

**RESEARCH ARTICLE**

**A Legion Study on the Comparison of Therapeutic Potential of *Arecaceae* and Refined *Saccharum officinarum* Sugar**

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**ABSTRACT:**

Beside the availability of many natural sweetening agents, white sugar the chief reason for obesity and diabetics has been consumed as the prime sweetener across the world. The natural sugars are more organic, nutritious, healthy and nutritive in nature. A comparative study was carried out to bring out the benefits of Palm sugar over the refined white sugar. Three common dessert recipes were formulated with incorporation of (Arecaceae Sugar) Palm Sugar as sweetening agent and compared with the dessert samples made out of refined white sugar (*Raccharum officinarum* Sugar). All six dessert samples are experimented with laboratorial tests. The result of the study exposes the character of the samples and presence of vitamins and minerals exhibiting that recipes incorporated with palm sugar are more medically and nutritiously high.

**KEYWORDS:** Dessert; Palm Sugar; Recipes; Refined White Sugar and Sweetening Agent.

**INTRODUCTION:**

Sugar is an ever present component that could not be avoided in daily food routine. Our body needs sugar for an active functioning and eminent metabolism. Natural sugar is present in the forms of glucose, fructose, and lactose as a composite with minerals, fibers and vitamins in fruits and vegetables, calcium and protein in dairy products.<sup>1</sup> Variety of natural sugar is available and used in many cuisines for ages; usage of these natural sugars has been slowly overrun by refined white sugar. Refined white sugar is an end product of natural sugar from sugarcane or beet, it has no minerals or nutritive values than carbohydrates and high calories<sup>2</sup> as it undergoes a continuous refinery process.<sup>3</sup>

Consumption of white refined sugar has been increased to more than 30% for the last three decades,<sup>4</sup> on an average the per capita consumption of white is about 24.7kg.<sup>5</sup> Increase in consumption of refined white sugar increases the prevalence of many deadly diseases like cardiovascular problems, diabetics, obesity and even cancer.<sup>6</sup>

To overcome these problems caused due to the consumption of refined white sugar awareness has to be created in reinforcing the usage of natural sugars. Palm sugar is one among the natural sugar procured from palm, a tree crop popularly available in the Asian countries.<sup>7</sup> Palm sugar is organic, unrefined, healthy and nutritious it has a good composition of minerals like calcium, phosphorous, iron, vitamins like riboflavin, vitamin B12, Vitamin C, protein and nicotinic acid.<sup>8,9</sup> Variety of palm sugar is available and consumed globally by all age groups<sup>10</sup> as syrup or candy forms for their medical benefits. Nipa palm sugar, rich in anti-oxidants, vitamin A and Vitamin C has the competence to remove body toxin and fight cancer cell developments.<sup>11</sup> Palm sugar is a rare plant source of vitamin B12 and inositol<sup>12</sup> that keeps the nerve system and blood cells healthy.<sup>13</sup> Incorporation of palm sugar as an alternative substitute to white sugar improves the organoleptic qualities and transforms the recipe more healthier<sup>10</sup> Hereby an attempt has been made to incorporate dessert recipes with palm sugar as sweetener, their characters and micronutrients present has been compared to the same dessert recipes being sweetened with refined white sugar.

## **MATERIALS AND METHODS:**

The study entails the incorporation of palm sugar in well known Indian dessert recipes and three recipes were namely kollu halwa, bottle guard pudding and samba rava keer. The recipes were selected upon the criteria to provide a healthy and nutritious dessert.

The ingredients were collected from the stores and market at Pallavaram, Chennai. Mise-en-place for the recipes was done and the desserts were made in authentic method of preparation at School of Hotel and Catering management at Vels Institute of Science, Technology and Advanced Studies. Three set of desserts are prepared with refined white sugar and palm sugar. The prepared desserts are sent to the food analysis laboratory for preceding the following laboratorial test.

### **Diagnostic Characters of Dessert Samples:**

The three dessert samples made out of both palm sugar and refined white sugar is individually monitored and analyzed for their diagnostic characters like nature, colour, odour, appearance etc.

### **Phytochemical Screening of Dessert Samples:**

#### **Preparation of extract:**

The extracts are prepared by dissolving 1 g of the prepared elements in 10 ml of 70% of alcohol. The extract hydro-alcoholic extract so prepared was used for biochemical test after 24 hours. As per the standard procedures<sup>14,15,16</sup> the chemical test was done with the alcoholic extract and powdered specimens.

#### **Test for Tannins:**

In a test tube with 20 ml of water 1 ml of sample is added, heated and then filtered. To the solution add 0.1% of ferric chloride is added and observed for brownish green or a blue-black coloration.

#### **Test for Flavonoids:**

A portion of aqueous filtrate of each sample is taken and 5 ml of dilute ammonia solution and concentrated Sulphuric acid is added. Occurrence of yellow coloration shows the presence of flavonoids.

