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Evaluation of jackfruit (*Artocarpus heterophyllus*) seed powder-based pasta - a case study

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Abstract

Jackfruit seeds, comprising 10-15% of the fruit, are nutrient-rich with high protein, carbohydrate, and mineral content. Analysis of jackfruit seed flour (JSF) revealed substantial protein (13.49%) and essential minerals like potassium and magnesium. The JSF, with high water and oil absorption capacities, enhanced pasta's nutritional value and texture when added in proportions of 5-20%, with 10% substitution preferred for optimal consumer satisfaction. Jackfruit seeds offer significant potential as a valuable resource in addressing food security challenges, particularly in densely populated regions. Their conversion into flour provides a sustainable solution to mitigate waste during seasonal abundance. With rich nutritional content and favourable functional properties, jackfruit seed flour enhances the nutrient profile and quality of various food products, such as pasta, while maintaining consumer acceptability. Moreover, the unique twist of roasting jackfruit seeds in sand adds a distinctive flavour and texture to dishes, contributing to culinary innovation. Embracing such natural processes not only enhances taste but also preserves essential nutrients, underscoring the importance of sustainable food practices.

Key words: Nutrient content, Consumer acceptability, Seed flour, Pasta, Nutrient rich

Jackfruit (*Artocarpus heterophyllus* Lam.) seeds make-up around 10-15% of the total fruit weight and have high carbohydrate and protein contents, dietary fiber, vitamins, minerals and phytonutrients. To increase the shelf life, jackfruit seed flour is a better option, so that the analysis had done. Jackfruit seed flour (JSF) is a cheap source of protein (13.49%), ash (2.47%) and carbohydrate (70.73%). The calorific value was 357.665 kcal/100g. It was also rich in potassium (6466 ppm), magnesium (4582 ppm) and sodium (8906 ppm). High water absorption capacity (2.91 ml/g), oil absorption capacity (0.884 ml/g) and bulk density (0.873 g/ml) were recorded for JSF. It had a least gelation capacity of 17%. The addition of JSF at different proportions (5%, 10%, 15% and 20%) to the pasta increased the nutrient content and textural properties. 10% JSF substituted pasta has got the maximum consumer acceptability.

Jackfruit, a tropical fruit widely cultivated across various regions including India, Burma, Ceylon, and parts of Africa and South America, is not only renowned for its deliciously sweet bulbs but also for its often-overlooked seeds, rich in nutrients and health-promoting compounds. In recent years, there has been a growing recognition of the potential benefits of utilizing jackfruit seeds, particularly in the creation of value-added products such as flour for incorporation into convenience foods. (Morton, J. (1987). *Jackfruit (Artocarpus heterophyllus).* In: Fruits of Warm Climates. Julia F. Morton, Miami, FL. pp. 58–64.)

The Jackfruit seed, wheat flour, and water ingredients of pasta are purchased from market. Preparation of Jackfruit seed flour by sand roasting, peeling then milling. There are some steps guide on how to do it first of all we make Jackfruit seed powder recipe. (Haq, N. (2006). Jackfruit seed powder can be prepared by sand roasting the seeds. The preparation of jackfruit seed flour begins with cleaning the seeds to remove any dirt or foreign materials. After cleaning, the seeds are sorted to ensure uniform quality. The sorted seeds are then sand roasted to reduce moisture and improve flavor. Once roasted, the seeds are peeled to remove the outer seed coat. The peeled seeds are then ground into a fine powder to obtain jackfruit seed (JFS) flour.

Fresh Jackfruit seeds were collected and cleaned now dry the seeds in oven and also preheat the sand, roast the seeds and let them cool down after this separate them now grind them into powder form and store the powder. Refined wheat flour (Maida) was purchased from market. The reagents and chemicals used are of analytical grade (AR) unless and otherwise specified. (Haq, 2006).

