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Formulation of Anti-Diabetic Jam From Jamaican Cherry (Muntingia Calabura)

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ABSTRACT: Muntingia calabura, commonly known as Jamaican Cherry, is a nutritious fruit Borne from a multipurpose tree. The plant has been widely cultivated in India, South Asia, Malaysia, Indonesia, and the Philippines. Despite its nutritional, Anti-microbial, and anti-inflammatory properties, Jamaican Cherry lacks Commercial value. The fruit is rich in ascorbic acid, fiber, beta-carotene, thiamine, Riboflavin, and niacin, making it beneficial for anti-diabetic purposes by reducing Blood sugar levels and enhancing digestion. Stevia, a natural sugar substitute, was employed to replace regular sugar in the formulation. The objective of this study was to formulate, standardize, and analyze a processed anti-diabetic product, as well as a nutritional jam derived from Jamaican Cherry. The results of the study demonstrates the feasibility of creating processed anti diabetic product and a nutritional jam from jamaican cherry presenting a valuable addition to the range of functional food available.

KEYWORDS: Anti-diabetic jam , Muntingia Calabura , Stevia, Chia seeds powder, Pectin , citric acid

I. INTRODUCTION

2.1 Diabetes Mellitus

2.1 Diabetes Mellitus

Diabetes mellitus (DM) is a chronic metabolic disease characterized by hyerglycemia, and is usually associated with various other chronic diseases such as obesity, hyperlipidemia, hypertension and cardiovascular diseases. As such, DM is an increasing global health problem. Currently, DM is broadly classified into type 1 (T1D) and type 2 (T2D), in which genetics and environmental factors may play roles in the pathogenesis of these two types of diabetes. T1D, also known as insulin-dependent diabetes, is a chronic condition in which β -cells are destroyed resulting in high blood glucose levels due to little or lack of insulin produced by β -cells. T2D, the most prevalent diabetes accounting for more than 90% of all DM, occurs with various degrees of β -cell dysfunction and insulin resistance, and this condition is also commonly associated with obesity. The incidence of DM and its complications have increased significantly in the past few decades partly due to changes in lifestyle and living conditions. In 2017, approximately 8.4% of adults, i.e. 451 million adults, were diagnosed with DM worldwide and these figures were estimated to reach 693 million by 2045. High prevalence of DM causes severe social and economical burdens particularly in low and middle-income countries [1,3] Therefore, prevention and control programs are urgently needed to inhibit the dramatic increase in the incidence of DM and its complications. Diabetes Mellitus is a metabolic disease that causes high blood sugar. Over 8.5% of the global population is affected by high blood sugar levels and diabetes and in the past two decades alone there has been a dramatic increase in the diagnosis of type 2 diabetes. Diabetes is predicted to become the major cause of death and disability in the world by 2030. Primary prevention of diabetes is clearly a major public health priority. Dietary factors could play an important role in its pathogenesis. Dietary modification has been shown to delay or prevent the development of Diabetes mellitus. [2]



2.2 Jamaican Cherry

Muntingia Calabura, commonly known as Jamaican cherry, is a plant species belonging to the family Muntingiaceae with a variety of traditional uses. Following on these folklore claims, the works on phytochemical constituents, traditional uses, pharmacological benefits and their mechanisms are presented in a number of studies as well as the in vitro and in vivo investigations. This species contains valuable photochemical with known medicinal properties that are beneficial to the well-being (e.g. anti-microbial, anti-nociceptive, anti-inflammatory etc.) [4] Jamaican cherry is non climacteric fruit and is very fast growing tree of slender proportions. The fruits are smooth, soft, with very minute yellowish seeds present in the juicy pulp and they are characterized by a very sweet, musky taste with a fig like flavor, and fully ripened fruits taste similar to cotton candy. These fruits are not commonly found in markets; they are widely consumed by rural people in India. The fruit is known for its high nutritional value and contain high concentration of flavonoid and phenolic compounds. Due to its taste, nutritional value, and high content of antioxidant compounds, the fruit has a great potential to be used as a functional food in the food industry. [8]

II. RELATED WORK

Jamaican cherry is a wonderful antioxidant. By reducing the cell damage caused by oxidization, the fruit can enhance immunity, and reduce the duration of illnesses. And due to its anti-bacterial and anti-fungal properties, Jamaican cherry fruit can also help treat common colds, flu, and other infections. Our fast-paced and unhealthy lifestyle exposes us to several illnesses, the most common one being stomach or gastric ulcer, which can show symptoms like heartburn, belching, indigestion, passing excessive amounts of gas, or vomiting. So due to its, antimicrobial properties, the fruit can help prevent and treat gastric ulcers by eliminating harmful bacteria, it can also reduce your risk of developing other bacterial digestive issues and promote gut health. Jamaica cherry relieves blood vessels, so that blood can flow normally. Eating the fruit and drinking tea made of the leaves works great for getting rid of headaches. [9]

