DEVELOPMENT OF FOXTAIL MILLET BREAD WITH HONEY POWDER

CH.V.R GAYATHRI
Department of Food Processing and Technology
JNTUK (Jawaharlal Nehru Technological University)
Andhra Pradesh
Chepenivinuthna@gmail.com

ABSTRACT

Millet is a good source of protein, fiber, key vitamins, and minerals. .Millet is an adaptable grain. There are many simple ways to prepare it, making it easy for people with celiac disease to include this gluten-free grain in their diets Bread preparation using foxtail millet flour is very challenging as it lacks gluten. Foxtail millet is highly nutritious, non- glutinous and non-acid forming food. They are a rich source of protein, fiber and nutraceuticalscomponents. Hence, they are soothing and easy to digest.

Main Aim of this study is to improve the nutritional value and quality of bread, andpromote the industrial development of the whole-grain food industry, a texture analyzer was used to study the effects whole foxtail millet flour. This study also focused on effects of honeypowder on dough rheology and bread quality were studied using sugar as controls.

Present study is to incorporate foxtail millet flour in 3 different formulations S1(50%) S2(40%) S3(20%) .Proximate Analysis, Texture Analysis, Sensory Evaluation and shelf life studies has been carried out for these samples .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.

Study concluded that foxtail millet flour with natural honey powder could be potentially a useful ingredient as a dough improver. Honey usage in the bread formulation supported an improvement in dough rheology, better sensory and texture properties of breads without affecting the sensory and nutritional qualities.

Key Words: Foxtail Millet, Honey powder, Dough Rheology, Bread.

Introduction

Bread is one of the most widely consumed food products in the world andbread making technology is one of the oldest technologies known. This technology has been evolving continuously as new materials, equipment and processes are being developed. As theincrease in changing lifestyle and the occurrence of diseases has raised demand for novel and healthy foods that has emphasized the utilization of alternative flours to wheat. In this context,the functional and nutritional attributes of millets that comprise of higher phytochemicals, dietary fiber (DF), non-gluten proteins ,low glycemic index and micronutrients, deserves a special attention in bakery products such as bread.

Foxtail millet (Setaria italica L.) is rich in proteins, fats, carbohydrates, dietary fiber, vitamins and minerals it has been identified as a major millet in terms of worldwide production, as it is the sixth highest yielding grain and also have good antioxidantpotential contributed by phytates, polyphenols, tannins, anthocyanins, phytosterols are presentin it. Naturally, it is gluten-free, which is suitable for celiac patients and have low glycemic index (GI) potential

The regular intake of millets is connected with various health effects like anti-ulcerative, anti-inflammatory and hypoglycemic property. Apart from various health benefits, millets are alsogood source of vitamins, protein, energy and minerals Owing to their richness in various nutritional and functional attributes they are termed as 'nutricereals'; however they have limited utilization due to coarse nature, less awareness of their nutritive value and especially their limited use in bakery industry due to lack of gluten proteins. . Combining wheat with millet flours replaces hydrophilic gluten proteins with hydrophobic (millet) proteins hence thedough mixing behavior is altered.

Honey is a natural biological product that comprises of simple sugars (glucose and fructose: 70–80%), water (10–20%), and other minor constituents such as organicacids, mineral salts, vitamins, proteins, phenolic compounds, and free amino acids Honey is the oldest and only available unique natural sweetener to mankind and is the last of natural unprocessed food to be consumed Honey can be used in bread formulation to increase overallquality of the product and to extend its shelf life. However, liquid honey is viscous and difficultto disperse in the dough, limiting its use in the food industry so, honey powder (dry honey) made from liquid honey can be dispersed easier, and so it has been more widely used in bread baking industry for improving bread quality. . Today, there is an increasing number of people interested in wheat free foods motivated by health concerns but also by the desire to avoid wheat in the diet

