JOURNAL OF CURRENT RESEARCH IN FOOD SCIENCE

E-ISSN: 2709-9385
P-ISSN: 2709-9377
JCRFS 2024; 5(1): 205-207

www.foodresearchjournal.com
Received: 19-04-2024
Accepted: 24-05-2024

Siddiqui Mudassir Ur Rahim
Student, M.Tech, Department of Agricultural Engineering, Maharashtra Institute of Technology, Aurangabad, Maharashtra, India

Dr. DT Bornare
Ph.D. Scholar, Associate Professor and HOD, Department of Agricultural Engineering, Maharashtra Institute of Technology, Aurangabad, Maharashtra, India

Dr. SG Jaiswal
Ph.D. Scholar, Assistant Professor, Department of Agricultural Engineering, Maharashtra Institute of Technology Aurangabad, Maharashtra, India

Correspondence Author;
Siddiqui Mudassir Ur Rahim
Student, M.Tech, Department of Agricultural Engineering, Maharashtra Institute of Technology, Aurangabad, Maharashtra, India

Incorporation of jackfruit seed flour in production of bread: A review

Siddiqui Mudassir Ur Rahim, Dr. DT Bornare and Dr. SG Jaiswal

DOI: https://doi.org/10.22271/foodsci.2024.v5.i1d.146

Abstract
This review paper explores the multifaceted potential of jackfruit (*Artocarpus heterophyllus* Lam.) seeds, an often underutilized byproduct, in enhancing nutritional value and functional properties of food products, particularly bakery items. Jackfruit, abundant in tropical regions, produces seeds rich in protein, carbohydrates, and essential phytonutrients. Despite their high nutritional content, these seeds are frequently discarded due to their perishability. Transforming jackfruit seeds into flour extends their shelf life and allows for incorporation into diverse food products. The review highlights the nutritional benefits of jackfruit seed flour, including its protein, fiber, and resistant starch content, which contribute to improved digestive health, reduced fat absorption, and potential anti-diabetic effects. Furthermore, the integration of jackfruit seed flour in bakery products, such as bread and cookies, is examined, emphasizing its role in combating malnutrition and promoting sustainable food practices. This paper underscores the importance of utilizing jackfruit seeds as a functional food ingredient to enhance dietary quality and reduce food waste.

Keywords: Jackfruit seeds, byproduct, bread, jackfruit seed flour, shelf life, health, functional food

1. Introduction

1.1 Jackfruit

Jackfruit (*Artocarpus heterophyllus* Lam.), belonging to the Moraceae family, is a prominent evergreen tree thriving in tropical regions, notably in India, Bangladesh, and Southeast Asia. This medium-sized tree, typically reaching heights of 28 to 80 feet, bears fruit on its side and main branches. The average weight of a jackfruit ranges from 3.5 to 10 kg, with some reaching up to 25 kg. There are two main varieties of jackfruit: one that is small, fibrous, soft, and sweet, resembling the texture of raw oysters, and another that is crisp and crunchy but less sweet. Despite being from a non-leguminous plant, the large seeds are edible, albeit hard to digest.

Jackfruit provides approximately 2 MJ of energy per kg of its ripe fruit. It is rich in protein, starch, calcium, and thiamine. Beyond its unique-tasting ripe fruit, the seeds are also consumed as a dessert or ingredient in Asian cuisine. They are commonly used in cooked dishes and their flour is employed in baking, offering a significant starch content.

1.2 Jackfruit Seed

Jackfruit seeds constitute around 10 to 15% of the total fruit weight and are rich in carbohydrates and protein (Bobbio *et al*., 1978) [4]. Typically discarded or steamed and eaten as snacks or in local dishes, fresh seeds are perishable and don't store well. To extend their usability, they can be converted into flour, which is then used in various food products. Jackfruit seeds, often underutilized, offer notable nutritional benefits and make up about 10-15% of the fruit's weight (Hossain *et al*., 2014) [8]. In South India, seeds are collected, sun-dried, and stored for use during the rainy season. However, processing and storage challenges lead to significant waste annually. Fresh seeds have a shelf life of about one month when kept cool and moist. Roasting and powdering the seeds can further extend their shelf life, allowing their incorporation into bakery and confectionery products by blending with wheat flour and other economical flours (Hossain, 2014) [8]. In some Indian regions, seeds are boiled, roasted, or used as a potato supplement (Banerjee & Datta, 2015) [2].

