



# A Guide on **Jack Fruit** Cultivation & Value Addition

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**गोवा के लिए भा.कृ.अनु.प. का अनुसंधान परिसर**

**(भारतीय कृषि अनुसंधान परिषद)**

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**ICAR RESEARCH COMPLEX FOR GOA**

(Indian Council of Agricultural Research)

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## FOREWORD

It is refreshing to note that more and more people are realizing the importance of Jackfruit. We, as a country have neglected this Kalpavruksha since a long time.

With good awareness campaign and training, jackfruit can contribute in a big way to local food security. In addition, it can be additional income to farming families and SHGs through value addition and marketing.

Srilanka, our neighboring country has 14 organisations giving training in value addition of jackfruit. We have none!

Srilanka has more than 20 food processing companies that among others produce 3 to 5 jackfruit products like polos (tender jackfruit) curry, tender jackfruit in brine, jack seed in brine *etc.* These are exclusively meant for export.

Vinamit, probably the world leader in vacuum fry jackfruit chips, a Vietnam company owns 10,000 hectares of jackfruit orchards. Panruti, our own jackfruit paradise in Cuddalore district of Tamilnadu fetches the kind of income for jackfruit farmers that their counterparts elsewhere can't day-dream!

Fifty thousand tonnes of tender jackfruit go to North India from Kerala every year. Our north Indian friends' pay anywhere from 25 to 40 per Kg of this as a final consumer. All these end up as *subzi* (vegetable) on their dining table. For Ninety percent of North Indians, Jackfruit means only a vegetable. Introducing jackfruit as fruit to North India is a challenge as of now. But with persistent efforts, it can be turned into an opportunity. We need a technology like

the one MARDI (Malaysian Agricultural Research and Development Institute) has developed to extend the shelf life of fresh jackfruit bulb, transport it long distance and to sell in new areas.

In my opinion, except for the class table variety fruits, converting and promoting a good chunk of our jackfruit, especially soft-fleshed (rassal, barka) into vegetable would be result-oriented. It is nutritive, safe sans any pesticide trace and above all will act as a 'bottle-brush to clean our alimentary canals.'

Maharashtra has five units- big and small – canning tender jackfruit. Its mass jackfruit pulp production, pectin extraction and ready to cook vegetable production that is now done silently can be scaled up in the whole country.

We need to document thousands of forgotten, traditional and experimental recipes of Jackfruit this great in latent form in our country. Well, bigger goals also start with smaller foot-work. This technical bulletin painstakingly produced by our ICAR Scientists' team at Goa is one. They have given training in value addition, provided necessary gadgets to the village community and are following up.

Our country easily produces abundant food in form of jackfruit. If all of our KVK's, research organizations strive hard like ICAR RC Goa has done, can't we collectively stop this criminal wastage of this wonder crop and augment rural economy and local food stock in the process? Amen!

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## PREFACE

GOA is a small coastal state of India with abundant wealth of native fruit trees like jack fruit, kokum, jamun, karonda etc. Among these fruit crops, jack produces abundant crop every year even under neglected condition. Based on the bulb texture, there are two types of jack fruits viz., firm and soft types (referred as *kappa* and *rassal* respectively in Konkani). However, the consumption of jack fruits is disproportionate to the fruit production in the state. Key reasons those can be attributed to this situation are, 60-70% of the trees being soft fleshed, rendering them less preferred for dessert purpose and availability of fruits during June-July coinciding peak monsoons. But one need not wait for the soft fleshed types to ripen, perhaps till monsoons and allow them to drop on ground and decompose. There are ample opportunities for value addition in both firm and soft types of jack fruit in all stages of maturity right from immature to well ripened stage. It can't be denied that there are few small and marginal entrepreneurs in Goa, who are involved in value addition. However, in order to establish it in large scale, a strong awareness has to be created among the local folk of Goa. In this endeavour, Awareness Trainings were imparted to tribal farmers of Goa. During the trainings, demonstrations of various value added products were shown to them, by various experts. Mrs Sunetra Talaulikar, SMS (Home Science), KVK, North Goa and Mrs Nirmala Singh demonstrated different dishes made from jack fruit in Konkani and North Indian style respectively. Mrs. Padmini Sivadasan, from Kerala demonstrated nearly 20 items from jack fruit. She has a strong passion for jack fruit and is a winner of Kerala State Award for demonstrating 100 items from jack fruit in one day in State Exhibition of Kerala. All the three experts shared their recipes readily during the programmes, for which we are grateful. Recipes of all the items demonstrated and also few more interesting recipes shared by them have been compiled in this bulletin. Besides imparting awareness and knowledge on value addition, capacity building was also accomplished to the tribal farmers of Goa. They were distributed with processing machinery like, jack fruit cutter, chips cutter, electric cabinet dryer, wet grinder, kokum cutting machine, sealing machine and related accessories like utensils, knives etc.

The tribal Self Help Groups who are beneficiaries of this programme

will be guided in future for establishment of strong forward and backward linkages, facilitating proper packaging, labelling and marketing, including FPO certification. Emphasis will be given in imparting trainings to more and more farmers of Goa on value addition in jack fruit. At the same time, capacity building of marginal farmers in processing such native fruits of Goa will also be focussed upon.

A sum up of basic details about jack fruit, its improved cultivation aspects, scope for value addition, different ready to refer recipes and the various programmes on Awareness and Capacity Building to tribal farmers of Goa has been furnished in this Technical Bulletin.

We place on record our thanks to Dr. N.P. Singh, Director, ICAR Research Complex for Goa, for his encouragement in conducting the programmes and to Mr. Shree Padre, Water Journalist, Kerala for his enduring support and motivation. We also thank Mr. Dhilon Velip for his continuous support in executing the programmes involving Tribal folk of Goa.

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# A GUIDE ON JACK FRUIT - CULTIVATION AND VALUE ADDITION

## 1. Introduction

Jack is a tropical fruit species found in tropical, high rainfall, coastal and humid areas of the world. It belongs to family Moraceae. Scientifically *Artocarpus heterophyllus*, it is the favourite fruit of many, owing to its sweetness. The jackfruit tree is widely cultivated in tropical regions of India, Bangladesh, Nepal, Sri Lanka, Vietnam, Thailand, Malaysia, Indonesia and the Philippines. Jackfruit is also found across Africa, e.g., in Cameroon, Uganda, Tanzania, and Mauritius, as well as throughout Brazil and Caribbean nations such as Jamaica. However, India is considered to be the native of jack fruit.

In our country, the trees are found distributed in southern states like Kerala, Tamil Nadu, Karnataka, Goa, coastal Maharashtra and other states like, Assam, Bihar, Tripura, Uttar Pradesh and foothills of Himalayas. The name originated from its Malayalam name *Chakka*. It is also called *kathhal* (hindi and urdu), *pala* (tamil), *halasina hannu* (kannada) *panasa pandu* (telugu) and *phanos* (marathi and Konkani). The fleshy carpel which is botanically the perianth is the edible portion.

Apart from its use as a table fruit, jack is a popular fruit for preparation of pickles, chips, jack leather and *papad*. The fruit has got good potential for value addition into several products like squash, jam, candy, *halwa* etc. The ripe bulbs can be preserved for one year in sugar syrup or in the form of sweetened pulp. The unripe mature bulbs can be blanched and dehydrated for further use through out the year. Seed is a rich source of starch and a delicacy during season. The timber is highly valued for its strength and sought for construction and furniture. The dried leaves are stitched to make disposable plates.

## 2. Nutritional and medicinal properties of jack fruit

Jack fruit is rich in several nutrients (Table 1). It can act as source of complete nutrition to the consumers. The fruit is equivalent to Avocado and olive in terms of the healthier mix of nutrients for human dietary needs, almost having the exact nutrient equivalents of mother's milk. It is rich in vitamin B and C, potassium, calcium, iron, proteins and high level of carbohydrates, affordable and readily available supplement to our staple food.