So, the blends of wheat and millet flour along with honey powder could have thepotential of improving the nutritive value and the quality of bread bakery products, honey powder is included in dough formulation in order to improve their nutritional, sensory and keeping quality

The main aim is to Develop breads with blending of wheat flour and foxtail millet flour with 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 review of literature for the present study "Development of Foxtail Millet Bread With Honey Powder " is presented with the following heads:

2.1 Health benefits and Nutritional properties of Foxtail Millet Flour.
2.2 Utilization of Spray Dried Honey Powder.
2.3 Incorporation of various Millet flour in Bakery products

2.1 Health benefits and Nutritional properties of Foxtail Millet Flour:

Li Zhen Zhang ,Rui Hai Liu in 2015, Evaluated Phenolic and carotenoid profiles and antiproliferative activity of foxtail millet Demonstrated it is one of the most important cereals in the Chinese diet also studied its antioxidant profiles and concluded , foxtail millet is a valuable cereal that shows potential in prevention and management of cardiovascular, geriatric diseases and cancers

Zainab Fatima and Avanti Rao in 2019, Studied on Development, Organoleptic Evaluation and Acceptability of Products Developed by Incorporating Foxtail Millet and It was concluded that all the products that were developed were calculated for energy, protein, fat, carbohydrate, iron and calcium. Hence, a bright future is envisaged for use of Foxtail milletin convenience foods, particularly traditional convenience mixes to meet the challenges of themodern dynamic food industry.

2.2 Utilization of Spray Dried Honey Powder

Kosal Ram et al in 2019, Studied to produce a honey powdercontaining retrograded starch, characterize the powder and use it as an alternative to sucrose in bread formulations. The honey powder was produced by spray drying honey using retrograded starch as a drying agent. The spray dried honey powder was characterized for moisture and sugar contents and color and concluded that spray dried honey powder with retrograded starch could be used as a substitute for sucrose in baking bread

Qunyi Tong et al, Studied the Effect of honey powder on dough rheology andbread quality and conducted farinograph and extensograph studies also analysed the texture properties of bread like hardness, adhesiveness, gumminess, chewiness , springiness and cohesiveness and concluded that Honey powder could potentially be usedas a dough improver. Honey powder usage in the bread formulation supported an improvement in dough rheology, better sensory attributes, and enhanced texture propertiesof bread

2.3 Incorporation of various Millet flour in Bakery products

Bharathi Sharma et al in 2017, studied on Effect ofincorporating finger millet in wheat flour on mixolab behaviour, chapatti quality and starch digestibility showed that Finger millet flour can be utilized in chapatti making by blending with wheat flour The resistant starch increased on incorporation of fingermillet flour to wheat flour hence it could be more suitable for diabetic patients. 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, loweredretrogradation 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 Biochemical, Rheological, and Microstructural Background and conclude that sorghum bread of superior quality relative to previously described formulations was produced in the study and providedbest Bread Samples

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, vitaminsand 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 ”

