



## Title: Assessment and Comparison of Nutritional Properties of Jackfruit Seed Powder with Rice, Wheat, Barley, and Maize Flour

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### Abstract

Jackfruit (*Artocarpus heterophyllus* Lam.) is widely known as a nutritious fruit. They grow mostly in Brazil and some other parts of Africa and South Asian countries. Jackfruit is the national fruit of Bangladesh, and it grows copiously in the Northern part of the country. Jackfruit seed powder has been researched and used as a functional food in different food products. This work investigated some physicochemical properties and nutritional parameters of five types of grain flours collected from the northern region of Bangladesh. The grain flours are jackfruit seed powder, rice powder, barley powder, wheat flour powder, and maize powder. In this study, we have observed that jackfruit seed powder is highly nutritious. So, it can also be said from the study that jackfruit seed powder from Bangladesh has a high nutritional value when compared to other flours. It can be used alone or along with these flours in different food products. Therefore, in the era of ensuring sustainable development and meeting challenges



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of nutrition security, jackfruit seed powder can be an appropriate choice to reduce postharvest loss and produce value-added products.

## Introduction

Jackfruit seeds, like other seeds, can be enjoyed in a variety of ways. The seeds of jack fruits are traditionally eaten as a vegetable substitute in curries in South Asia.<sup>1,2</sup> These nutty seeds can be ground into flour, roasted, or boiled for consumption. A few food industries also use seed flour as a binding agent in some food preparations. Besides, it is wellknown for appearing in many delicious desserts. People can make salads and healthy hummus. Seeds of jackfruit Flour can be used in baking and cooking. Besides, these seeds can be made into nutritious butter.<sup>3</sup> Additionally, it aids in boosting male libido and addressing a variety of sexual issues in males. The jackfruit seed powder was widely used to cure infections and wounds in ancient times and is revered for its potent antibacterial capabilities.<sup>4</sup>

Rice (*Oryza sativa*), a staple food for more than half of the population of the earth, is produced in >100 different countries, with Asia accounting for 90% of the worldwide total.<sup>5</sup> Rice flour is finely milled rice that is mostly utilized in gluten-free baking or as a dusting powder in large-scale baking processes.<sup>6</sup> The most essential component of this flour is starch, which is deleterious to its functionality in culinary systems like baking, noodles, gravies, crackers, and many others.<sup>7</sup> Roasted-rice powder gives a nutty flavor to larb and thickening soups and dipping sauces. Wheat (*Triticumaestivum*) is one of the most consumed grains and takes the next position after rice. It also has high nutrition value.<sup>8-10</sup> In many regions, maize or corn (*Zea mays*) is a mainstay food. It is the third most important crop in the world, following rice and wheat.<sup>11</sup> It is processed extensively into various goods, including cornmeal, grits, starch, flour, and breakfast cereals. Chapatis or flatbreads made from maize flour are primarily consumed in a few northern Indian states. It is used to make cornmeal, sweeteners, and bread. Maize starch, popularly known as corn starch, is used in the bakery sector and for thickening sauces, pies, soups, and stews. The application of maize starch powder by bakeries to increase the consistency and softness of cakes is one of its greatest industrial applications.<sup>12</sup> Barley (*Hordeumvulgare*) is another

widely consumed and highly nutritious grain.<sup>13,14</sup> After wheat, rice, and corn, barley is the fourth most crucial grain crop farmed worldwide. It may be harvested in a variety of climates. Among crop plants, barley has several distinctive qualities, making it a crucial crop in contemporary agriculture for both human and animal sustenance. It is also adaptable and can be used to create bread, soups, and health commodities. It also serves as a malt source for alcoholic drinks.<sup>15</sup> The objective of our study is to compare the nutritional value of jackfruit seed powder with rice powder, wheat flour, maize powder, and barley powder.

## Seed Powder Preparation

The jackfruit seeds were soaked in water for ten minutes. The sections of the cotyledon with the covering of spermoderm were divided into pieces. They were dried in an oven at 50°- 60° C for twenty-four hours.<sup>16</sup> The chips were then ground in a blender and sieved. Then, the seed powder was vacuum-packed. Rice powder was made by soaking the rice in water for ten minutes. It was then milled and dried at 60° C for 24 hours. The grains of barley, maize, and wheat were correspondingly washed in water to produce barley powder, maize powder, and wheat powder and dried at 50-60°C for 24 hours.<sup>9</sup> Afterwards, the barley, maize, and wheat were milled and sieved. All powders were sealed in airtight glass containers and refrigerated below 5°C for future research. The nutritional, vitamin, and mineral contents of the flours were determined by collecting quintuplicate samples of each grain powder.

