

Development of Pasta Using Pearl Millet and Plantain

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Abstract: This study explores the development and nutritional potential of a novel food product plantain pasta fortified with pearl millet. The formulation leverages the natural carbohydrates content and mild sweetness of plantain alongside the higher fiber, protein, and micronutrients profile of pearl millet to create a functional, gluten free alternate to conventional pasta, the blend aims to improve dietary diversity and provide a nutrition option suitable for health-conscious consumer, including those with gluten intolerance. Sensory evaluation indicates good acceptability in terms of texture, taste, and appearance, while nutritional analysis reveals enhanced levels of dietary fiber, iron, and magnesium. This innovation demonstrates the viability of combining indigenous crops to develop sustainable and health promoting food products.

Keywords: Plantain, Pearl Millet, Gluten Free and Nutrients.

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I. INTRODUCTION

Pasta is one of the world's most popular food products, known for its long shelf life, ease of preparation, and nutritional content. There is 14.0 million tons of Pasta produced worldwide annually, with Italy leading the way with approximately four million tons. Pasta is an excellent source of carbohydrates (starch), protein, and fiber, despite its low fat content. Several studies have found that the structure of Pasta, in which the gluten protein network surrounds the starch granules, and the risk of esophageal cancer when compared to other cereal-based foods. In addition, Pasta can be used as a suitable carrier of bioactive compounds promoting healthier lifestyle and keeping consumption of its high most unchanged.

Plantain (*Musa paradisiaca*) is widely grown in tropical and subtropical climates. It is one of the most important sources of carbohydrates for millions of people in Africa, the Caribbean, Latin America, Asia, and the Pacific. Plantain is an extremely perishable fruit with a short shelf life. Thus, it is frequently processed into long-lasting products such as chips and flour. Plantain can be utilized for personal consumption or as an input by other producers. Plantain flour is an alternative for cassava flour for diabetes people and a raw material for making cakes, chips, puff-puffs, biscuits, bread, and pancakes. Plantain flour is a popular product due to its nutritional and therapeutic benefits.

Unripe plantain contains refractory starches that cannot be digested before cooking. Resistant starches are important in food because they resist digestion and act like fibre,

affecting digestive functions like cancer, constipation, glycemia, and cholesterol. They also help regulate blood glucose levels, which can aid in the prevention and management of chronic diseases like obesity and diabetes.

Pearl millet (*Pennisetum glaucum*), often known as Bajra, is a grain crop grown in tropical semi-arid climates, particularly in Africa and Asia. Bajra is highly adapted to production systems with little rainfall (200-600 mm), therefore it may be cultivated in regions where other cereal crops, such as wheat or maize, would fail. Pearl millet is a staple in the poorest countries and among the poorest populations. It is also one of the most drought-resistant cereal and millet crops. Pearl millet is commonly used as transitory summer grazing crop or, in some locations, a food crop. Pearl millet is one of the four.

In comparison to other millets, pearl millet has the highest macronutrient content and is significantly richer in resistant starch, soluble and insoluble dietary fibre. Essentially, pearl millet has a huge root structure that absorbs soil minerals and is more important for nutrition than other cereal crops such as wheat, rice, maize, and sorghum. The mineral has high levels of iron, zinc, magnesium, copper, manganese, potassium, and phosphorus.

II. REVIEW OF LITERATURE

➤ Health Benefits of Plantain

The fiber and resistant starch in plantains improve satiety, allowing people to feel fuller for longer. Plantains can help with weight management by lowering overall calorie

intake and preventing overeating. However, in order to get these benefits, they should be prepared using healthy cooking methods such as boiling or baking rather than frying.

Plantains include vitamin B6, which is vital for brain health and cognitive function. It promotes the creation of neurotransmitters like serotonin and dopamine, which govern mood and emotions. A diet high in vitamin B6 can lower the risk of depression and promote mental health. **(Singh, N.et al., (2016)).**

One of the most significant benefits of plantains is their high fiber content, which improves digestion and promotes gut health. Fiber regulates bowel motions, avoiding constipation and promoting a smooth digestive process. Furthermore, plantains contain resistant starch, a form of carbohydrate that acts as a prebiotic by feeding good gut flora and boosting overall gut health.

Despite being a starchy food, plantains have a low glycemic index when cooked in a healthy fashion, such as boiling or baking. Resistant starch reduces the absorption of sugar into the system, reducing blood sugar rises. This makes plantains an excellent nutritional choice for diabetics or anyone who want to keep their blood sugar levels steady. **(Sani, A.et al., (2021)).**

➤ Health Benefits of Pearl Millet

Pearl millet is extremely excellent for digestion due to its high fiber content. The high fiber content helps regulate bowel motions, reducing constipation and promoting a healthy digestive tract. It also functions as a prebiotic, stimulating the growth of good gut bacteria, which improves gut health and overall digestion. Regular consumption of pearl millet can help to maintain a healthy gut flora, resulting in enhanced nutritional absorption and digestive efficiency.