Its seeds are rich in proteins and can be relished as a nutritious nut. The fruit is also the source of chemical "Jacalin" useful in preventing colon cancer, AIDS *etc.*,

**Table 1. Nutritive value of jackfruit (100 g)**

Constituent	Average value
Moisture (%)	76.20
Energy (cal)	88.00
Protein (g)	1.90
Fat (g)	0.10
Fibre (g)	1.10
Carbohydrates (g)	19.80
Potassium (mg)	107.00
Calcium (mg)	20.00
Phosphorous (mg)	41.00
Iron (mg)	0.56
β Carotene (mg)	175.00
Thiamine (mg)	0.03
Riboflavin (mg)	0.13
Niacin (mg)	0.40
Vitamin C (mg)	7.00

### 2.1 Health benefits of Jackfruit

#### 2.1.1 Strengthens Immune System

Jackfruit is an excellent source of vitamin C, which helps to protect against viral and bacterial infections. Vitamin C helps to strengthen the immune system

function by supporting the white blood cells function. One cup of jackfruit can supply the body with a very good amount of this powerful antioxidant.

### **2.1.2 Protects against Cancer**

In addition to vitamin C, jackfruit is also rich in phyto-nutrients such as *lignants*, *isoflavones* and *saopnin* which have anti cancer and anti aging properties. These phyto-nutrients may help eliminate cancer causing free radicals from the body and slow down the degeneration of cells that can lead to degenerative diseases.

### **2.1.3 Aids in healthy digestion**

Jackfruit is also known to contain anti ulcer properties which help cure ulcers and digestive disorders. In addition, the presence of high fiber in the jackfruit prevents constipation and helps in smooth bowel movements. These fibers also offer protection to mucous membrane by driving away the carcinogenic chemicals from the large intestine.

### **2.1.4 Maintains a healthy eye and skin**

Jackfruit contains vitamin A, a powerful nutrient which is known to maintain a healthy eye and skin. It also helps prevent vision related problems such as macular degeneration and night blindness.

### **2.1.5 Boosts Energy**

Jackfruit is considered as an energy generating fruit due to the presence of simple sugars like fructose and sucrose which give you an almost immediate energy boost. Although Jackfruit is an energy rich fruit, it contains no saturated fatty oil and cholesterol making it a healthy fruit to savour.

### **2.1.6 Lowers high blood pressure**

Potassium contained in Jackfruit has been found to be helpful in the lowering of blood pressure and thus reducing the risk of heart attack as well as strokes.

### **2.1.7 Controls Asthma**

The root of jackfruit has been found to help those who suffer from asthma. Extract of boiled jackfruit root has been found to control asthma.

### **2.1.8 Strengthens the Bone**

Jackfruit is rich in magnesium, a nutrient which is important in the absorption of calcium and works with calcium to help strengthen the bone and prevent bone related disorders such as osteoporosis.

### **2.1.9. Prevents Anaemia**

Jackfruit also contains iron which helps to prevent anaemia and also helps in proper blood circulation in our body.

### **2.1.10. Maintains a healthy Thyroid**

Jackfruit is loaded with copper, an important mineral, which plays a key role in the thyroid metabolism, especially in hormone production and absorption.



*Jack fruit tree in a Kulagar*





### 3. Cultivation aspects of jack fruit

#### 3.1 Climatic and soil requirements

Jack grows well and gives good yield in warm humid climate of hill slopes and hot humid climate of plains. The crop grows successfully from sea level upto an elevation of 1200 M at an optimum temperature range of 22-35° C. It cannot tolerate frost or drought. The yield and quality of fruits are medium under low humidity. The West coast plains with high humidity are found to be highly suitable. A deep rich alluvial or open textured loamy soil or red laterite soils with slightly acidic condition (pH 6.0 – 6.5) with good drainage is ideal for jack fruit, however, it can come up in variety of soils.

#### 3.2 Varieties

Cultivated or naturally found jack trees can be broadly classified into two types viz., firm flesh (*kappa*) and soft flesh (*rassal*) based on the firmness of the bulb. However, there are few important varieties introduced by and released from various organisations. A brief description of the same are given here under.

##### 3.2.1 Konkan Prolific

It is a selection released from Dr BSKKV, Dapoli, Maharashtra. The average plant height is 14.7 m with average spread of 11.5 m (N-S) and average girth of 1.10 m. Growth habit is semi spreading and fairly large with leaves dark green and alternate. The tree is monoecious with small male flowers held by pedicel. Female flowers are larger than the male and pedicel is thick. Fruit is a multiple type, medium size (8 to 9 kg), fruit's skin colour is green when immature and greenish yellow to brownish yellow when ripe. The fruit contains the edible, sweet, aromatic, crisply bulbs.

##### 3.2.2 Singapore (or) Ceylon Jack

It was introduced into Tamil Nadu from Sri Lanka. Fruits are medium in size each weighing 7-10 kg. The carpels are crisp, sweet, yellow with strong pleasant aroma. It is a precocious bearer viz, even seedling progenies will start bearing from 3 years after planting (normally in other types the seedling progenies will start bearing only from 7-8 years after planting.) Fruits will be available from March - June and again from September - December.

### 3.2.3 Hybrid jack

It is a cross between Singapore jack x Velippala developed at Fruit Research Station, Kallar, Tamil Nadu. Trees are precocious in bearing: Carpels are bigger in size and sweeter than the parents.

### 3.2.4 Burliar-1 ( T Nagar selection)

It was developed at Fruit Research Station, Burliar, Tamil Nadu. The trees are medium in height and prolific in bearing.

### 3.2.5 PLR-1(Palur-1)

It is a high yielding variety developed at Vegetable Research Station, Palur of Tamil Nadu Agricultural University. A single plant selection isolated in Panikkankuppam village near Panruti of South Arcot District of Tamil Nadu. The fully ripe fruits have flat stigmatic surface instead of a spiny surface. The special feature of this variety is that the trees bear fruits twice in a year viz., fruits will be available in the regular jack season from March to June and an off season crop during October to December is also available. Each tree bears about 60-80 fruits. The average fruit weight is 12 kg containing 115-120 bulbs. The total bulb weight per fruit is 2.36 kg which accounts for 19.68% of the total fruit weight. Bulbs are pale yellow in colour, crisp and sweet with TSS of 19° Brix.

### 3.2.6 PPI-1( Pechiparai-1)

It was developed at Horticultural Research Station, Pechiparai of Tamil Nadu Agricultural University by clonal selection from Mulagumoodu local. Trees are medium tall, maximum bearing in tree trunk. On an average, each tree bears 107 fruits weighing 1818 kg per year in two seasons, viz., April – June and November – December. Carpels are sweet, crisp, tasty with pleasant aroma. Suitable for commercial planting as well as for planting in home garden.

## 3.3 Propagation and planting

When propagated through seeds, jack exhibits a wide variation among its progenies. Hence vegetative propagation is recommended. Commercially inarching on 10 months old jack seedlings is done to produce vegetative progenies. The grafts come to bearing within 4 ½ -5 years when compared to seedlings which take 7-8 years normally.

Soft wood grafting (cleft method) on 2 months old seedlings with scion of 3-4 months old also was found to be successful (70 -80%). Since the viability of seeds is very low, seeds have to be sown immediately after extraction to raise rootstocks. Rudrakshi and *A. hirsuta* are also used as rootstock.

Pits of size 1 cubic meter are dug at a spacing of 6-8 m and filled with top soil mixed with 10 kg FYM. The grafts are planted in the centre of the pits during June-September. Proper staking is required to avoid lodging and subsequent breakage at graft joint. Thatching or providing shade with coconut leaves and thorough mulching of basins after the cessation of monsoon season are essential to avoid mortality of grafts.

### 3.4 Training and manuring

Jack trees are trained to a single stem, early side branches should be removed so that a uniform smooth trunk develops for a height of 1.5 – 2 M and then side branches should be permitted to arise. The flower buds appear on trunk which should be kept free of vegetative growth. The nutrients should be applied as detailed in Table 2.

**Table 2. Requirement of manures and fertilizers for jack fruit**

Manure / Nutrients	1 year after planting (Kg/plant)	Annual increase (Kg/plant)	5 <sup>th</sup> year onwards (Kg/plant)
FYM	10 kg	10 kg	50 kg
N	0.150	0.150	0.750
P	0.080	0.080	0.400
K	0.100	0.100	0.500

The fertilizers are applied during rainy season. If irrigation is available they can be split into two doses and applied twice in a year *ie* during June –July and September – October. The manures and fertilizers can be applied in a circular trench taken 50-60 cm away from the trunk.

### 3.5 Irrigation

Though jack is cultivated under rainfed conditions, it is very sensitive to drought. Hence irrigation should be given depending on the type of soil, season *etc.* so that, there should not be any moisture stress especially during flowering and fruit set. Similarly too much of soil moisture will affect the quality of fruit. The carpels will develop an insipid taste when there is excess soil moisture.