## Assessment of Nutrients and Physicochemical Parameters

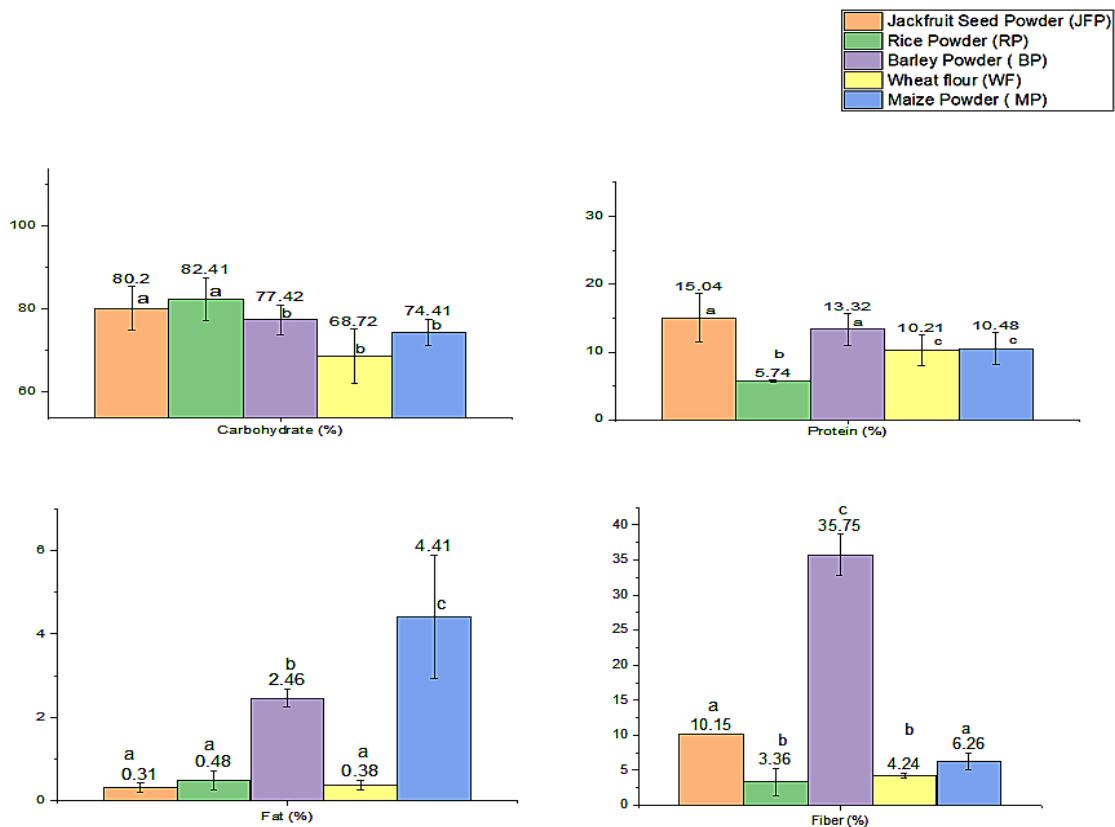
Carbohydrate content in the five types of powder was determined by the Phenol- Sulfuric Acid Method.<sup>17</sup> The absorbance was taken at 490 nm in a UV spectrophotometer.<sup>18,19</sup> By using the Kjeldahl method to relate nitrogen content to protein content, protein content was indirectly estimated.<sup>20</sup> To determine the fat content of the flours, AOAC method 7.045 (2000) was applied.<sup>21</sup>

