POST HARVEST

ASSINMENT NUMBER 1

**Jackfruit article**

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**ABSTRACT:**

**INTRODUCTION:**

**Botanical Name:**Artocarpusheterophyllus (Moraceae)

**Common Name:** Jackfruit

**JACKFRUIT:**

The NT has several commercial growers of Jackfruit sending many tonnes to interstate markets. To counter the latex when cutting the fruit, use a little vegetable oil on your hands and the knife to stop it from sticking

**Distribution:** Jackfruit is believed to have originated in India gradually spreading to South East Asia and now widely cultivated in tropical regions throughout the world.

**Australian Distribution**: Mostly tropical regions of Queensland, Northern Territory and West Australia.

**Description**: Jackfruit is a medium sized evergreen tree that ranges from 9-12metres, with deep green, shiny leaves. They are monoecious (male and femalere productive organs borne on separate parts of the plant), with very small flowersgrouped into tightly packed inflorescences. The fruit are the largest of all cultivated fruits, and can weigh up to 50kgs, and contain seeds enclosed in a sweet, aromatic edible flesh. The flesh texture and aroma can vary depending on the cultivar.

**Varieties:** Jackfruit is cross pollinated and mostly seed propagated, therefore much variation exists. There are basically two types, soft flesh and crisp flesh.

**Culture:** Spacing is generally 6-9 metres and seedling trees take 2-4 years to produce fruit. Air layering, inarching, grafting and bud grafting are methods of propagation that have varying degrees of success. Pests and Diseases: Some of the major pests and diseases include shoot borers, bark borers, mealy bug and scale insects, blossom and fruit rots, and bacterial dieback.

**Fruiting Season:** Mainly from September to November

**Keywords**: Jack fruit, antioxidants, health benefits, nutrients

**PREHARVESTING IN JACKFRUIT**:

Make three shallow cuts in the fruit a few days before harvesting. This will allow the majority of the latex to ooze out. Harvest the fruit with clippers or loppers or, if picking jackfruit that is high up on the tree, use a sickle. The cut stem will exude white, sticky latex that can stain clothing.

**HARVESTING:**

Harvesting: The fruit is mature when there is a change in colur from pale green to a darkish green brown, the spines flatten out and there is a characteristic aroma. Cut the stalk with a sharp knife and lower carefully. Waiting for it to fully ripen on the tree and not checked daily will result in an overripe fruit within 24 hours. It is also harvested when small and green and cooked in stews and curries. the proper stage of maturity, jackfruit should be harvested. For jackfruit, depending on the clone, optimal maturity occurs 12–16 weeks following flower anthesis. Fruit can be collected approximately 16 weeks following flower anthesis, when the flesh is colored yellow and orange. The color of the skin, the color and growth of the spikes, the color of the stalk, and the fruit's form can all be utilized as maturity indices in addition to timing. Additionally, when tapped, mature fruit has a hollow sound.   
In the morning, when field temperatures are still low and acceptable for the product, harvesting is best done. To prevent the fruit from falling to the ground, cut the stem with a sharp knife while holding it. Harvested.

When jackfruits are unripe, they are sometimes referred to be vegetables. However, after they reach maturity, they can be picked and eaten. Its meaty texture often likened to pulled pig or chicken breast makes unripe jackfruit, which needs to be cooked before eating. The sweet, yellow or orange bulbs of ripe jackfruit are edible. They can be consumed raw or added to sweets like puddings and ice cream. One way to describe the flavor of ripe jackfruit is as tropical as it gets a combination between banana and pineapple.

**TYPES OF HARVESTING:**

Harvesting is done through various types of strategies. One may think of cutting, stacking, gathering, laying, etc. some of the main types of harvesting include,

* Hand harvesting
* Harvesting with hand tools
* Harvesting with machinery

1. **HAND HARVESTING**

Harvesting by hand is just harvesting with one's own hands. Harvesting is typically done by farmers using just their hands and no tools. Because the equipment and tools needed for harvesting were not yet developed, this is an outdated technique. When harvesting by hand, produce, fruits, and vegetables are selected and gathered into a small cart. Harvesting vegetables belonging to the roots and tubers families involves physically pulling up the plant. Upon harvesting, the grains are ground into flour to make rice and wheat. Harvesting by hand demands a lot of time, energy, and muscle.