### 3.6 Intercultivation

During the pre-bearing age pulses can be raised as intercrop and dried leaves can be spread below the trees to serve as a mulch for moisture conservation. As the trunk increases in size, the active buds of female inflorescence develop from the trunk as well as from main scaffold branches, this type of bearing habit is called ‘cauliflorus’.

These fruit buds should be protected from any possible damage by rubbing of body of the stray cattle such as buffaloes through spreading dried thorny bushes. This is very essential especially when there is no proper fence in the fields.

### 3.7 Plant protection

#### 3.7.1 Pests

##### **Brown weevil: (*Ochyromera artocarp*)**

It bores into the tender buds, shoots and fruits.

##### **Management**

Destroying fallen fruits and buds, collection and destruction of grubs and adults and spraying the trees with monocrotophos (0.035 %)

#### 3.7.2 Diseases

##### **Fruit rot: (*Rhizopus artocarp*)**

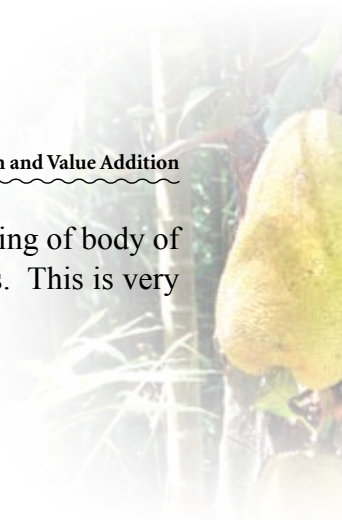
It causes premature fall of young fruits due to rotting and may result in heavy loss in yield under very humid conditions.

##### **Management:**

Spraying Dithane M.45 (0.2 %) or Bavistin (0.05 %) or Fytolan (0.2 %) at 15 days interval during fruit growth.

### 3.8 Harvest and yield

Normally jack starts producing fruits from 7<sup>th</sup> - 8<sup>th</sup> year onwards. Grafted plants start to yield from 4<sup>th</sup> - 5<sup>th</sup> year itself. In Singapore jack, even seedlings start bearing from 3<sup>rd</sup> year. Normally the fruits will be available from March to June. In higher elevation harvest extends upto September. Even in plains certain genotypes bear an off season crop during October - December. The yield ranges from 20 to 100 fruits / tree. The fruit weight varies from 10 to 30 kg.





## 4. Status and scope for jack fruit in Goa

Goa is blessed with a natural wealth of jack trees. They are found abundantly in the Western ghats areas of Goa. It forms a part of backyard garden and an inevitable component of *kulagars*, the traditional gardens inherited from generation to generation with areca nut as a main crop. The trees are also naturally found as a component in natural vegetation along with kokum, yams, phalsa *etc* . Both firm fleshed (*kappa*) and soft fleshed (*rassal*) jack trees are available in Goa. The fruit size varies from mere 3 kg to 20 kg. There are light green, yellow and even black fruited trees. The bulb size varies from 4 cm to 10 cm long; light cream to deep orange in colour; insipid to very sweet with varying range of acidity in the flakes. All these trees flower after the monsoons and give fruits from April-May onwards. But most of the trees bear fruits in peak during June-July. Mostly these fruits are not harvested and hence fall on ground and rot. While fresh consumption of jack bulbs is limited, processing and value addition is also negligible. In Konkani cuisine, immature and mature jack fruits are relished in various forms of dishes. But the half ripened and ripened fruits are mostly fed to cattle. It has been reported to increase milk yield of cattle. Thus, the full potential of jack fruit has not been realised by the local folk of Goa. The huge post harvest loss of the fruits paves way for loss of nutrients in the fruit that would otherwise nourish the consumers. Thus, jack fruit is a commercially unexploited fruit and there exists no awareness among the farmers about its potential.

The jack fruit trees naturally exist in the farm lands and in secondary forest regions. They produce fruits only with the blessings of nature and there is no human intervention. Therefore, by default, they are organic produces. Trading the fresh fruits (*kappa*) as organic jack to *mundies* in nearby cities like Mumbai and Pune will fetch good profit. The immature fruits can be sold in ready to use chopped form, packed in LDPE pouches, as in case of mushroom. This product will be in good demand even in Goan market. The mature bulbs can be blanched and packed for sale as vegetable in the super markets. The pulp of ripe fruits (*rassal*) fruits can be preserved in tins and sold in Indian markets and also to ethnic population in international markets. Besides this, a number of value added products can be prepared from all stages of maturity of a jack fruit. And these products have got a wide range of keeping quality and market.



## 5. Value addition in Jack fruit

Jack fruit has got great potential for value addition. More than 100 items can be prepared from jack fruit right from immature stage to well ripened stage. Each item has its own virtues in terms of taste, preference, keeping quality *etc.* A glimpse of the potentiality of the fruit for processing and value addition is as follows:

**Table 3. Potentiality of jack fruit for value addition**

S. No	Stage of fruit	Items that can be prepared	Remarks	Type suitable
1	Immature	Culinary preparations	Fresh consumption	Both firm and soft
2		Cutlets	Fresh consumption	Both firm and soft
3	Half mature	Pickle	Can be preserved	Both firm and soft
4		Cutlets	Fresh consumption	Both firm and soft
5		Pulao/ Biryani	Fresh consumption	Both firm and soft
6	Fully mature	Papad	Can be preserved	Firm type preferred
7		Cutlets	Fresh consumption	Both firm and soft
5		Chips	Can be preserved	Firm type preferred
6		Pakoda	Fresh consumption	Both firm and soft
7	Well Ripened	Pulp (Base material)	Can be preserved	Both firm and soft
8		Halwa	Can be preserved	Both firm and soft
9		Gulab Jamun	Fresh consumption	Both firm and soft
10		Sweet vada	Fresh consumption	Both firm and soft
11		Miniappam (Unniappam)	Fresh consumption	Both firm and soft

12		Leather	Can be preserved	Both firm and soft
13		Jam	Can be preserved	Both firm and soft
14		Custard	Fresh consumption	Firm type preferred
15		Wine	Can be preserved	Both firm and soft
16		Squash	Can be preserved	Both firm and soft
17		Kheer/Payasam	Fresh consumption	Both firm and soft
18		Mocktail	Fresh consumption	Both firm and soft
19		Cake	Fresh consumption	Both firm and soft
20	Seeds	Culinary preparations	Fresh consumption	Both firm and soft
21		Pakodas	Fresh consumption	Both firm and soft
22		Kheer/Payasam	Fresh consumption	Both firm and soft
23		Starch flour	Can be preserved	Both firm and soft

***Immatured jack fruit******Half matured jack fruit******Fully matured jack fruit******Well ripened jack fruit bulbs******Jack fruit seeds***

## 6. Recipes

Jack fruit is a potential raw material for value addition. Several delicious products can be made out of jack fruit right from immature fruit to seeds. The recipes of few items that can be made out of different stages of jack fruit are furnished below:

### 6.1 Items that can be prepared out of immature jack fruit

#### 6.1.1. Ready to cook tender jack

##### Ingredients

Jack fruit (tender/immature)	- 1 kg
Sodium hypochlorite	- 25-50 g
Sterile water	- 2l

##### Method

- 🌀 Select good quality tender jack
- 🌀 Remove outer peel using a clean knife
- 🌀 Wash with sterile water with 10 % sodium hypochlorite
- 🌀 Cut the treated fruit into small pieces
- 🌀 Blanch the pieces for 3 minutes in hot water
- 🌀 Pack the pieces in LDPE bags using hand wrapper
- 🌀 It can be stored below 18° C for 10 days



Courtesy: [www.thesmilearchitects.com](http://www.thesmilearchitects.com)

### 6.1.2 Tender Jack Bhaji (South Indian style)

#### Ingredients:

Jack fruit (tender/immature)	- 250 g
Green chillies	- 5 to 6
Mustard seeds	- 2 teaspoon
Asafoetida	- 1 teaspoon
Curry leaves	- 10-15 leaves
Coconut (Grated)	- 1 table spoon
Jaggery	- 10 g
Salt	- to taste
Oil	- 20 ml

#### Method:

- Heat oil in pan
- Season with mustard seeds. After they burst, add asafoetida, curry leaves, followed by green chillies and stir well till fried
- After the above get fried well, add finely chopped jackfruit pieces, coconut, jaggery and salt to taste
- After the jack fruit pieces get cooked well, it can be consumed.



