

DEVELOPMENT OF VALUE ADDED PRODUCTS OF MONKEY JACK FRUIT
(*Artocarpus lakoocha*)

Dissertation 1 Report

Submitted by:

Sakshi

Reg. no. - 11717698

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School of Agriculture

Lovely Professional University, Phagwara



Under the guidance of

Dr. Ashwani Kumar

Assistant Professor

Department of Food Technology and Nutrition

School of Agriculture

Lovely Professional University, Phagwara

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CERTIFICATE

This is to certify that **Sakshi** (Registration No. 11717698) has personally completed M.Sc. Dissertation I entitled “DEVELOPMENT OF VALUE ADDED PRODUCTS OF *ARTOCARPUS LAKOOCHA*” under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of dissertation has ever been submitted for any other purpose at any University.

The project report is appropriate for the submission and the partial fulfillment of the conditions for the evaluation leading to the award of Master of Nutrition and Dietetics.

Date: 12 MAY, 2018

Signature of Supervisor

Dr. Ashwani Kumar
Assistant Professor
Department of Food Technology and Nutrition
School of Agriculture
Lovely Professional University
Phagwara, Punjab, India

DECLARATION

I hereby declare that the work presented in the pre-dissertation report entitled “DEVELOPMENT OF VALUE ADDED PRODUCTS OF *ARTOCARPUS LAKOOCHA*” is my own and original. I have carried out the work at School of Agriculture, Lovely Professional University, Phagwara, Punjab, India under the guidance of **Dr. Ashwani Kumar**, Assistant Professor (Food Technology) of School of Agriculture, Lovely Professional University, Phagwara, Punjab, India, for the award of the degree of Master of Science in Food Technology.

Date: 12 MAY, 2018

Sakshi

Place: Phagwara, Punjab (India)

Registration No. : 11717698

I certified that the above statement made by the student is correct to the best of my knowledge and belief.

Place: Phagwara, Punjab (India)

Dr. Ashwani Kumar

Date:

Assistant Professor
Dept of Food Technology and Nutrition

School of Agriculture

Lovely Professional University
Phagwara, Punjab, India

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1. INTRODUCTION

Monkey jack fruit (*Artocarpus lakoocha roxb.*) is a tropical fruit and is emanated from India. Asian countries like Bangladesh, Bhutan, Nepal, Myanmar, Srilanka, Thailand, Maylasia and Laos yield this fruit (Hossain *et al.* 2016). The genus *Artocarpus* belongs to the family *Moraceae* which comprises of about 60 genera and over 1000 species. Many of these species are used as a source of food and in traditional medicinal practices. *Artocarpus* genus is known for its large edible fruit with high nutritive values. The important species belonging to this genus are *Artocarpus heterophyllus*, *Artocarpus altilis*, *Artocarpus hirsutus*, *Artocarpus lakoocha* and *Artocarpus camansi* (Hari *et al.* 2014)

Fruits of *Artocarpus* genus are integral part in the human diet and are highly nutritious. Edible portion of jack fruit is rich in carbohydrate, protein, fat, fiber, calcium, phosphorous, iron, vitamin A and thiamine. Fruits consist of vitamins and beta-carotene and are an excellent source of antioxidants. Minerals like zinc, copper, magnesium and iron are also present in them which act as antioxidant (Jahan *et al.* 2017). Antioxidants from the plant source play an important role to maintain normal health and to prevent cardiovascular diseases (Pandey and Bhatnagar 2009). As per World Health Organization, 80% of the world population has been depend upon the traditional herbal medicine and their primary healthcare (Vijayan *et al.* 2007).

Different components and chemical extract of this plant also provide possible sources for new drugs (Tijani *et al.* 2008). Tropical fruits also lower the threat of noncontagious diseases like diabetes mellitus, cancer, heart disease, neurodegenerative diseases as established by lot of scientists (Rajurkar and Gaikwad 2012). For the preparation of potential therapeutic compounds the medicinal plants are used which consist of anti-inflammation, anti-bacterial and cytotoxic activities (Hayat *et al.* 2009). Free radicals comprise of properties to oxidative damage and excessive production and also less antioxidant protection which can cause some diseases and enhanced aging (Goze *et al.* 2009). Various flavonoids and phenolic acid which are strong antioxidant are present in the plant *A.lakoocha* (Jasprica *et al.* 2007). People now days are adopting natural ingredients instead of synthetic ingredients due to more knowledge and scientific evaluation. The whitening properties in the natural cosmetics are growing day by day and due to their increase demand, a significant role is provided by the various companies which are producing cosmetics including whitening properties. Fruits available in tropical areas play an important role in the supplementary nutrient diet and income of rural

area people (Narzary *et al.* 2013). It is time to introduce new food products from *A. lakoocha* to the people because of its high content of phytochemicals, nutrients and its high antibacterial, anti-inflammatory properties. Along with its antiageing and whitening properties it can also be used as a medicine for various diseases like dropsy, skin infections and wounds. These plants are known to contain many potential bioactive phytochemicals which shows many pharmacological properties (Hari *et al.* 2014)