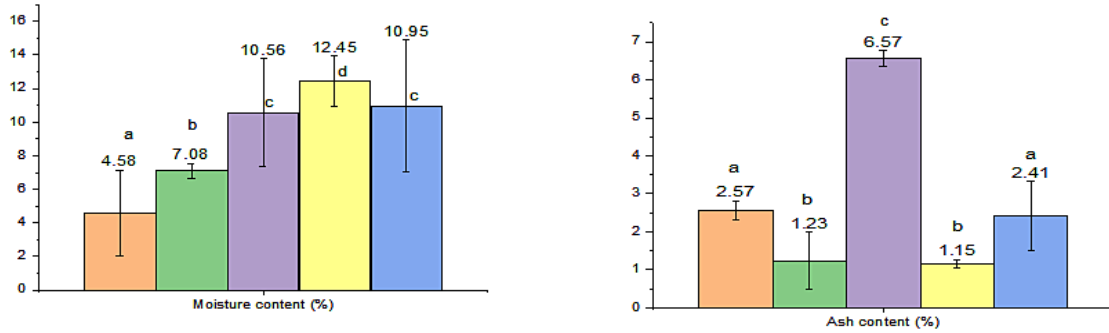
The Vitamin contents in the flours were measured by the method described by Batifoulier *et al.* (2006) in HPLC.<sup>22,23</sup> Sodium and Potassium were analyzed in Flame Photometer, and phosphorus was analyzed in UV-spectrophotometer.<sup>24,25</sup> The other minerals were determined using Flame Atomic Absorption Spectrophotometer (FA-AAS).<sup>26,27</sup> Fibre content of the seed powders was estimate during the AOAC method 991.43.<sup>28</sup> Moisture content was determined by the method explained by Are fin *et al.* (2020).<sup>29</sup> Ash content was determined by the AACC method 08–01.<sup>30</sup> One-way ANOVA procedures were used to statistically evaluate the collected data to determine the significance level of variance at a 95% confidence level. For the purpose of determining each parameter, five duplicate samples of each grain powder were collected. To find the variation

among the sample groups, a post hoc "Tukey" test was performed.

**Result and Discussion**

The bar diagram in Figure 1 represents the percentages of carbohydrate, protein, fat, fiber, moisture, and ash content in 5 types of flours. In all cases, the difference in significance level was <0.001. Jackfruit seed powder contains a substantial amount of carbohydrate (80.2 ± 5.23) (Mean ± SD) %. Statistically, the difference in carbohydrate content in jackfruit seed powder (JFP), barley powder (BP), wheat flour (WF), and maize powder (MP) is statistically significant. But JFP carbohydrate content is not statistically different from that of rice powder (RP).



