Theme: “Appui aux filières et aux entreprises agroalimentaires”

Title: Jackfruit and breadfruit processing: potential for development of innovative and nutritious food products by food enterprises to promote their utilisation and sustainable food production

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Presentation Objectives

1. To establish the need for value-addition to **jackfruit** and **breadfruit**
2. To advocate the potential of **jackfruit** and **breadfruit** processing for research and innovation
3. To share the Faculty of Agriculture (FoA), University of Mauritius, protocol for enhancing the postharvest storage stability of **jackfruit** and **breadfruit**
4. To initiate discussions for collaborative research on innovative food product development from **jackfruit** and **breadfruit**
5. To promote utilisation of **jackfruit** and **breadfruit** by **consumers** and **food enterprises** towards food security and sustainable development in the Indian Ocean islands
Jackfruit: **Historical Background**

“Le Jacq est un arbre d’un beau feuillage, qui donne un fruit monstrueux. Il est de la grosseur d’une citrouille; sa peau est d’un beau vert, toute chagrinée. Il est rempli de grains dont on mange l’enveloppe, qui est une pellicule blanche gluante et sucrée. Il a une odeur empestée de fromage pourri…”

- Jacques-Henri Bernardin de Saint-Pierre (1737-1814)
- French writer
- Engineer of the French army service in Mauritius in the 18th century
- Best remembered for “Paul et Virginie” novel based on a love story in Mauritius

*Introduced in the Mascarene islands since the middle of the 18th century*
**JACKFRUIT**

**Scientific name:** *Artocarpus heterophyllus*

**Family:** Moraceae

**Geographic distribution:** India, Bangladesh, Southeast Asia, China, the Caribbean, Central and South America, Africa, Indian Ocean islands

**Two main varieties:**
- Small, fibrous, soft, mushy
- Large, crisp, crunchy

**Several cultivars:**
- Black Gold, Golden Nugget, Honey Gold, Lemon Gold & Golden Pillow
- Vary in size, shape (round to oblong) and flesh characteristics (white, cream, yellow to orange)
- Skin is rough (spiny) and thick; profuse white latex exudate
- Maturity and ripeness: green, greenish-yellow, brownish yellow
- Average weight: 3.5 to 10 kg (small less than 10 kg; large up to 25 kg or more); size coding according to weight by Uganda Standard (DUS, 2015)
- Flesh yield (small jackfruit): 30-40% (Ramchurn, 2014); (Bheeroo, 2015)

**Main types in Mauritius:** “jacque jaune”; “jacque blanc”; “jacque la boue”

**Traditional crop with historical and cultural significance:** mature green in curry, “ène bon carri Jacque”, and vegetarian briani

The generic name comes from the Greek words ‘artos’ (bread) and ‘karpos’ (fruit); the fruits are eaten and are commonly called breadfruit. The specific name, ‘heterophyllus’, is Latin for various leaved, or with leaves of different sizes and shapes; it is from the Greek word ‘heteros’ (different).
**BREADFRUIT**

Scientific name: *Artocarpus altilis*

Family: Moraceae

**Geographic distribution:** New Guinea, Pacific region, the Caribbean, Central and South America, India, Southeast Asia, China, Africa, Indian Ocean islands, northern Australia

**Hundred named varieties in the Pacific islands; seedless varieties in the tropics:**

**Maturity criteria (EAC, 2010):**

- **Colour** – Dark green to greenish yellow skin with light brown markings, cream to yellow flesh
- **General visual appearance:** smooth pebbled skin composed of small rounded segments; skin often with brownish latex strains; short stem present with clean cut
- **Sizing:** small < 1.5 kg; large ≥ 2.5 kg

**Flesh yield** (small breadfruit): average 90.61±0.953 % (Beeharry, 2016)

**Main types in Mauritius:** spherical, oval, oblong (FAREI, 2018)

FAREI ORGANIC ORCHARD, PAMPLEMOUSSES

(about 50 breadfruit trees & 20 jackfruit trees; very good windbreaker)
Geographical distribution of Jackfruit and Breadfruit trees in backyards:
Coastal areas (hot & humid)
Pamplemousses (FAREI orchard)
Beau-Bassin, Coromandel,
Quatre-Bornes, Bonne-Terre
Réduit, Vacoas

Mauritius:
Geography and Demography
Area: 1,865 square kilometers
Capital city: Port-Louis
Population: 1.2 million
Other islands under territorial jurisdiction: Rodrigues, Chagos islands
Nutritional and Potential Health Significance of Jackfruit and Breadfruit

• Two very good literature reviews advocate the value of breadfruit and jackfruit as food security crops with potential health benefits


• Swami, Thakor, Haldankar and Kalse (2012). Jackfruit and its many functional components as related to human health: a review. *Comprehensive Reviews in Food Science and Food Safety*. (Institute of Food Technologists publication, USA)