Given India's malnutrition issues due to inadequate protein intake, jackfruit seeds could serve as an economical alternative protein source. Increasing consumer awareness of diet-disease relationships has boosted demand for jackfruit seeds, recognized for their additional health

benefits beyond basic nutrition. Studies have explored the physicochemical properties of jackfruit seed starch (Bobbio *et al*., 1978) [4], proximate compositions of different varieties, and their functional properties and protein digestibility.

1.3 Nutritional Properties of Jackfruit Seeds

Jackfruit seeds are rich in protein, fiber, and starch, with considerable antioxidant properties yet to be fully explored. They are also a good source of various minerals, including iodine, nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, zinc, and copper (Maurya & Mogra, 2016) [10].

1.4 Health Benefits of Jackfruit Seeds

Phytonutrients such as lignans, saponins, and isoflavones in jackfruit seeds offer significant health benefits (Noor, 2014) [12]. Incorporating jackfruit seed flour into deep-fried products can reduce fat absorption (Butool & Butool, 2015) [6]. The high dietary fiber and B-complex vitamins content in the seeds aid in reducing heart disease risk, preventing constipation, and promoting weight loss. Additionally, the resistant starch in jackfruit seeds helps regulate blood sugar and supports gut health. The seeds also exhibit antimicrobial properties, preventing foodborne diseases (Maurya & Mogra, 2016) [10]. Jacalin, a lectin found in jackfruit seeds, is used to assess the immune system of HIV-infected individuals. In China, the seeds are used to counteract alcohol toxicity, and in India, they are part of an antidote for heavy drinkers (Butool & Butool, 2015) [6].

1.5 Bakery Products

India's bakery industry is rapidly growing, with baked goods gaining popularity due to their convenience, affordability, diverse flavors, and high nutritional value. Bakery products are excellent vehicles for fortifying diets with functional ingredients, delivering health benefits to consumers. Recent research has shown the successful incorporation of jackfruit seed flour in various bakery products, such as biscuits, cookies, bread, cakes, and muffins (Siti Faridah & Noor Aziah, 2012) [12].

1.6 Introduction of Bread

Bread, historically considered the most important food after health and water, derives from ancient Greek "artos." Its history spans thousands of years, rooted in ancient Greece where "artos" evolved from verbs meaning "connect" or "prepare," and the modern term "bread" comes from a term meaning "rub" or "little bit." Bread has been a staple, especially for the poor, across Europe, America, the Middle East, and North Africa, while rice remains the main food in East Asia. Despite its nutritional value and variety of flavors, bread is often criticized for contributing to weight gain.

2. Review of literature

According to Julia F. Morton (1965) [9], jackfruit, also referred to as jack or jak, holds significant value in certain regions but often goes unappreciated in others, particularly in areas like South Florida where a plethora of popular fruits are readily available. However, in warmer regions where dietary diversity is essential, comprehending its culinary uses can notably enhance its acceptance and economic importance. Additionally, its valuable timber makes it a worthwhile consideration for foresters in Tropical America. As early as 1928, O. W. Barrett expressed surprise at the general lack of awareness regarding these "large and interesting fruits."

Typically, jackfruits are either consumed fresh or processed into various products such as jams, jellies, juices, beverages, squashes, and syrups (FAOSTAT, 2002) [7]. The seeds of jackfruit, ranging from 100 to 500 per fruit and measuring 2-3 cm in length and 1-2 cm in diameter, are versatile in their use. They can be cooked, roasted, or fried, and their flour is employed in making baked goods like bread and cakes. These seeds are notably rich in protein, starch, lignans, isoflavones, and saponins, offering a plethora of health benefits, including anti-cancer, anti-aging, and antioxidant properties. Globally, starch, serving as the primary storage carbohydrate in plants, is produced at an annual rate of 66.5 million tons.

