A Research Article on Attempted Isolation and Evaluation of sucrose (Sugar) From Fishtail palm (caryota urens) flowering Bud : challenges and Observations

Sayali Sadanand Taktode , Prof. Anand Gawai , Dr.Nandu kayande

1. Student of bachelor of pharmacy Dr.R.N.Lahoti institute of pharmaceutical education and research centre,sultanpur Tq.Lonar Dist.Buldhana. , Pin code 443302
2. Professor.Dr. R.N.Lahoti institute of pharmaceutical education and research centre sultanpur T.q. Lonar , Dist Buldhana ,pin code - 443302
3. Principal Dr. R.N . Lahoti institute of pharmaceutical education and research centre sultanpur T.q lonar . Dist. Buldhana pin . code – 443302

Abstract : Sucrose is a naturally occurring disaccharide widely used as a sweetening agent and energy source. The present study focuses on the isolation and evaluation of sucrose from the flowering bud of fishtail palm (Caryota urens). The extraction process involved collection of plant material followed by aqueous extraction, filtration, and concentration to obtain crude sugar. The isolated product was subjected to preliminary evaluation tests including Molisch's test, Benedict's test, Fehling's test, and hydrolysis test to confirm the presence of carbohydrates and sucrose. The results indicated partial confirmation of sucrose, although some tests showed variations due to possible impurities and incomplete crystallization. The study highlights the potential of Caryota urens as a natural source of sucrose, while also emphasizing the need for optimization of isolation techniques to improve yield and purity.

This study focus on the Attempted Isolation and Evaluation of sucrose From Fishtail palm flowering Bud. The obtained product did not show expected characteristics of pure sucrose . various qualitative test such as benedict ,fehling ,s and hydrolysis test where performed , showing inconsistent result indicating partial hydrolysis and impurities .

During the attempted isolation of sucrose from the flowering bud of Caryota urens, several challenges were encountered which affected the yield and purity of the final product.

Key words :

Name : Caryota urens (Fish tail palm) Sucrose isolation

Natural sugar extraction Plant-derived sucrose Fish tail palm sap Flowering bud extract

Introduction :

Caryota urens, commonly known as the fish tail palm, is a tropical plant widely distributed in South and Southeast Asia, including India. It belongs to the family Arecaceae and is traditionally valued for its sap, which is rich in carbohydrates and used for the production of jaggery, toddy, and sugar. The inflorescence sap of Caryota urens is considered a potential natural source of sucrose due to its high sugar content and ease of extraction.

Sucrose is a disaccharide composed of glucose and fructose and is one of the most important naturally occurring sugars in plants. It plays a crucial role in energy storage and metabolism and is widely used in food, pharmaceutical, and biochemical industries. The isolation of sucrose from plant sources is of significant interest in Pharmacognosy and natural product chemistry, as it helps in understanding the chemical composition and potential applications of plant-derived substances.

The fish tail palm has been traditionally utilized in rural communities for its sweet sap; however, systematic scientific studies on the isolation and evaluation of sucrose from its flowering buds are limited. Investigating this plant as a source of sucrose can contribute to the development of alternative natural sweeteners and promote the utilization of underexplored plant resources.

Therefore, the present study aims to isolate sucrose from the flowering bud of Caryota urens and evaluate it using standard qualitative tests such as Benedict's test, Fehling's test, and Molisch test. This research will provide insight into the feasibility of sucrose extraction and its identification from this natural source.

- **Plant Profile :**

Common name : fishtail palm Scientific/Botanical Name: Caryota urens Family: Arecaceae

Fig . 1. Fish tail palm (Caryota urens)

Aim : isolation and Evaluation of sucrose From Fish tail palm flowering Bud challenges and observation
Material handling : flowering buds where collected crashes filter and subjected to evaporation . Qualitative test perform include vending test filling test and hydrolysis test.

Procedure:

Plant Material Collection and Isolation & Evaluation of Sucrose.

1. plant material collection :

- Fresh flowering buds (inflorescence) of Caryota urens were collected from a local area .
- The collected material was washed with distilled water to remove dirt and impurities.
- The clean material was cut into small pieces and used immediately for extraction.

Fig. 2 flowering bud

2. Extraction of Sap (Raw Material Preparation)

1. The fresh flowering buds were crushed using a mortar and pestle.
2. The crushed material was pressed through muslin cloth.
3. The filtrate (sap) was collected in a clean beaker.
4. The sap was filtered again to remove fine particles.

Fig .3. Extract Of flowers bud

3. Clarification of Extract

1. The collected sap was heated at 60–70°C for 10–15 minutes.
2. A small amount of lime water ($Ca(OH)_2$) was added to remove impurities.
3. The mixture was filtered to obtain a clear solution.
4. The clear filtrate was used for further concentration.