Courtesy: [www.curryworld.worldpress.com](http://www.curryworld.worldpress.com)



### 6.1.3 Tender Jack Bhaji (North Indian style)

#### Ingredients:

Jack fruit (tender/immature)	- 250 g
Cumin seeds	- 1 teaspoon
Red chilli powder	- 1 teaspoon
Coriander powder	- 2 teaspoon
Garlic	- 6-7 cloves
Ginger	- 1 inch piece
Onion (medium size)	- 1 (finely chopped)
Tomato puree	- 1/2 teaspoon
Oil	- 2 to 3 tablespoon
Salt	- to taste

#### Method:

- ☞ Heat oil in pan
- ☞ Deep fry the jack fruit pieces till golden colour, drain from oil and keep aside.
- ☞ Remove half oil from kadai. In the remaining oil, splatter cumin seeds.
- ☞ Add ginger garlic paste and then finely chopped onion to the oil.
- ☞ After it turns brown, add chilli powder, coriander powder and tomato puree. Cook well till oil leaves the paste.
- ☞ Add enough of water to get thick gravy. Then add the fried jack fruit pieces and required salt.
- ☞ Boil together till the jack fruit pieces turn tender
- ☞ Add garam masala, boil for few minutes, garnish with coriander leaves and serve hot.



Courtesy: [www.maayeka.blogspot.com](http://www.maayeka.blogspot.com)



## 6.2 Items that can be prepared out of half matured jack fruit

### 6.2.1 Jackfruit Pickle (North Indian type)

#### Ingredients

Jack fruit (half matured)	- 1 kg raw
Salt	- 100 g
Chilli Powder	- 30 g
Fennel seeds	- 2 teaspoon
Fenugreek seeds	- 1 tea spoon
Asafoetida power	- 1 tea spoon
Mustard seeds	- 3 tea spoon
Onion seeds /Kalonji	- ½ teaspoon
Turmeric Powder	- 1 teaspoon
Vinegar	- 100 ml
Mustard Oil	- ½ litre

#### Method:

- ❧ Select a jack fruit that is not fully matured. Remove or scrap away the green outer rind. Then, cut the jackfruit into big pieces along with seeds.
- ❧ Cook the jackfruit pieces in boiling water until soft.
- ❧ Drain, apply salt and keep aside spread on a plate for complete drying.
- ❧ Heat 2-3 teaspoon of oil and roast the mustard, fennel, fenugreek and Kalonji seeds.
- ❧ Cool the roasted spices and finely powder them.
- ❧ Heat oil in a broad mouthed cooking pan, add turmeric powder, chilli powder, asafoetida. After putting off the stove, add the above ground mixture.
- ❧ After the oil cools down, add the dried jackfruit pieces which should be thoroughly free from moisture.
- ❧ Then add vinegar, mix well and store in a clean dry sterilized bottle.



### 6.2.2 Jackfruit Pickle (South Indian type)

#### Ingredients

Jackfruit (half matured)	- 1 kg
Garlic	- 100g
Ginger	- 100g
Green chillies	- 100g
Gram flour /Besan	- 50g
Red chilli powder	- 2 table spoons
Turmeric powder	- 1 tea spoon
Curry leaves	- 2-3 sprigs
Oil	- ½ l
Vinegar	- 200 ml
Asafoetida powder	- 2 tea spoon
Cumin seeds	- 1 table spoon
Fenugreek seeds	- 1 table spoon
Salt	- to taste
Sugar	- to taste

#### Method

- ☞ Select a jack fruit that is not fully matured. Remove or scrap away the green outer rind. Then, cut the jackfruit into big pieces along with seeds.
- ☞ Dry roast cumin and fenugreek seeds and finely powder them.
- ☞ Heat oil in a broad mouthed cooking pan and fry chopped garlic, ginger, green chillies and curry leaves
- ☞ Add jack pieces and fry for 10 mins
- ☞ Add salt, chilli powder, turmeric powder, gram flour and vinegar
- ☞ Remove from flame and add asafoetida and cumin – fenugreek powder
- ☞ Add sugar, mix well, cool and store in a clean dry sterilized bottle



## 6.3 Items that can be prepared out of fully matured unripe jack fruit

### 6.3.1 Jackfruit cutlet

#### Ingredients

Jackfruit	- ½ kg
Onion	- 3 Nos
Green chillies	- 6 Nos
Pudina	- few leaves
Coriander leaves	- ½ bunch
Curry leaves	- 2-3 sprigs
Ginger	- ½ inch
Garlic	- 6 to 7 cloves
Garam masala	- 1 teaspoon
Ginger garlic paste	- 2 teaspoon
Gram flour	- 3 Teaspoon
Turmeric powder	- 1/2 teaspoon
Red chilli powder	- 1 teaspoon
Oil	- 500 ml
Salt	- to taste
Egg	- 2 no.
Bread crumbs	- Available in market (or) Make crumbs by beating 6 to 7 slices of bread in mixer



#### Method

1. Cut open mature unripe jackfruit. Remove bulbs and extract out the seeds.
2. Chop the bulbs into small pieces
3. Chop onion, garlic, ginger, coriander leaves, pudina and curry leaves into small pieces
4. Heat oil and fry onion followed by garlic, ginger, coriander leaves, pudina, curry leaves, green chillies and ginger-garlic paste. Then add jack fruit pieces. Allow it to cook till soft. Then, allow it to cool for 10 minutes.
5. Add garam masala, gram flour, red chilli powder, turmeric powder and salt to taste, to the above mixture.
6. Take egg white and beat.
7. Moisten your palm, make small balls of jack fruit cooked mixture, flatten the ball by gently pressing and dip in egg white
8. Roll it in bread crumbs
9. Deep fry in oil and serve hot.

### 6.3.2 Jack fruit papad

#### Ingredients

Mature /raw jack fruit bulbs	- 500 g
Salt	- 2 tea spoon
Black sesame or cumin seeds	- 2 tea spoon

#### Method

- ✎ Cut open mature unripe jackfruit. Remove bulbs and extract out the seeds.
- ✎ Boil the bulbs, drain well and grind into fine paste along with salt using mixer
- ✎ Mix ingredients like sesame or cumin seeds
- ✎ Flatten into layer of fine thickness
- ✎ Dry in trays of electric or solar cabinet drier/ by open sun drying
- ✎ Deep fry and serve





### 6.3.3 Masala papad

#### Ingredients

Raw jackfruit	- 500 g
Green chilli	- 6 no
Curry leaves	- 2 sprigs
Garlic	- 6 cloves
Ginger	- 1 inch
Cumin seeds	- 2 tea spoon
Salt	- to taste

#### Method

- ✎ Cut open mature unripe jackfruit. Remove bulbs and extract out the seeds.
- ✎ Boil the bulbs and grind into fine paste along with green chilli, ginger, garlic and curry leaves using a wet grinder / mixer
- ✎ Mix all the other ingredients like cumin seeds and salt
- ✎ Flatten into layer of fine thickness
- ✎ Dry in trays of electric or solar cabinet drier/ by open sun drying
- ✎ Deep fry and serve





### 6.3.4 Jack fruit Chips

#### Ingredients

Well matured jack fruit bulbs	- 1 kg
Salt	- to taste
Water	- to blanch
Oil	- 500 ml

#### Method

- ✎ Cut open mature unripe jackfruit. Remove bulbs and extract out the seeds
- ✎ Cut the bulbs in to shreds of 0.5 to 0.6 cm width, maintaining the length as much as the bulb
- ✎ Blanch the pieces in boiling water in which salt has been added for two minutes and allow to drain till completely dry
- ✎ Heat oil in a frying pan and fry the chips. Add 1-2 spoons of salt water in oil while frying.