**2.HARVESTING WITH HAND TOOLS:**

Tools were created to relieve farmers' stress when they had to harvest with just their hands. Tree fruits are the only products that can be harvested with these instruments. One of the hand instruments used to remove fruit from the tree and transfer it to the cart is the clipper. Vegetables like onions, garlic, carrots, etc. are also harvested with this instrument.

**3.HARVESTING WITH MACHINERY**:

Mechanisms were created after the usage of hands and tools. In addition to saving farmers time, these devices enable them to complete tasks without expending any strength. Combinations of these three are sometimes used for harvesting in various locations. A gathering rig is an illustration of a harvesting device. Along with assisting with packing, this equipment also assists with cleaning fruits and vegetables. Mowers are another type of harvesting machine that is used to remove crops from fields.

**METHODS OF HARVESTING:**

Harvesting is done in a few different ways. A person may be threshing. Gathering grains by threshing them involves beating the chaff or crops. Mostly rice and wheat grains are processed using this technique. Hand harvesting is what this kind of harvesting is. Small sickles, large sickles, small axes, and other tools are some of the other manual harvesting techniques. Barley, legumes, wheat, grass, etc. are the main uses for them. Farmers have greatly benefited from mechanized harvesting.   
  
In addition to cleaning the produce, the harvesting equipment resembles a machine and packages it for shipment. Farmers use this equipment for pre-harvesting once they have gathered all of the well-developed crops using hand labor and tools. Farmers employed cows in the past.

**HARVESTING PROCESS STAGES:**

The following are some of the phases and steps that make up the harvesting process:   
  
**REAPING:** Reaping is the act of pulling mature panicles and straws that have developed above ground.

**THRESHING:** Threshing is Separating the edible grains such as wheat, paddy, and so forth from the remaining chopped crop is known as threshing.   
**CLEANING:** cleaning is an important stage in the harvesting process that basically involves removing dust, other pollutants, and immature and non-grain fragments from edible food grains.   
**STACKING / PILLING:** Stacking is a method for arranging harvested crops for long-term storage.   
**BAGGING:** The harvesting process ends with bagging. The threshed grains are stored in gunny bags for both transit and storage.   
**STORAGE:** While large-scale production uses the harvested food for its own consumption, small-scale farming Farmers are forced to stockpile the crops as a result.

That's why it needs to be set up with appropriate storage. Poor storage procedures and insufficient storage space could lead to a considerable loss of grain. Fungi, bacteria, and environmental elements like moisture and temperature can also cause damage to the grains that are being stored, in addition to insects and rodents. Consequently, before to being stored, the grains need to be appropriately handled. To prevent rodent infestations, apply pesticides. Grains that are exposed to wet conditions develop fungus. This can be avoided by allowing grain to dry thoroughly in the sun. Another method of using chemicals to inhibit bacteria and other germs is fumigation. When storing grain in granaries, gunny bags, or god owns, it needs to be properly prepared.

**IMPORTANT OF HARVESTING**:

The importance of harvesting is given below:

* Utilizing cutting-edge technology to harvest crops decreases grain waste and improves grain quality and quantity.
* To preserve the quality of the fruits and ensure that the tools being used don’t harm the plant, the direction in which fruits, grains, and vegetables are chopped during harvest is crucial.
* The quality of grains or seed protection is enhanced by harvesting at the proper time.

**POST HARVESTING**

**HANDLING:** To preserve its quality and increase its shelf life, jackfruit must go through a number of processes after harvest. This is an all-inclusive guide:

**CLEANING**: Take care when jackfruits to prevent bruising or damage to the fruit.

**DRYING:** Wash the fruit with water to get rid of any impurities like sap or dirt.

**STORAGE:** To keep moisture from building up, pat dry the fruit with paper towels or a fresh cloth.

**PACKAGING:** Keep jackfruits in a dry, cool area with enough ventilation. The following circumstances provide for optimum storage: 12–15°C (54–59°F) is the temperature. - RH: 80–90% - Life in storage: 2-4 weeks.

**TRANSPORTATION:** To preserve ventilation, place jackfruits in breathable containers such as mesh bags, paper bags, or cardboard boxes.

**OBSERVATION:** To keep jackfruits safe from the sun, heat, and moisture, transport them in a covered vehicle

**Postharvest losses and quality issues**

Fruit rot, mechanical damage, moisture loss, uneven ripening, chilling injury, and metabolic processes like respiration and ethylene production are some of the reasons for jackfruit's diverse postharvest losses. While postharvest losses in Sri Lanka have been estimated by Medagoda (2011) to reach 70%, Hossain et al. (2017) have revealed that almost 38% of Bangladesh's total jackfruit crop is lost during this stage. Fruit rot and chilling damage are two main reasons why jackfruit loses quality after harvest. Fruit rot. This is an extremely dangerous.

