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RESEARCH ARTICLE

ANALYSIS OF FUNCTIONAL QUALITIES OF RAW JACKFRUIT FLOUR

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ABSTRACT

The study was carried out with the objective to develop raw jackfruit based flour to study its suitability for baking by assessing its functional qualities. The raw jackfruit bulbs of cv koozha varieties was cut into small pieces(1.5x2 cm), blanched, immersed in 0.2% KMS solution, dried milled, sieved in 0.5mm siever and packed in PP covers.. The flour prepared from dehydrated bulbs were analysed for various functional properties such as water absorption index, oil absorption index, foaming capacity, swelling power and solubility were analyzed.

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INTRODUCTION

Jackfruit (*Artocarpus heterophyllus* Lam.) belongs to the family 'Moraceae' and is a native of India. India is the second biggest producer of the fruit in the world and is considered as the motherland of jackfruit. "Chakka", its Malayalam name, according to some, has given birth to the English name jackfruit. Jackfruit is widely grown as an important tree in Kerala's homesteads and also as a shade crop in coffee plantations. It is popularly known as the poor man's fruit in the eastern and southern parts of India. The tender fruits of the tree are used as vegetables and the ripe ones as table fruits. Every year a large amount of jackfruit is produced, out of which a significant portion goes waste due to its perishable nature and seasonal glut. Value addition through processing and preservation has to be considered as an important alternative for reducing the post harvest losses of this nutritious fruit and for serving it in off seasons. Due to the nutritional benefits and unexploited abundant availability, its value added products will have great market potential. Since dehydrated forms of the vegetables are more acceptable and economic, the objective of this study was to process raw jackfruit bulb flour and assess, its functional qualities.

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MATERIALS AND METHODS

The methodology is discussed under the following heads

- Selection of variety
- Collection of sample
- Processing of flour
- Packaging
- Quality analysis

Selection of variety

Jackfruit cv *koozha* was selected. Raw mature bulbs (90 -105 days after fruit set) were utilized for the study.

Collection of sample

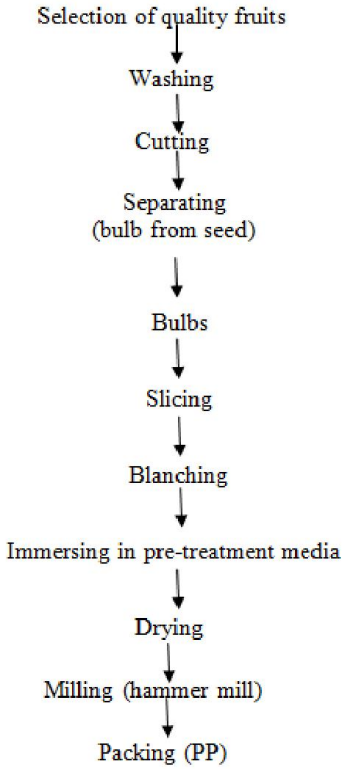
The matured jackfruits were procured from the Farm, College of Agriculture, Vellayani.

Processing of flour

The raw jackfruits were first washed, cut into small pieces. The bulbs were cut into 2x1.5 cm dimension. They were blanched in hot water for 2 minutes and immersed in cold water to control the cooking. The blanched slices were then immersed in

0.2% KMS solution for 2 minutes. They were dried in an electric oven at 65^{0}C till crispy for 24 hours. After drying these were milled and sieved in 0.5mm siever. The powder was finally packed in PP covers.

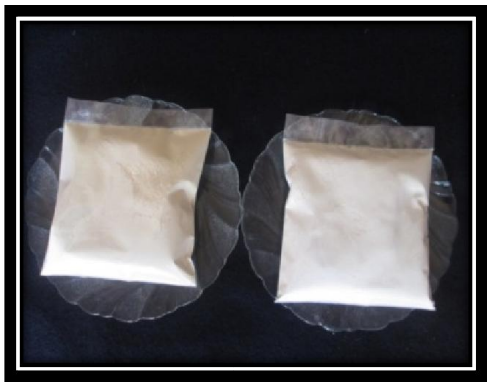
Flow diagram for preparation of raw jackfruit flour (RJF) flour



Separated bulbs

Sliced bulbs

Powdered bulb flour



Packed bulb flour

Quality analysis

The flour prepared from dehydrated bulbs were analysed for various functional properties such as water absorption index, oil absorption index, foaming index, swelling power and solubility.

Water absorption Index

This was determined using the method described by Beuchat (1977). One gram sample was weighed into a 25 ml graduated conical centrifuge tubes and 10 ml of was water added. The suspension was allowed to stand at room temperature (30 ± 2 °C) for 1 hr. The suspension was centrifuged at 2000 rpm for 30 minutes. The volume of drained water and the sediment was measured and the water absorbed was expressed as percent based on the original sample weight.

$$\frac{\text{Weight of water absorbed (g) x 100}}{\text{Weight of dry flour (g)}}$$

Oil Absorption index

This was determined using methods described by Beuchat (1977). One gram sample was weighed into 25 ml graduated centrifuge tube and 10 ml of refined vegetable oil added. The suspension was centrifuged (2000 rpm) for 30 minutes. The volume of oil on the sediment and separated volume were measured and the oil absorbed was expressed as per cent oil absorption based in the original sample weight.

