# DEVELOPMENT OF FOXTAIL MILLET BREAD WITH HONEY POWDER

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**ABSTRACT**

Millet is a great source of protein, fiber, important vitamins, and minerals.T This gluten-free grain may be cooked in a variety of simple ways, making it simpler for people with celiac disease to include it in their diets. Making bread using foxtail millet flour is challenging since it lacks gluten. Foxtail millet is highly nutritious, non- glutinous and non-acid forming food. They are a rich source of protein, fiber and nutraceuticals components. Hence, they are soothing and easy to digest.

The key goals of this study are to enhance the bread's nutritional content and quality and to advance the commercial growth of the whole-grain food sector. Whole foxtail millet flour's impacts were investigated using a texture analyzer. This study employed sugar as a control to examine the impact of the honey powder on bread quality and dough rheology.

In the current study, foxtail millet flour will be used in 3 different formulations: S1 (50%) S2 (40%) S3 (20%).These samples have undergone proximate, texture analysis, sensory evaluation, and shelf life studies .The S3 sample with added honey had the best texture characteristics out of all of them, including low hardness, adhesiveness, gumminess, chewiness, and high springiness, cohesiveness, and good crumb and crust structure Sensory evaluation and shelf life studies are analyzed and compared to the control sample.

According to the study, foxtail millet flour containing natural honey powder may be effective as a dough enhancer. The use of honey in the bread recipe helped to enhance the rheology of the dough and the sensory and textural features of the loaves without degrading their nutritional or sensory value

Key words: Bread, dough rheology, honey powder, and foxtail millet

# Introduction

Bread is one of the most widely eaten meals in the world Technology has been developing gradually as new materials, methods, and instruments are produced. The use of alternative flours to wheat has been highlighted as the need for unique and nutritious foods has increased due to the rise in illnesses and changing lifestyles. Therefore, millets' nutritional and functional properties—which include higher quantities of , dietary fiber (DF), non-gluten proteins, low glycemic index deserve special consideration in baked foods like bread

The grain known as foxtail millet, Setaria italica L., is abundant in dietary fiber, proteins, vitamins, and minerals. Because it contains phytates, polyphenols, tannins, anthocyanins, and phytosterols, it has been noted as a significant millet in terms of global output.

Millets have been linked to favorable impacts on health because to their anti-ulcerative, anti-inflammatory, and hypoglycemic properties. Millets provide several health advantages in addition to being a fantastic source of vitamins, protein, energy, and minerals. Although they are rich in a range of nutritional and functional qualities and are known as "Nutri cereals," they are only sometimes used in the baking business due to their coarse texture, absence of gluten proteins, and low level of consumer knowledge of their nutritional worth. Hydrophilic (gluten) and hydrophobic (millet) proteins are switched out when wheat and millet flours are mixed, which alters how the dough combines.

Simple sugars glucose and fructose, water (10-20%), and other minor components such organic acids, mineral salts, vitamins, proteins, phenolic compounds, and free amino acids make up the remainder of this naturally occurring biological product. Honey is the last remaining natural, unprocessed food that may be ingested and only available unique natural sweetener to mankind. To improve the bread's overall quality and lengthen its shelf life, honey can be incorporated in the recipe. However, as liquid honey is sticky and challenging to mix into dough, its usage in the food business is limited. As a result, honey powder (dry honey), which is created from liquid honey but can be mixed more easily, has become more popular in the bread baking sector for enhancing bread quality. People are becoming more and more interested in wheat-free meals nowadays, driven by both health concerns as well as the need to reduce wheat out of their diets.

Therefore, combining wheat and millet flour with honey powder may have the ability to increase the nutritional value and quality of bread bakery products. Honey powder is used in the formulation of dough to enhance the products' sensory, keeping, and nutritional qualities.

The main aim is to Develop breads with blending the flours of wheat and foxtail millet by incorporation of honey powder with different formulations and to study following objectives

1. To study the characteristics of developed foxtail millet bread.
2. To study the proximate analysis and shelf studies of bread

## Chapter II

## REVIEW OF LITERATURE

The following headings are used to present the review of the literature for the current study, "Development of Foxtail Millet Bread With Honey Powder":

2.1 Nutritional and health advantages of foxtail millet flour.
2.2 Use of Honey Powder That Has Been Spray Dried.
2.3 Using different types of millet flour in bakery goods

### 1.1.Nutritional and Health Benefits of Foxtail Millet Flour:

Li Zhen Zhang and Rui Hai Liu in 2015.,Foxtail millet's phenolic and carotenoid profiles and antiproliferative properties were examined. Foxtail millet is a remarkable grain with promise in the prevention and management of cardiovascular, geriatric, and cancer disorders. It has been shown to be one of the most crucial
cereals in the Chinese diet. Researchers have additionally studied its antioxidant profiles.

