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Value added products from jackfruit (*Artocarpus heterophyllus*) fruit

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Abstract

The jackfruit (*Artocarpus heterophyllus*), is known as the largest tree-borne fruit in the world. It belongs to family *Moraceae*. *Ar-tocarpus* is the third largest genus in the *Moraceae* family. Several economically important species such as breadfruit (*A. altilis*) and jackfruit (*A. heterophyllus*) that is cultivated throughout the tropics. Origin of it is believed indigenous to the rainforests of the West-ern Ghats. Jackfruit is known as the national fruit of Bangladesh and Sri Lanka and the state fruit of the Indian states of Kerala and Tamil Nadu. Kerala is the largest producer of jackfruit in the world and is an important staple food for certain sections of the people in these areas. The tree bears annually 60-75 fruits, each weighing 20 to 30 Kg. Raw, ripe and unripe jack fruit is used in different cuisines. It is a rich source of vitamin A, C and minerals like calcium, iron, sodium, potassium etc.

Keywords: Jackfruit; minerals; vitamin C

Introduction

Jackfruit can be used to develop various ethnic food products, but a major portion of it is being lost as waste due to ignorance of sufficient processing techniques. In this cue, we can implement new techniques that could increase the shelf-life of jackfruit product by various processing techniques, rendering its availability in off-seasons and also by reducing wastages. Jackfruit is a highly nutritious food and products developed from it could add to the list of varieties of flavour.

Jackfruit can be preserved by applying various techniques like drying, freezing, canning or by converting it into various products. The main advantage of jackfruit is that all parts of it can be used. Jackfruits are rich in carbohydrate mainly starch, protein, vitamins and minerals. Due to its high carbohydrate content, it is considered a staple food in some areas. Jackfruit is also considered as an immediate energy booster due to the presence of simple sugars like fructose and sucrose. Though carbohydrate contributes a major part of jackfruit, it has a low glycemic index due to its high fibre content. Fibre helps to maintain normal bowel movements, lower blood pressure, and prevent cancer. These fibers also offer protection to the mucous membrane by driving away from the carcinogenic chemicals from the large intestine.

Jackfruit is an excellent source of vitamin C. It is a powerful antioxidant and helps to strengthen the immune system. Jackfruit is also rich in phytonutrients which have anti-cancer and anti-ageing properties. Vitamin C, flavonoids and phytonutrients boost skin and immune function and help to cure ulcers and indigestion. Jackfruit helps to fight wrinkles. Its consumption helps in getting a glowing complexion and flawless skin.

Vitamin A present in jackfruit helps to maintain a healthy eye and skin. It also helps to prevent vision-related problems. It contains no saturated fatty acid and cholesterol making it a healthy fruit.

Potassium content in the fruit has been found to be helpful in the lowering of blood pressure and thus reducing the risk of heart attack as well as strokes. Extract of boiled jackfruit root has been found to control asthma. 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. Jackfruit also contains iron which helps to prevent anaemia and also helps in proper blood circulation in our body. Jackfruit maintains a healthy thyroid because the fruit is loaded with copper, an important mineral, which plays an important role in thyroid metabolism, especially in hormone production and absorption.

Several studies have reported various health benefits of jack-fruit, including its role in the management of type 2 diabetes and obesity.

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In one study, it is mentioned that the extracts of jackfruit significantly improved glucose tolerance in both normal and diabetic patients. Jackfruit has also been found to be having anti-ulcer and anti-inflammatory effects.