• Breadfruit: high variability in nutritional data due to botany, provenance, fruit maturity and development stage
## Key Nutritional Data

<table>
<thead>
<tr>
<th>Jackfruit</th>
<th>Breadfruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Poor source of energy (flesh)</td>
<td>• Good source of energy</td>
</tr>
<tr>
<td>• Good source of potassium</td>
<td>• Good source of potassium</td>
</tr>
<tr>
<td>• Low in sodium and lipid</td>
<td>• Low in sodium and lipid</td>
</tr>
<tr>
<td>• Good source of vitamin C</td>
<td>• Good source of vitamin C</td>
</tr>
<tr>
<td>• Good source of phytochemicals, including phenolic compounds</td>
<td>• Lower Glycaemic Index than white bread</td>
</tr>
<tr>
<td>• Potential health benefits</td>
<td>• Better source of crude fibre compared to potato</td>
</tr>
</tbody>
</table>

(Swami *et al*., 2012)  
(Turi *et al*., 2015)

*No published compositional data for Mauritius and Rodrigues*
Utilisation and Value-Addition in Mauritius

• Since 2011, the Food & Agricultural Research Institute (FAREI) has promoted research on production and value-addition to breadfruit
• FAREI has also worked on processing of green and ripe jackfruit
• Also a research area of academics and students of the Faculty of Agriculture, University of Mauritius (acidity; sugars; vitamin C; instrumental colour and texture; sensory analysis; in-house consumer testing)
• Two commercial products manufactured in Mauritius: breadfruit gluten free flour and breadfruit chips
• However, jackfruit and breadfruit remain under-utilised by food entrepreneurs and consumers
Why is green jackfruit under-utilised?

- Jackfruit: cutting and peeling is challenging due thick skin and profuse latex
- Market sellers offer peeled and cut jackfruit
- Jackfruit and breadfruit are very susceptible to enzymatic browning
- Cutting of the fruit releases oxidases from cells
- Exposure of the fruit flesh to atmospheric oxygen
- Accelerates oxidation of polyphenols to brown pigments
Potential for Research and Innovation: Pre-cooked Frozen Jackfruit and Breadfruit

- Research conducted at the Faculty of Agriculture has established a protocol for enhancing post-harvest storage stability
- Soaking of peeled and cut fruit in citric acid/ascorbic acid/lemon juice solutions, pre-cooking, blot-drying, packaging and storage in a domestic freezer
- Citric acid, E330 (0.5 to 2%): increases acidity and affects enzyme activity
- Ascorbic acid, Vitamin C, E300 (0.5 to 4%): very good reducing agent
- Simple protocol which can be applied by consumers
- Potential for validation, transfer and uptake by food enterprises
Slicing of mature, green jackfruit: thick skin and profuse latex

Coring: jackfruit slice was halved before removing the core with oiled hands

Peeling with oiled hands
Removal of green jackfruit seeds

Cutting & soaking in 10% lemon juice solution

Draining of green jackfruit cubes

Pre-cooking in boiling water for 10 minutes
Protocol for Jackfruit & Breadfruit Preservation

Drained, pre-cooked green jackfruit

Pre-cooked breadfruit

Pre-cooked and packaged green jackfruit
Ready for frozen storage
Frozen green jackfruit

Thawing of green jackfruit by soaking frozen cubes in water

Thawed green jackfruit: Ready-to-Use for Curry, Briani and Burgers

Green jackfruit Curry

Green jackfruit Curry
“In recent reports across the UK predicting the food and drink trends for summer 2018, top of the list has been the vegan barbecue. This is not just due to the fact that more people are choosing the vegan lifestyle but meat-eaters too will be enjoying a vegetable burger or sausage and many other vegan alternatives.

Consumers are definitely becoming more conscious of what they are eating and many people are choosing to cut down on animal products. This is being helped with vegan alternatives becoming tastier and more readily available. All of the main supermarkets are stocking a large range of vegan and vegetarian products.

The star of the barbecue this summer is the meat substitute made from Indian jackfruit, this is due to its texture and flavour, a very popular vegan alternative.”

Potential for Research and Innovation: Jackfruit and Breadfruit Veggie Burgers

- **New Food Product Idea**: Frozen Veggie Burgers formulated with fresh Jackfruit, Breadfruit, Kidney Beans enhanced with local herbs and spices for local and export markets
- Mindful Consumerism: Health and Environment Conscious Consumers
- Increasing demand for vegetarian food products globally
- Opportunity for collaborative research, innovation and knowledge transfer to food enterprises and catering businesses
- Potential partners: University of Mauritius (UoM), Food and Agricultural Research and Extension Unit (FAREI), UoM alumni from Rodrigues; regional partners from Indian Ocean islands

**TO PROMOTE UTILISATION OF TRADITIONAL CROPS FOR ENHANCED FOOD AND NUTRITION SECURITY**
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- My FAMILY

Thank you for your attention
List of References