Zainab Fatima and Avanti Rao in 2019, conducted research on the development, organoleptic evaluation, and acceptability of products made with foxtail millet. It was found that all the products created had their energy, protein, fat, carbohydrate, iron, and calcium content calculated. In order to satisfy the demands of the contemporary, dynamic food market, Foxtail millet is thus expected to have a bright future in the production of convenience meals, particularly traditional convenience mixes.

### 2.2 Utilization of Spray Dried Honey Powder

Kosal Ram et al in 2019, researched to create a retrograded starch honey powder, describe the powder, and employ it as a substitute for sucrose in bread compositions. Retrograded starch was used as a drying agent when spray-drying honey to create the honey powder. It was determined that the spray dried honey powder containing retrograded starch may be utilized as a substitute for sucrose in baking bread after characterizing it for moisture, sugar levels, and color.

The bread's texture properties, such as hardness, adhesiveness, gumminess, chewiness, springiness, and cohesiveness, were also examined. Qunyi Tong et al. concluded that honey powder may be used as a dough improver after researching the impact of honey powder on dough rheology and bread quality. Bread's improved sensory qualities, improved texture features, and improved dough rheology were all facilitated by the use of honey powder in the recipe.

### 2.3 Incorporation of various Millet flour in Bakery products

Bharathi Sharma et al in 2017, observed on Effect of finger millet in wheat flour on mixolab behavior, chapatti quality and starch digestibility showed that Finger millet flour can be utilized in chapatti making by blending with wheat flour . The incorporation of finger millet flour to refined wheat flour lowered retrogradation on index as shown by the mixolab Finger millet flour has improved bioactivity, lowered retrogradation and starch digestibility behaviour and can be used to partially replace wheat flour in chapatti making.

Tilman J. Schobert et al in 2015, evaluated gluten-free sorghum bread improved by sourdough fermentation using biochemical, rheological, and microstructural background. They came to the conclusion that the study's sorghum bread produced the best bread samples and was of higher quality than previously described formulations.

## CHAPTER-III

## MATERIALS AND METHODS

The present study "Development of foxtail Millet Bread with Natural HoneyPowder" was conducted in the School of food Technology, JNTUK. This study was conductedby developing Bread by incorporating Foxtail Millet Flour in different proportions. The developed product was subjected to different physico-chemical tests

This chapter includes detailed description of experimental procedure of the study

3.1 Raw Materials.

3.2 Criteria for selection of materials.

3.3 Preparation of foxtail millet flour.

3.4 Preparation of Bread

3.5 Formulation of samples.

3.6 Evaluation of the proximate Analysis of Bread.

3.7 Sensory evaluation of Bread.

### 3.1 MATERIALS:

**3.1.1** Fresh foxtail millet grains and spray dried honey powder were procured in the wholesaleMarket in Kakinada.

**3.1.2** Chemicals and glassware: Chemicals, glassware were utilized from the food analysislaboratory of School of Food Technology, JNTUK

### 3.2 CRITERIA FOR SELECTION OF MATERIALS:

Foxtail millet (Setaria italica L.) is rich in proteins, fats, carbohydrates, dietary fiber and minerals and highly nutritious, non-glutinous and non-acid forming food. Honey is a natural biological product that comprises of simple sugars and mineral salts, vitamins,proteins,phenolic compounds, and free amino acids Honey powder (dry honey) made from liquid honeycan be used in bread formulation to increase overall quality of the product and to extend its shelf

**Preparation of Foxtail Millet flour:**

Fresh grains were collected

↓

Removal of extraneous matter

↓

Cleaning

↓

Drying (sun drying)

↓

Milling and Sieving

↓

Foxtail millet flour

### 3.3 Preparation of Bread

The Processing protocol presented in the Fig-1. In the first step Sugar and yeast are combinedly mixed with warm water in a large mixing bowl and are mixed well. This mixture is left aside for 10 to 15 minutes. The millet And Wheat flour flour was takenin different compositions presented in “Table 3.5 ”