Fig .4.Heating of extraction

4. Concentration of Extract

1. The clarified sap was heated on a water bath.
2. Continuous stirring was done to avoid burning.
3. The solution was concentrated until it became thick (syrupy consistency).
4. The concentrated solution was cooled at room temperature .

Fig.5. formation of thick syrup

5. Isolation of Sucrose (Crystallization)

1. The concentrated syrup was kept undisturbed for crystallization.
2. It was stored at low temperature (refrigerator) with added ethanol for 24–48 hours.
3. Formation of sugar crystals was observed.
4. The crystals were separated by filtration
5. The crystals were dried between filter paper or in a desiccation.

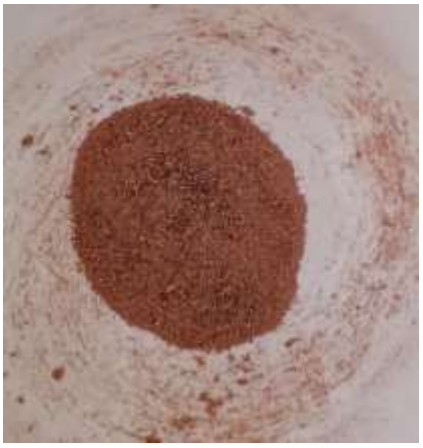


Fig .6. sugar crystal

6. Evaluation of Sucrose

(A) Physical Examination Colour : red , Brown colour fo

Taste : not Sweet , partially Sweet in Taste

Appearance : Crystalline solid , Low sucrose concentration Presence of impurities Improper temperature

B) Chemical Examination:

1. Molish test:

Molisch Test (Test for Carbohydrates)

The Molisch test is a general qualitative test used to detect the presence of carbohydrates in a sample. It is based on the dehydration of carbohydrates by concentrated sulfuric acid to form furfural or hydroxymethylfurfural, which then reacts with α -naphthol (Molisch reagent) to produce a characteristic violet or purple-colored ring.

Reagents Required :

Molisch reagent (α- naphthol in alcohol) Concentrated sulfuric acid (H_2SO_4) Procedure :

Take 2 ml of test solution in a test tube. Add 2–3 drops of Molisch reagent.

Mix gently.

Carefully add concentrated sulfuric acid along the side of the test tube without mixing. Observe the junction of the two layers.

Observation :

Not formation of violet/purple ring at the interface Grey colur observe

No ring formation → Negative result Result : Negative test

Conclusion :

The absence of a violet or purple ring at the interface after addition of Molisch reagent and concentrated sulfuric acid indicates a negative Molisch test, suggesting that carbohydrates are not present in the given sample or are present in very low/undetectable amounts.

2. Beneduct test :

Purpose : The Benedict's test is used to detect the presence of reducing sugars in a sample, such as glucose, fructose, lactose, and maltose.

Procedure:

1. Take 2 ml of Benedict's reagent in a clean test tube.
2. Add 1 ml of brown sugar solution.
3. Mix thoroughly.
4. Heat the mixture in a boiling water bath for 2–5 minutes.
5. Allow it to cool and observe the color change. Result : Partially Positive Result

Color Observed : partially blue

Moderate concentration of reducing sugar
Conclusion: Brown sugar shows a partially positive Benedict's test due to the presence of small amount of sugar.