III. MATERIALS AND METHODS

3.1 Materials

100g Jamaican Cherry (Muntingia Calabura) - Anti diabetic fruit
2. 3g Stevia powder - For Natural sweetness
3. 10g Chia seeds - Helps to form a gel-like consistent desired texture
4. 1g Pectin - Act as a thickening agent
5. 0.6g Citric Acid - Adds acidity to the fruit mixture, activates pectin and enhances dark colour look to the Jam.

3.2 Preparation of Jamaican Cherry

Pulp Jamaican Cherry fruits (100g) were carefully selected and cleaned for the jam preparation. The fruits were processed and then crushed to obtain a pulpy consistency

3.3 Preparation of Jam

Jamaican Cherry pulp was taken. Stevia powder (3g) was added as a sugar substitute to impart sweetness without affecting blood sugar levels. Chia seeds (10g) were incorporated to enhance the jam's texture and nutritional content. Citric Acid (0.6g) was introduced for acidity, improved flavor and natural preservation. Pectin (1g) was included to improve the jam's setting and consistency. The mixture was heated and stirred on low flame until it reached a thick, jam-like consistency. The anti-diabetic jam was allowed to cool 23 before being transferred into air tight container The final end product was stored in a cool, dark place for optimal preservation.

3.4 Ingredient formula for preparation

Proportion for Jamaican Cherry (Muntingia Calabura) Jam Since we need 100g, the proportion is $100g/100g = 1$. Proportion for Stevia powder: 3g in 100g of jam, so the proportion is $3g/100g = 0.03$. Proportion for Chia seeds: 10g in 100g of jam, so the proportion is $10g/100g = 0.1$. Proportion for Pectin: 1g in 100g of jam, so the proportion is $1g/100g = 0.01$. Proportion for Citric Acid: 0.6g in 100g of jam, so the proportion is $0.6g/100g = 0.006$. Based on the



proportions calculated above, the formula for making Jamaican Cherry jam for 100g is: 24 Jamaican Cherry (Muntingia Calabura) pulp or juice: 100g Stevia powder: $(0.03 * \text{desired weight of jam in grams})$ Chia seeds: $(0.1 * \text{desired weight of jam in grams})$ Pectin: $(0.01 * \text{desired weight of jam in grams})$ Citric Acid: $(0.006 * \text{desired weight of jam in grams})$ This formula allows you to scale the recipe proportionally based on the desired weight of jam you want to prepare. Simply multiply each ingredient proportion by the desired weight of jam in grams to get the amount of each ingredient needed. This formula is derived based on the principle of maintaining consistent proportions of ingredients relative to the total weight of the jam. Overall, this particular formula provides a systematic and reliable approach to jam-making, ensuring consistency, flexibility, and efficiency in production while maintaining the desired taste, texture, and quality of the final product.