*NB. Frying without blanching or over cooking results in hard chips*



### 6.3.5 Jack fruit Bajjas

#### Ingredients

Well matured jack fruit bulbs	- 500 g
Gram flour	- 250 g
Chilli powder	- 2 teaspoon
Turmeric powder	- 1 teaspoon
Pepper powder	- ½ teaspoon
Cumin powder	- ½ teaspoon
Salt	- to taste
Oil	- 500 ml

#### Method

- ✎ Cut open well mature unripe jackfruit. Remove bulbs and extract out the seeds. Cut one bulb into two pieces
- ✎ Add salt, chilli powder, turmeric powder, jeera powder and pepper powder to gram flour and mix well by adding water till medium consistency.
- ✎ Dip the fruit pieces into the batter
- ✎ Heat oil in frying pan and deep fry in hot oil till they turn golden brown.



### 6.3.6 Jack fruit pakodas

#### Ingredients

Well matured jack fruit bulbs	- 500 g
Onions	- 3 no.
Green chilli	- 8 no.
Coriander leaves	- half bunch
Curry leaves	- 2-3 sprigs
Gram flour	- 200 g
Chilli powder	- 2 teaspoon
Salt	- to taste
Oil	- 500 ml

#### Method

- ✍ Cut open well mature unripe jackfruit. Remove bulbs and extract out the seeds
- ✍ Shred the bulbs in to small pieces, add chopped onion, green chilli, curry leaves and coriander leaves.
- ✍ Add gram flour, salt and chilli powder to the above; mix well by adding water till required consistency.
- ✍ Make small to medium sized balls and deep fry in oil



### 6.3.7 Jack fruit xacuti

#### Ingredients

Jackfruit	- 1 kg
Oil	- 250 ml
Onion	- 200 g
Tomato	- 150 g
Turmeric powder	- 1 teaspoon
Chilli powder	- 20 g

#### Preparation of Garam Masala

##### Ingredients

Coriander seeds	- 25 g
Fennel seeds	- 10 g
Cloves	- 15 no.
Pepper	- 15 no.
Cinnamon	- 2 inch piece
Cardamom	- one
Nutmeg rind	- 2 flakes
Nutmeg	- 1/4th
Salt	- to taste

#### Method to prepare garam masala

- ☞ Dry roast all ingredients required for garam masala and powder them for later use.

#### Preparation of wet Masala

##### Ingredients

Coconut (grated)	- 1 full (medium size)
Chopped onion	- 100 g
Garlic	- 10 pods
Poppy seeds	- 1 teaspoon
Tamarind	- Small lemon size

#### Method to prepare wet masala

- ☞ In a pan, heat oil, add 100 g of onion, garlic pods and fry till golden brown. To it, add grated coconut and fry till light brown followed by poppy seeds and keep aside.
- ☞ Grind fried coconut, onion and garlic with tamarind into smooth paste using water.



### Method to prepare Xacuti

- ❧ Peel jackfruit and make into big pieces (like chicken pieces) and blanch in water for 5 mins
- ❧ Heat oil and fry jack fruit pieces till golden brown and keep aside.
- ❧ In a vessel, heat oil, fry 100 g of finely chopped onion till brown. Then, add 100 g of chopped tomato and fry well.
- ❧ To this, add garam masala powder, chilli powder and then add fried jack pieces,
- ❧ Mix well and then add the coconut based wet masala and turmeric powder. Stir well and cook for 10 mins.
- ❧ Garnish with chopped coriander leaves and serve with hot rice or roti.

### 6.3.8 Jack fruit Biryani

#### Ingredients:

Jack fruit	- unripe 750 g (500 g with seeds and 250 g without seeds)
Onions	- 200 g
Green chilies	- 4 no.
Ginger	- ½ inch piece
Garlic	- 7-8 pods
Oil	- 200 mg
Coriander leaves	- small bunch
Salt	- to taste
Lime	- 1 no.
Rice	- 500 g

#### Preparation of Garam Masala

##### Ingredients

Coriander seeds	- 15 g
Cloves	- 6 or 7
Pepper	- 10 no.
Cumin	- 1 teaspoon
Black cuiun	- ½ tea spoon
Cinnamon	- 2 no.
Cardamom	- 1 no.
Red chili	- 5 no.



### Method to prepare garam masala

- ❧ Dry roast all ingredients required for garam masala and powder them for later use.

### Method to prepare jack fruit biryani

- ❧ Peel jack and separate out 500 g of bulbs as big pieces along with seeds. Besides this, take 250 g of bulb after removing seeds and shred or cut them into 2- 4 pieces
- ❧ Fry the shred pieces into chips.
- ❧ Blanch the bigger pieces in hot water for 5 minutes and keep aside.
- ❧ Chop onion and keep aside
- ❧ Grind green chillies, ginger, garlic into smooth paste
- ❧ Boil water and cook rice. Just when it splits, drain water, add salt, 2 teaspoon oil and keep aside
- ❧ In a pan, heat oil, add ginger, garlic and green chilli paste, onion and fry till golden brown.
- ❧ Add 500 g of blanched jackfruit pieces and fry till soft
- ❧ Add garam masala powder, cooked rice, salt, lemon juice and stir well
- ❧ Garnish with golden brown onion, coriander leaves and chips (fried of jack fruit)
- ❧ Serve hot with curd.



## 6.4 Items that can be prepared out of well ripe jack fruit

### 6.4.1 Jack fruit pulp (Basic recipe)

#### Ingredients

Jackfruit pulp	- 1 kg
Jaggery	- 1 kg
Ghee	- 200 g
Water	- 1 l

#### Method:

- ✍ Cut open well ripe jackfruit. Remove bulbs and extract out the seeds.
- ✍ Boil the ripe bulbs with minimum required water till they turn soft.
- ✍ Drain the excess water and grind the bulbs into a smooth pulp using mixer
- ✍ Prepare jaggery syrup by dissolving one kg of jaggery in one litre of water.
- ✍ After the syrup boils add jack fruit pulp and ghee
- ✍ Mix well and stir continuously till the pulp is thick in consistency



### 6.4.2 Jackfruit Halwa

#### Ingredients

Jack fruit pulp (Basic recipe)	- 200 g
Water	- 1 cup
Ghee	- 1/2 cup
Sugar	- 1 cup
Cashewnuts	- 10 no.
Maida	- 1 teaspoon

#### Method:

- ☞ In a broad vessel with thick base, add sugar, basic recipe, water and maida and mix well. When it starts boiling, add cardamom, ghee roasted cashewnut and ghee
- ☞ Stir till it thickens to consistency of halwa
- ☞ Apply ghee to tray /plate and spread.
- ☞ Allow it to cool, cut and serve.



### 6.4.3 Gulab Jamum

#### Ingredients

Jack fruit pulp (Basic recipe)	- 5 tea spoon
Maida	- 2 tea spoon
Milk powder	- 2 tea spoon
Ghee	- 1 table spoon
Cardamom powder	- 1 teaspoon
Sugar	- 250 g

#### Medhod:

- Add maida and milk powder to basic jack fruit pulp
- Add 2-3 drops of vanilla essence and cardamom powder and make smooth dough
- Make sugar syrup by adding 250 g of sugar in 250 ml of water. After the syrup boils, simmer the flame and leave for 5 mins to get the required thin consistency sugar syrup
- Make small balls of dough, deep fry in ghee and soak in sugar syrup.





#### 6.4.4 Jack fruit unniyappam (mini appams)

##### Ingredients

Jack fruit pulp (Basic recipe)	- 250 g
Rice flour	- 250 g
Black sesame	- 50 g
Cardamom powder	- 2 tsp
Coconut	- 1/2 (finely chopped into cubes)
Salt	- 1/2 to 1 teaspoon

##### Method:

- 🌀 Fry the finely chopped coconut cubes/ pieces in ghee
- 🌀 Add rice flour, sesame seeds, cardamom powder, roasted coconut pieces and pinch of salt to basic recipe.
- 🌀 Mix well the above ingredients in to a smooth dough, without adding water
- 🌀 Roll into small balls and deep fry in oil.





