Journal of Chemical Health Risks

www.jchr.org

JCHR (2023) 13(4), 833-838 | ISSN:2251-6727

Development and Formulation of Value-Added Product from Palmyrah Palm

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(Received: 02 September 2023 Revised: 14 October Accepted: 07 November)

KEYWORDS
Value added product, Under-utilized fruit, Ice Apple, Natural Preservative, Jam

ABSTRACT:

Ice apple is a tropical fruit of the Palmyra palm tree that is less well-known. It is frequently accessible throughout the hot, humid summer months. Borassus flabellifer is the scientific name for this plant, which belongs to the Arecaceae family. The fleshy fruit, which is filled with transparent, delicious juice, has remarkable cooling characteristics. In the summer, this ice apple trait is most effective for preventing exhaustion and dehydration. Ice apple has the texture of litchi fruit and tastes like a slightly sweet tender coconut. The body's fluid and electrolyte balance can be maintained by the substantial amounts of sodium and potassium found in ice apples. A low-calorie watery fruit ice apple is an excellent way for managing weight loss.

The present study is aimed to the develop value added product from under-utilized fruit i.e., Ice Apple, which is highly perishable. In order to increase the shelf life of the product, jam has been made in which sugar acts as a natural preservative. The ingredients used for developing Ice Apple Jam were procured from the local market of Godavari District, Andhra Pradesh. The procedure to develop ice apple jam include peeling off the skin of ice apples, blending paste, heating the paste at appropriate temperature and time and addition of ingredients (sugar, cardamom, essence). This jam has to be stirred at regular intervals in order to prevent lumps. A total of three variations were made. The first variation includes preparation of jam with addition of sugar. Second trail includes addition of cardamom and sugar, and the third variation includes addition of essence and sugar. Sensory evaluation has been subjected to the three variations and the second variation has been highly accepted by the panel members.

Introduction

In India, Sri Lanka, Malaysia, the Philippines, Indonesia, and many regions of East Africa, the palmyrah palm tree grows naturally. It can be found throughout India in Kerala, Andhra Pradesh, Orissa, Bengal, Bihar, and along the entire west coast. It grows readily under cultivation and in nature as well. The nuts must be planned and protected from livestock until they are large enough to be harvested with ease. Trees grow quite slowly and mature in between 15 and 30 years. The Palmyrah palm is a huge tree with a trunk that can reach a height of 30 meters. At the base, it may have a circumference of more than 1.5 meters. The trunk is dark and shaped like cylinders. It is additionally ruffled by semi-circular scars left by fallen leaves. The tree is immediately identified by its massive fan-shaped leaves. There may be 25-40 fresh leaves, which are

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leathery, gray green, fan-shaped, 1-3 meters broad, folded along the midrib, and spring in a clump at the top. They are often tough with thick stems. The palmyrah comes in two varieties: male and female. The male and female blooms are never held by the same tree. Male and female trees both produce flower spikes, but only the female plant bears fruit. However, tap toddy is made from both trees. Small and arranged in tightly packed spikes, the blossoms eventually turn into huge, roundish-brown fruits. Male and female flowers differ in size. Male blooms are smaller. India has over 122 million palm trees, with Tamil Nadu contributing the most and Andhra Pradesh coming in second(PC et al., 2017).

Value added products from Palmyrah:

The Palmyrah palm may be turned into a variety of food and non-edible goods, adding value to every part of the plant.

Toddy: Toddy is made by tapping the inflorescence's tip and catching the juice's drip in earthen jars for later use. Neera, a light beverage that is chilly in nature, is made from the juice that was collected the night before and is delightful. It tastes sweet and syrupy. A few hours after daylight, the toddy naturally ferments. It is well-known locally as the beverage Tadi. It undergoes distillation to create the alcoholic beverage known as palm wine, arrack, or arak. This sap, which is known as sweet toddy and produces jaggery, molasses, palm candy, and vinegar, is kept from fermenting by rubbing the interior of the toddy-collecting container with lime paste. The tappers, who typically come from the lowest socioeconomic group in society, are the ones who carry out the bulk of the trade in toddy and related goods.

Toddy palm wine: Toddy palm wine is a spirit produced from fermented palm tree flower sap. Toddy wine has a powerful aroma and a light flavor. It is white and sweet. Due to yeast that is naturally found in the sap of the palm blossom, the sap naturally ferments. Soon after the sap is gathered, fermentation begins, and within two hours, it has quite high alcohol content but less than 4%. But its 24-hour shelf life is incredibly short.