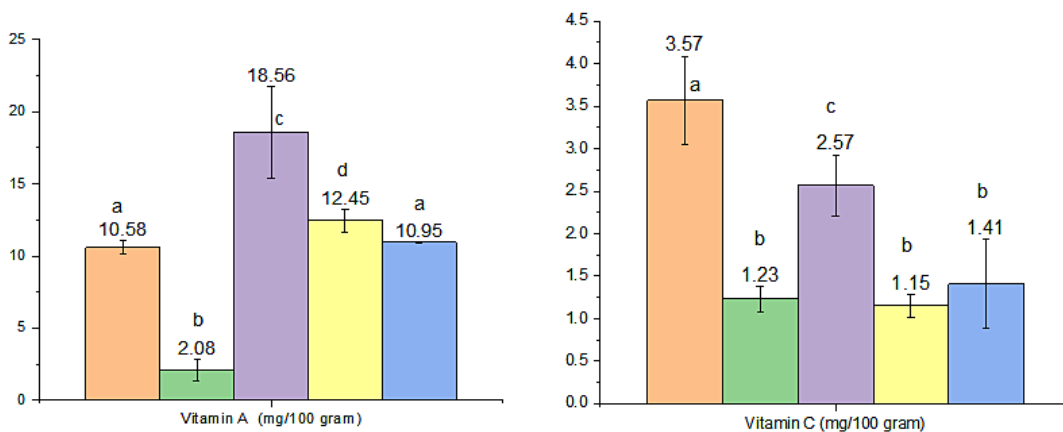


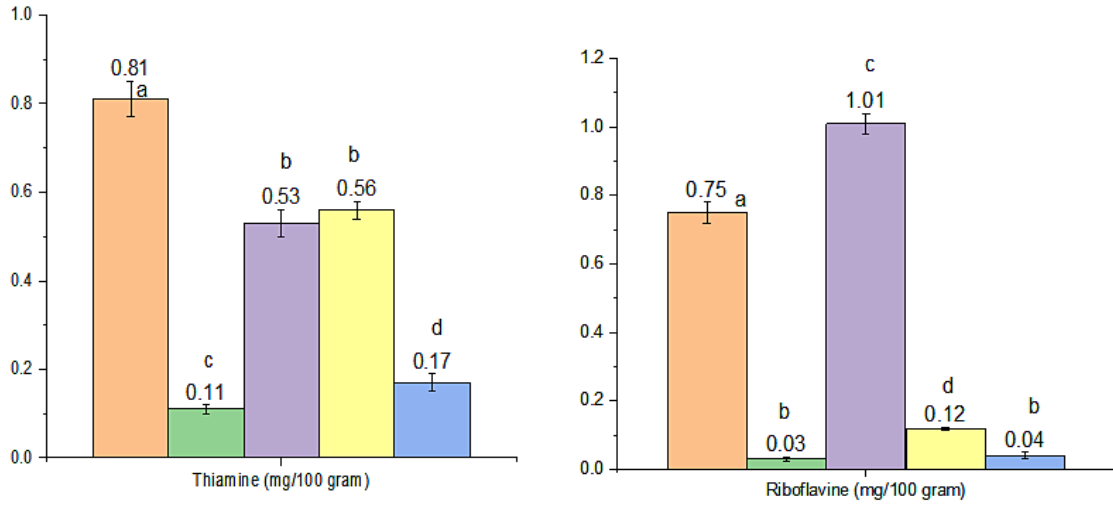
**Fig. 1: Mean (ME±SD) basic nutrient content (%) and physico-chemical indices of 5 types of flours. ME= Mean, SD= Standard Deviation. Means with same alphabet are not significantly different at (p < 0.05) for the respective samples.**

The JFP protein content (15.04 ±3.61) % is significantly higher than that of rice powder, wheat flour, and maize powder but not significantly different from that of barley powder. JFP fat content (0.31± 11) % is not significantly different from that of rice powder (RP) and wheat flour (WF). It contains a significantly higher quantity of dietary fiber than RP, WF and MP. The moisture content was significantly different than that of other powders. The ash content was not significantly different from that of maize powder.

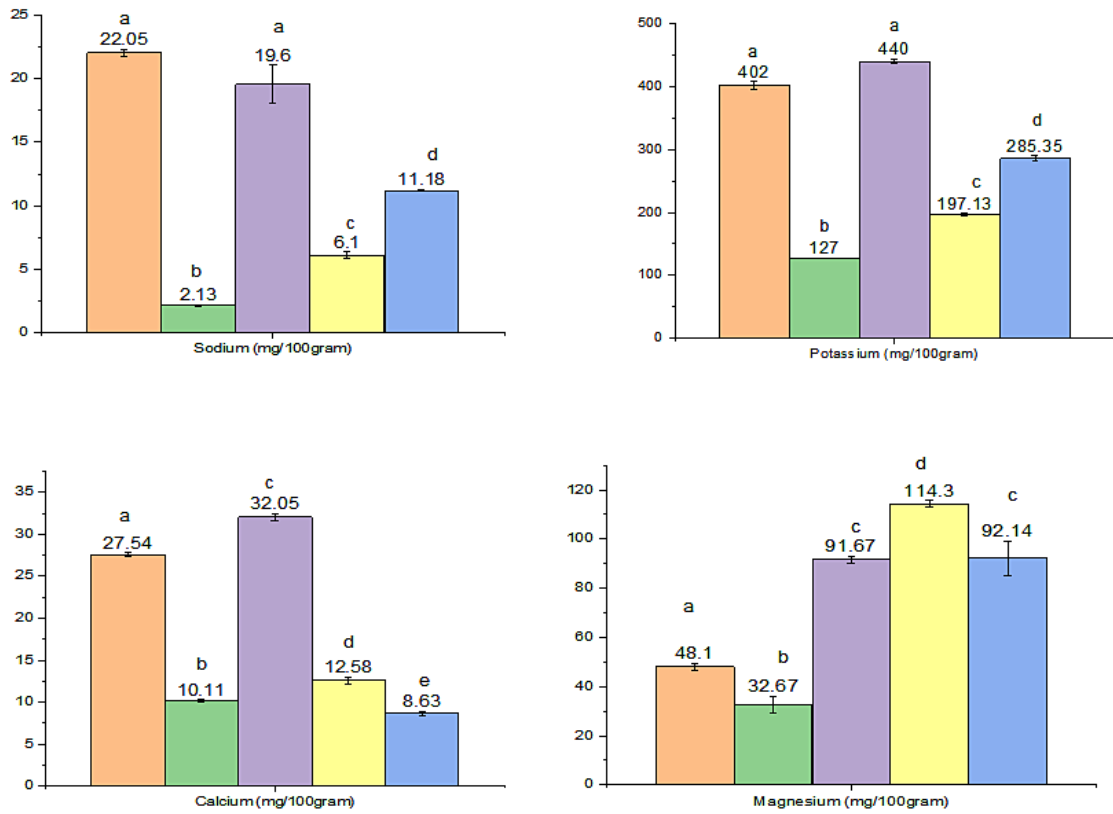
maize powders, and barley powder. It demonstrates that jackfruit seed powder provides a higher amount of Vitamin C (3.57± 0.52 mg/ 100 gram) than other flours. It is statistically significantly higher than that of other flours. Vitamin A concentration (10.58±0.46) mg/100 gram of JFP was not statistically significantly different from that of maize powder. Thiamine and riboflavin are abundant in jackfruit seed powder. The amount of riboflavin (0.75±0.03) mg/100 gram in JFP was higher than that of RP, WF and MP. The thiamine content (0.81±0.04) mg/100 gram of JFP was higher than that of other flours. It might be due to the presence of the spermoderm.

