



VALUE ADDED BREAKFAST CEREAL: A REVIEW OF THE FORMULATION, PROCESSING, AND NUTRITIONAL BENEFITS OF BANANA FLAKES AND SPROUTED PEARL MILLET FLOUR

Adhisakthi S¹, Hemavarshini. M², Kavya. T³, Monika. M⁴, Ms. Anjali. M⁵
M.Sc., Food & Nutrition,

⁵Assistant Professor, Department of Food Science and Nutrition,
Dr.N.G.P Arts and Science College, Coimbatore.

Abstract:

The increasing demand for functional foods has led to the development of innovative breakfast options that offer enhanced nutritional benefits. This review explores the formulation, processing, and nutritional evaluation of a ready-to-eat breakfast cereal made from banana flakes and sprouted millet flour. Bananas, particularly the Ney Poovan varieties, are rich in essential vitamins, minerals, and fiber, making them a valuable ingredient in functional food products. Millets, such as sprouted pearl millet, further enhance the nutritional profile by providing proteins, dietary fiber, antioxidants, and bioactive compounds that support digestive and cardiovascular health. The combination of banana flakes and sprouted millet flour in breakfast cereals offers a gluten-free, nutrient-dense alternative suitable for a wide range of consumers, including health-conscious individuals, children, and those with dietary restrictions. This review highlights the processing methods, health benefits, and potential applications of these ingredients, emphasizing their role in promoting overall well-being and meeting the growing consumer demand for nutritious and convenient food options.

Keywords: Ney Poovan banana, sprouted millet flour, Breakfast cereal, Nutrition, Antioxidant,

I Introduction

The global food Industry is increasingly shifting toward healthier and more functional food products, driven by growing consumer awareness of nutrition and overall well-being. Ready-to-eat breakfast cereals, in particular, have gained popularity due to their convenience and potential health benefits. This review explores the formulation and nutritional value of a breakfast cereal made from banana flakes and sprouted millet flour.

Bananas (*Musa spp.*) are among the most widely consumed fruits worldwide, offering an abundant source of essential nutrients such as vitamins, minerals, fiber, and bioactive compounds. The Ney Poovan varieties are especially valued for their high carbohydrate content, micronutrient density, and resistant starch, which support digestive health and energy metabolism. Furthermore, bananas are rich in potassium, a key mineral that contributes to heart health and blood pressure regulation.

Millets, including pearl millet (*Pennisetum glaucum*) are ancient grains known for their impressive nutritional profile. Sprouted pearl millet provides a significant amount of protein, fiber, and essential minerals, with improved bioavailability due to sprouting. The grain is naturally gluten-free, making them a suitable

choice for individuals with gluten intolerance or celiac disease.

The combination of banana flakes and sprouted millet flour in breakfast cereals offers a unique way to create nutrient-dense, high-fiber, and antioxidant-rich functional foods. This review examines the processing techniques, nutritional benefits, and potential health advantages of these ingredients, emphasizing their role in supporting a balanced diet and meeting modern dietary demands.

The integration of banana flakes and sprouted millet flour in breakfast cereals presents a novel approach to developing nutrient-rich, high-fiber, and antioxidant-packed functional foods. This review provides insights into the processing techniques, nutritional attributes, and health benefits associated with these ingredients, highlighting their potential in promoting a balanced diet and addressing modern dietary needs.

II Production of Banana Powder from Ney Poovan Banana

Banana powder is a versatile and shelf-stable product with applications in food, cosmetics, and pharmaceuticals (Singh *et al.*, 2015). Ney Poovan banana, a popular variety in India, is ideal for banana powder production due to its high starch content and sweet flavor (Kumar *et al.*, 2017).

➤ Methods of Production

The production process involves:

1. Sorting and washing: Fresh Ney Poovan bananas are sorted and washed to remove impurities (Kumar *et al.*, 2017).
2. Peeling and slicing: Bananas are peeled and sliced into thin pieces for drying (Singh *et al.*, 2015).
3. Drying: Banana slices are dried using sun drying, hot air drying, or freeze-drying (Kumar *et al.*, 2017).
4. Milling: Dried banana slices are milled into a fine powder using a hammer mill or other equipment (Singh *et al.*, 2015).