Varieties of jackfruit

Various varieties are found around the world. The genus *Artocarpus* comprises about 50 species; most of them are native to Asia. 15 of them produce edible starchy fruit. The most important species are:

Breadfruit - *A. altilis*

Jackfruit - *A. heterophyllus*

Marang - *A. odoratissimus*

Champedak - *A. integer*

Entawak - *Artocarpus ansiophyllus*

Kwai muk - *A. hypargyrea*

Pudau - *A. kemandu*,

Lakoocha - *A. lakoocha*

Butong - *A. nitidus*

Monkey jackfruit - *A. rigidus*

Pingan - *A. sarawakensis*

Pedalai - *A. sericicarpus*

Mainly two varieties of jackfruits are available in South India: koocha and varikka. Fruits from the koozha variety have small, fibrous, soft, mushy and very sweet bulbs whereas bulbs from varik-ka are firm. Fruits of the koozha variety are mainly used in the raw state to make various dishes. Varikka variety is the commercially important one with high-quality fruits and is preferred in processing industries. Colour of the bulbs ranges from off-white to yellow to dark orange. Fruits with red-fleshed bulbs are also reported.

Some of the biochemical parameters can be assessed for maturity indices is the total sugar content, Total soluble solids, percent moisture and dry matter present. Quality of the product can be judged by sensory evaluation of peel colour, pulp colour, texture, flavour, sweetness, taste and overall acceptability. Physico-morpho-logical characters can be determined by measuring the fruit weight, circumference, length and diameter of fruit, weight of the bulb and seed, number of bulbs, spine spreading, spine density and flatness.

Value-added products from jackfruit

More than 100 types of products can be developed from jackfruits.

Dehydrated Raw jackfruit slices

Dehydrated Raw jackfruit slices can be obtained by sun-drying or mechanical drying. Sun drying is a simple, cheaper and age-old preservation technique. While comparing with mechanical drying it has some drawbacks. The quality of the product can be maintained for a long period by opting mechanical drying methods. For making dehydrated jackfruit slices, fresh raw jack fruit bulbs were selected, cleaned and sliced. The slices are dried with or without sulphuring. Bhatia., *et al.* mentioned that the quality of the product can be improved by treating the bulbs with 0.1% potassium meta bisulphite solution for 30 minutes. The bulbs are then subjected to blanching. It is done by dipping the slices in hot boiling water for 3 minutes. They are then dried, cooled and packed. This can be used to make various products after rehydration.

Dehydrated Raw jackfruit flour

Dehydrated Raw jackfruit flour is a processed product from raw jackfruit bulbs. Recent researches increase its popularity

due to low glycemic index and good fiber content. This flour can be used as a substitute for rice and other cereal flours. This can be mixed with so many traditional recipes and can make numerous value-added products like breakfast cereal products, bakery products, snacks etc.

Jackfruit mixture

It is snack food. For making jackfruit mixture raw jackfruit is selected. The interesting fact behind the preparation of jackfruit mixture is that all parts of the fruit are used to make the product so-called the name jackfruit mixture. The processing involves taking the whole fruit except the green skin with spines. Clean and cut the white portion beneath the skin into small pieces. Slice the fresh bulbs. Separate and keep the fibers aside. After preliminary processing, fry each portion separately in hot oil and cool to room temperature. Combine all the portions in a vessel and mix with salt, red chilli powder, fried garlic and curry leave and asafetida powder. Decorate with fried peanut and roasted gram. Pack and store it in an airtight container.

Jackfruit candy

A fruit is impregnated with cane sugar or glucose and subsequently drained and dried is called a candied fruit. The manufacturing principle of jackfruit candy is osmotic dehydration. Osmotic dehydration is a hurdle technology which combines both the effect of preservation by high sugar content and high-temperature drying technique. Slightly ripe jackfruit bulbs are the raw material for jackfruit candy. Overripe fruits should be avoided. Firstly, the bulbs are cleaned and dipped in sugar solution having 65-700 brix followed by draining and drying in a mechanical drier at 60-62 °C till it is completely dried. It is an intermediate moisture food product. Pack and store it properly.

Jackfruit squash

It is prepared by mixing sugar, water and citric acid to the pulp in appropriate proportions. It contains 25% pulp and 1.5% acidity. A total soluble solids (TSS) content of 45° brix is maintained. Sugar, citric acid and water are mixed and heated to make sugar syrup. It is then filtered and blended with strained jackfruit pulp to get squash.