As highlighted by Hossain (2014) [8], jackfruit, belonging to the Moraceae family, is a large, edible tropical fruit believed to have originated in the Western Ghats of India, now predominantly cultivated in countries such as Bangladesh, Myanmar, Malaysia, Indonesia, and Thailand.

According to the United States Department of Agriculture (2016), jackfruit stands out as the most protein-rich fruit, boasting 1.72 grams of protein per 100 grams, surpassing other fruits like bananas, mangoes, figs, and pineapples. Additionally, it serves as a significant source of potassium, offering 448 mg per 100 grams, and is rich in thiamine, niacin, calcium, sodium, magnesium, and vitamin B6.

Hossain (2014) [8] notes that due to their perishable nature, jackfruit seeds are often discarded as waste. However, if stored in a cool and moist environment, they can last for about a month. To further prolong their shelf life, the seeds can be roasted and ground into powder, which can then be used as an alternative flour in bakery and confectionery items, typically blended with wheat flour and other cost-effective flours.

As outlined by Ocloo *et al*. (2010) [13], jackfruit comprises yellow-fleshed edible bulbs, rind, and seeds, with seeds constituting approximately 10 to 15% of the total fruit weight. They are notably rich in carbohydrates and protein.

Ranasinghe *et al*. (2019) [15] discuss the challenge of storing jackfruit seeds in underdeveloped countries due to their rapid germination. Combining jackfruit seed flour with traditional wheat flour can help alleviate waste while enhancing the nutritional value of bakery products. Additionally, jackfruit is nutrient-dense, containing carbohydrates, proteins, vitamins, minerals, and phytochemicals, suggesting notable anti-cancer properties due to the presence of isoflavones, antioxidants, and phytonutrients.

According to Abraham, J. JayamuthunagaI. (2014) [1], jackfruit seeds provide a safe and beneficial option for inclusion in balanced diets and functional foods, particularly in densely populated countries where seasonal vegetable availability may fall short of meeting dietary needs. Despite their limited shelf life, processing them into seed flour creates a longer-lasting alternative product, facilitating value addition and finding applications in various food items such as noodles, pasta, snacks, cakes, gluten-free biscuits, nutrient-rich mixes, and drinks.

The moisture content of seed flour plays a crucial role in indicating both its water content and overall solid composition, significantly influencing its storage longevity

and quality. In this context, the measured moisture content of the seed flour stands at 7.758%. Generally, lower moisture levels correspond to improved shelf stability and enhanced quality, with the duration of the drying process typically determining the moisture content of the flour.

As discussed by Dhanimsetti *et al*. (2016), the production of baked goods like bread, cakes, buns, doughnuts, muffins, and biscuits often involves the use of wheat flour containing proteins that interact upon hydration, leading to gluten formation. This gluten content is essential for achieving the desired texture and structure of the final product. With a growing consumer preference for healthier and more convenient food options, there has been a noticeable surge in efforts to develop bakery items that not only offer nutritional benefits but also boast appealing sensory attributes.

Belitz *et al*., 2004; Hui (2006) [3, 16] the primary ingredient in bread-making is flour, with its characteristics heavily influenced by the properties of the grains and the extent of milling undergone. Higher degrees of milling result in decreased starch content and increased components found in the outer layers of the grain, such as inorganic substances, insoluble fiber, and vitamins.

Psaltakis (2002) [14] notes the extensive efforts to create various types of bread, with wheat flour serving as the primary ingredient in bakery products. Flour derived from hard wheat, boasting high protein levels, is primarily used in the production of bread and other baked goods like croissants and doughnuts.

