



Formulation and acceptability of value added Foxtail cookies

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Abstract

Millets are traditional cereal grains known for their high nutritional value and health benefits. Among them, foxtail millet (*Setaria italica*) is rich in dietary fiber, complex carbohydrates, minerals, and antioxidants. The present study aimed to formulate and evaluate the acceptability of value added foxtail millet cookies incorporated with ragi (*Eleusine coracana*) and bajra (*Pennisetum glaucum*). Three formulations were prepared for the study, including a control sample with 100 percent foxtail millet flour and two variations with the addition of ragi flour and bajra flour. Other ingredients such as butter, powdered sugar, psyllium husk, desiccated coconut, baking powder, baking soda, cardamom powder, milk, and salt were used in the preparation of the cookies. The cookies were baked and allowed to cool before evaluation. Sensory evaluation was carried out to assess attributes such as color, flavor, taste, texture, and overall acceptability. The incorporation of ragi and bajra was expected to enhance the nutritional quality of the cookies. The study emphasizes the potential of millet based bakery products as healthier alternatives to conventional refined flour snacks and promotes the utilization of nutrient rich millets in modern diets.

Keywords: Foxtail millet, Value added cookies, Ragi flour, Bajra flour, Millet based bakery products, Sensory evaluation, Nutritional enrichment, Acceptability study.

Introduction

Millets are small-seeded cereal grains that belong to the grass family and have been cultivated for thousands of years in Asia and Africa. They are known for their high nutritional value, drought resistance, and ability to grow in poor soil conditions. Millets are rich in dietary fiber, minerals, and antioxidants and are therefore considered “nutri-cereals.” In recent years, millets have gained importance due to their role in preventing lifestyle diseases and improving nutritional security (Saleh *et al.*, 2013) ^[1].

Foxtail Millet

Foxtail millet (*Setaria italica*) is one of the oldest cultivated millets widely grown in Asian countries including India and China. It is highly adaptable to semi-arid climates and requires minimal water for cultivation. The grain is rich in complex carbohydrates, dietary fiber, and essential minerals. Due to its gluten-free nature and low glycemic response, foxtail millet is increasingly used in functional food products (Sharma & Niranjana, 2018) ^[3].

Nutritional Composition of Foxtail Millet

Foxtail millet contains a balanced composition of carbohydrates, protein, dietary fiber, vitamins, and minerals. It is particularly rich in iron, magnesium, phosphorus, and B-complex vitamins that support metabolic functions. The grain also contains antioxidants and phytochemicals that help reduce oxidative stress. Compared with refined cereals, foxtail millet provides better satiety and improved glycemic control (Shobana *et al.*, 2013) ^[2].

Need for Value Addition in Millets

Despite their excellent nutritional properties, millet consumption has declined due to urbanization and preference for refined cereal products. Traditional millet

foods often require longer preparation time and may have lower consumer appeal. Therefore, value addition through products such as biscuits, cookies, noodles, and ready-to-eat foods is necessary. These value-added products help improve millet consumption and marketability (Taylor & Emmambux, 2008).

Nutritional Importance of Ragi and Bajra

Ragi (*Eleusine coracana*) is well known for its exceptionally high calcium and dietary fiber content which supports bone health and digestion. Bajra (*Pennisetum glaucum*) is rich in protein, iron, magnesium, and antioxidants that help improve cardiovascular health and energy metabolism. The incorporation of these millets with foxtail millet enhances the overall nutritional quality of food products. Therefore, combining ragi and bajra with foxtail millet can improve both nutrient content and functional properties of bakery products (Yadav *et al.*, 2012) ^[4].