2. PROBLEM BACKGROUND

The fruit of *A. lakoocha* has high nutritive value. Edible portion of jack fruit is rich in carbohydrate, protein, fat, fiber, calcium, phosphorous, iron, vitamin A and thiamine. Minerals like zinc, copper, magnesium and iron are also present in them which act as antioxidant. It abodes several bioactive compounds of health significance and has traditionally being used as a part of ayurvedic medicinal system. However, the knowledge about this fruit is confined to the rural settings. There is limited knowledge on the changes in the nutritional composition of fruits with maturation. Knowledge of the nutritional composition of the fruit at various stages of maturation can help to make various value added products.

3. REVIEW OF LITERATURE

3.1 Taxonomical classification -

Kingdom : Plantae

Phylum : Tracheophyta

Class : Magnoliopsida

Order : Rosales

Family : *Moraceae*

Genus : *Artocarpus*

Species : *lacucha*

Source – Encyclopedia of life

3.2 Medicinal properties -

It has anti-inflammatory, anti viral, anticancer and anti-HIV properties. Bark of this tree contains 8.5 % of tannin which has been used to treat skin lesion (Tomar.R *et al.* 2015). Fruit pulp of *A. lakoocha* consumed act as refresher of liver. Seeds and milky latex of this fruit can also be used as purgative. Any wound can be cure by using powdered form of its bark (Hossain M.F.1 *et al.* 2016). For stomach and liver diseases, seed and bark of this fruit is useful. Tridosha impotency, loss of appetite can be caused by unripe fruit as it is hot, sweet and sour. Ripe fruit of *A. lakoocha* is sour, sweet and is tonic to liver (Piyush Gautam and Ramesh Patel 2014). Powdered form of heartwood extract has been used for skin whitening agent. The cell growth and its development can directly be affected by free radical products (Jenkins G. 2002). The hydroglycolic extract of *A.lakoocha* heartwood posses an important antioxidant and tyrosinase inhibitory activities, which are often used in cosmetic products as antioxidant and skin whitening agent (Hossain M.F.1 *et al.* 2016). Extract of *A.lakoocha* also comprise of liposomes having phospholipid bilayers and an aqueous cavity that secure and bring the water soluble substances into the interior of the skin which promotes the skin permeation. Anti-glycation and anti-oxidation of phytocompound can avert cellular aging (Pietta P.G 2000). In vitro, 25 micro gram/ml phytooxyresvertrol (POV) can helps to avert DNA damage and non-toxic to the cell. For the treatment of taemiasis, it has been

scientifically proved that *A. lakoocha* is effective (Hossain M.F.1 *et al.* 2016). The bark contains flavonoids and phenolic content and also possesses methanolic extracts which has a strong antioxidant activity (Suwannalert *et al.*2012).

3.3 Taste of *Artocarpus lakoocha*

A. Lakoocha fruit has distinctive flavor that is not found in any other fruit, they are a mixture of sweet, sour and tangy taste with citrusy overtones that resemble with fruit kiwi. This pleasant and unusual flavor cannot be expected in other *Artocarpus* members like *durian* and *cempedak*. They are musky and have salty overtones. The skin of the fruit when cut excludes white latex with similar texture of a jackfruit with a fibrous consistency and they are stringy.



Source – Fruits.com <http://www.fruitsinfo.com/lakoocha-fruit.php>

3.4 Nutritional and phytochemical aspect -

Jack fruit is a highly nutritive seasonal food, which is considered as poor man's food in south East Asia. Edible portion of jack fruit is rich in carbohydrate, protein, fat, fiber, calcium, phosphorous, iron, vitamin A and thiamine. Fructose, glucose and sucrose are the major sugars present in jack fruit. The major fatty acids found in various parts of jack fruit are palmitic, oleic, stearic, linoleic, lauric, arachidic acids. Jack fruit seeds are good sources of starch, protein, mineral and fibre contents. *Artocarpus lakoocha* fruit is reported to contain alkaloids, flavanoids, phenols, tannins, steroids and saponins. The edible fruits and seeds of monkey jack contain carbohydrates, proteins and minerals. Also a lectin, *Artocarpus lakoocha* agglutinin was isolated from the seeds.

Source - (Shajib *et al.* 2012).