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Pearl millet is beneficial to bone health because it contains calcium and magnesium, two vital elements that help strengthen bones and maintain their density. Adequate calcium consumption is critical for bone development and avoiding osteoporosis, whereas magnesium promotes bone production and overall skeletal health. **(Umapathy, V. R., et al.,2022)**

Pearl millet is extremely good for diabetes management due to its low glycemic index (GI), which helps minimize abrupt blood sugar increases. Its high fiber content inhibits the absorption of glucose into the bloodstream, resulting in improved blood sugar management. This makes pearl millet a good dietary choice for diabetics since it promotes consistent energy levels and lowers the risk of insulin resistance. Regular ingestion can help maintain long-term blood sugar control and metabolic health.

Pearl millet is good for your skin and hair because it contains zinc, iron, and vitamin E, all of which are needed for a healthy complexion and strong hair. Zinc and iron promote hair growth and prevent hair loss by increasing blood circulation to the scalp, whilst vitamin E nourishes and protects the skin from oxidative damage. **(Carvalho, C.W. P. et al., (2018)).**

➤ Nutritional Value of Plantain:

Table 1 Nutritional value of 100 Gram of Plantain **(Pandiyar, M. et al., (2018)).**

S.no	Nutritional compound	Grams	Units
1.	Energy	122	kcal
2.	Water	65	gm
3.	Carbohydrates	32	gm
4.	Protein	1.3	gm
5.	Fiber	2.0-3.4	gm
6.	Total lipids	0.4	gm
7.	Sodium	4	mg
8.	Potassium	500	mg
9.	Calcium	3	mg
10.	Magnesium	35	mg
11.	Iron	0.6	mg
12.	Phosphorous	30	mg
13.	Vitamin b1	80	µg
14.	Vitamin b2	40	µg
15.	Vitamin b5	600	µg

➤ *Nutritional Value of Pearl Millet:*Table 2 Nutritional value of 200 Gram of Pearl Millet (*Malik, S.et al., (2015)*).

S.no	Nutritional compounds	Grams	Units
1.	Energy	756	kcal
2.	Water	17.3	gm
3.	Carbohydrates	146	gm
4.	Protein	22	gm
5.	Fiber	17	gm
6.	Total lipids	8.4	gm
7.	Sodium	10	mg
8.	Potassium	390	mg
9.	Calcium	16	mg
10.	Magnesium	228	mg
11.	Iron	6	mg
12.	Phosphorus	570	mg
13.	Vitamin B1	842	µg
14.	Vitamin B2	580	µg
15.	Vitamin B6	768	µg

➤ *Phase I:*• *Identification of Raw Material:*

The raw materials for making pasta using pearl millet and plantain include carefully selected and processed ingredients to achieve the desired texture and nutritional value. Pearl millet can be used in the form of whole grains or flour, as it is rich in fiber, protein, and essential minerals such as iron, magnesium, and phosphorus. Before use, the grains need to be dehulled, cleaned, and ground into flour to serve as the structural base of the pasta.

Plantain, whether unripe or ripe, is an important ingredient because of its high starch content, nutritional fiber, and potassium. Unripe plantains contribute to a harder texture, whilst ripe plantains provide natural sweetness and improve the mixture's binding characteristics. Plantains are normally peeled, sliced, dried, and pounded into flour, or mashed into a paste, depending on the preparation process. To improve taste and texture, you can add water, salt, spices, or oil. The combination of pearl millet and plantain creates a nutrient-dense, gluten-free option for producing pasta, providing both health advantages and variety in preparation.

➤ *Flow Chart:*

Fig 1 Flow Chart

- *Selection of Raw Material:*

Pearl millet flour, generated from cleaned and dehulled grains, serves as the major base due to its high fiber, protein, and mineral content; however, because it lacks gluten, a binding agent is required for proper dough production. Plantain, particularly in its unripe form, is an important component because it contains resistant starch, which improves the dough's elasticity and consistency. Compared to other millet that the pearl millet has a act as a good binding agent. Pearl millet has more nutritional value compared to refine-flour and wheat flour. And the cost the cost the pearl millet is also economically affordable. And the plantain is easily available in the local market. As same as banana plantain also had a more nutrient.

➤ *Phase 2:*

- *Preparation of the Powder for the Product:*

To prepare a delicious and unique banana pasta dish, start thoroughly cleaning and washing raw banana to remove any dirt or impurities. Once cleaned, place the bananas in a pot of boiling water and cook them until they become tender

and soft to the touch. After boiling, carefully peel off the skin while the bananas are still warm, as this makes the process easier. Next, mash the cooked bananas into a smooth, lump free consistency using a fork or masher. Gradually add flour to the mashed bananas, kneading the mixture until a soft, pliable dough forms that it easy to shape. Roll and shape the dough into long, slender strands that resemble the traditional pasta, such as spaghetti or fettuccine.