**PRE HARVESTING FAECTOR AFFECTING POST HARVEST QUALITY:**

Many pre-harvest variables, like as genetics, cultural techniques, and climate, have a significant impact on the postharvest quality of fruit. Producing fruit that is less susceptible to postharvest diseases can be achieved by determining the effects of preharvest variables. Origination is the primary method used to identify most commercial cultivars of jackfruit. As a result, it is important to connect and validate the distinctiveness of jackfruit from every region. According to Debbarma, Manivannan and Kushwaha (2018), the physicochemical characteristics of seventy accessions of jackfruit from seven different regions in India were examined in relation to their geographic location. The results showed that the fruit from Varkala (Kerala) had the highest total sugars and soluble solid contents (SSC), while the accessions from South Sikkim and Khowai (Tripura) had the highest titratable acidity (TA). With respect to morphological metrics, the highest quantity of bulbs, fruit size, pulp weight, and seed weight.

**To assist with the harvesting 0f jackfruit**

* **Identifying Ripeness:**

Jackfruit is ready to harvest when the outer rind changes color, usually from green to a yellowish or light brown hue. The fruit emits a strong, sweet aroma when ripe. The spines of the jackfruit become softer as it ripens.

* **Using Proper Tools**:

Use a sharp knife or a sickle to cut the jackfruit from the tree.

Be cautious of the thick, sticky latex that oozes from the stem; apply oil or soap on your hands and tools to prevent the sap from sticking.

* **Handling the Fruit**:

Jackfruit is large and heavy, so provide support while cutting it off the tree to avoid damage. Lower the fruit gently to the ground or use a basket or net to catch it, especially for large, heavy fruits.

* **Cleaning and Storing**:

Wash the harvested jackfruit to remove any dirt or sap. Store jackfruit in a cool, dry place if not consumed immediately. You can also refrigerate it for longer shelf life.

**BY ASIA PERVEEN**

**Handling Conditions of Jackfruit:**

Handling jackfruit begins at **harvest**, where timing is crucial for quality. Harvesters check for **ripeness indicators**, such as changes in skin color and the fragrance of the fruit. Immature jackfruits do not ripen well after harvest, while overripe fruits are more susceptible to spoilage. Since jackfruit is large and heavy, it must be harvested carefully to prevent physical damage, such as bruising and cuts. Bruising accelerates spoilage, leading to significant post-harvest losses​.

After harvest, workers must manage the **latex sap** that oozes from the fruit when cut. The sap can stain and stick to tools, making handling difficult. Coating tools with oil or using gloves is an effective way to minimize the impact of the sap​.

**Post Harvest Handling Practice:**

Fruit can be stored on coir net platforms after harvest, with the cut end facing the ground to keep latex away from the fruit's surface. Size can be used to rank the fruit because larger fruits typically produce larger bulbs than smaller ones. To eliminate dirt, foreign materials, latex, stains, and field contamination, rinsing with chlorinated water is a typical phyto-sanitation technique used after sorting and grading. Fruit should be properly washed to get rid of extra moisture from the surface after washing with chlorine-infused water. Whereas mature fruit can ripen in the packhouse, immature fruit should be stored for 3-5 days at room temperature. During ripening, uneven ripening is a serious issue.

**Pre-Harvest Handling Practices:**

Pre Harvest Handling Practices of Jackfruit involve several crucial steps to ensure the fruit's quality and minimize losses. Farmers should regularly monitor the fruit's maturity, checking for optimal color, size, and sweetness, and harvest them at the right stage to prevent over-ripening. Proper handling techniques, such as gently twisting or cutting the fruit from the tree, are essential to avoid bruising or damaging the fruit. Immediately after harvesting, the fruit should be cleaned, graded, and sorted according to size and quality to remove any defective or diseased fruit. The fruit should then be stored in a cool, dry, well-ventilated area, away from direct sunlight, to maintain its quality and prolong its shelf life. Additionally, farmers may apply a post-harvest treatment, such as a fungicide or wax coating, to reduce moisture loss and prevent fungal infections. By following these pre-harvest handling practices, farmers can ensure that their Jackfruit crop reaches the market in optimal condition, maintaining its quality and freshness for consumers.