### 6.4.5 Jack fruit sweet vada

#### Ingredients

Jack fruit pulp (Basic recipe)	- 250 g
Maida flour	- 250 g
Baking powder	- 1 tsp
Sesame seeds	- 50 g
Cardamom powder	- 2 tsp
Salt	- ½ to 1 teaspoon

#### Method:

- ☞ Add maida flour, sesame seeds, cardamom powder, baking powder and pinch of salt to basic recipe.
- ☞ Mix all the above ingredients in to a smooth dough, without adding water
- ☞ Roll into balls, flatten on a greased surface, pierce a hole with finger and deep fry in oil



### 6.4.6 Jack fruit custard

#### Ingredients

Milk	- ½ litre
Custard Powder	- 4 teaspoon
Sugar	- 500 gms
Jackfruit bulbs	- ½ kg (ripe)

#### Method

- Add custard powder to milk, mix well and boil it.
- Add sugar to boiling milk and boil for few more minutes
- After the milk cools to room temperature, refrigerate it for 4-5 hours / till the required semi solid consistency is reached.
- Cut ripe jack fruits into small pieces, add to the custard and serve



### 6.4.7 Jackfruit wine

#### Ingredients

Jackfruit (ripe)	- 1 kg
Sugar	- 500g
Water	- 1 l
Yeast	- ½ teaspoon
Cinnamon	- 2 inch bark
Poppy seeds	- 10 no.
Cardamom	- 2-3 no.
Star anise	- 1 no.
Cloves	- 2-3 no.

#### Method

- ✎ Cut open well ripened jackfruit. Remove bulbs and extract the seeds.
- ✎ Cut the well ripened bulbs into small cubes
- ✎ Wrap all the spices in a muslin cloth and keep aside
- ✎ Boil and cool the water in a vessel with lid
- ✎ Add jack pieces, sugar, and the wrapped spices. Add yeast for fermentation.
- ✎ Close the lid
- ✎ Stir regularly for 20 days
- ✎ After 20 days, strain and store the wine in a clean glass bottle



### 6.4.8 Jack fruit kheer

#### Ingredients

Pulped ripe jack fruit bulbs	- 500 g
Rice flour	- 50-100 g
Coconut	- 1 no.
Milk	- 250 ml
Cardamom powder	- 1 teaspoon
Jaggery	- 200 g
Dry fruits	- 100 g
Ghee	- 100 g

#### Method of extracting coconut milk

- ❧ Grate the coconut
- ❧ Put the grated coconut into a mixer jar, add equal volume of warm water and run the mixer for 15 seconds
- ❧ It can be done in batches if the mixer jar is too small for the grated coconut
- ❧ Extract the coconut milk by squeezing the ground coconut. This is called the first coconut milk. Keep it aside. Pool all the first milk extracted if done in batches.
- ❧ Then, add the coconut residue that is left out after the extraction of the first coconut milk in to the mixer jar. Add equal volume of warm water and run the mixer for 10-15 seconds.
- ❧ Again repeat the extraction by squeezing the ground coconut residue. This is called the second coconut milk. Pool all the second milk extracted if done in batches.







### Method of making rice flour balls

- ❧ Make a smooth dough of rice flour with hot water
- ❧ Make small balls of the dough (roughly 1 cm diameter)
- ❧ Boil water in a pan.
- ❧ Drop the balls of rice flour
- ❧ The balls get cooked well in 10-15 mins
- ❧ Then, drain the excess water and keep the cooked balls aside.

### Method of making jaggery syrup

- ❧ Dissolve 200 g of jaggery in 200 ml of water thoroughly
- ❧ Cook in an open pan and stir
- ❧ Allow it to boil. After it boils, strain it through a metal strainer to remove any dirt or dust and keep aside
- ❧ The strainer should be washed immediately to avoid clogging of fine holes in the strainer


### Method of making kheer

- ❧ Cut open well ripe jackfruit. Remove bulbs and extract out the seeds.
- ❧ Cut the well ripe bulbs into small cubes. Blend it smooth with a mixer.
- ❧ In a pan add jack fruit pulp and the second coconut milk extracted
- ❧ Stir well for thorough mixing and boil to get a smooth blend of pulp and coconut milk. Add little water if required.
- ❧ After it starts boiling, add the cooked rice flour balls into this blend
- ❧ Add the first coconut milk extracted to it.
- ❧ Then add milk, cardamom and jaggery syrup that was already prepared
- ❧ Garnish with dry fruits and nuts roasted in ghee.



### 6.4.9 Jack Fruit Pudding

#### Ingredients




Ripened jack fruit	- 500 g
Sugar	- 250 g (or as required)
Cream/condensed milk	- 150 g
Milk	- 500 ml
China grass	- 20 g
Vanilla essence	- 1 teaspoon

#### Method

- ✎ Cut china grass into small pieces. Add in a glass of water and keep it aside.
- ✎ Boil milk, sugar and the china grass water .
- ✎ Cook and pulp the well ripe jackfruit.
- ✎ Add the pulp to the milk mixture and stir on a slow flame till a thick custard consistency is formed. Add cream and essence.
- ✎ Cool in the fridge for about 2 hrs and serve.


### 6.4.10 Jackfruit Fritters

#### Ingredients



Ripe jack fruit	- 200 g
Maida	- 50 g
Corn flour	- 25 g
Sugar	- 1 tea spoon
Sesame seeds	- tea spoon
Cardamom powder	- ¼ tea spoon
Salt	- to taste
Oil	- 200 ml

#### Method

- 
- ✎ Cut ripe jackfruit bulbs into broad pieces.
  - ✎ Mix all the ingredients except oil into a thick batter.
  - ✎ Dip the jackfruit pieces in the batter.
  - ✎ Fry in the oil till golden brown and serve

### 6.4.11. Jack fruit squash

#### Ingredients

Well ripened jack fruit bulbs	- 1 kg
Pineapple	- 1 no
Sugar	- 3/4 cup
Water	- 100 to 150 ml
Citric acid	- 1 teaspoon

#### Method

- ✂ Cut open well ripe jackfruit. Remove bulbs and extract out the seeds.
- ✂ Cut the well ripe bulbs into small cubes.
- ✂ Boil 1 kg of pieces in water and then pulp into fine paste.
- ✂ Take 1 part of pulp, add water and mix thoroughly using mixer.
- ✂ Extract juice from pineapple and add to jack pulp in 0.5: 1 ratio.
- ✂ Prepare sugar syrup by boiling 250 g of sugar in 250 ml of water.
- ✂ Add sugar syrup to jack fruit pulp followed by citric acid.
- ✂ Add 700 mg of Potassium Meta bisulphite for 1 litre of squash.
- ✂ Cool and fill in glass bottles.



### 6.4.12 Jack fruit jam

#### Ingredients

Well ripened jack fruit	- 500 g
Sugar	- 350 g
Citric acid	- 1 teaspoon
Water	- as required

#### Method

- ✎ Cut the well ripe jack fruit into small pieces
- ✎ Boil the pieces with water and pulp into fine paste
- ✎ Add the jack fruit paste and sugar and cook on pan with little water, if required
- ✎ Add permitted food colour and citric acid to the mixture. Add one tablespoon of lime juice to the same (optional).
- ✎ Stir continuously till jam consistency
- ✎ Test for end point using ladle test.



### 6.4.13. Jack fruit leather

#### Ingredients

Well ripened jack fruit - 500 g

#### Method

- ✎ Cut the well ripened jack fruit into small pieces
- ✎ Pulp into fine paste
- ✎ Spread the smooth pulp as uniform layer on trays
- ✎ Dry using solar or electric cabinet drier. The leather can also be dried under direct sun light in plates or trays. It is dried till moisture is lost and starts coming out of the tray. If dried beyond this, it becomes brittle.
- ✎ After drying, cut into desired size and shape and pack in polythene pouches





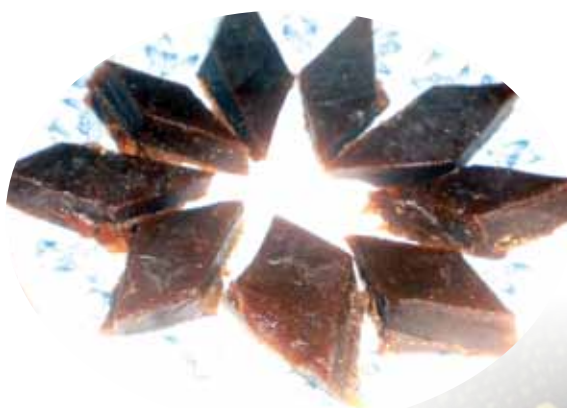
#### 6.4.14 Jack fruit chocolate

##### Ingredients

Jackfruit pulp	- 1 kg
Sugar	- 500 g
Milk powder	- 150 g
Butter	- 100 g
Cocoa powder	- 50 g

##### Method

- ✎ Cut the well ripened jack fruit into small pieces
- ✎ Pulp into fine paste
- ✎ Mix jack fruit pulp and sugar in a heavy bottom pan.
- ✎ Cook on flame till it reduces to 1/3rd volume
- ✎ Then add milk powder dissolved in 100 ml of hot water, followed by ghee and cocoa powder mixed in hot water.
- ✎ Mix well and stir on low fire till desirable consistency. One should be able to make balls by rolling on palm.
- ✎ Pour the mixture in a plate and roll it into chocolates
- ✎ Refrigerate for 2hrs and then pack individually in butter paper.