Bring a large vessel of water to a boil, gently place the banana pasta strands into the boiling water, and cook them until they reach an alternative texture, firm yet tender. While the pasta is cooking, prepare a rich and creamy white sauce using ingredients such as butter, flour, milk, and cheese, adjusting the seasoning to taste. To enhance the dish, suite a selection of fresh vegetables such as bell pepper, mushroom, and add white sauce, stirring to combine. Once the banana past is cooked, drain it thoroughly to remove excess water and immediately transfer it into the white sauce and vegetable mixture. Gently toss everything together until the pasta is evenly coated in the creamy sauce, allowing them to increase the flavour of the pasta.

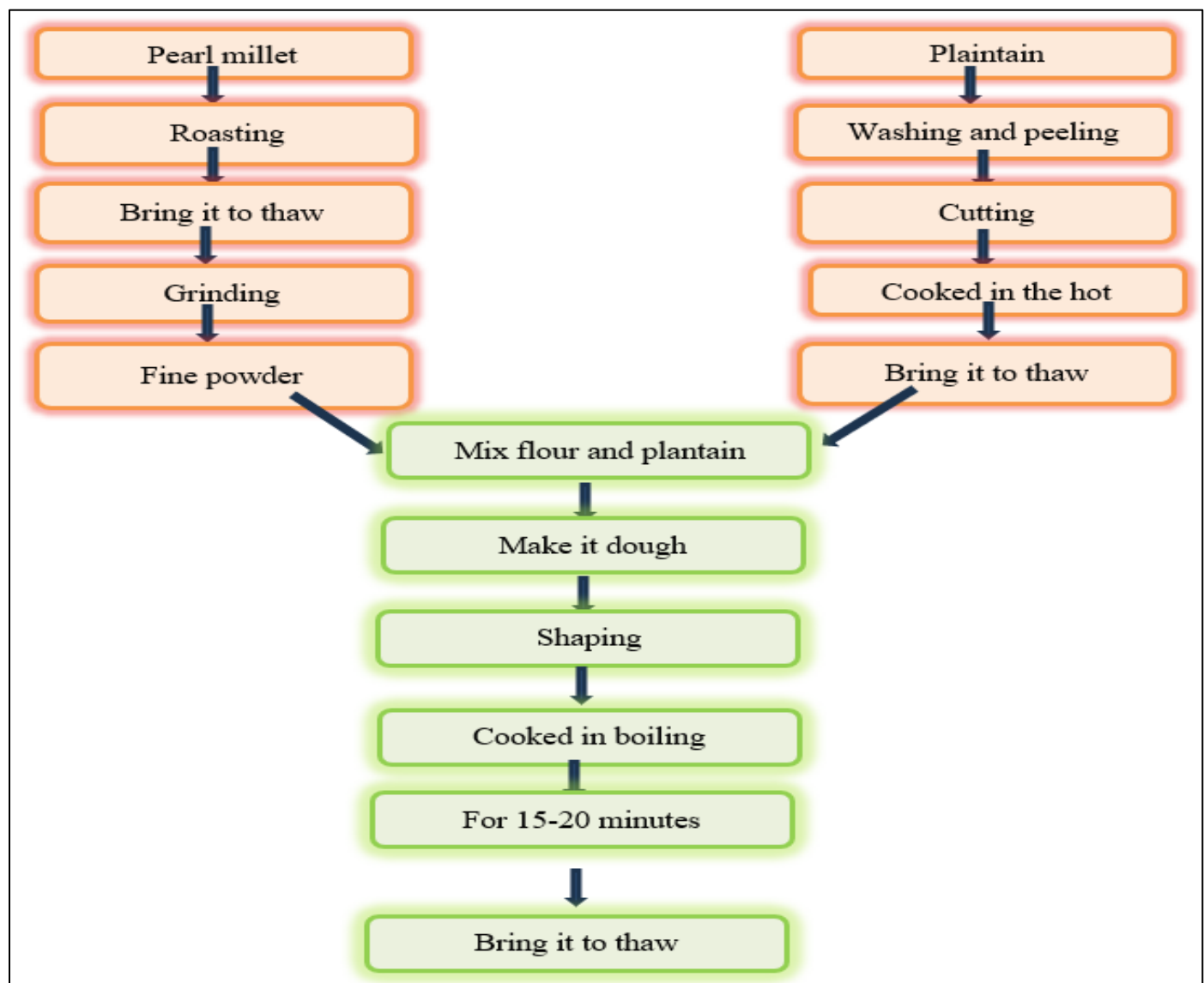


Fig 2 Preparation of the Powder for the Product

III. CONCLUSION

Plantain pasta with pearl millet is more than just a meal its a celebration of traditional nutrients rich ingredients coming together to form a balanced and satisfying dish. The soft, slightly sweet flavour of plantain complements the earthy texture of pearl millet, creating a harmonious blend that is both comforting and nourishing. Rich in fiber, essential minerals, and natura energy, this dish supports good digestion and sustained fullness. Whether enjoyed as a staple food or part of a diverse diet, its reflects the value of combination locally available crops to promote both health and culinary heritage. This fusion highlights the potential of simple ingredient to create something both meaningful and delicious.

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