### . Transportation of Jackfruit:

**Transportation:** Transportation poses challenges due to the fruit’s bulkiness and sensitivity. It is important to protect the fruit from physical shocks during transport. Proper packaging solutions include cushioned crates or boxes that limit movement and prevent crushing. Furthermore, vacuum packaging is effective, particularly for minimally processed jackfruit portions, as it reduces oxygen exposure, slowing down the degradation process​.

**Temperature Control**: Temperture control is critical during transport. Jackfruit is sensitive to both heat and cold. The ideal transit temperature for fresh whole jackfruit is around 12-14°C (53-57°F). Higher temperatures can cause the fruit to ripen too quickly, while prolonged exposure to temperatures below 10°C can result in chilling injuries. Both extremes shorten the fruit’s shelf life and affect its quality​.

**TRANSPORTATION GUIDELINES FOR JACK FRUIT:**

1. Handle with care:

Jackfruits are fragile and prone to bruising, so handle them gently to avoid damage.

2. Use cushioning materials:

Place cushioning materials like straw, hay, or foam sheets between the fruits to absorb shocks and prevent bruising.

3. Cover the fruits:

Cover the fruits with a breathable material like cloth or netting to protect them from dust, sun, and rain.

4. Maintain ventilation:

Ensure good ventilation during transportation to prevent moisture buildup and fungal growth.

**SUITABLE VEHICLES FOR THE TRANSPORTATION OF JACKFRUIT**:

1. Trucks:

Open or closed trucks with a flatbed or container can be used for transporting Jackfruits.

2. Trailers:

Trailers with a flatbed or container can be attached to a tractor or truck for transportation.

3. Pickup vans:

Pickup vans with a covered or open bed can be used for smaller quantities.

4. Three-wheeled vehicles:

Three-wheeled vehicles like autorickshaws or tempo can be used for short-distance transportation.

5. Bullock carts or hand carts:

In rural areas, bullock carts or hand carts can be used for short-distance transportation.

**Storage of Jackfruit:**

**Whole Jackfruit**: The optimal temperature for storing whole jackfruit is between **12°C and 14°C** (53-57°F), where it can be stored for about 3-4 weeks. At this temperature, ripening is slowed, and the fruit’s texture and flavor are preserved. Storing the fruit at lower temperatures, such as in regular household refrigerators (around 4°C), can cause chilling injuries, which lead to poor texture and taste​.

**Minimally Processed Jackfruit**: For processed jackfruit, which includes peeled and portioned bulbs, refrigeration is necessary to prevent rapid spoilage. **Vacuum packaging** and **modified atmosphere packaging (MAP)** are highly effective for extending the shelf life of jackfruit portions.

* **Vacuum packaging**: This method removes most of the oxygen from the packaging, reducing respiration rates and slowing down the deterioration process. Under vacuum packaging, firm-fleshed jackfruit portions can last for up to 20 days at 4°C, while soft-fleshed portions can last up to 15 days​(
* **MAP with Silica Gel**: This method creates a controlled atmosphere inside the packaging, often with reduced oxygen and increased carbon dioxide, which extends shelf life by slowing respiration. When combined with moisture-absorbing materials like silica gel, this method preserves jackfruit portions for up to 18 days​.

Without proper refrigeration, jackfruit spoils quickly. **Ambient storage** at room temperature results in rapid spoilage within 1-2 days for whole fruits, and minimally processed jackfruit bulbs last only 2-3 days, even with vacuum packaging​.

**Post-Harvest Quality and Losses:**

Jackfruit is highly perishable, and improper handling or storage can lead to significant **post-harvest losses**. **Mechanical damage** during harvest or transport, exposure to high temperatures, and inadequate storage facilities are the primary reasons for spoilage​.

Losses can also occur if the fruit is not marketed quickly enough after harvest, as jackfruit deteriorates rapidly in ambient conditions. Implementing efficient post-harvest handling, transportation, and storage systems can significantly reduce these losses​.

In summary, careful handling, proper packaging, temperature control during transport, and appropriate storage methods, such as refrigeration and vacuum or modified atmosphere packaging, are essential to extend the shelf life and maintain the quality of jackfruit.

