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Formulation of brining solution for jackfruit and plantain flower using class-one preservatives

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Abstract

The oldest and least expensive method of preserving vegetables, meat, fish, and other foods while retaining a good portion of their nutritional value is brining or salting. Most of the water in the vegetable is absorbed by the salt making it for microbes to survive. Vegetables preserved in brine have a longer shelf life owing to the combined action of the salt and the acid by fermentation. The current study was initiated in order to standardize the recipes for several brining solutions for tender jackfruit and plantain flowers that are readily available locally while also examining shelf life of the vegetables after brining. This study's practical application is to prevent jackfruit and plantain flower waste and spoilage. This will enable suitable brine solution for the trial vegetable without using chemical preservatives and will open up the prospect of further research in this area. In regions where only class-one preservatives are available, they can nevertheless be utilized to preserve food even though they do not produce desirable effects. There are few research studies available, therefore it is recommended that more studies be conducted in the future.

Keywords: Brining, class-one preservative, jackfruit, plantain flower

Introduction

The tropical fruit tree species, jackfruit can be found in humid, tropical, coastal locations with considerable rainfall. It is a member of the Moraceae family. Its scientific name is *Artocarpus heterophyllus*, and due to its sweetness, it is a favorite food of many people. In tropical areas of India, Bangladesh, Nepal, Sri Lanka, Vietnam, Thailand, Malaysia, Indonesia, and the Philippines, jackfruit trees are commonly farmed. (Mondal *et al.*, 2013) ^[1].

Due to its many culinary applications and affordable abundance, jackfruits have gained the rightful nickname of "poor man's food". The majority of jackfruit is eaten when it is ripe as a fruit and when it is tender as a vegetable. Tender jackfruit is a well-liked vegetable. Jackfruit is a delicate fruit that is used in juices, curries, pickles, and salads. Ripe fruits are also typical and are utilized in juice, jam, jellies, and canned goods. Chips and papads are made from unripe jackfruit bulbs (Janick and Paul, 2008) ^[2].

Tender jack fruit has a nutritional content of 2.6 g of protein, 4.4 g of fibre, 50.1 mg of calcium, 97 mg of phosphorus, 1.5 mg of iron, 206 mg of potassium, and 11 mg of vitamin C per 100 gm of edible portion. Jackfruit is utilized as a vegetable, fruit, and replacement for staple foods for human consumption. Additionally, the jack fruit has beneficial antioxidant compounds. 14 of the 18 carotenoids were originally reported after the carotenoids content of jack fruit was successfully identified (Jagtap and Bapat, 2010) ^[3]. The jackfruit is a wonderful energy food because it is also a great source of complex carbohydrates and nutritional fibre. A single jackfruit can frequently serve as a family's whole dinner.

Due to its natural compositional and textural properties, jackfruit has a limited shelf life and cannot be kept for an extended period of time. Due to improper postharvest knowledge while harvesting, shipping, and storing, both in terms of quality and quantity, a sizeable amount of jackfruit, specifically the amount gathered during the peak season (June to July), is wasted every year. Therefore, in order to extend its availability throughout the year, it has become urgent to reduce postharvest losses and increase its shelf life. Processing and preservation can significantly reduce fruit and vegetable postharvest losses and increase their availability during the off-season. (Ambily and Anitha, 2016) ^[4].

Banana (*Musa acuminata* Colla) flowers or blossoms, also known as plantains, appear at the tip of a bunch of developing bananas as a huge, tapering cone from the centre of the banana tree. They would develop into bananas if left on the tree.

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They are delicious to eat, much like bananas. 'Mocha' is the Bengali word for plantain blooms, 'Vazhaipoo' is the Tamil word, and 'Kelful' is the Hindi word. Large, pointed, mostly crimson blooms with some yellow and some pink are seen (Ambrose, 2018) ^[5]. The bloom has a starchy, nutty, and crunchy flavour. The florets inside are either white or pale yellow in colour, or the colour ranges from orange to purple. Although they are a crop waste product, plantain flowers have a good nutritional profile. A study (Preethi and Balakrishnamurthy, 2011) ^[6] found that each hectare of banana fruit harvesting leaves behind 300 kg of banana bracts. Plantain flowers which are regarded as an Asian or tropical vegetable, can be sliced and added to stews, soups, rice or noodle meals, and cooked vegetable dishes. They are frequently seen in Asian or tropical food markets. The very nutritious edible bloom known as banana flower, which is regarded as an agricultural by-product, has been evaluated for a variety of nutritional components on a global scale.

According to numerous estimates of the nutritional components of the flower, including moisture, ash, protein, fibre, and carbohydrates (Elaveniya *et al.*, 2014; Olusegun and Eniade; 2014) ^[7, 8], the flower is a rich source of fibre (70%) and carbohydrates (53.78%) as well as protein (19.60%) (Ramu *et al.*, 2017) ^[9].