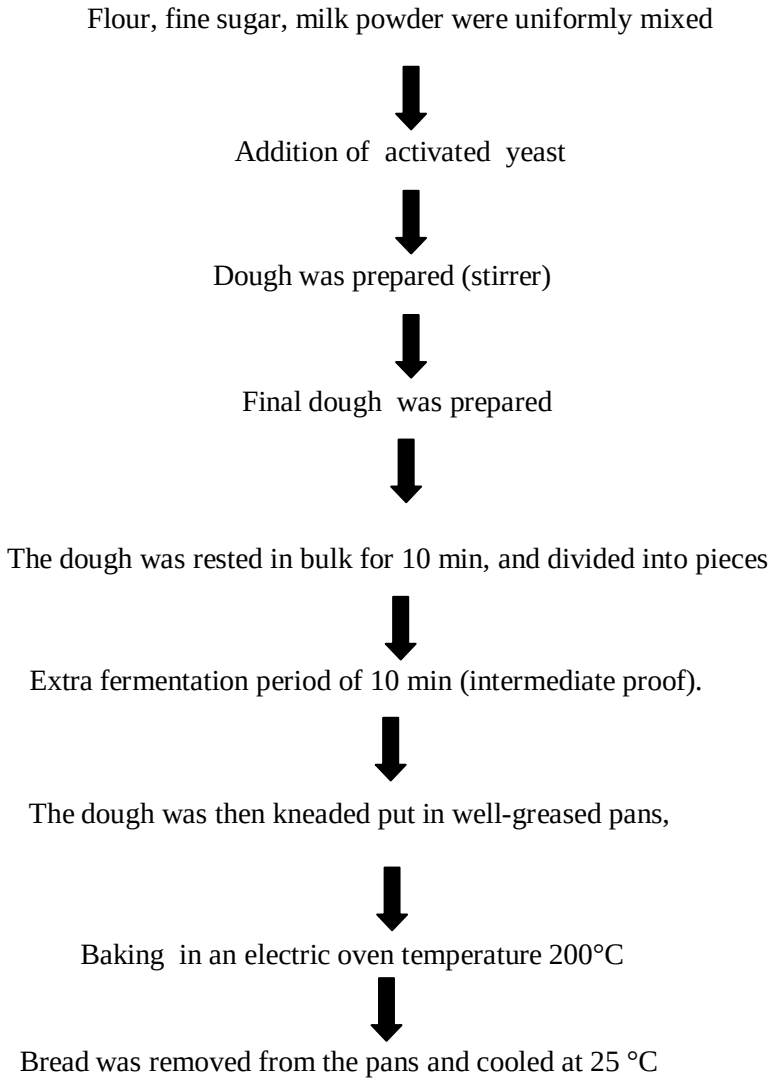



**Fig-1**

Warm water is used to knead this mixture of all the components into a loose, sticky dough. To allow the yeast to do its work, the dough is set aside for around 40 minutes.. After the raising of the dough it is kneaded once again and is put into the baling bread mould which is greased in prior.The dough filled mould is placed into an oven which is pre- heated to 210 C and is baked for about 20 minutes. Before removing the mould from the oven the temperatureis lowered to 160 C and it is backed for another 10 minutes. After baking the bread moulds was removed from the oven and let them cool and taken from the mould the baked bread wascut into slices and packed with proper packing techniques.

### 3.3 FORMULATION OF SAMPLES

| Ingredients | Sample 1(g) | Sample 2(g) | Sample 3(g) | Normal Bread (g) |
|---|---|---|---|---|
| Whole wheat flour | 50 | 60 | 80 | 100 |
| Foxtail millet flour | 50 | 40 | 20 | - |
| Honey powder | 15 | 15 | 15 | - |
| Sugar | - | - | - | 15 |
| Butter | 5 | 5 | 5 | 5 |
| Yeast | 5 | 5 | 5 | 5 |
| Water | 100 | 100 | 100 | 100 |

Table 3.5 Formulations.

### 3.4 EVALUATION OF THE PROXIMATE ANALYSIS OF BREAD.

#### 3.4.1 MOISTURE CONTENT:

Moisture content is estimated using air oven drying method by placing about 2-5 g ofsample for 24 h in a hot air oven (Model KOMA 3) maintained at 103 + 1°C (FSSAI, 2012).

**Procedure:**

i. Dry the empty dish and lid in the oven at 105°C for 3 hours and transfer to desiccatorto cool. Weigh the empty dish and lid ($W_1$).
ii. Weigh about 2-5 g of sample to the dish. Spread the sample to the uniformity. Closethe lids tightly and note their weights ($W_2$).
iii. Place the dish with sample in the oven with the lids open. Dry for 24 hours at 103+1°C.
iv. After drying, transfer the dish with partially covered lid to the desiccator to cool.
v. Reweigh the dish and its dried sample i.e., the bone-dry material ($W_3$).
vi. Moisture content on wet basis (w.b.) is calculated as mentioned.