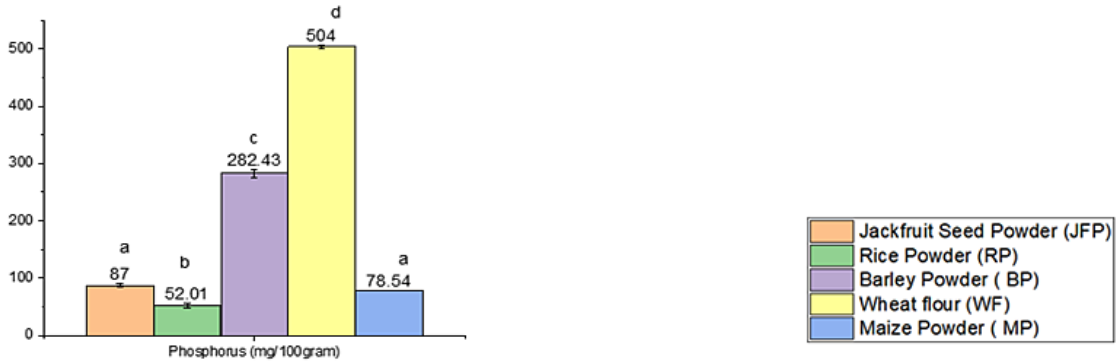
In figure 2, the vitamin content of jackfruit seed powder is compared to that of rice flours, wheat flours,