The considerable dietary fibre found in banana blossom (5.74g/100g) keeps our bodies healthy, lowers cholesterol levels, and guards against obesity (Bhaskar *et al.* 2011) ^[10]. They are a good source of phenolic, flavonoids, and antioxidants as well.

Banana blossom is incredibly nutritious and offers a number of health advantages, including the treatment of ulcers, pneumonia, dysentery, and other conditions. Banana blossom can be used as an ingredient in food compositions rather than being discarded as agricultural waste. (Padam *et al.*, 2014) ^[11]

Materials and Methods

Jackfruit and plantain flowers that are readily accessible locally are chosen and acquired from the neighbourhood and supermarket. The appendix contains the formula for the brine solution in detail.

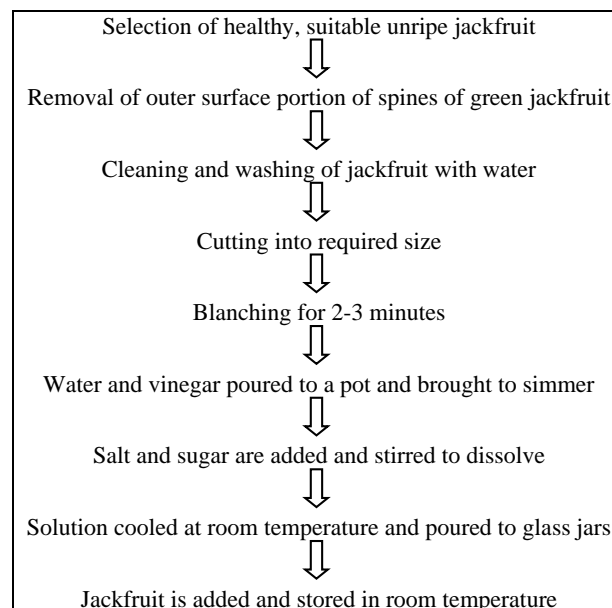
A. Preparation of brine solution

One cup of water and vinegar are combined to make the brine, which is then simmered in a small pot. The salt and sugar are stirred to dissolve. It is important to make sure the brine is cold before adding the food to ensure food safety. The food is poured into the jars when the solution has been cooled to room temperature.

i. Preparation of jackfruit brine

The healthy, suitable unripe jackfruit is selected. The outer surface portion of spines of jackfruit is removed and the cleaned jackfruit is washed with water. The jackfruit is diced to the appropriate size and blanched for two to three minutes. A small saucepan is filled with one cup of water and vinegar, and it is simmered. Stirring dissolves the sugar and salt. After being chilled to room temperature, the solution is put into glass jars, the jackfruit is added, and the containers are then kept at room temperature.

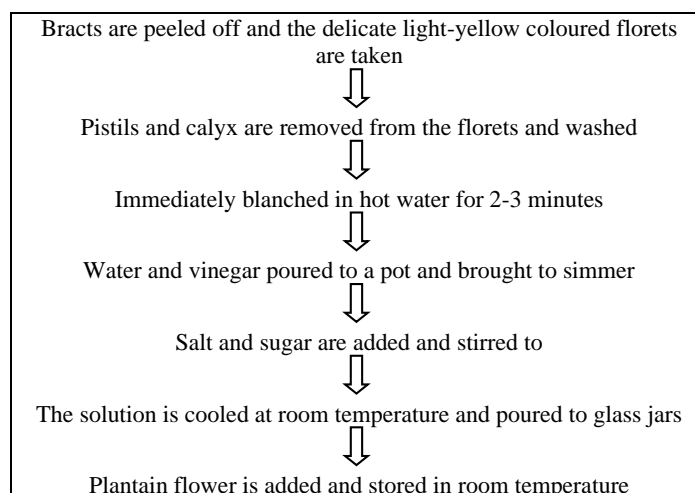
Process flowchart of preparation of jackfruit brine



ii. Preparation of plantain flower brine

The purplish leaf-like part of the flower called 'bracts' are peeled off and the delicate light-yellow coloured florets are taken and the pistils and calyx are removed from the florets and washed and immediately blanched in hot water for 2-3 minutes. One cup of water and vinegar are poured into a small pot and brought to a simmer. The salt and sugar are stirred to dissolve. Before using the brine, for food safety, it is taken care that the brine is cold before the plantain flower can be added. The solution is cooled at room temperature, poured to the glass jars and the plantain flower is added and stored in room temperature.