By using Physio-chemical method we will analysis Jackfruit seed flour the proximate composition of Jackfruit seed flour (JSF) was determined using association of official analytical chemist (AOAC, 2000) methods. (AOAC (2000). The analysis included: moisture content using

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oven drying method, Ash content by burning in a muffle furnace, protein content by Kelda method, fat content by Soxhlet extraction using petroleum ether, crude fibre by acid and alkali digestion method, carbohydrate content calculated by deducting the sum of moisture, protein, fat, ash, and crude fibre from 100. Now we analysis the moisture of jackfruit seed flour by using oven drying method in this analysis we use the following equipment and materials: analytical balance, drying oven, sample containers, desiccators, heat-resistant gloves, spatula or scoop, stopwatch. After this we analysed Jackfruit ash by bumming it in a muffler fumie to determine its composition and elemental content.

Blends of wheat flour and jackfruit seed flour (JSF) were prepared in different ratios (100:0, 95:5, 90:10, 85:15, 80:20) and analysed for moisture, protein, and ash. Wheat Flour Gluten content in wheat flour was estimated by washing the dough to remove starch, sugars, water-soluble proteins, and other minor components. The pasting properties of wheat flour-JSF blends were measured using a rapid visco-amylographn to determine onset gelatinization temperature, peak viscosity, breakdown, and setback values. Pasting properties of wheat flour JSF blends were measured using a Rapid Visco Analyser (RVA Starchmaster2, Newport Scientific, Warri wood, Australia), following the AACC method 22-10A [1 4] to determine the onset gelatinization temperature, peak viscosity, breakdown and setback values.

The viscosity values were reported in terms of Brabender Units (BU). Pasta was prepared using wheat flour and different concentrations of JSF (10%, 15%, and 20%). The dough was mixed, hydrated, extruded, and dried. The cooking quality determination involved analysing cooked pasta for water absorption, cooking loss, and firmness using a universal texture measuring system. The parameters including moisture, crude protein, crude fat, crude fibre, and crude ash were determined for both wheat flour and jackfruit seed flour.

Firmness of cooked pasta was measured using a universal texture measuring system, with stickiness expressed in gram force and firmness in kg-s. The scanning electron microscopy was used to study the changes in pasta structure during cooking, particularly starch-protein interactions. These methods provide a comprehensive approach to analysing both jackfruit seed flour and pasta, ensuring thorough examination of their physio-chemical properties and quality characteristics.

The moisture content of jackfruit seed flour was found to be 7.758%. This relatively low moisture content indicates good shelf stability. The fat content was 2.317%, comparable to literature values but slightly higher and ash content was 2.472%, within the range reported for jackfruit seeds, suggesting consistency. Jackfruit seed flour showed a protein content of 13.49%, lower than some literature values but consistent with varietal differences and environmental factors. The crude fibre content was 3.25%, comparable to literature values with potential varietal and locational influences. Carbohydrates were the major component, constituting 70.713% of the flour, consistent with previous studies. The caloric value was 357.66 kcal/100g, in line with literature but slightly higher, providing substantial energy. The pH was 6.02, indicating a slightly acidic nature, while titratable acidity (as lactic acid) was 0.574%, contributing to the overall flavour profile and preservation. Jackfruit seed flour was rich in sodium, potassium, and magnesium, but low in copper and manganese, consistent with literature, albeit with some variations.

The results demonstrate the nutritional richness and potential health benefits of jackfruit seed flour. While some variations from literature values were observed, they could be attributed to varietal differences and environmental factors. Further research could explore the impact of these variations on nutritional value and functional properties. Overall, jackfruit seed flour presents an opportunity for value addition and utilization in various food applications, contributing to both nutrition and economic empowerment.

The process of making jackfruit seed pasta begins by mixing wheat flour and jackfruit seed (JFS) flour in a spar mixer at 60 rpm. After mixing, the dough is allowed to hydrate for 15 minutes. The hydrated dough is then transferred to a pasta extruder machine, where it is kneaded for 1 minute. Using a single-screw extruder, the dough is shaped into pasta and cut into the desired size. The pasta is then dried at 75°C for 3 hours. Once dried, the pasta is packed and stored properly for future use.

CONCLUSION

In countries with high population where the food requirements are not being fulfilled by seasonal vegetables, jackfruit seeds can be used as a good substitute.

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