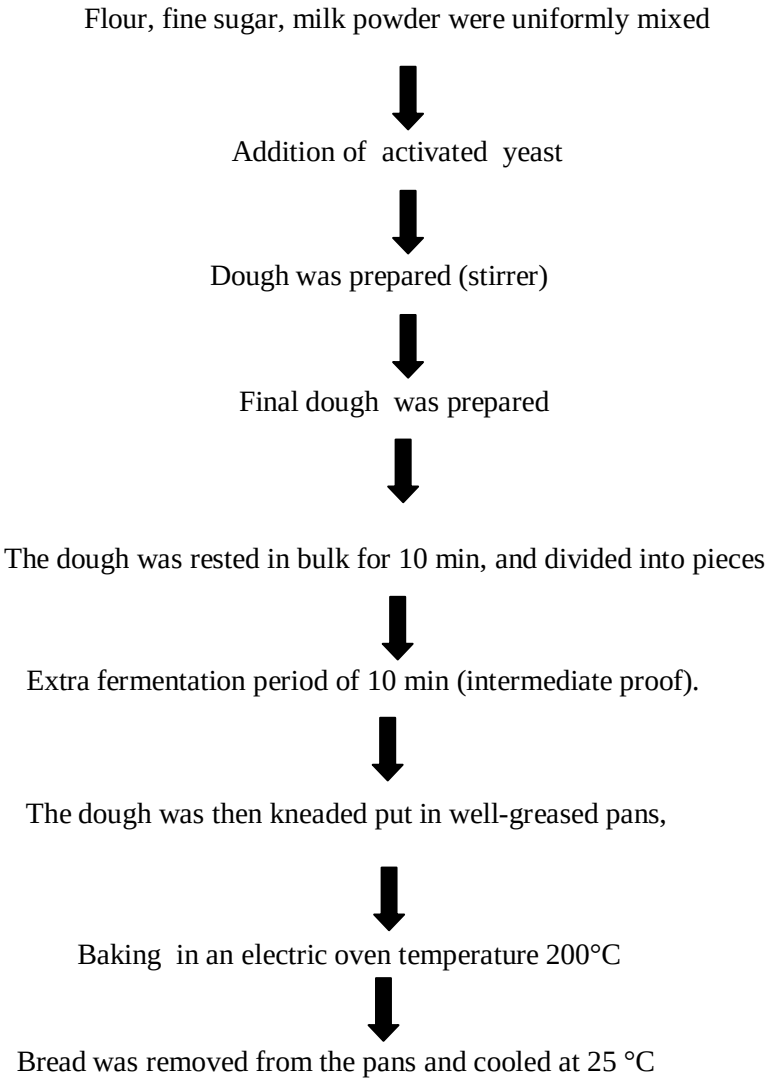


Fig-1

This mixture of all the ingredients is kneaded into loose sticky dough using warm water. The dough is left aside for about 40 minutes to let it rise by the action of the yeast. 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

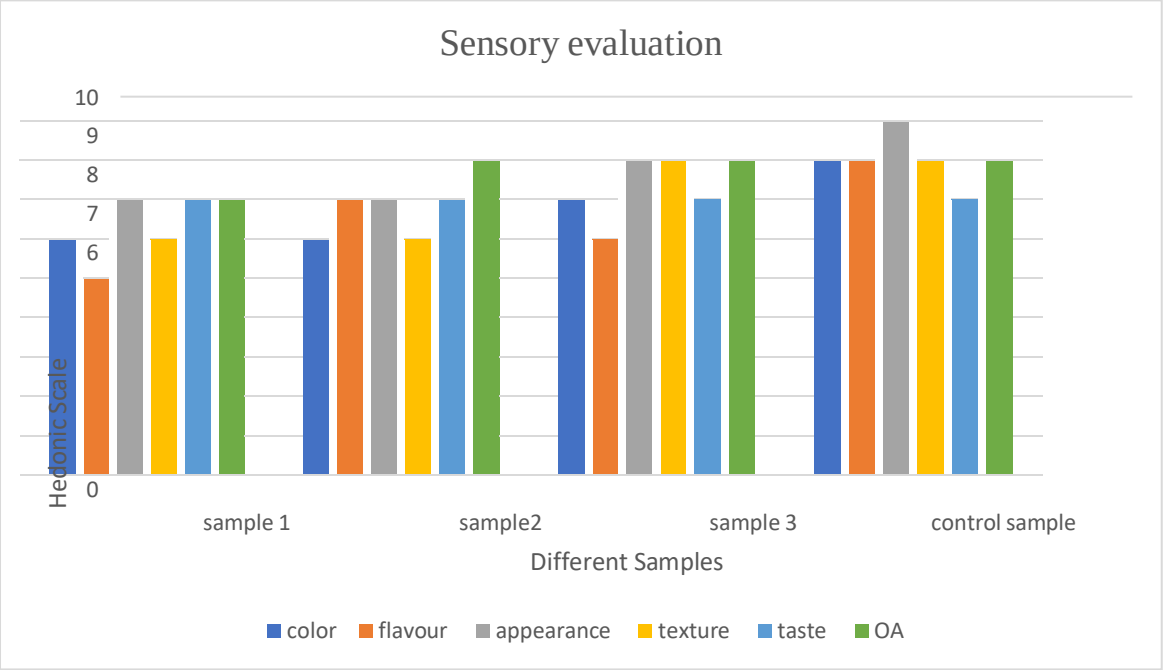
4.2.2 Ash

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 organoleptic 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	2.0