Palm Jaggery: It also goes by the name palmgur. Due to its medicinal and nutritional benefits, it is very expensive. It tastes intensely earthy and chocolate-like. Neera, or unfermented tree sap, is used to make Jaggery. Tappers first gather sap in earthen containers that have been treated with slacked lime. The clarified sap is transferred to the boiling galvanized iron pan on a conventional furnace and cooked at 110°C after lime sedimentation and filtering. Neera is changed into a viscous fluid and then poured into wooden molds where it is allowed to harden. 1 kilogram of Jaggery requires about 8 litres of Neera. Before boiling, lime with carbon dioxide, citric acid, or unripe tamarind fruits can be used to increase the quality of the gur.

Palm Sugar: Neera, clean of debris, is heated in an alloy vessel while a little amount of superphosphate is added. The liquid is allowed to cool after uniform boiling. After the sediment has been removed, it is cooked to 110°C for two hours to achieve a honey-like consistency. After allowing the liquid to cool, it is then placed into a crystallizer. It is centrifuged to collect sugar once the sugar crystals have formed, and then it is dried and pulverized to store (Srivastava et al.)

Scope of Value Addition in Palmyrah Palm

Changes in the physical shape of agricultural food result in better acceptance, extended availability, improved market viability, and an increased cost-benefit ratio for the grower of the agricultural produce. Commoditization of agricultural products is a form of value addition. However, with a rising population, industry, and urbanization, India faces major security challenges. The introduction of novel species into India's agricultural production system is critical for increasing agricultural resilience. In this perspective, Palmyra palm is an example of an underutilized crop that has gotten little attention from agricultural researchers.

Value Addition's Importance in Palmyra

Fresh endosperm from tender Palmyra fruit, sap, and tuber flour are all perishable and highly susceptible to deterioration after harvest. After being removed from the husk, the endosperm of the tender Palmyra fruit

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JCHR (2023) 13(4), 833-838 | ISSN:2251-6727

begins to discolour, lose its appearance, and ferment, producing a foul odour. In these conditions, it is particularly crucial to transform sensitive fruit sap and endosperm into value-added products with enough shelf-life in order to continue using the products.(*Bioactive Compounds*, n.d.)

Review of Literature

Many medicinal plants and trees have been used, both in part and as complete plants or trees. In this way, the Palmyra tree is unique in that it contains gallons of therapeutic substances. All of its parts have therapeutic qualities. Various sections of this plant contain biological and pharmacological effects, such as anthelmintic, diuretic, antioxidant, and antibacterial activity of the fruits, wound healing, immunomodulatory, and even antimalarial capabilities. The chemical ingredients generate free radicals, which operate as an antioxidizing agent to regulate metabolic processes. It is well known that the leaves of this plant are high in phytochemicals. The plant's many parts are used to treat a variety of maladies, including secondary syphilis, antiperiodic, heart burns, and liver and spleen enlargement.The fruit of the tree was discovered to be sedative, anthelmintic, laxative, and cold. They serve as aperients and expedite the digestive process(Jerry, 2018)

The Palmyra Palm is the most advantageous species for each component since it has economic and therapeutic value, can withstand harsh climatic conditions, and can fend against natural disasters. The uses of the plant can be broadly divided as non-edible, edible, and value-added (Selvakumar&Thanapaul, 2021)

India, which has a population of more than 125 million and is known as the "tree of life" with approximately 800 established applications, including food, beverage, fiber, medicinal, and lumber, leads the globe in the abundance of palmyra palms. It is referred to as the "KarpahaVeruksham" (Celestial tree) in Tamil culture since each of its components has a specific use(Renuka et al., 2018)

The fruit is used as an aperient and to aid in digestion in addition to being cooling, laxative, and sedative. As a stimulant, tonic, anti-phlegmatic, and amebicide, palmyra sap is utilized. Palm Candies are a treatment for coughs and other respiratory issues. Sugar palm fruits are also used to treat inflammatory skin conditions and are more effective at easing chicken pox symptoms. Additionally, it guards against both adult and infant malnutrition. Ascorbic acid, a natural vitamin, has been discovered to be present in this tree. Because palmyra sap has a low glycemic index, it helps prevent diabetes and obesity. Boils, prickly heat, and facial redness can all be treated and prevented with fresh palm sugar. Smoking dried roots is another method for treating nose issues (Shobana et al., 2019)

Aside from its therapeutic properties, the abundance of minerals and low cost make Palmyra Palm an important component of a labourer's diet (Basava Prasad et al., 2023)

Materials and Methods:

In this experiment titled "**Development and formulation of value-added product from palmyrah palm" ,** Jam was developed by using the standard procedure of FSSAI with the palmyrah palm which is low cost and can be very easily prepared even at the house hold level by using minimal processing methods. The raw materials were collected from the local market and the Ice Apple Jam was developed in the Laboratory of department of Dairy and Food Technology, PVRT Degree College, Kakinada as a part of the final year project.

Procurement:

The ice apples, cardamom, sugar, lemons that are used for making jam is purchased from Ramachandrapuram market. Essence is purchased from victory bazar.