**Pre-harvest quality and losses:**

Pre harvest quality and losses in Jackfruit (Artocarpusheterophyllus) can be affected by several factors. Here are some common issues:

Pre-harvest quality and losses in Jackfruit are critical concerns, as the fruit is susceptible to various factors that can impact its quality and yield. The fruit's tendency to crack, insect damage from pests like fruit flies, beetles, and caterpillars, and diseases such as powdery mildew, leaf spot, and root rot can significantly affect its quality. Moreover, nutrient deficiencies, water stress, and inadequate pollination can also compromise fruit quality, leading to reduced yields. Furthermore, pre-harvest losses occur due to fruit drop, bird damage, animal infestation from bats, monkeys, and squirrels, and disease infection, resulting in a substantial reduction in yield. To mitigate these issues, farmers must adopt good agricultural practices like regular monitoring for pests and diseases, proper irrigation and water management, balanced fertilization, pruning and training the tree for better sunlight penetration, and using bird-scaring techniques or netting to protect the fruit. By implementing these measures, farmers can ensure a higher yield of good-quality Jackfruit, minimizing pre-harvest losses and quality issues

**(BY BUSHRA WAHEED)**

**Disease Attack on Jackfruit**

**Anthracnose**

Anthracnose in jackfruit is a fungal disease caused by Colletotrichumsiamense, characterized by dark-edged, light-centered lesions with chlorotic halos, primarily affecting older leaves. The disease has a low incidence per plant (1-5%) but can spread under humid conditions, as the fungus reproduces and spreads via spores. In 2018, jackfruit plants in some areas of Brazil (Goiás, Paraná, São Paulo, and Distrito Federal) showed signs of anthracnose, a disease causing dark-edged, light-centered lesions on older leaves. The disease was caused by the fungus Colletotrichumsiamense, confirmed by testing. This fungus could also infect other plants like soursop, cashew, and mango, showing it can affect more than just jackfruit.(Borges, 2023)

# **Fruit Rot Disease**

In Mexico, jackfruit is grown on about 1,500 hectares, with 91% of production in Nayarit. During the rainy season (May to September), high humidity (80-90%) led to fruit quality and quantity losses due to a fungal disease. In July 2018, diseased jackfruits in Nayarit showed soft rot with cottony white mycelia and black spores, sometimes covering the whole fruit. When the fungus was cultured, it grew gray cottony mycelia, and the spores developed in groups with black sporangia. The fungus was identified as Rhizopusstolonifer, known for causing fruit rot(R. S. Garcia- Estrada, 4 Sep 2019)

**Management of Fruit Rot Disease**: Fruit Rot Disease in jackfruit, caused by fungal pathogens, can be managed through a multi-faceted approach. Cultural practices include sanitation, pruning, and irrigation management. Chemical control involves fungicides like copper oxychloride and carbendazim. Biological control using biofungicides like Trichoderma and Pseudomonas offers a natural alternative. Integrated Pest Management (IPM) combines these methods for optimal results. (Ahsan Ullah Khan, December 2020)

**Fruit Bronzing**

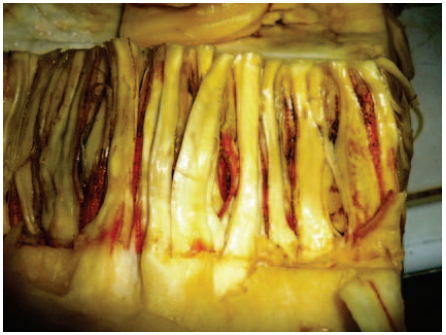
****Jackfruit bronzing is a disease that causes yellowish-orange to reddish discoloration in the pulp and rags of jackfruit. The pathogen was isolated from infected fruits and tested for its pathogenicity on both attached and detached fruits. It is a Gram-negative, non-motile, facultatively anaerobic, slightly pleomorphic bacterium that produces a yellow pigment in culture. The bacterium measures 1-2 µm in length and is catalase positive, hydrolyzing gelatin and starch but not tween 80. It also produces acid from glucose, galactose, fructose, and sucrose, but not from lactose or maltose. Identification was confirmed through physiological, biochemical tests, and DNA analysis using PCR(Ruben M. Gapasin, 2014)**.**

Figure 1Naturally infected jackfruit showing the symptom of bronzing disease.

**Management of jackfruit bronzing** involves several strategies to control the spread and minimize damage:

1. Regularly remove and destroy infected fruits, leaves, and debris to reduce the source of infection.
2. Avoid waterlogging around the jackfruit trees, as excessive moisture can promote the growth of pathogens. Proper drainage is important.
3. Regular pruning of branches to improve air circulation and sunlight penetration can help reduce infection.
4. Application of appropriate bactericides or fungicides may help control the disease, but it is essential to consult local agricultural experts for recommendations on safe and effective products.