Process flowchart of preparation of plantain flower brine



B. Shelf-life study

The shelf life study of the brined jackfruit I, II and III along with the standard brine solution are studied for 60 days at normal room temperature (average room temperature of 31.76 °C). Also, the shelf life study of brined plantain flower I, II and III along with its standard brine solution are studied for 60 days at normal room temperature (average room temperature of 31.76 °C).

Results



Fig 1: Jackfruit brine solutions



Fig 2: Plantain flower brine solutions

Three brine solutions were formulated for both the vegetables with a standard. The observations of different brine solutions

obtained are given in the table below:

Table 1: Observation of different brine solutions

Sample	Brine Solution	No. of days observed	Freshness	Colour/Appearance	Clarity of Brine Solution	Sedimentation
Jackfruit	Standard	60 days	Yes	No change	Yes	Slightly
Jackfruit	I	60 days	Yes	Slight browning	Yes	Slightly
Jackfruit	II	60 days	Yes	Slight browning	Yes	Slightly
Jackfruit	III	60 days	Yes	Browning	Yes	Slightly
Plantain flower	Standard	60 days	Yes	Slight browning	Yes	Slightly
Plantain flower	I	60 days	No	Browning	Yes	Yes
Plantain flower	II	60 days	No	Browning	Yes	Yes
Plantain flower	III	60 days	No	Browning	Yes	Yes

Discussion

A favourable result was observed in the standard brine solution of jackfruit. It was observed that slight browning was present in the first and second brine solution of jackfruit and standard brine solution of plantain flower. Browning was present in the third brine solution of jackfruit and in all the brine solutions of plantain flower. The browning that was seen in these items during the brining process may be attributed to greater latex content. In the initial preparation of jackfruit and plantain flower, no preservatives were employed, and just tap water was utilized for washing, which could be the possible explanation for browning. Additionally, it's possible to hypothesize that brine with higher concentrations causes browning, colour leaching, and physical

changes.

However, a good result was yielded in the standard brine solution of jackfruit. The jackfruit's freshness can still be noticed, and no visual alterations were noted. It is possible to hypothesize that the jackfruit will last longer when the brine concentration is lower. Wabali and Simon (2013) [12], studied the effect of brine solution on mushroom preserved at room temperature (26- 30 °C) and results obtained indicates the preservative effect of brine solutions at 0-15 percent concentration, the changes in colour, texture and smell were not significant while the shelf life remained the same as the control. However, 20 percent concentration of brine solution showed a significant change in quality parameter as the concentration of brine solution increases the quality

parameters of mushroom. Although quality characteristics do not change after 35 percent concentration, the shelf life of mushrooms treated with a 30 percent brine solution is 100% better than the control, which had a shelf life of three days.

Another observation made was the cloudiness in brine solution and sedimentation at the bottom of the jars. According to an article called “Fermented Vegetables Troubleshooting FAQ” by Cultures for Health, the possible reason may be because they were culturing well or due to fermentation.

(<https://www.culturesforhealth.com/learn/natural-fermentation/fermented-vegetables-troubleshooting-faq/>)^[13]

Conclusion

Salting or brining may be a practical method of preserving vegetables. The process is not difficult. It is inexpensive and requires little equipment. Vegetables properly preserved with salt or salt and vinegar will keep for many months in a cool climate. They will keep a much shorter time in a warm climate unless they can be sealed and heat processed when the brining is finished.

Before considering the brine solution, some important points to consider are: The food to be processed should be kept at a low temperature and a low bacteria count, the brine should be prepared correctly, appropriate amount of ingredients should be selected and the prepared brine jars should be sealed air-tight and stored in a room temperature away from direct sunlight.

According to the results of the study, “higher concentrations in brine result in colour leaching and browning of the brine.” “Low concentrations of brine produce good results, no visual changes are noticed, and shelf life is extended”. In regions where only class-one preservatives are available, class one preservatives can nevertheless be utilized to preserve food even though they do not produce desirable effects. As a result, brining can be used as a food preservation technique to lengthen the shelf life of food, stop it from decomposing on its own, and store it for later use. There are few research studies available, but it is suggested that more be done in the future.

Appendix

Formulation and Standardization of the brining solution

Standard Brine Solution Recipe

- 1 tbs (15 g) sugar
- ½ Cup (115 g) salt
- 1 Cup (230 ml) water
- 1 Cup (230 ml) vinegar

Brine solution I

- 1 tbs (15 g) sugar
- ½ Cup (115 g) salt
- 1 Cup (230 ml) water
- 1 Cup (230 ml) vinegar

Brine solution II

- 1 tbs (15 g) sugar
- ¼ C (57.5 g) salt
- 1 C (230 ml) water
- 1 C (230 ml) vinegar

Brine solution III

- 2 tbs (30 g) sugar
- 1/3 C (76.67 g) salt
- 1 C (230 ml) water
- 1 C (230 ml) vinegar

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