Jackfruit jam

Jam is prepared by boiling the fruit pulp with sugar to a thick consistency. The extracted pulp is mixed with sugar, acid and pectin and heated until 68.5° brix is obtained. The endpoint of the product can be determined by using a hand refractometer. When the endpoint is reached jam is filled hot in sterile bottles. Store the jars in a cool place.

Jackfruit jelly

Manufacture of Jelly is almost similar to jam but the main difference is that jelly is prepared from strained or clarified fruit extract. The clear extract is boiled with sugar and pectin to get a clear, transparent, well-set jelly. Jelly has a TSS of 65° brix.

Jackfruit leather

Bulbs of ripe fruits are selected, cleaned and made into a fine pulp. The pulp is then transferred into a tray to form a thin layer. It is then dried to form a sheet. This process is repeated until the desired number of layers is obtained. After complete drying, it is separated from the tray and cut to pieces or can be rolled.

Jackfruit chocolate

Jackfruit chocolate is a confectionery. It is prepared by concentrating milk, sugar, cocoa powder and jackfruit pulp in an open kettle under low flame. Ghee is added to the mix when the product becomes concentrated to desired consistency while the mix begins to separate from the pan. Transfer the mix into a tray and cool it. Refrigerate for one hour and cut it into desired size and shape. Pack in decorated aluminium foil paper.

Jackfruit ganache

It can be prepared from dark, milk or white chocolate. Heat jack-fruit pulp and glucose syrup together. Temper the chocolate and mix with heated fruit pulp. Cool the mix and use it as a filling in chocolate or flavourings in desserts.

Jackfruit cake

The cake is a baked product. Baking is a dry heat cooking method in an oven. Jackfruit cake is made by blending the pulp obtained from fully ripened bulbs with cake batter. The major ingredients used in cake are maida, sugar, butter/margarine/refined oil and eggs. Baking powder is also used as the leavening agent. Sieve maida and baking powder together to mix well and keep aside. The cake batter is prepared by beating fat and sugar in a bowl until it becomes creamy. To this add eggs one by one and beat well. Add flour mixture and finally jackfruit pulp. Transfer this mix into an oiled baking tray and bake in a preheated oven at 180 °C for 30 minutes.

Jackfruit muffins

It is also a baked product prepared by blending all-purpose flour, sugar, egg, fat, milk, jackfruit pulp, and baking powder. Jack-fruit preserve and cake jeera can also be included in the recipe for decorative and flavouring purpose. Method of preparation is almost similar to cake. After the proper beating, the batter is transferred into muffin pans and bake in a preheated oven at 180 °C for 15-20 minutes. Cool and pack properly

Jackfruit honey

Jackfruit honey is honey like product with jackfruit flavour. The fully ripened fruit is selected for this purpose. The other major ingredients used in jackfruit honey are sugar and citric acid. For making honey cleaned jackfruit bulbs and sugar is placed into a jar as alternate layers. Pour some citric acid over it. Allow resting for 9 days. After 9 days strain it and remove the pieces. Boil the clear juice in an open kettle and concentrate until it reaches honey-like consistency. Cool and store it in a sterile bottle.

Jackfruit pudding

The method of preparation of jackfruit pudding is similar to other puddings. The main ingredients include milk, sugar, gelatin and jackfruit pulp.

Jackfruit wine

Wine is a fermented beverage. After preliminary processing, the fruit is mixed with water, sugar and yeast for fermentation. Yeast utilizes sugar and produces ethyl alcohol and carbon dioxide.

**Conclusion**

During wine production, *Saccharomyces cerevisiae* is used as the culture. After mixing, the contents are transferred into an earthen jar and incubated under anaerobic conditions at ambient temperature for 7-9 days. After first fermentation separates the residues from the fermented juice by filtration and allows to stand for 21 days without any disturbances. During this period complete fermentation occurs and very fine residues will settle down. The clarified juice is then pasteurized and bottled.

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