*Courtesy: Jack fruit festival, Sirsi, May 2013.*

## 6.5 Items that can be prepared out of jack Seed

### 6.5.1 Jack seed payasam / kheer

#### Ingredients

Jack seed	- 500 g
Jaggery	- 300 g
Coconut	- 1 no.
Cardamom	- 3 no.
Ghee	- 100 g

#### Method of extracting coconut milk

- ❧ Grate the coconut
- ❧ Put the grated coconut into a mixer jar, add equal volume of warm water and run the mixer for 15 seconds
- ❧ It can be done in batches if the mixer jar is too small for the grated coconut
- ❧ Extract the coconut milk by squeezing the ground coconut. This is called the first coconut milk. Keep it aside. Pool all the first milk extracted if done in batches.
- ❧ Then, add the coconut residue that is left out after the extraction of the first coconut milk in to the mixer jar. Add equal volume of warm water and run the mixer for 10-15 seconds.
- ❧ Again repeat the extraction by squeezing the ground coconut residue. This is called the second coconut milk. Pool all the second milk extracted if done in batches.



### Method of making jaggery syrup

- ❧ Dissolve 300 g of jaggery in 100-200 ml of water thoroughly
- ❧ Cook in an open pan and stir
- ❧ Allow it to boil. After it boils, strain it through a metal strainer to remove any dirt or dust and keep aside
- ❧ The strainer should be washed immediately to avoid clogging of fine holes in the strainer

### Method

- ❧ Cut open well ripe jackfruit. Remove bulbs and extract out the seeds.
- ❧ Boil the jack fruit seeds till they are cooked.
- ❧ Remove seed coat manually, cut in to small pieces and make a smooth paste using a mixer
- ❧ Boil the jack seed powder in second coconut milk extracted. Add water if required
- ❧ Add jaggery syrup prepared already
- ❧ Stir well and then add first thick milk of coconut
- ❧ Add dry fruits and nuts fried in ghee



### 6.5.2 Jack seed Burfi

#### Ingredients

Jack fruit seeds	- 25-30 no
Maida	- 100 g
Gram flour	- 150 g
Milk	- 200 ml
Sugar	- 500 g
Butter	- 150 g
Vanilla essence	- 1 tea spoon
Cardamom powder	- ¼ tea spoon
Pista crushed	- 1 table spoon

#### Method

- ✎ Cut open well ripe jackfruit. Remove bulbs and extract out the seeds.
- ✎ Boil the jack fruit seeds till they are cooked.
- ✎ Remove seed coat manually, cut in to small pieces and make a smooth paste using a mixer
- ✎ Add maida, gram flour and sugar to milk and mix well
- ✎ Into a pan add paste of jackfruit seed and the milk mixture and mix thoroughly
- ✎ Keep on the fire and keep on stirring till it becomes hard and roll into a ball in the hand
- ✎ Keep adding butter in small quantities while stirring
- ✎ Towards the end add vanilla essence, cardamom powder and pista
- ✎ When done pour the mixture into a greased pan. When cool cut into pieces



Courtesy: [www.showmethethecurry.com](http://www.showmethethecurry.com)



### 6.5.3 Jack seed pakodas

Well matured jack fruit seeds	- 500 g
Onions	- 3 no.
Green chilli	- 8 no.
Coriander leaves	- half bunch
Curry leaves	- 2-3 sprigs
Gram flour	- 50 g
Chilli powder	- 2 teaspoon
Salt	- to taste
Oil	- 500 ml

#### Method

- 🌀 Boil the jack fruit seed
- 🌀 Remove seed coat, cut in to small pieces and make powder in a mixer
- 🌀 Add chopped onion, green chilli, curry leaves and coriander leaves.  
Add gram flour, salt and chilli powder to the above; mix well by adding water till required consistency.
- 🌀 Make small to medium sized balls and deep fry in oil



## 7. Equipping the farmers for value addition in jack fruit

Smart ways of tapping the potential of jack fruit and thus realizing its entrepreneurial value is the need of the hour. Creating awareness among farmers, transforming them into traders of fresh fruit or processed products can certainly address this issue. This involves creating awareness and imparting trainings to the farmers of Goa on these issues. Besides this, capacity building of marginal farmers can also uplift their economic status and also attract youth towards agriculture. In this regard, ICAR Research Complex is carrying out the following activities.

### 7.1 Trainings imparted for empowering tribal folk of Goa for value addition in jack fruit

Infact, this programme was executed as a series of activities funded by Tribal Sub Plan Programme, Govt. of India. Initially, surveys were conducted in villages of Canacona, Quepem and Ponda talukas, where there are tribal folk and abundant jack fruit and kokum trees as well. During the visits, meetings with various tribal farmers' Self Help Groups were held; awareness was created about the significance of value addition in minor fruits of Goa. They were encouraged to attend the trainings that would be conducted in the institute.

#### 7.1.1 Capacity building activities

##### 7.1.1.1 Awareness training cum demonstration on Value addition in Jack and kokum fruits (3<sup>rd</sup> April 2013)

**An awareness training cum demonstration on Value addition in Jack and kokum fruits** was conducted at ICAR Research Complex for Goa on 3<sup>rd</sup> April 2013. This programme sponsored by Tribal Sub Plan, Govt. of India, was conducted exclusively for the benefit of tribal folk. It was attended by 25 participants from villages like Shirdona, Quitula, Podural, Valpoi, Pilar and Dongrim. Two experts *viz.*, Mrs. Sunetra Talaulikar, SMS (Home Science) and Mrs Nirmala Singh, Home maker, demonstrated various value added products to the participants. Different machineries like hand operated jack fruit cutter, hand operated chips cutter, kokum cutting machine, electric cabinet dryer and sealing machine were demonstrated during the training. The participants were also given hands on training to operate the same.

Then various value added products like jack fruit pickle, jack fruit chips, jack fruit bajjas, jack-pineapple RTS, jack fruit leather and kokum *sharbat* were method demonstrated by the experts during the day. There was active and enthusiastic participation by the trainees. During the plenary session, the feedback was strong and



***Inaugural session of the Training Programme***



***Participants of the Training Programme***



***Demonstration of value addition in Jack fruit by Expert Mrs Nirmala Singh***



***Active Participation of trainees during the programme***



***Participants of the Training Programme***



***Active Participation of trainees during the programme***

positive. Few participants wanted to take up processing in commercial scale for their livelihood enhancement. They were also keen to use the machineries for the same. Mrs Aruna Vishnu Wagh, who graced the occasion emphasized that the participants should make use of the technologies and processes demonstrated during the programme. She also stressed upon the importance of packaging. Likewise, Director of the institute addressed the gathering about the significance of processing, packaging and marketing of products.



### 7.1.1.2 Training cum demonstration on Value addition in Jack fruit (15<sup>th</sup> to 16<sup>th</sup> April 2013)

A training cum demonstration on Value addition in Jack fruit was conducted at ICAR Research Complex for Goa on 15<sup>th</sup> and 16<sup>th</sup> April 2013. This programme was conducted for the benefit of rural folk of Goa. It was attended by more than 100 participants from villages like Cotigaon and Gaondongrim (Canacona Taluka), Morpirla (Quepem), Dhava (Volpoi) and Aldona (Bardez). Three experts viz., Mrs. Sunetra Talaulikar, SMS (Home Science), Mrs Padmini Sivadasan, and Mr Sivadasan from Kerala demonstrated various value added products to the participants. Again all the machineries like hand operated jack fruit cutter, hand operated chips cutter and electric cabinet dryer were demonstrated during the training. The participants were also given hands on training to operate the same.

Preparation of jack fruit pulp was demonstrated first. This was used as base material to prepare various other products like Halwa, Gulab jamun, unniappam and sweet vada. Then fresh and ripe fruit was used to demonstrate products like dessert, kheer, jam, squash and wine. Mature but unripe fruits were used to demonstrate products like pakoda, cutlet, plain and masala papad. Half mature fruits were demonstrated for pickle making. Seeds were used for making pakodas and kheer. There was active and enthusiastic participation by the trainees.