#### **Test for Steroids:**

To one ml of dessert sample 2ml of acetic anhydride is added with two ml of sulphuric acid. The actual color of the sample changes from violet to green or blue, indicating the presence of steroids.

#### **Test for alkaloids:**

Mayer's test proves better to test for alkaloid, to one ml of extract few drop of Mayer's reagent is added at the sides of the test tube. The test is proved positive if there appears a creamy or white precipitate.

#### **Test for Polyphenols:**

Test for polyphenol is done by adding 4 ml of ethanol to the samples and heated in a water bath for fifteen minutes. Finally freshly prepared ferric cyanide solution is added to the warm extract. A blue green color is formed which indicates the presence of polyphenols.

#### **Qualitative Analysis of Inorganic Elements:**

The test performed with the filtrate being prepared with treating the prepared samples by HNO<sub>3</sub> and hydrochloric acid, (3:1 v/v) for a hour<sup>17</sup>

#### **Calcium:**

Presence of calcium in the samples of desserts is found by adding one drop of diluted ammonium hydroxide and saturated ammonium oxalate solution to 10ml of the prepared filtrate. A precipitate of calcium oxalate is formed which is soluble in hydrochloric acid but insoluble in acetic acid.

#### **Magnesium:**

White calcium oxalate precipitate was separated by filtering the above solution. The filtrate was heated and cooled. Solution of sodium phosphate in dilute ammonia solution was added. White crystalline precipitate was observed.

#### **Sodium:**

Little uranyl magnesium acetate reagent was added to 2ml of the test solution, shaken well and kept for few minutes. Yellow crystalline precipitate of sodium magnesium uranyl acetate was observed.

#### **Potassium:**

Few drops sodium cobalt nitrite solution was added to 2-3ml of the test solution. Yellow precipitate of potassium cobalt nitrite was observed.

#### **Iron:**

Few drops of 2% potassium ferrocyanide were added to 5ml of the test solution. Dark blue coloration was observed.

#### **Sulphate:**

To 5ml of the test solution, lead acetate reagent was added. A white precipitate, soluble in sodium hydroxide, was formed.

#### **Phosphate:**

5ml of test solution was prepared in nitric acid and a few drops of ammonium molybdate solution were added. It was heated for about 10 minutes and left to be cooled. A yellow crystalline precipitate of ammonium molybdate was observed.

**Chloride:**

3 to 5ml of lead acetate solution was added to about 5 to 7ml of the filtrate. A white precipitate soluble in hot water was observed.

**Nitrates:**

Ferrous sulphate solution was added to 5ml of the test solution. No brown colour was produced, but when sulphuric acid was added (slowly from the side of the test tube), a brown colored ring was produced at the junction of two liquids.

**Qualitative Analysis of Vitamins:**

**Test for Vitamin- A**

Dissolve quantity equivalent to 10-15 units in 1 ml of chloroform and add 5ml of antimony trichloride solution. a transient blue colour is produced immediately.

**Test for Vitamin-C**

Dilute 1 ml of 2% w/v solution with 5 ml of water and add 1drop of freshly prepared 5% w/v solution of sodium nitroprusside and 2 ml of dilute sodium hydroxide solution. Add 0.6 ml of HCL drop wise and stir, the yellow colour turns blue.

**Test for Vitamin -D**

Dissolve a quantity equivalent to about 1000 units of Vitamin-D activity in chloroform and add 10ml of

antimony trichloride solution. a pinish –red colour appears at once.

**Test for Vitamin -E**

500mg of the sample powder was macerated with 10ml of ethanol for 5 minutes and then filtered. Few drops of 0.1% ferric chloride in ethanol and 1ml of 0.25% of 2'-2'dipyridyl to 1ml of the filtrate. Bright-red colour was formed on a white background. The background gradually assumes a pink.<sup>18</sup>

**RESULTS AND DISCUSSION:**

In the present study, three different desserts prepared with refined white sugar and palm sugars were investigated. The diagnostic characters, phytochemical, elemental and vitamins were examined in all six dessert sample made out of refined white sugar and palm sugar. The results were discussed as below. The diagnostic characters of dessert recipe sample give the clear idea about the nature of the samples. There exists no far-reaching difference in diagnostic character of the desserts. There exist a slight difference in color between the samples made out of refined white sugar and palm sugar as the recipes made from palm sugar takes its colour from palm sugar itself.