**Bacterial Soft Rot**

Bacterial Soft Rot, caused by Erwiniacarotovora, is a severe bacterial disease affecting jackfruit. It leads to soft, mushy, and rotten fruits, causing significant yield losses, affecting jackfruit, characterized by water-soaked lesions, softening, and collapse of fruit tissue, slimy pulp, and premature fruit drop. The bacterium enters through wounds or natural openings, contaminated water, or insect vectors, and thrives in high humidity (80%), temperatures (25-35°C), and rainy conditions.(Nurul Hawani Idris, 27 July 2023)

**Management of Bacterial Soft Rot**:Management involves cultural practices (sanitation, pruning, irrigation management), chemical control (copper-based bactericides, antibiotics), biological control (Pseudomonas fluorescens, neem oil), resistant varieties, and Integrated Pest Management (IPM). (R. M. Himel, 2017)

**Pest Attack**

Jackfruit trees are attacked by 35 different insect pests, with the jackfruit trunk borer (Batocerarufomaculata) being the most harmful. This pest bores into tender shoots and buds, making it hard to control because it feeds internally. Insecticides can't reach the infested areas effectively, and the irregular development of larvae makes it difficult to predict and manage the pest. In Bangladesh, there are no effective management strategies against the trunk borer. Fungal and oomycete pathogens are major global issues reducing jackfruit yields, with plant epidemics caused by these organisms dating back to the 19th century. Healthy jackfruit plants can perform well, but their potential is hindered by pests and pathogens in the field or garden.

**Management of the borer pest:** To manage the jackfruit trunk borer, it is recommended to:

1. Regularly check infested shoots and buds, collect, and destroy any beetles and grubs found.
2. Seal the borer holes with mud and apply Para dichlorobenzene into the holes in the shoots and buds to control the pests.

**Bud Weevil Pest**

The bud weevil is a common pest of jackfruit, particularly in South India. Its small grubs burrow into tender flower buds and fruits, causing them to drop early or prematurely. The adult weevils are greyish-brown and can also be seen feeding on the leaves, further damaging the plant. This pest can impact both fruit yield and plant health.

**Management of bud weevils**: To manage bud weevils in jackfruit, regular monitoring is essential. Infested buds and fruits should be collected and destroyed to reduce pest numbers. Spraying neem-based insecticides or biological pesticides can help control both the grubs and adult weevils. Additionally, maintaining good plant hygiene, such as removing fallen debris, can minimize weevil breeding grounds.

**TYPES OF PACKAGING:**

Here are different types of packaging involved:

**MODIFIED ATMOSTPHERIC PACKAGING (MAP):**

MAP is an important method to control the quality of the crop after harvest. Jackfruit exhibits high respiration rate and ethylene production, which can be reduced by using MAP alone or in combination with other postharvest methods. It has been reported that fruit respiration, ethylene production and microbial activity were reduced by using MAP (polyethylene terephthalate tank) together with sodium benzoate (0.045%), citric acid (1%), calcium chloride (1%) and ascorbic acid (0.02%) before the bulbing process. Subsequently, reported that after 7 weeks of storage at 6°C, jackfruit increased vitamin C, carotenoids, flavonoids and total phenols in MAP by 31%, 43%, 8% and 7% respectively compared to the fruit control. In addition to the oil composition, the type of MAP material is also an important factor affecting the quality of the fruit. Shelf life with minimum physiological loss compared to all other MAP materials (polypropylene and polystyrene). Similarly, transparent polyethylene containers containing 2% O2, 8% CO2 and 90% N2 showed higher SSC, TA and hardness, while weight loss, respiration and ethylene production jackfruit bulbs were evaluated for the effects of different volumes. technologies (active MAP, passive MAP and vacuum packaging) for blanched and frozen jackfruit bulbs show that active MAP and vacuum packaging are more effective in reducing microbial counts and controlling odor. Integration the effect of packaging (high-quality clothing, electrical equipment, volume, packaging) the shelf life of 33 days, while Shrink film has the shortest shelf life. In addition, microbial rot is one of the biggest constraints in jackfruit seed sales management. Maceration of bulbs. However, all these studies were conducted on fresh fruit seeds, and the effect of MAP on extending the storage period of whole fruit and controlling fruit quality has not been investigated. (Kaura, 2023)