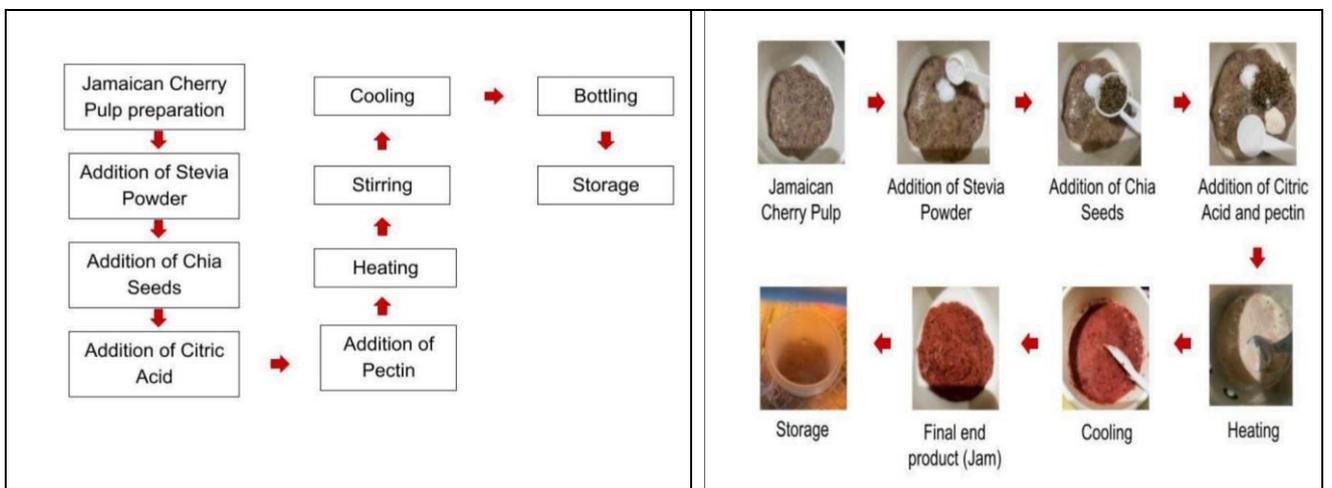


Fig.1 and Fig.2 Flow chart of Jam making process.

IV. RESULTS AND DISCUSSION

The organoleptic properties of Final Product Jamaican Cherry Jam was carried out using 7 point hedonic scale by 4 panellist and sensory characteristics such as colour, Texture, Taste, Appearance and overall acceptability were evaluated 4.6 Sensory Characteristics

3.6 Nutritional Analysis

Carbohydrate was analysed by AOAC method- UV Spectrophotometric method in which 100 gm sample was taken used for determining the mono,di, oligosaccharides.

- Protein was analysed by AOAC method- Kjeldhal Method was used for protein estimation and about 100gm sample was taken.
- Fat Analysis by AOAC method- Gravimetric Method for the fat analysis the gravimetric method involves the use of Solvent Distillation about 100gm was taken
- The Calorie content of the given sample was analysed by AOAC method – Spectrometer method
- The Sugar content of the given sample was analysed by AOAC method – HPLC.
- Fibre was determined in the sample using the standard methods of analysis of the AOAC 962.09 (1984).
- Sodium was determined by atomic absorption spectrophotometric method AOAC 985.01

3.7 Shelf Life Assessment

The 2-week shelf life assessment of Anti-Diabetic Jam from Jamaican Cherry (Muntingia Calabura) Shelf life was assessed by 5 parameters such as Texture Stability, Color Retention, Consistency Analysis, pH Level, Aroma Intensity



5.3 Shelf Life Assessment

1. Texture Stability:

Initial Texture Score: 9/10 Texture Score at 2 weeks: 8/10 Conclusion: A slight reduction in texture score within 2 weeks indicates minor changes, possibly due to storage conditions, while overall texture remains satisfactory.

2. Color Retention:

Initial Color (Lab* values): L* = 70, a* = 5, b* = 20 Color at 2 weeks: L* = 69, a* = 6, b* = 21 Conclusion: Negligible alteration in color parameters within 2 weeks suggests good color stability of the jam during this timeframe.

3. Consistency Analysis:

Initial Consistency: Smooth and uniform Consistency at 2 weeks: Consistency maintained Conclusion: Consistency remains satisfactory within 2 weeks, with no significant changes observed.

4. pH Level:

Initial pH: 3.8 pH at 2 weeks: 3.9 Conclusions: Marginal increase in pH within 2 weeks indicates minor acidity changes, remaining within acceptable limits.

5. Aroma Intensity:

Initial Aroma Strength: Pronounced fruity aroma Aroma Intensity at 2 weeks: Slight reduction in aroma Conclusion: Slight decrease in aroma intensity within 2 weeks may be attributed to storage, but the jam retains a pleasant scent overall. In summary, the 2-week shelf life assessment of Anti-Diabetic Jam from Jamaican Cherry (*Muntingia Calabura*) reveals minor changes in texture, color, and aroma, while consistency and pH remain stable. Despite subtle variations, the jam maintains its overall quality within this timeframe, providing valuable insights for short-term storage and consumer satisfaction.

V. CONCLUSION AND FUTURE WORK

The 2-week evaluation of the Anti-Diabetic Jam from Jamaican Cherry highlighted its consistent stability in sensory attributes, underlining its suitability for short-term storage and ensuring consumer satisfaction. Expert assessment after storage at 10°C and equilibration enhanced the reliability of the evaluation, providing valuable insights for product quality assurance and development. Jamaican Cherry Jam emerges as a flavorful and nutritionally-rich option, meeting consumer demands for both taste and health benefits. With its optimal sensory performance and nutrient profile, it stands as a promising choice for consumers seeking wholesome and satisfying dietary options, showcasing its potential in the competitive market landscape.

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