Table 1. Nutritional composition of fruit of *Artocarpus lakoocha*-

Nutrient	Amount
Energy	79 kcal
Moisture	90 g
Protein	2 g
Fat	1 g
Mineral	1 g
Fiber	3g
Calcium	67 mg
Phosphorous	25 g

Source – fruits.com <http://www.fruitsinfo.com/lakoocha-fruit.php>

3.5 Traditional use of *Artocarpus lakoocha* plant

Pickle – Unripe fruit of *artocarpus lakoocha* is first harvested and then washed in warm water and cut into small pieces and keeps them for sun drying for 2-3 hours. To make pickle add oil, turmeric, fenugreek seeds, saunf, salt, red chilli powder and garam-masala and then mixed well. Keep them for one month to get it ready meanwhile sun drying is necessary.

Vegetable of its flowers – After washing the male flowers, its vegetable is cooked by adding oil, cumin seeds, salt, pepper, turmeric and onion. And is serve with parantha.

In curries - Pulp of the fruit is being used in curries as its taste is sweet and sour.

Sauce – Fruit and its spike of male flower is used to make delicious sauce.

Along with the above uses, *Artocarpus lakoocha* is been used for medicine purposes for diabetes, skin whitening to heal wounds and cuts.

4. PROPOSED RESEARCH OBJECTIVES

1. To analyse nutritional composition of flower and fruit of *A. lakoocha* .
2. To study the effect of various processing methods on the nutritional and anti-nutritional composition of *A. lakoocha*.
3. To develop value added products using *A.lakoocha* and their quality evaluation.
4. To study the effect of storage on developed products.

5. PROPOSED RESEARCH METHODOLOGY

5.1 Experiment 1 : Quality evaluation of the raw material.

5.1.1. Raw materials to be used –

- a. Flower of *Artocarpus lakoocha*.
- b. Unripe fruit of *Artocarpus lakoocha*.
- c. Ripe fruit of *Artocarpus lakoocha*.

5.1.2. Test to be performed :

Proximate composition

- | | |
|---------------------|--|
| a) Moisture content | (Olawuni et al. 2013) |
| b) Carbohydrate | (Elezabeth and Subramanian, 2013) |
| c) Proteins | (Mundi et al. 2012) |
| d) Fats | (<i>Soxhlet extraction method</i>) |
| e) Ash | (Elezabeth and Subramanian, 2013) |
| f) Crude fibre | (<i>AOAC 2000</i>) |
| a. Dietary fibre | (Van Soest and Wine (1967), AOAC 991.43) |

Bioactive compounds

- | | |
|------------------|-----------------------------------|
| a) Total phenols | (Sakakibara et al. 2003) |
| b) Tannins | (Ricci et al. 2015) |
| c) Anthocyanins | (Elezabeth and Subramanian, 2013) |
| d) Flavonoids | (Elezabeth and Subramanian, 2013) |
| e) Phytates | (AOAC 98611-1988) |
| f) Oxalates | (Moureau & Savage 2009) |

Experiment 2. Development of value added products of *Artocarpus lakoocha*

On the basis of the proximate composition of fruits i.e. unripe and ripe fruits, the final products will be developed by using RSM design using design expert version 6.0.10. The proposed products to be developed are -

1. Pasta
2. Instant snacks
3. Instant soup

5.1.3. Sensory Evaluation

Final product will be evaluated for the sensory characteristics on the basis of 9 Point hedonic scale and composite sensory scale.

A. Sensory analysis:

A 9 point hedonic scale will be used to evaluate the experimental samples using 100 semi trained panelists. Healthy male and female of suitable age will be selected for the evaluation.

- a. Color and appearance
- b. Flavor and sweetness
- c. Body and texture
- d. Mouth feel
- e. Overall acceptability

Expression	Points to be assigned
Liked extremely	9
Liked very much	8
Liked moderately	7
Liked slightly	6
Neither liked nor disliked	5

Disliked slightly	4
Disliked moderately	3
Disliked very much	2
Disliked extremely	1

Sample code	Color and appearance	Flavor and sweetness	Body and texture	Mouth feel	Overall acceptability	Remarks (if any)

Optimized product will be obtained using the above experimental setup.

B. Mean Sensory score on composite sensory scale for the Health Drink:

Sensory attributes	Possible score	Mean Score \pm SD	Number of Judges
Appearance			
Consistency			
Flavor			
Absence of defects			
Total Score			

5.2. Experiment 3: Microbiological Study

a. Total plate count (TPC)

b. Yeast Count

c. Mould Count

6. EXPECTED RESEARCH OUTCOME

It is a nutrient dense fruit and the products developed using this fruit will be rich in various nutrients specifically calcium, phosphorus and fibre. Apart from this, the product will be a low cost nutritional product which will suits to all the economic group of the country. Thus development of new products from *A. lakoocha* will adds more options to the fresh produce in the market and can also be helpful for meeting the prevailing challenges of the nutritious food products. With the new research outcomes and development of the new products will also become an income source of the people.

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