Health Benefits of Foxtail Millet

- Helps regulate blood sugar levels
 - Improves digestive health due to high fiber content
 - Supports cardiovascular health
 - Helps in weight management options
 - Provides antioxidants that reduce oxidative stress
 - Contributes to bone health through essential minerals
- Anitha *et al.*, 2017) ^[5]

Foxtail Millet Cookies

Cookies are widely consumed bakery products due to their convenience, taste, and long shelf life. Traditionally they are prepared using refined wheat flour which has lower fiber and micronutrient content. Replacing wheat flour with foxtail millet flour can significantly improve the nutritional quality of cookies. Millet-based cookies provide higher

fiber, minerals, and antioxidants compared with conventional cookies (Kaur *et al.*, 2017)^[6].

Consumer Reflection

Consumers today are increasingly interested in healthier snack that provide both taste and nutrition. Millet-based bakery products are gaining popularity due to their perceived health benefits and functional properties. However, consumer acceptance depends on sensory qualities such as taste, texture, aroma, and appearance. Proper formulation is therefore essential to improve consumer acceptability (Sharma *et al.*, 2018)^[3].

Challenges in Formulation of Millet-Based Cookies

The formulation of millet-based cookies presents several challenges due to the absence of gluten in millet flour. This may affect dough structure, texture, and binding properties of the final product. Millet flours can also influence flavor and color characteristics. Therefore, careful ingredient selection and recipe standardization are required to obtain acceptable sensory quality (Shobana *et al.*, 2013)^[2].

Research Highlights

Several studies have reported the successful incorporation of millet flour in bakery products such as biscuits, cookies, and cakes. These products showed improved nutritional value, higher dietary fiber, and enhanced antioxidant properties compared to wheat-based products. Research also indicates that blending millets with other ingredients can improve texture and sensory acceptability. Such studies highlight the potential of millet-based functional foods in promoting healthier diets (Saleh *et al.*, 2013)^[1].

Sensory evaluation

Sensory evaluation is a scientific discipline used to determine, analyze, and interpret the reactions of the consumers to the characteristics of foods and other materials perceived by the senses of sight, smell, touch, taste and hearing. Sensory quality evaluation is crucial for marketing purposes; the results give in-depth insight on the preference and overall acceptance towards product (Parn *et al.* 2015). Sensory characteristics of energy bar samples were evaluated for different sensory attributes by a group of twenty panelists. Sensory attributes like appearance, taste, smell, texture, crunchiness, chewiness, mouth feel, after taste and overall acceptability) for all samples were assessed using Fivepointer hedonic scale. (Stone *et al* 2012)

Objectives

- To formulate value added foxtail millet cookies by incorporating ragi flour and bajra flour.
- To evaluate the sensory acceptability of the developed foxtail millet cookies.

Review of literature

The study entitled with Development and Formulation of value added foxtail cookies is reviewed as follows,

- Value added foxtail biscuits - commercial review
- Health benefits of foxtail based bakery products

Methodology

The methodology of a present study entitled " Development and Formulation of value added foxtail cookies" is discussed under the following phases

- Selection of area
- Selection of ingredients
- Preparation procedure
- Organoleptic evaluation
- Consolidation and analysis of organoleptic evaluation

Phase – I: Selection of Area

The study was conducted in the PG Department of Foods and Nutrition laboratory, Muthurangam Government Arts College, Vellore, where the preparation and evaluation of cookies were carried out.

Phase – II: Selection of Ingredients

- Foxtail millet flour
- Ragi flour
- Bajra flour
- Powdered sugar
- Butter
- Psyllium husk
- Desiccated coconut
- Baking powder
- Baking soda
- Cardamom powder
- Milk

Phase – III: Formulation and Preparation of Cookie 500 g of foxtail millet flour = 30 cookies

| S.no | Procedure | Measurement |
|------|--|--|
| 1. | Cream butter and powdered sugar until smooth | Butter 190g, sugar 250g |
| 2. | Seive foxtail flour with ragi/bajra flour, baking powder, baking soda. | Foxtail flour- 500g Ragi / Bajra-100g |
| 3. | Add the dry ingredients to the creamed mixture and mix well | Above ingredients |
| 4. | Add psyllium husk, desiccated coconut and cardamom powder | Psyllium husk-15g, coconut50g cardamom-2,1/2 tsp |
| 5. | Add milk and prepare a soft dough | Milk as required |
| 6. | Roll the dough and cut into cookies shapes | - |
| 7. | Bake in a preheated oven | 180 c for 12-15 mins |
| 8. | Cool the cookies and store in an airtight container | - |