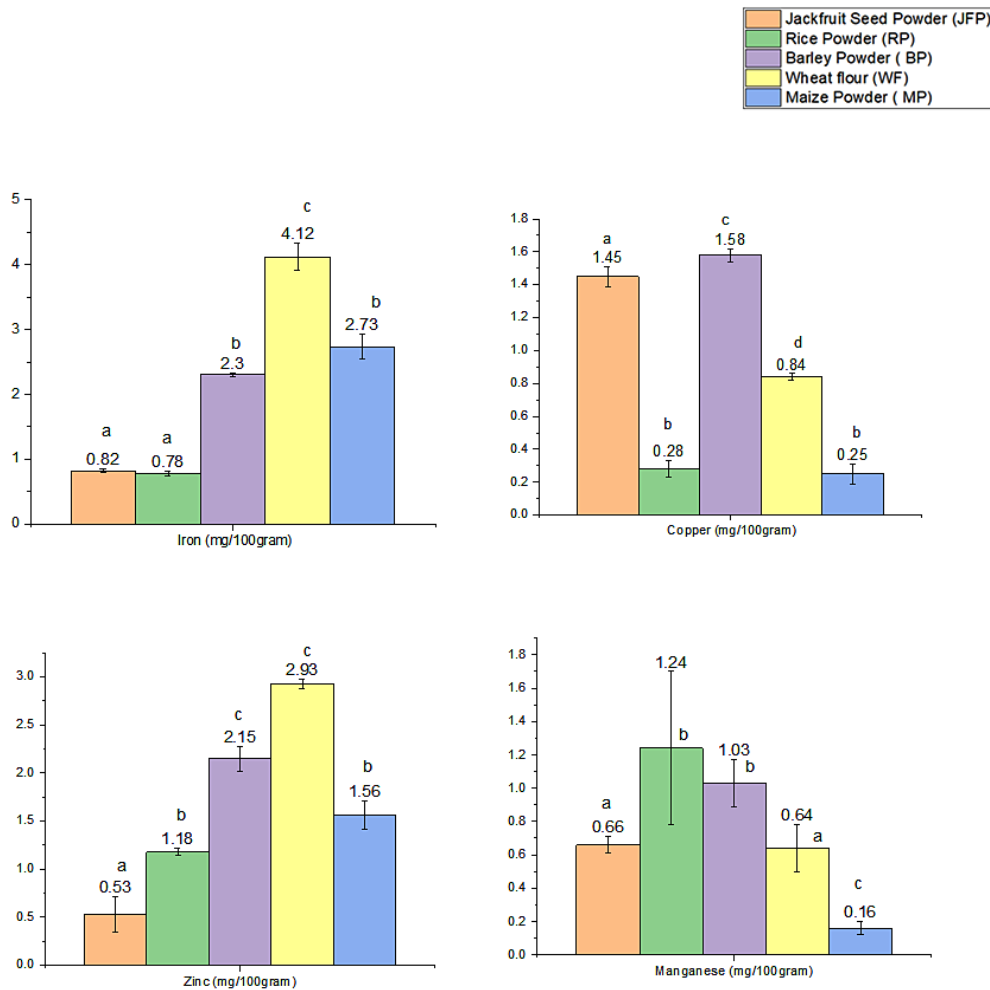


**Fig. 2: Comparison of Mean (ME±SD) Vitamin A, Vitamin C, Thiamine, Ribo flavine contents of 5 types of flours. ME= Mean, SD= Standard Deviation. Means with same alphabet are not significantly different at (p < 0.05) for the respective samples.**





**Fig. 3:** Comparison of Mean (ME±SD) Sodium, Potassium, Calcium, Magnesium and Phosphorus contents of 5 types of flours. ME= Mean, SD= Standard Deviation. Means with same alphabet are not significantly different at ( $p < 0.05$ ) for the respective samples



**Fig. 4:** Comparison of Mean (ME±SD) Iron, Copper, zinc, and manganese contents of 5 types of flours. ME= Mean, SD= Standard Deviation. Means with same alphabet are not significantly different at ( $p < 0.05$ ) for the respective samples.

Sodium content ( $22.5 \pm 3.12$  mg/100 gram) was statistically significantly higher than that of other flours. Compared to rice, wheat, and maize powder, jackfruit seed powder has a much greater potassium concentration ( $402 \pm 5.92$  mg/100 gram). Compared to other flours, this flour has a much greater calcium concentration ( $27.54 \pm 0.25$  mg/100 gram) in comparison to rice, wheat, and maize powder. A comparison of the Iron, Copper, zinc, and manganese contents of jackfruit seed powder with RF, WF, RF, MP and BP is shown in Figure 4. According to figure 4, JFP has iron content ( $1.02 \pm 0.03$ ) mg/100 gram, and manganese content ( $0.16 \pm 0.03$ ) mg/100 gram of JFP was not statistically significantly different from that of RP and WF. Therefore, it can be said that jackfruit seed powder contains a lot of vitamins and minerals.

### Conclusion

According to our research, not only are the seeds of the jackfruit edible, but they are also very nutritious. They have been related to various positive effects on one's health, including enhancements to digestion and reductions in cholesterol levels. The nutritional value of jackfruit is equivalent to that

of rice, barley, wheat, and maize. Therefore, it has the potential to be used to create products with added value. The nutritional value of powdered jackfruit seed is unknown to the majority of individuals. However, if consumed raw, they have the potential to reduce the body's ability to absorb nutrients and raise the risk of bleeding in individuals who are already on certain drugs. From that perspective, jackfruit seed powder can be an excellent choice to be used as an additive in different food products. Besides, it can contribute to the reduction of post-harvest loss and thus, contribute to the economy.

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### Conflict of Interest

This research has no conflict of interest.

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