*Value added products of jack fruit demonstrated during the programme*

During the plenary session, Mrs. Sunetra Talaulikar, SMS (Home Science), sought for feedback from the participants. She also encouraged them to clarify their doubts. The feedback was strong and positive. Few participants wanted to take up processing in commercial scale for their livelihood security. They were also keen to use the machineries for the same.





**Experts Mrs Padmini Sivadasan and Mrs Sunetra Talaulikar during Inaugural session**



**Method demonstration of value added products**



**TSP beneficiaries who attended the training cum demonstration**



**Active participation of team members**



**Hands on training to farmers**

### 7.1.1.3 A Refresher Training and Distribution of Processing Machinery for Value Addition in Jack and Kokum fruits (14<sup>th</sup> June 2013)

**A Refresher Training and Distribution of Processing Machinery for Value Addition in Jack and Kokum fruits** was conducted in the institute on 14<sup>th</sup> June 2013. On gaining interest and confidence on the subject from the above mentioned trainings, around 10 groups came forward to start Processing and Value addition of jack and kokum on commercial scale. On scrutinizing their applications followed by visits to their villages by our Institute committee, six groups were short listed for the same. The following Processing machinery and accessories were distributed to them at the institute.

**Table 4. Processing machinery and accessories distributed to TSP beneficiaries**

S. No	Name of Item	Cost per unit (Rs)	Number distributed	Total cost (Rs)
1	Kokum cutting machine	34312.00	6	205872.00
2.	Hand operated Jack fruit cutter	14000.00	6	84000.00
3.	Jack fruit cutter machine (for chips)	6187.00	6	37122.00
4.	Electric dryer	44437.00	6	266622.00
5.	Sealing machine	2600.00	6	15600.00
6.	Bajaj Wet Grinder	4175.00	6	25050.00
7.	Aluminium lid	2645.00	6	15870.00
8.	Aluminium Kadai	1559.00	6	9354.00
9.	S.S.Zara (Big)	189.00	6	1134.00
10.	S.S.Knife (Big)	310.00	12	3720.00
11.	Plastic drum (100 l)	700.00	24	16800.00
12.	Plastic Sheet for drying	14.00	120	1680.00
Total				<b>682824.00</b>
<b>(Rupees Six lakh eighty two thousand eight hundred and twenty four only)</b>				





*Processing equipments and accessories distributed to the Tribal Self Help Groups*



*Distribution Programme*



*Mr Vishnu Wag, Hon'ble MLA, St Andre Constituency giving away the kit*



*Mr Sripad Naik, Hon'ble MP, North Goa giving away the kit*



*Mr.Subhash Phal Dessai, Hon'ble MLA, Sanguem Constituency giving away the kit*

### 7.1.1.3 Installation cum demonstration training at Netravali, Sanguem (27<sup>th</sup> June 2013)

Followed by the distribution of machinery, a brief, **“Installation cum demonstration training”** was conducted in Netravali village of Sanguem Taluka on first priority as this group was a new entrant from the proposed Model village of Goa as per Govt of Goa programme. Training was conducted by Dr (Mrs) S.Priya Devi and Mrs.Sunetra Talaulikar for a group of 15 women. Value added products of jack fruit like squash, pickle, *bhajjas*, chips, *kheer* from seed and leather were demonstrated to them. Later on, an appropriate site for installing the machineries was selected.



*Training cum Demonstration to Tribal Self help Group at Netravali*



*Demonstration to Tribal Self help Group at Netravali*



*Active Participation of trainees during the programme*





## 7.2 A brief description of equipments and inputs distributed

The various machineries distributed to farmers groups are listed below. They are essential for processing the fruits into various value added products of good demand. The details of processing machinery distributed to the Self Help Group farmers are as follows:

### 7.2.1 Hand operated Jack fruit cutter

- ❧ To cut the whole jack fruit into pieces
- ❧ It is hand operated
- ❧ Blade dimensions: 135-150 mm on narrow side, 200-250 mm on wide side, blade thickness 3-5 mm
- ❧ Handle length: 600-700 mm
- ❧ Contact parts like blade and platform in food grade (SS)
- ❧ Frame work /body of MS



### 7.2.2. Jack fruit cutter machine

- ❧ To cut the bulbs into pieces
- ❧ Hand-operated
- ❧ Frame size 10" x 9.5" x 19"
- ❧ Capacity: 15-20 kg /hr
- ❧ All contact parts like cutter /blades *etc.* in food grade stainless steel material



### 7.2.3 Kokum cutting machine

- ❧ Mild Steel angle frame work
- ❧ Contact parts in food grade stainless steel material
- ❧ Capacity: 400-500 kg/hr
- ❧ 1HP single phase motor



#### 7.2.4. Electric Cabinet dryer

- ❧ Outer body –Mild Steel
- ❧ Inner body – Stainless Steel
- ❧ Size H-25-35”, W-25-30”, D-20-25 “
- ❧ Number of trays -14 no.
- ❧ 6-7 no. as perforated or mesh trays, 6-7 as plain trays
- ❧ Tray size: 18” x 20” x 0.75”
- ❧ Thermostat for temperature setting
- ❧ Air circulation fan-0.5 hp motor
- ❧ 200-250 V single phase, 1500-2000 W.
- ❧ All contact parts in food grade (Stainless Steel) material



#### 7.2.5 Sealing machine

- ❧ PP sealing machine
- ❧ Electric operated





### 7.2.6 Wet grinder

- ❧ Electric operated
- ❧ Capacity: 3 liters / batch
- ❧ To grind the jack bulbs or seeds into pulp for various products



The equipments and other inputs have been distributed to six potential tribal Self Help Groups. They will be guided and tracked in the coming years to ensure progress and to facilitate processing and marketing of the products.





## 8. Future thrust

Jack fruit or Phanos or fanos (*Artocarpus heterophyllus* Lam) a member of the Moraceae family is an important fruit in India. Jackfruit which is believed to have originated in the Western Ghats is considered as the poor man's crop in India. Jack trees are grown in the homestead garden of Goa without any management practices. Absence of organised marketing strategies among the growers results in wastage of major quantity of the fruits produced in Goa. Nevertheless there have been efforts to produce the traditional home made products of raw and ripe jack during the season. Promotion of scientific means of post harvest handling, primary processing and preservation of jackfruit is essential so that the raw materials are made available to consumers and entrepreneurs round the year. The market potential of jackfruit can be better exploited if fruits are made available to the consumers in a ready to eat or ready to cook form throughout the year.

Jack fruit produced in Goa show very high variability in shape due to propagation of Jackfruit trees through seeds. Even though trees are broadly classified as “*Kappa*” and “*Rassal*” based on fruit texture, no serious efforts have been taken to identify and propagate better germplasm for the State. Efforts should be made for identifying and propagating germplasm that can be specifically identified for vegetable purpose, table purpose and processing purposes in Goa.

Technologies for post-harvest handling, preservation of fresh fruits and preparation of primary processed products that can be used for production of other products need to be promoted and commercialized for ensuring availability of the fruit throughout the year and for avoiding the wastage of this wonderful fruit.

Emphasis should be given in imparting trainings to more and more farmers of Goa on value addition in jack fruit. At the same time, capacity building of marginal farmers in processing such native fruits of Goa should also be focussed upon. Establishment of strong forward and backward linkages, facilitating proper packaging, labelling and marketing, including FPO certification should also be ensured.

## Appendix

1.	Asafoetida	Hing
2.	Black Cumin	Shahi Jeera
3.	Cardamom	Elaichi
4.	Chilli powder	Mirchi powder
5.	Cinnamon	Tejpatta
6.	Clove	Lavang
7.	Coriander	Kothimbir
8.	Cumin	Jeera
9.	Curry leaves	Kharripatta
10.	Fennel	Saunf
11.	Garlic	Lasoon
12.	Ginger	Adrakh
13.	Gram flour	Basan
14.	Jaggery	Gud
15.	Lime	Limbu
16.	Mustard	Sarson
17.	Nutmeg	Zaiphal
18.	Pepper	Kalimirchi
19.	Sesame	Til
20.	Tamarind	Imli
21.	Turmeric	Haldi





## **ICAR RESEARCH COMPLEX FOR GOA**

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