Phase IV: Organoleptic evaluation

Organoleptic evaluation of food involves a scientific approach to assess the product's sensory attributes across the senses Taste, Smell, Sight, and Touch. Each sense offers unique insights into a product's overall quality and consumer appeal. It involves analyzing various aspects of these substances has on our senses. when examining foxtail cookies Organoleptic evaluation helps us recognize specific properties such as color, odor, texture, taste, size, and shape. The initial visual impression of a plant or extract often provides valuable clues about its identity. In the context of food quality context, Organoleptic testing ensures that products meet sensory standards related to taste, Smell, texture, and appearance. (Jstor.,2022)

Selection of panel members

The quality of the food when assessed by humans by the means of sensory organs, it is said to be sensory evaluation. Sensory evaluation of the product was done by 20, students belongs to II PG Foods & Nutrition, of Muthurangam Government Arts College (A), Vellore. Appendix II)

The data from the sensory analysis was collected through 5 point hedonic rating score card

Phase –V

Consolidation and analysis of Organoleptic evaluation results.

The results and data obtained from sensory analysis of 20 samples were analysed consolidated and interpreted statistically.

Results and Discussion

The data obtained from sensory analysis were tabulated and the best sample among the three were find out using chi square analysis.

Conclusion

Milletts are highly nutritious grains that provide essential nutrients such as dietary fiber, proteins, vitamins, and minerals which contribute to improved health and prevention of lifestyle diseases. Among them, foxtail millet has gained importance due to its rich nutrient composition, low glycemic index, and functional properties that make it suitable for the development of value added food products (Saleh *et al.*, 2013)^[1].

The incorporation of other nutrient-rich millets such as ragi and bajra further enhances the nutritional quality of food products by increasing the content of calcium, iron, dietary fiber, and antioxidants. The development of millet based bakery products such as cookies can improve consumer acceptability and encourage the inclusion of millets in daily diets (Shobana *et al.*, 2013)^[2].

Therefore, the formulation of value added foxtail millet cookies using ragi and bajra can serve as a healthier alternative to conventional refined flour cookies while promoting the utilization of traditional millets in modern food products and improving overall nutritional intake (Sharma & Niranjana, 2018)^[3].

References

1. Saleh ASM, Zhang Q, Chen J, Shen Q. Millet grains: Nutritional quality, processing, and potential health benefits. *Comprehensive Reviews in Food Science and Food Safety*,2013;12(3):281-295.
2. Shobana S, Krishnaswamy K, Sudha V, Malleshi NG, Anjana RM, Palaniappan L, Mohan V. Finger millet (Ragi, *Eleusine coracana*) improves glycemic response in individuals with diabetes. *Journal of Food Science and Technology*,2013;50(3):597-602.
3. Sharma S, Niranjana K. Foxtail millet: Properties, nutritional value, and health benefits. *Food Reviews International*,2018;34(4):329-363.
4. Yadav OP, Rai KN, Rajpurohit BS, Hash CT, Mahala RS, Gupta SK, Rathore MS. Pearl millet (Bajra) nutritional value and health benefits. *Journal of Agricultural Research*,2012;50(3):403-414.
5. Anitha S, Kane-Potaka J, Tsusaka T, Botha R, Rajendran A. Acceptance and impact of milletbased foods on nutrition and health. *Food Security*,2017;9(4):733-749.
6. Kaur K, Grewal RB, Kaur A. Development of value-added bakery products using millet flour. *International Journal of Food Science and Nutrition*,2017;2(4):35-40.