**Table 1: Diagnostic Characters of samples**

Sample	Features of Dessert Samples			
	Nature	Color	Odour	Taste
KOLLU HALWA (Palm Sugar)	Jelly	Brown	Ghee	Sweet
KOLLU HALWA (White Sugar)	Jelly	Light Brown	Ghee	Sweet
BOTTLEGUARD PUDDING (Palm Sugar)	Jelly	Light yellow	Ghee	Sweet
BOTTLEGUARD PUDDING (White Sugar)	Jelly	Light yellow	Ghee	Medium Sweet
SAMBA RAVA KEER (Palm Sugar)	Solid	Brownish yellow	Ghee	Medium Sweet
SAMBA RAVA KEER (White Sugar)	Solid	Light yellow	Ghee	Sweet

**Table 2: Phytochemical analysis of samples**

S. No	Constituents	Concentration level in Dessert samples					
		Kollu halwa (Palm)	Kollu halwa (White)	Bottle guard pudding (Palm)	Bottle guard pudding (White)	Samba rava Keer (Palm)	Samba rava Keer (White)
1.	Tannin	P	A	HC	P	P	A
2.	Flavonoids	P	A	HC	A	P	A
3.	Steroids	HC	P	HC	P	HC	P
4.	Alkaloids	P	HC	HC	P	HC	HC
5.	Polyphenol	HC	HC	HC	HC	HC	HC

P indicates presence, HC -indicates high concentration, A- indicates absence

**Phytochemical analysis of samples:**

A phytochemical analysis is done to evaluate the presence of bioactive constituents that helps to promote and sustain health. Presences of these constituents in food have a positive impact on human health, to overcome many deadly diseases.<sup>19</sup> In the present study the presence of tannin, flavonoids, steroids, alkaloid and polyphenol was checked in the dessert samples. The result reveals the presence of these bioactive constituents that indicates a positive effect on the health.

Table 2 illustrates that tannin is present in bottle guard pudding (Palm). Compared to the dessert samples prepared with palm sugar indicates a high concentration of these phytochemicals than the desserts made out of refined white sugar. Beside the presence of these chemical in other ingredients addition of palm sugar to these samples improves their concentration in the dessert samples.

**Table 3: Mineral analysis of samples**

S. No	Constituents	Concentration level in Dessert Samples					
		Kollu halwa (Palm)	Kollu halwa (White)	Bottle guard pudding (Palm)	Bottle guard pudding (White)	Samba rava Keer (Palm)	Samba rava Keer (Palm)
1	Calcium	HC	P	HC	P	P	P
2	Magnesium	P	P	P	P	P	P
3	Sodium	HC	HC	HC	HC	P	P
4	Potassium	HC	HC	HC	P	P	P
5.	Iron	P	A	P	A	P	A
6.	Phosphate	P	HC	P	P	P	P

P indicates presence, HC indicates high concentration, and A indicates absence

**Table 4: Vitamin analysis of samples**

S. No	Constituents	Concentration level in Dessert Samples					
		Kollu halwa (Palm)	Kollu halwa (White)	Bottle guard pudding (Palm)	Bottle guard pudding (White)	Samba rava Keer (Palm)	Samba rava Keer (White)
1.	Vitamin A	P	A	P	A	HC	A
2.	Vitamin C	HC	P	HC	P	HC	P
3.	Vitamin D	HC	A	HC	A	HC	A
4.	Vitamin E	HC	P	HC	P	HC	A

P indicates presence, HC indicates high concentration, A indicates absence

**Minerals:**

Minerals play a vital role in structural development of our body. They are inorganic nutrients only a few mg is required for our body construction.<sup>20</sup> Plants are the main source of these minerals consumption of these plants as food provides the required minerals for human beings.<sup>21</sup> Laboratorial tests were also conducted to find the presence of active mineral compounds in desserts samples made from palm sugar and refined white sugar. Table 3 illustrates the level of concentration of these minerals present in six desserts samples. As the palm sugar is natural and unrefined the presence of these minerals are high as been not removed but in white sugar these minerals are removed due to a set of refinery procedures. Among the dessert recipes the concentration of these minerals are comparatively high in dessert recipes made out of palm sugar than refined white sugar.

**Vitamins:**

Vitamins are organic materials that are indispensable for body growth. Vitamin is present in all plant and animal source of foods. Vitamins are organic compounds as it can be even altered by oxygen in air. Vitamins strengthens the body, builds and develops cells and help to resist infections<sup>22</sup> Vitamins plays an active role to fight against infectious diseases, avoids cardiovascular problems and prevents from many chronic diseases<sup>23</sup>

Analysis for vitamins present in the dessert samples are illustrated in Table 4, it shows that the level of concentration of vitamins are high in dessert samples made from palm sugar.

A high concentration of Vitamin A and Vitamin D is present in Samba Rava Kesari (Palm) beside the Concentration level of Vitamin C and Vitamin E are high in all three samples made out of palm sugar.

**CONCLUSION:**

Sweetening agents have a characteristic to influence their physicochemical properties in the recipes used. Palm sugar imposes its diagnostic characters and micro-nutrient content into the dessert recipes and improves it nutritive and medical benefits. The result of the study exposes that the dessert recipes made out of palm sugar have a high concentration micronutrients than those recipes made with refined white sugar.

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