Foaming capacity

The foaming capacity (FC) was determined as described by Narayana and Narasinga (1982.One gram of flour sample was added to 50 ml distilled water at 30 ± 2°C in a graduated cylinder. The suspension was mixed and shaken for 5 min to foam. The volume of foam after 30 sec of whipping was expressed as foam capacity using the formula:

$$\text{Foaming capacity} = \frac{\text{Volume of AW- Volume of foam BW}}{\text{Volume of BW}} \times 100$$

Where, AW = Foam volume after whipping, BW = Foam volume before whipping.

Swelling power

This was determined by the method described by Leach *et al.,* (1959) with modification. One gram of the sample was mixed with 10 ml distilled water in a centrifuge tube and heated at 80 °C for 30 min. The mixture was continually shaken during the heating period. After heating, the suspension was centrifuged at 1000 rpm for 15 min. The supernatant was decanted and the weight of the paste taken.

The swelling power was calculated as:

$$\text{Swelling power} = \frac{\text{Weight of the paste}}{\text{Weight of dry sample}}$$

Solubility

This method of Oladele and Aina (2011) was adopted. One gram of jackfruit flour was mixed with 10ml distilled water in a centrifuge tube and heated at 80^{o}C for 30 minutes while shaking continuously. The tube was removed from the bath, wiped dry, cooled to room temperature and centrifuged for 15 minutes at 2200rpm. The supernatant was evaporated, and the dried residue weighed to determine the solubility. Solubility was determined using the formula:

$$\text{Solubility \%} = \frac{\text{(Weight of dried sample in supernatant)}}{\text{(Weight of original sample)}} \times 100$$

RESULTS AND DISCUSSION

In this study the functional properties of the flour were analyzed and these were compared with those of refined wheat flour.

Table 1. Functional quality of Jackfruit bulb flour

Functional Quality of Jackfruit bulb flour			
Functional qualities (%)	Bulb flour	Refined wheat flour	T statistics
Water absorption index	2.95	1.50	6.835*
Oil absorption index	1.61	3.40	-253.142**
Foaming capacity	13.20	20.12	-48.317*
Swelling power	16.35	12.75	159.652**
Solubility	12.11	11.50	10.773**

(Values represent mean of four replication)

Water absorption index

The analysis revealed that jackfruit bulb flour had higher (2.95%) water absorption index than wheat flour (1.50%). Water absorption index represents the ability of the products to associate with water when processing into dough and pastes. The result suggests that jackfruit bulb flour would be useful in foods such as bakery products which require hydration to improve handling features.

Oil absorption index

Oil absorption capacity is attributed mainly to the physical entrapment of oils. It is an indication of the rate at which the protein binds to fat in food formulations. The oil absorption capacity of jackfruit bulb flour in this study was lower than refined wheat flour(1.6% and 3.4%)The lower oil absorption capacity of jackfruit flour could be due to the hydrophobic proteins. The relatively low oil absorption capacity of JFB flour suggests that it could absorb low fat in cooking procedure which is healthier.

Foaming capacity

Foaming capacity is the ability of a substance in a solution to produce foam after shaking vigorously. Proteins, foam when whipped because they have higher surface activity. The foaming property is used as an index of the whipping feature of protein isolates. This explains why jackfruit flour had lower foam capacity, since it is recorded with lower crude protein content. The foaming capacity of refined wheat flour was (20.12%) which was higher than the jackfruit bulb flour (13.20%)

Swelling power

The swelling power of the flours was 16.35% and 12.75% for jackfruit bulb flour and refined wheat flour respectively. The gelatinisation and swelling power tests provides suitable predictive methods for identifying baked quality of flour. Formation of protein amylase complexes in native starches and flours may be the cause of the higher swelling power. The extent of swelling depends on the temperature and availability of water. As per literature, increase in water absorption increases the swelling power. The high swelling power suggests that jackfruit bulb flour could be useful in food system where swelling property is required.

Solubility

Solubility value of jackfruit bulb flour was 12.11% while for the refined flour it was 11.5%. This observation indicates higher solubility of jackfruit flour than refined wheat flour. The high solubility of jackfruit bulb flour suggests that it is more digestible and assimilable. Than refined wheat flour and therefore it could be suitable for different food products qualitatively.

Conclusion

From the study it can be concluded that. raw jackfruit flour had higher water absorption index. It suggests that jackfruit bulb

flour would be useful in foods such as bakery products which require hydration to improve handling features. Low oil absorption capacity of JFB flour suggests that it could absorb only little fat, which is a healthier characteristic. This suggests that the jackfruit flour has low protein thus lower foaming capacity. Due to the higher the water absorption capacity, higher the swelling power was observed. Higher water absorption capacity and swelling power revealed greater the solubility.

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