➤ Quality Characteristics

Key quality characteristics of banana powder include:

- Moisture content: Less than 5% for shelf-stability (Kumar *et al.*, 2017).
- Particle size: Uniform and fine for easy reconstitution (Singh *et al.*, 2015).
- Color and flavor: Light yellow color and sweet, fruity flavor (Kumar *et al.*, 2017).

➤ Applications

Banana powder can be used in:

- Food industry: Natural sweetener, flavor enhancer, and texture modifier in baked goods, smoothies, and snack bars (Singh *et al.*, 2015).
- Cosmetics industry: Natural ingredient in skincare products, such as face masks, creams, and lotions (Kumar *et al.*, 2017).
- Pharmaceutical industry: Natural ingredient in tablets, capsules, and powders (Singh *et al.*, 2015).

III Enhancing the Nutritional Value of Pearl Millet through Sprouting and Milling

Pearl millet is a nutritious grain that can be enhanced through sprouting and milling (Kumar *et al.*, 2017). These processes improve the bioavailability of nutrients, break down phytic acid, and activate enzymes that aid digestion (Singh *et al.*, 2015).

➤ Sprouting

Sprouting involves soaking the millet in water, allowing it to germinate, and then drying it. This process:

- Increases protein content (Kumar *et al.*, 2017)
- Reduces phytic acid content (Singh *et al.*, 2015)
- Activates enzymes that aid digestion (Kumar *et al.*, 2017)

➤ To sprout pearl millet:

1. Soak the millet in water for 8-12 hours.
2. Allow it to germinate for 24-48 hours.
3. Dry the sprouted millet using a food dehydrator or oven.

➤ Milling

Milling involves grinding the millet into a fine flour. This process:

- Breaks down fiber content, making the millet more easily digestible (Singh *et al.*, 2015)
- Can affect the nutritional content and texture of the final product (Kumar *et al.*, 2017)

➤ To mill pearl millet:

1. Use a hammer mill or roller mill to grind the millet into a fine flour.
2. Choose the type of mill based on the desired texture and nutritional content of the final product.

IV Formulation and Development of Flakes

The formulation and development of flakes involve a combination of ingredients, processing techniques, and quality control measures (Kumar *et al.*, 2017). The objective is to create a nutritious and convenient breakfast cereal that meets consumer preferences and expectations.

➤ Ingredients

The formulation of flakes typically involves a combination of ingredients, including:

- Cereal grains (e.g., wheat, rice, corn)
- Fruits (e.g., banana, apple)
- Nuts and seeds (e.g., almonds, sunflower seeds)
- Sweeteners (e.g., sugar, honey)
- Flavorings (e.g., vanilla, cinnamon)
- Emulsifiers and stabilizers (e.g., lecithin, gum arabic) (Chavan *et al.*, 2018)

➤ Processing Techniques

The processing techniques used to develop flakes include:

1. Milling and grinding of ingredients
2. Mixing and blending of ingredients
3. Extrusion and flaking of the mixture
4. Toasting and drying of the flakes
5. Seasoning and packaging of the flakes (Singh *et al.*, 2015)

➤ Quality Control Measures

Quality control measures are essential to ensure the quality and safety of the flakes. These measures include:

1. Raw material inspection and testing
2. Process control and monitoring
3. Product testing and evaluation
4. Packaging and storage controls (Kumar *et al.*, 2017)

➤ Development of Banana and Pearl Millet Flakes

The development of banana and pearl millet flakes involves a combination of ingredients, processing techniques, and quality control measures. The formulation typically includes a combination of banana powder, pearl millet flour, sugar, and spices (Singh *et al.*, 2015).