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Flow Chart:

Peeled ice apples

↓

Preparation of ice apple paste

↓

Heating of the paste

↓

Addition of sugar

↓

Mix it well until it becomes a thick paste

↓

Addition of Cardamom powder/ Vanilla essence

↓

Addition of Lemon Juice and Stir it

↓

Concentrated paste/ Jam

↓

Ready to serve/ Bottling and Storage

Procedure:

Take Ice Apple, peel them and blend them into small pieces. Then make the pieces into a fine paste. Add this paste on a pan and start heating the paste, later add sugar to the paste and stir it continuously. Then add Cardamom powder or Vanilla essence of choice to add a variety of taste to the product. Then add Lemon Juice which acts as a natural preservative for the jam. Stir continuously until the mixture becomes a thick paste or until it reaches the consistency of jam.

After thickening of the mixture, check the jam for consistency using End point Determination Test. This is can be done by using a basic sheet test, when the jam is boiling, just a small portion is taken out with a spoon or wooden ladle and allowed to cool slightly. It is then allowed to drop. If the product falls off in the form of a sheet (or) flakes instead of flowing in a continuous stream (or) syrup, it means that the end point has been reached and the product is ready. Otherwise boiling is continued till the sheet test is positive.

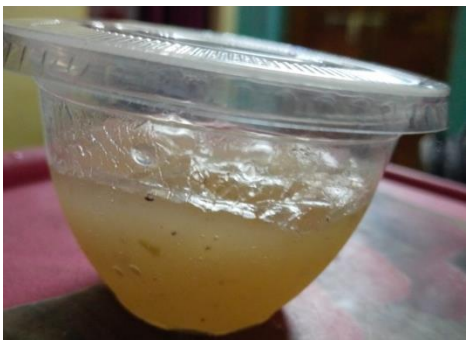

Fig 1: Ice Apple Jam

Formulation of the product:

3 trails were made to formularize the Ice apple Jam. The samples were titled as T1, T2 and T3 the codes were given to identify the difference in between the trails.

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INGREDIENTS	T1	T2	T3
Ice apple	40g	40g	40g
Sugar	27.7g	27.7g	27.7g
Vanilla Essence	-	1.5g	-
Cardamom Powder	-	-	0.3g
Lemon Juice	2ml	2ml	2ml

Table 1: Formulation of Ice apple Jam

Sensory Evaluation for the developed Ice Apple Jam:

The developed jam was subjected to the acceptability; the three formulations are evaluated by Semi trained panellists by using 9- point Hedonic Scale. The panellists evaluated the developed jam on the parameters such as appearance, texture, Flavor and taste.

Results:

Sensory Evaluation:

Sensory evaluations for the samples were carried out for the parameters appearance, texture, Flavour, taste and over all acceptability.

Mean Scores of the Developed Ice Apple Jam:

Product	Formulations	Quality Attributes				
		Appearence	Texture	Flavour	Taste	Overall Acceptability
Ice Apple Jam	T1	8.66±1.63	8.83±0.81	7.83±3.20	8.33±1.63	8.16 ±1.50
	T2	8.66±1.03	8.83±0.81	8.33±1.61	8.16±1.50	8.33 ±1.03
	T3	8.83±0.81	9 ±0	8.33±1.63	8.66 ±1.03	8.66 ±1.03

Table 2: Mean and Standard Deviation of the three formulations.

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Discussion:

All the sensory attributes i.e. appearance, texture, flavour, taste and overall acceptability are higher for T3 formulation. T3 scored the highest across all sensory characteristics. in terms of appeareance (8.83), texture (9.0), flavour (8.33), taste (8.66) flavor and overall acceptability (8.66). and the least accepted is T1 with the overall acceptability of 81.6.

Conclusion:

Ice apple, a tropical fruit from the Palmyra palm tree, is available in the tropical season and which is a low cost fruit. This study aims to create a value-added product using ice apple, a highly perishable fruit. The jam, made with sugar, cardamom, and essence and natural preservative as lemon juice was developed using local ingredients from the Godavari District, Andhra Pradesh. Three variations were tested, with the second variation being highly accepted by panel members.

Future Scope:

The nutritional analysis of the product and shelf life studies has to be carried out in the future.

Acknowledgement:

Firstly I am thankful to Ms. S. Bhargavi, Assistant Professor for kindly guiding me in this project. I am grateful to M. Dhaskinya Bhavana, HOD& Assistant Professor of Department of Food & Dairy Technology, P.V.R Trust Degree College for helping me in completion at every stage. Without her help and support I would not have been completed this project. I extend my sincere gratitude to teaching and non-teaching staff, lab assistant who helped me in this work progress. Lastly, I would like to thank Ms. S. Gayathri for helping in writing this research article.

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