**VACUUM PACKAGING**:

The fact is that vacuum packaging has been proven to effectively extend the life of the fruit, effectively control and control microbial damage, and its effect can be improved by chemical treatment. The combination of vacuum packaging and citric acid pretreatment has been shown to help control low-level disease in seeds stored at 4°C. Nuts have been reported to exhibit nutritional benefits for up to three weeks for blindness, two weeks for half vision and two weeks for vision. Inhibition of microbial activity (< 1 log CFU/g) was then found in frozen jackfruit bulbs packed in 80% vacuum polyethylene bags. Image analysis was performed on fresh fruit and showed lower incidence of discoloration and browning in vacuum-packed fruits compared to the control. In addition, vacuum-packed nuts stored at low temperature showed better colour and less microbial contamination compared to those stored in the refrigerator (8-10°C). A comparison of vacuum-packed jackfruit eye analysis was published in Chilled and Frozen. Onions show better biological activity in frozen form. However, the effect on whole fruits requires further investigation. (Kaura, 2023)

**WAX COATING**:

Coatings to keep fruits and vegetables fresh are widely studied today. They consist of natural biopolymers with specific properties that provide a barrier that delays ripening, prevents dehydration and reduces mass transfer (gaseous or liquid) that slows down aging. Low microclimate generation of O2 and high CO2. The effect mainly depends on the crop, type of cover and maturity. Jackfruit coatings have been studied mainly on fruit bulbs rather than whole fruits. Used additives as a pretreatment before applying chitosan to jackfruit bulbs and found that chitosan protected the sensory properties of texture and flavour that affected the shelf life of pre-cut bulbs and lasted for 46-48 days in a controlled atmosphere. (AC) The interaction of AC, pretreatment and chitosan coating exerts a synergistic effect, imparting microbial and physiological stability to pre-cut products. Evaluated the effect of different coatings (aloe vera gel and pectin) on the quality of jackfruit bulbs stored at 6°C for 7 days and concluded that bulbs coated with aloe vera gel significantly controlled weight loss and ascorbic acid loss. They were rich in calories, proteins, vitamins A and C, and had an extended shelf life of 7 days. Applied potassium sorbate/calcium chloride with 1-methylcyclopropene (1-MCP) to jackfruit bulbs and edible coatings (xanthan gum, sodium alginate, or gellan gum). The combined treatment and coating alone showed a decrease in maturation rate, weight loss, and respiration compared to the control. It also achieved high-quality indicators for colour, total soluble solids, titratable acidity and pH, while increasing the shelf life to 12 days without changing the sensory characteristics.

Natural Shine® 505-OR is a high-gloss organic coating for organically grown citrus fruits and is recommended for domestic export markets. It is 100% organic, biodegradable and approved by USDA and OMRI (Organic Materials Review Institute) regulations. It regulates moisture loss and adds shine even after sweating semi-perfect, on the other hand, is a sucrose ester coating that inhibits moisture loss while allowing gas exchange between the fruit and the surrounding environment. Reduces weight loss and excessive breathing, resulting in firmer cherries with less chewing, increased water retention, and longer green stems, leaving no oily or greasy film on the fruit, and adding shine. When used on fresh pears, it reduces bruising and weight loss and maintains green colour without altering the normal ripening process. There are no reports on the effectiveness of commercial coatings mentioned for whole jackfruit preservation. The purpose of this study was to evaluate the effectiveness of commercial coatings on jackfruit stored under simulated shipping conditions and simulated marketing conditions for export to the United States. (Montalvo-González, 2022)

**ETHYLENE ABSORBER:**

The effect of addition of ethylene absorber on the quality of fresh-cut fruits during storage at 10°C for 8 days was investigated. Rigid polypropylene box (10 x 10 cm) with clip closure, wrapped in stretch film, for fresh fruit packaging. Containers are available with or without plastic bags (FX 2gm). O2, CO2 and C2H4, weight loss, surface colour (L\*-brightness and b\*-yellow), total soluble solids (TSS), pH and sensory evaluation of fruits were measured every 2 days in each pack. At the end of storage period (8th day) the colour of control fruit had disappeared (L\*72.54). Cured fruit had better taste because TSS and pH were higher on day 8 (27% and 4.97).Jackfruit, install ethylene absorber. (M.N. Latifah, 2018)

**BY HAFIZA BISMA SALEEM**

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