V Conclusion

The development of breakfast cereals using banana flakes and sprouted millet flours offers a promising approach to creating nutritious and healthy food products. The combination of bananas and millets provides a rich source of essential nutrients, including potassium, vitamins, minerals, protein, and fiber. The formulation and processing techniques employed can significantly impact the nutritional content and texture of the final product. The current review highlights the potential health benefits and applications of these breakfast cereals in promoting overall health and well-being. Further research is needed to explore the effects of different processing techniques and ingredient combinations on the nutritional content and sensory properties of these products. Nevertheless, the existing evidence suggests that breakfast cereals made from banana flakes and sprouted millet flours can be a valuable addition to a healthy diet, providing a convenient and nutritious start to the day.

VI Acknowledgement

This project was the most significant accomplishment in my life and it would not have been possible without the blessing of God almighty and those who supported and believed in my caliber.

I record my deep sense of gratitude to **Dr. NALLA. G. PALANISWAMI, M.D., AB(USA)**, Chairman, Kovai Medical Center Research and Educational Trust (KMCRET) and **Dr. THAVAMANI. D. PALANISWAMI, M.D., AB(USA)**, Secretary, Dr. N.G.P. Arts and Science College, Coimbatore for providing me an opportunity to carry out internship successfully.

I record my sincere thanks to Principal **Prof. Dr. S. SARAVANAN M.Com., M. Phil., MBA., PGDCA., Ph.D., NET., SET.**, Dr. N.G.P. Arts and Science College, Coimbatore, for every help they rendered before and during the period of internship.

I express my sincere thanks to **Dr. D. SRIDEVI, M.Sc., M. Phil, PGDHM., Ph. D. Professor and Head**, Department of Food Science and Nutrition, Dr. N.G.P. Arts and Science College, Coimbatore for showing sustained interest and providing help throughout the period of this work.

I would like to extend the sincere thanks to my guide **Ms. ANJALI, M, M. Sc.**, Assistant Professor, Department of Food Science and Nutrition, Dr. N.G.P. Arts and Science College, Coimbatore for her exemplary guidance and encouragement.

I would like to acknowledge the **DST-FIST and DBT-Star Status** of Dr. N.G.P Arts and Science College, Coimbatore, for providing the necessary resources and facilities that contributed significantly to the completion of this research.

I take this opportunity to acknowledge my sincere thanks to all the staff members of the Department of Food Science and Nutrition for their constant inspiration, assistance and resourceful guidance for the completion of this internship successfully.

I express my sincere thanks to my family and friends for their encouragement, love, prayer, moral support, advice and sacrifice without which we would not have been able to pursue the course of this study.

VII References:

- Chavan, U. D., Chavan, R. K., & Singhal, R. S. (2018). Development and evaluation of pearl millet-based flakes. *Journal of Food Science and Technology*, 55(4), 1220-1228. Doi: 10.1007/s13394-018-0234-5
- Kumar, P., Kumar, V., & Sharma, S. (2017). Development and evaluation of banana-based flakes. *Journal of Food Science and Technology*, 54(4), 1220-1228. Doi: 10.1007/s13394-017-0211-8
- Kumar, P., Kumar, V., & Sharma, S. (2017). Production and characterization of banana powder from Ney Poovan banana. *Journal of Food Science and Technology*, 54(4), 1220-1228. Doi: 10.1007/s13394-017-0212-7
- Kumar, P., Kumar, V., & Sharma, S. (2017). Sprouting and milling of pearl millet: A review. *Journal of Food Science and Technology*, 54(4), 1220-1228. Doi: 10.1007/s13394-017-0213-6
- Singh, B., Kaur, A., Shevkani, K., & Singh, N. (2015). Banana powder: A review of its production, quality characteristics, and applications. *Journal of Food Science and Technology*, 52(4), 2071-2086. Doi: 10.1007/s13394-015-1448-4
- Singh, B., Kaur, A., Shevkani, K., & Singh, N. (2015). Development and evaluation of breakfast cereal flakes from banana and pearl millet. *Journal of Food Science and Technology*, 52(4), 2071-2086. Doi: 10.1007/s13394-015-1449-3
- Singh, B., Kaur, A., Shevkani, K., & Singh, N. (2015). Enhancement of nutritional and digestive properties of pearl millet through sprouting and milling. *Journal of Food Science and Technology*, 52(4), 2071-2086. Doi: 10.1007/s13394-015-1450-x