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 extending shelf of product

References

- Kamara, M.T., Amadou, I, Tarawalie, F.; Zhou, H.M. Effect of enzymatic hydrolysis on thefunctional properties of foxtail millet (Setaria italica L.) proteins. *International journal of Food Science Technolgy*. 2010, 45, 1175–1183
- Saleh, A.S.M.; Zhang, Q. (2013). Millet grains: Nutritional quality, processing, and potentialhealth benefits. *Journal of Food Science and Food* Safety 12, 281–295
- Nagaprabha, P.; Bhattacharya, S. Textural characterization of foxtail millet gels: effect ofcations and hydrocolloids. *Journal Of Food Science and Technology* 2015, 53, 257–268.
- Dharmaraj, U.; Rao, B.V.S.; Sakhare, S.D.; Inamdar, A.A. Preparation of semolina from foxtail millet (Setaria italica) and evaluation of its quality characteristics. *Journal Of. CerealScience* . 2015, 68, 1–7
- Indrani, D., Prabhasankar, & Rao, G. V. (2003). Rheological Characteristics, and Bread-Baking Performance of Wheat-Flour Dough as Affected by Enzymes. *Journal of Food Science, 68(9), 2804–2809*
- Chhavi, A.; Sarita, S.(2012) Evaluation of composite millet breads for sensory and nutritional qualities and glycemic response. Malays. *Journal of Food Nutrition* . 18, 89–101
- Kawamura-Konishi, Y., Shoda, K., Koga, H., & Honda, Y. (2013). Improvement in gluten-free rice bread quality by protease treatment. *Journal of Cereal Science*, 58(1), 45–50.
- Deshpande, H.W.; Poshadri, A. Physical and sensory characteristics of extruded snacks prepared from foxtail millet based composite flours. *International Food Research Journal*2011, 18, 730–735.
- . Amadou, I.; Le, G.W.; Shi, Y.H. . (2013)Evaluation of antimicrobial, antioxidant activities,and nutritional values of fermented foxtail millet extracts by lactobacillus paracasei Fn032.*International Journal of Food Properties*, 16, 1179–1190
- Devisetti, R.; Yadahally, S.N.; Bhattacharya, S. (2014), Nutrients and antinutrients in foxtailand proso millet milled fractions: Evaluation of their flour functionality. *LWT - Food ScienceTechnology*. 59, 889–895
- Nazni, P.; Shobana, D.R.(2016) Effect of processing on the characteristics changes inbarnyard and foxtail millet. Journal Of Food Processing Technology . 566
- Addo, K. (1997). Effects of honey type and level on the baking properties of frozen wheatflour doughs. *Cereals Food World*, 42, 36−40.
- Glabe, E., Anderson, P. W., & Goldman, P. F. (1970). Dried honey and dry molasses. Bakers'Digest, 70−72.
- Barcenas, M. E., & Rosell, C. M. (2005). Effect of HPMC on the microstructure, quality andaging of wheat bread. *Food Hydrocolloids*, 19, 1037−1043
- Subramanian, R., Umesh Hebbar, H., & Rastogi, N. K. (2007). Processing of honey: Areview. *International Journal of Food Properties*, 10, 127−143.
- Plessas, S., Pherson, L., Bekatou, A., Nigam, P., & Koutinas, A. A. (2005). Bread makingusing kefir grains as baker's yeast. *Food Chemistry*, 93, 585−58