



7ème
édition

QualiREG 2018

Les Rencontres de l'Agroalimentaire
en océan Indien 2018

16-21 novembre 2018

Moroni, Comores

Un événement du réseau
 QualiREG

 cirad

 LABORATOIRE DELCONOM

 INRAPE



 FCCO

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

Author: Mrs B Esha Aumjaud, Lecturer, Faculty of Agriculture, University of Mauritius

Date: 17 November 2018



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*



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

“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 Bernandin 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



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).

JACKFRUIT

Scientific name: *Artocarpus heterophyllus*

Family: Moraceae

Geographic distribution: India, Bangladesh, Southeast Asia, China, the Carribean, 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

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 \geq 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
- Turi, Liu, Ragone and Murch (2015). Breadfruit: A traditional crop with the potential to prevent hunger and mitigate diabetes in Oceania. *Trends in Food Science & Technology*. (Elsevier publication)
- 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

Jackfruit

- Poor source of energy (flesh)
- Good source of potassium
- Low in sodium and lipid
- Good source of vitamin C
- Good source of phytochemicals, including phenolic compounds
- Potential health benefits

(Swami *et al.*, 2012)

Breadfruit

- Good source of energy
- Good source of potassium
- Low in sodium and lipid
- Good source of vitamin C
- Lower Glycaemic Index than white bread
- Better source of crude fibre compared to potato

(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



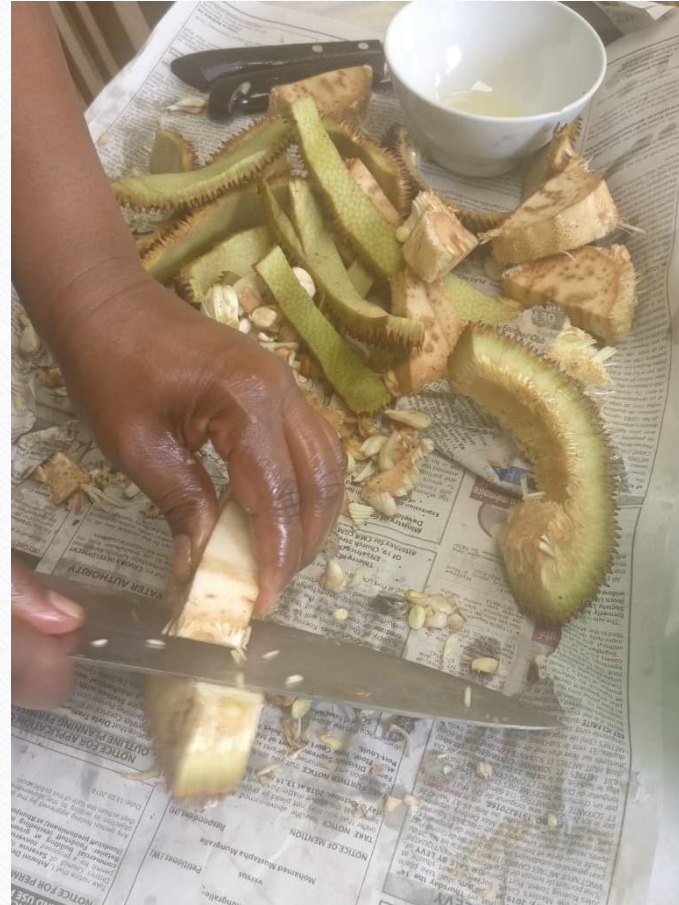
**Fruit & Vegetable Market
Quatre-Bornes, Mauritius**

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**



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



**Thawing of
green
jackfruit by
soaking
frozen
cubes in
water**



**Green
jackfruit
Curry**



SUMMER TREND 2018: THE VEGAN BARBECUE

“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.”

<http://www.kanegrade.com/news/news-27.html>



FAREI organic orchard



Jackfruit Veggie Burger

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**

Acknowledgements

- Réseau QualiREG and sponsors
- The Food and Agricultural and Research Extension Institute (FAREI) of the Ministry of Agro-Industry and Food Security, Mauritius: Dr S Ganeshan (Chief Executive Officer); Mrs I Ramma (Principal Research Scientist); Mrs B Dussoruth (Research Scientist); Mrs S Subramaniam (Research Scientist)
- Associate Professor D Puchooa, Dean, Faculty of Agriculture, University of Mauritius
- My FAMILY

THANK YOU FOR YOUR ATTENTION

List of References

1. Beeharry, A. (2016). Development and evaluation of quality of a breadfruit product. BSc (Hons) Agriscience and Technology (Minor: Agribusiness Management). Dissertation. Faculty of Agriculture, University of Mauritius.
2. Bheeroo, M. (2015). A study on the quality of blanched and chemically pretreated frozen jackfruit for new food product development. BSc (Hons) Food Science and Technology. Dissertation. Faculty of Agriculture, University of Mauritius.
3. DUS (2015). Draft Uganda Standard DUS 1615. Fresh jackfruit – Specification. Uganda National Bureau of Standards.
4. EAS (2010). Draft East African Standard CD/K/097. Fresh breadfruit – Specification and grading. East African Community.
5. FAREI, Ministry of Agro-Industry and Food Security, Mauritius. Booklet on breadfruit.
6. Ragone, D. (2006). Species profiles for Pacific Island agro-forestry. *Artocarpus altilis* (breadfruit). www.traditionaltree.org
7. Ramchurn, G. (2014). Development and evaluation of the quality of food products prepared from jackfruit. BSc (Hons) Food Safety and Quality. Dissertation. Faculty of Agriculture, University of Mauritius.
8. Swami, S.B., Thakor, N.J., Haldankar, P.M., and Kalse, S.B. (2012). Jackfruit and its many functional components as related to human health: a review. *Comprehensive Reviews in Food Science and Food Safety*, **11**, 565-576.
9. Turi, C.E., Liu, Y., Ragone, D., Murch, S.J. (2015). Breadfruit (*Artocarpus altilis* and hybrids): A traditional crop with the potential to prevent hunger and mitigate diabetes in Oceania. *Trends in Food Science and Technology*, **45**, 264-272.