**Calculation:**

$$\text{Moisture content (\%)} = (\mathbf{W}2 - \mathbf{W}3) / (\mathbf{W}2 - \mathbf{W}1) \times 100$$

Where,

$W_1$ = Weight of the empty box (g)

$W_2$ = weight of the box + weight of the sample (g)

$W_3$ = weight of the box + weight of the bone - dry material

### 3.4.2 ASH CONTENT:

The ash content is determined using AOAC Official Method 2000.

**Procedure:**

1. Place the crucible and lid in the furnace at 550°C overnight to ensure that impurities on thesurface of the crucible are burned off.

2. Cool the crucible in the desiccator (30 min).

3. Weigh the crucible and lid to 3 decimal places.

4. Weigh about 5 g sample into the crucible. Place the crucible and lid in the furnace.

5. Heat at 550°C overnight. During heating, do not cover the lid. Place the lid after completeheating to prevent loss of fluffy ash. Cool down in the desiccator.

6. Weigh the ash with crucible and lid when the sample turns to grey. If not return the cruciblеand lid to the furnace for the further ashing.

**Calculation:**

$$\text{Ash (\%)} = weight\ of\ ash\ /weight\ of\ sample \times 100$$

### 3.5 EVALUATION OF SENSORY ANALYSIS OF DEVELOPED PRODUCT:

Sensory analysis for developed product were conducted based on nine-point Hedonic scale (1-dislike extremely, 2-dislike very much, 3-dislike moderately, 4-dislike slightly, 5- neither like nor dislike, 6-like slightly, 7-like moderately, 8-like very much and 9-like extremely) for the quality attributes of appearance, flavor, mouth feel and taste.

## CHAPTER IV

## RESULTS AND DISCUSSION

The present study was conducted to study on Development of foxtail Millet Bread with Honey powder . The obtained results were presented in this chapter under the followingheadings.