3. Conclusion

The review underscores the untapped potential of jackfruit seeds, a byproduct rich in essential nutrients and functional properties, in enhancing the nutritional value of food products, especially in the bakery industry. Jackfruit seeds, abundant in tropical regions, are a valuable source of protein, carbohydrates, and phytonutrients, yet they are often discarded due to their perishability. Converting these seeds into flour not only extends their shelf life but also provides a versatile ingredient that can be incorporated into a variety of food products, thus promoting sustainable food practices and reducing waste.

The nutritional benefits of jackfruit seed flour, which include high protein, fiber, and resistant starch content, contribute significantly to digestive health, reduced fat absorption, and potential anti-diabetic effects. Incorporating this flour into bakery products such as bread, cookies, and other baked goods can help combat malnutrition and provide a functional food ingredient that enhances dietary quality. This approach aligns with the increasing consumer demand for nutritious and sustainable food options.

Overall, the utilization of jackfruit seeds as a functional food ingredient not only improves dietary intake but also supports environmental sustainability by reducing food waste. The review highlights the need for further research and development to fully harness the benefits of jackfruit seeds in various food applications, thereby contributing to better health outcomes and sustainable food systems.

4. References

1. Abraham J, Jayamuthunagai J. An analytical study on jackfruit seed flour and its incorporation in pasta. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2014;5(2):1597-1610.
2. Banerjee S, Datta S. Effect of dry heat treated jackfruit seed powder on growth of experimental animals. IOSR Journal of Pharmacy and Biological Sciences. 2015;10:42-46.
3. Belitz HD, Grosch W, Schieberle P. Food Chemistry. 3rd ed. New York: Springer Verlag Berlin Heidelberg; c2004.
4. Bobbio FO, El-Dash AA, Bobbio PA, Rodrigues LR. Isolation and characterization of the physicochemical properties of starch of jackfruit seeds (*Artocarpus heterophyllus*). Cereal Chemistry. 1978;55:505-511.
5. Burkill HM. The Useful Plants of West Tropical Africa. Vol. 4, Part 2. Royal Botanic Gardens, Kew; c1997. p. 160-161.
6. Butool S, Butool M. Nutritional quality on value addition to jackfruit seed flour. International Journal of Scientific Research. 2015;4:2406-2411.
7. FAOSTAT. Database FAO. Food and Agriculture Organisation of the United Nations, Rome, Italy; c2002.
8. Hossain MT. Development and quality evaluation of bread supplemented with jackfruit seed flour. International Journal of Nutrition and Food Sciences. 2014;3(5):484. http://dx.doi.org/10.11648/j.ijnfs.20140305.28
9. Morton JF. The jackfruit (*Artocarpus heterophyllus* Lam.): Its culture, varieties, and utilization; c1965.
10. Maurya P, Mogra R. Assessment of consumption practices of jackfruit (*Artocarpus heterophyllus* Lam.) seeds in villages of Jalalpur block district Ambedarnagar (U.P.) India. Remarking. 2016;2:73-75.
11. McGee H. On Food and Cooking. New York: Scribner; c2004. Available at: http://www.zanneio.com/
12. Noor F. Physicochemical properties of flour and extraction of starch from jackfruit seed. International Journal of Nutrition and Food Sciences. 2014;3(4):347.
13. Ocloo FCK, Bansa D, Boatin R, Adom T, Agbemavor WS. Physico-chemical, functional, and pasting characteristics of flour produced from jackfruits (*Artocarpus heterophyllus*) seeds. Agriculture and Biology Journal of North America; c2010.
14. Psaltakis G. Old Testament. Vol. B. Exit-Lefkion. Ed. SOTIR; c2002. ISBN 978-960-9575.
15. Ranasinghe RA, Maduwanthi SD, Marapana RA. Nutritional and health benefits of jackfruit (*Artocarpus heterophyllus* Lam.): A review. International journal of food science. 2019;2019(1):4327183.
16. Hui YH, editor. Handbook of food science, technology, and engineering. CRC press; c2006.