to maintain a consistent mixing rate. Watch for the first permanent colour change in the solution, which indicates that the endpoint has been reached. The solution should turn a faint pink colour that persists for about 30 seconds.

Record the final volume of NaOH in the burette. Calculate the volume of NaOH used by subtracting the initial volume from the final volume. The titratable acidity is often expressed in terms of a specific acid, such as tartaric acid in wine or citric acid in fruit juices. Use the following formula to calculate the titratable acidity (*Sadler, G.D et al*, 2010).

Titratable Acidity (g/L) = (Volume of sample (L) / Volume of NaOH used (L)) × Normality of NaOH × Equivalent weight of acid)

#### Moisture

The moisture content of the sample was determined by using the method of (AOAC 2007)

Procedure:

1. The Petridish with lid was weighed.
2. A 5 g of the sample was weighed into the petridish and spread evenly for uniform drying.
3. oven was set at 100 to 105 and the petridish with sample was placed inside the oven with lid open for 15 - 17 hours.
4. the petridish was cooled in a desiccator with lid open for 1-2 hours.

#### PROTEIN

Biuret Reagent: Dissolve 3 g of copper sulphate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) and 9 g of sodium

potassium tartrate in 500 ml of 0.2 mol/litre sodium hydroxide; add 5 g of potassium iodide and make up to 1 litre with 0.2 mol/litre sodium hydroxide. 2. Protein Standard: 5 mg BSA/ml.,( Nawsheen Boodhun,2018).

Procedure:

1. Pipette out 0.0, 0.2, 0.4, 0.6, 0.8 and 1 ml of working standard in to the series of labelled test tubes.
2. Pipette out 1 ml of the given sample in another test tube.
3. Make up the volume to 1 ml in all the test tubes. A tube with 1 ml of distilled water serves as the blank.
4. Now add 3 ml of Biuret reagent to all the test tubes including the test tubes labelled blank and unknown.
5. Mix the contents of the tubes by vertexing / shaking the tubes and warm at  $37^\circ\text{C}$  for 10 min.
6. Now cool the contents to room temperature and record the absorbance at 540 nm against blank
7. Then plot the standard curve by taking concentration of protein along X-axis and absorbance at 540 nm along Y-axis.
8. Then from this standard curve calculate the concentration of protein in the given sample. (Mahesha et al.,2012)

Calculations

OD of test (optical density)

Total protein (g o) = X Concentration of standard OD of standard

### **Sensory evaluation:**

Sensory evaluation is one of the important criteria for analysing and accepting of any food product by means of sense, taste, touch. The sensory evaluation for formulation and quality evaluation of millet-based rusk is carried to evaluate the acceptability on the basis of texture, appearance, taste, smell, and overall acceptability by using nine – point hedonic scale method by 10 trained panel members. Based on the results of the sensory evaluation any one of the variations will be selected for further analysis. Sensory Evaluation of millet-based rusk. The results of sensory evaluation of formulated two variation is exhibited in the Table 2.

### **RESULT AND DISCUSSION:**

The Rusk products ranged from 4cm to 5cm whereas the width measurement maintained at 1.5cm and thickness ranged from 1.5. The thickness was the highest due to the rapid solid formation of the milk present in the rusk. It may also be due to the fact that, fox tail millet contains more fibre and fibre, and also the millet milk has high amount of dietary fibre, both soluble and fiber in millet is known as Prebiotic has a higher capacity of binding with the liquid to form a shape and in this way solid formation happened in a short time.

### **Table 2 Sensory Evaluation of Foxtail millet Based Rusk**

S.NO	Trails	Colour	Appearance	Texture	Odour	Taste	Overall Acceptability
1.	T1	8	8.5	8	8.5	8.5	8.5
2.	T2	7	7	7	7.5	7.5	7
3.	T3	7.5	7.5	7	8	7	7.5

The mean score of the sensory evaluation is obtained for the trails (T1) by overall acceptability. Therefore, from the results it is concluded that the Foxtail millet and bajra millet scored maximum score so it was further subjected to quality analysis

**Table 3 Nutritional analysis of Millet based Rusk for 5 gm of sample**

S.NO	Nutrient	Value
1.	Moisture	0.17 %
2.	Fat	0.2 %
3.	Protein	1.6 gm
4.	Acidity	0.52 %
5.	SNF	1.3 %

## CONCLUSION:

The fusion of using bajra and foxtail millets in rusk form presents a promising avenue for creating a nutrient including high – quality proteins, vitamins and minerals. Which are good for healthy heart and good health. Furthermore, incorporating innovative snacks like millets-based rusk into diet can contribute to achieving dietary goals and consumes acceptance of such innovative and creative food products could provide valuable insights and healthy foods with nutritional intake and good health for the consumers.

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