**4.1 Sensory evaluation for the developed product**.

4.1.1 Appearance

4.1.2 Colour

4.1.3 Flavour

4.1.4 Taste

4.1.5 Texture

4.1.6 Overall acceptability

**4.2 Proximate analysis for the developed product**.

4.2.1 Moisture

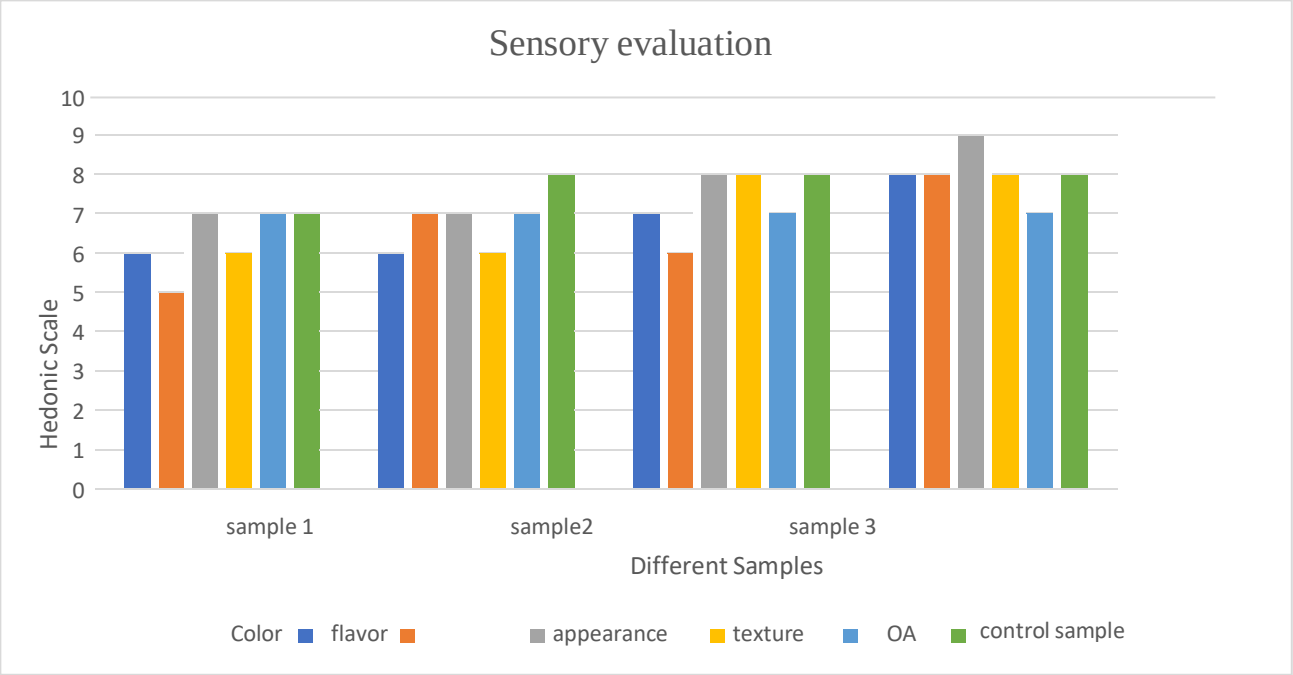
4.2.2 Ash

### 4.1 Sensory evaluation for the developed Bread .

Sensory evaluation score of different muffin samples S1, S2, S3 developed by incorporation ofFoxtail Millet and graphically represented in Table no: 4.1

| | color | flavour | appearance | texture | taste | OA |
|---|---|---|---|---|---|---|
| sample 1 | 6 | 5 | 7 | 6 | 7 | 7 |
| sample2 | 6 | 6 | 7 | 6 | 7 | 8 |
| sample 3 | 7 | 8 | 8 | 8 | 7 | 8 |
| control sample | 8 | 8 | 9 | 8 | 7 | 8 |

**Table no: 4.1 Sensory Evaluation for the developed Bread Samples**




**Graphical plot for the scores recorded during sensory evaluation of developed Product**

The formulated product has been standardized by the repeated trails in the laboratory and bythe checking the sorganoleptic characteristics through semi trained panel members. The final product was prepared by incorporating the changes which are suggested by the panel members. Initially the bread was less sweet and slightly hard, later on after several trails andstandardizing the amount of sweetness and the consistency was managed accordingly

Best bread Samples were selected by organoleptic test which was conducted on 9 point hedonic scale for appearance, colour, consistency, flavour, taste, mouth feel and overall acceptability. From the results shown in the Table 4.1, it could be observed that the appearance, colour, Texture , flavour, taste, mouth feel and overall acceptability were high for $S_3$ sample.and also observed that lower hardness, adhesiveness, gumminess, chewiness,but higher springiness, cohesiveness than the control bread Hence the $S_3$ sample was preferred by panellist and subjected to Proximate analysis

**4.2 Proximate analysis for the developed product**.

Moisture content and Ash values of Bread Developed By foxtail Millet Flour (S3) arerepresented in Table no: 4.2

| Proximate property | Values (%) |
|---|---|
| Moisture | 19.7 |
| Ash | 1.0 |

**Table no: 4.2 Proximate analysis of Developed Bread Sample (S3)**

## CHAPTER V
## SUMMARY AND CONCLUSION

From the results obtained, the present research work entitled “Development of FoxtailMillet Bread with Honey Powder” is summarized as follows

- Foxtail millet (Setaria italica L.) is rich in proteins, fats, carbohydrates, dietary fiber, vitamins and minerals and also have good antioxidant potential contributed by phytates,polyphenols, tannins, anthocyanins, phytosterols are present in it. Naturally, it is gluten-free, which is suitable for celiac patients and have low glycemic index (GI) potential.
- Combining wheat with millet flours replaces hydrophilic gluten proteins with hydrophobic (millet) proteins hence the dough mixing behavior is altered Honey can be used in bread formulation to increase overall quality of the product and to extend itsshelf life
- So, the blends of wheat and millet flour along with honey powder could have the potential of improving the nutritive value and the quality of bread
- In present Study Bread was Prepared in Conventional Method with Incorporation of millet flour in 3 different Formulations Among these, S3 sample with incorporated honey showed better texture properties with low hardness, adhesiveness, gumminess, chewiness and high springiness, cohesiveness and good crumb and crust structure
  .Sensory evaluation and shelf life studies are compared with the control sample and analysed
- Out of Sensory Score Of 3 Samples S3 obtained highest overall acceptability comparedwith the control sample
- So, this study concludes that Foxtail Millet bread have variation benefits. Millet is known for its health benefits. Packed with the goodness of iron, protein, fibre and minerals such as calcium and magnesium; the daily consumption of this millet can effectively help in losing weight Along with Honey powder usage in the bread formulation supported an improvement in dough rheology, better sensory attribute thereby prolonging shelf of product

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