3. Fehling Test:

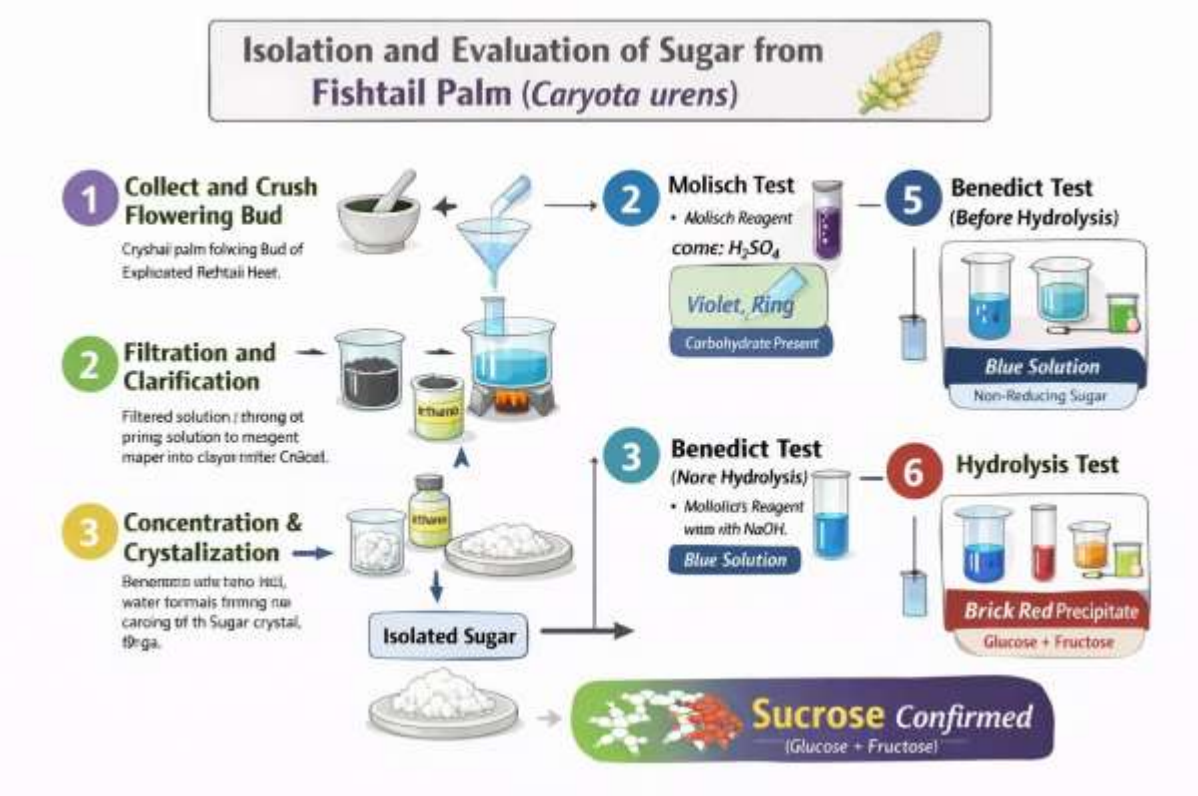
Purpose:
To detect reducing sugars (like glucose, fructose, lactose). Reagents Required:
Fehling's Solution A (Copper sulfate – blue colour)
Fehling's Solution B (Alkaline sodium potassium tartrate) Procedure :
Take equal amounts of Fehling A + Fehling B in a test tube. Mix properly → solution becomes deep blue.
Add your sugar sample solution.
Heat the mixture in a water bath for 2–5 minutes. Colour observation : remain Blue ,
Result: Negative , No reducing sugar Conclusion :
Absence of brick-red precipitate indicates that reducing sugars are not present in the sample.

4. Hydrolysis

Sucrose is a non-reducing sugar, but after hydrolysis it breaks into glucose and fructose, which are reducing sugars. These can then give positive results with tests like Fehling's or Benedict's.
Procedure :
Take a small amount of sucrose solution in a test tube. Add a few drops of dilute hydrochloric acid (HCl).
Heat the mixture gently in a water bath for 5–10 minutes (this causes hydrolysis). Cool the solution.
Neutralize the acid by adding sodium hydroxide (NaOH) slowly. Now perform Fehling's or Benedict's test on this solution.
Observation:
Brick red precipitate forms .
After hydrolysis + Fehling's/Benedict's test → Brick red precipitate forms.

Result : positive Test Conclusion:
The formation of a brick red precipitate after hydrolysis indicates that sucrose has been hydrolyzed into reducing sugars (glucose and fructose), confirming the presence of sucrose in the sample.

Fig. Evaluation test sample. Of sugar (sucrose).



Result : -

Sucrose was isolated from Caryota urens (fish tail palm) sap using standard extraction procedures. The obtained sample appeared as a whitish to light brown residue. Evaluation tests showed that the hydrolysis test and Fehling's test gave positive results, indicating the presence of reducing sugars after hydrolysis. However, Molisch's test and Benedict's test showed negative results, suggesting possible low carbohydrate concentration or incomplete isolation of pure sucrose.

Discussion : -

The positive hydrolysis and Fehling's test confirm that sucrose was present in the sample, as sucrose upon hydrolysis yields glucose and fructose, which are reducing sugars. The negative Benedict's test may be due to insufficient hydrolysis or low concentration of reducing sugars. Similarly, the negative Molisch's test result could indicate experimental error, dilution issues, or partial degradation of carbohydrates during processing. Variations in test results suggest that the isolated sample may not be completely pure sucrose and may contain impurities or insufficient quantity.

Conclusion : -

The study indicates partial success in the isolation of sucrose from Caryota urens. While hydrolysis and Fehling's test supported the presence of sucrose, inconsistent results from Molisch's and Benedict's tests suggest the need for improved extraction and purification methods to obtain more accurate and reliable results . The study demonstrates partial isolation of sucrose from Caryota urens. Further optimization of extraction and purification is required for improved accuracy and confirmation.

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