

# Determination of Total and Reducing Sugars of Chocolate Incorporated with Palm Sugar

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## Abstract

The aim of the project was to develop a new product of chocolate incorporated with palm sugar at varying percentages such as 25%, 50%, 75%, and 100% to obtain the benefits of both cocoa and palm sugar. Total sugar and reducing sugar were determined. The percentage total sugar was found to be higher in 50% Palm Sugar Chocolate (PSC). 75% PSC had the lowest percentage total sugar. The percentage reducing sugar was found to be higher in normal chocolate. 75% PSC had the lowest percentage reducing sugar.

**Keywords:** Cocoa; Palm sugar; Palm sugar chocolate

## Introduction

Chocolate is a sweet, usually, brown food preparation derived from the seeds of the *Theobroma Cacao*, a tree which is cultivated in many semi-tropical countries, especially in South America, the West Indies, Java, and Africa. The seeds are borne in pods about 6 to 10 cm long and these contain from 25 to 75 of the almond-shaped seeds embedded in a mass of cellular pulp. The pods are cut open and the beans, separated from the pulp are subjected to fermentation or "sweating" process for several days, during which the temperature rises. The results of this treatment are the development of the flavor, the change of color to the familiar rich chocolate tint and the hardening of the shell. After fermentation, the beans are dried. The cleaned and sorted beans are roasted at a temperature of 140°C to 300°C, thereby developing the aroma of cocoa through changes brought about in the essential oil. The beans are ground between stones in steam-heated mills. The heat of grinding and the high-fat content are sufficient to keep the material liquid. The resultant thin paste is run into molds and after hardening constitutes the ordinary "plain," "bitter" or unsweetened chocolate. "Sweet chocolate" is made by mixing powdered sugar and flavoring with the warm chocolate paste in a special mill. The mixture is hardened in molds as in the case of the plain chocolate. Milk chocolate is made by adding to the warm chocolate mass either specially prepared condensed milk or dry milk powder. The differing degrees of softness of the chocolate is attained by mixing in the necessary proportion of the "butter". Different types of chocolate are made by differing the ingredients of interest. Chocolate has become one of the most popular food types and flavors in the world. Western world dominates the processing and consumption of chocolate [1-5].

## Materials and Methods

### Materials

The ingredients used to develop chocolate are Choco bar, Vegetable fat, Icing sugar, Palm sugar. Chocolate with varied percentage (%) incorporation of palm sugar such as 25%, 50%, 75%, 100%, and normal chocolate was developed [6-8].

**Choco bar:** Choco bar is the source of cocoa in the project and contain cocoa solids, milk solids, sugar, vegetable fat and permitted emulsifying agents (E322, E476).

**Vegetable fat:** Vegetable fats are essentially vegetable oils that are solid at room temperature. It carries flavors of other ingredients since many flavors are soluble in oil and acts as a binding agent.

**Icing sugar:** Icing sugar is the powdered white sugar and contains a little corn sugar to give a fine texture

**Palm sugar:** Palm sugar is extracted from the sap of palm tree flower and dissolves instantly and easily in liquid and semi-liquid. Glycemic index of palm sugar is 35.

## Method

The ingredients-choco bar, vegetable fat, icing sugar, and palm sugar were bought from the market. The steps undertaken to develop chocolate are as follows [9,10]:

**Step 1-**One measure of choco bar and half the measure of vegetable fat are melted

**Step 2-**One measure of icing sugar was added to the melted bar and mixed thoroughly to obtain the required consistency

**Step 3-**Liquid chocolate mixture thus obtained was poured into the mould and kept under refrigeration

To develop different variations of palm sugar incorporated chocolate, in step 2, 0.75 measure of icing sugar and 0.25 measure of palm sugar were added to develop 25% palm sugar chocolate. 0.5 measure of icing sugar and 0.5 measure of palm sugar were added to develop 50% palm sugar chocolate. 0.25 measure of icing sugar and 0.75 measure of palm sugar were added to develop 75% palm sugar chocolate. One measure of palm sugar was added to develop 100% palm sugar chocolate. Other ingredients and steps being the same for all variations.

## Results and Discussion

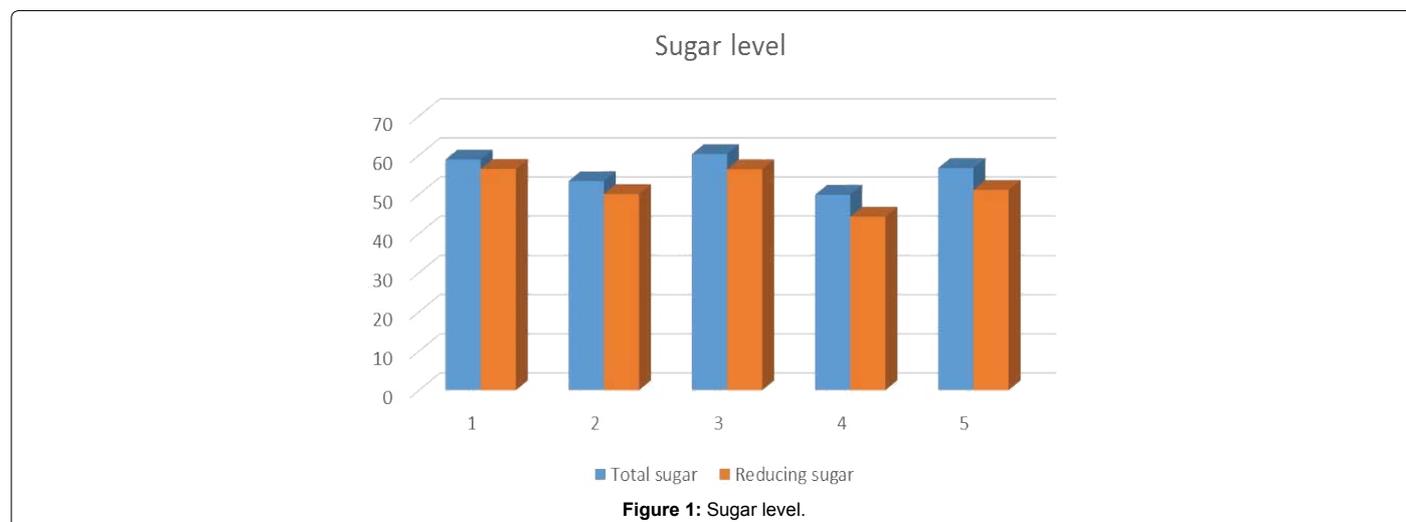
Total sugar and reducing the sugar for the five variations were determined.

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**Received** November 23, 2018; **Accepted** January 07, 2019; **Published** January 11, 2019

**Citation:** Nageswari G (2019) Determination of Total and Reducing Sugars of Chocolate Incorporated with Palm Sugar. J Food Process Technol 10: 782. doi: [10.4172/2157-7110.1000782](https://doi.org/10.4172/2157-7110.1000782)

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### Total and reducing sugar

The percentage total sugar was found to be higher in 50% Palm sugar chocolate with 60.3% total sugar as shown in Figure 1, followed by normal chocolate, 100% PSC, 25% PSC. 75% PSC had the lowest percentage total sugar. The percentage reducing sugar was found to be higher in normal chocolate, followed by 50% PSC, 100% PSC, 25% PSC. 75% PSC had the lowest percentage reducing sugar.

### Summary and Conclusion

A new product of chocolate incorporated with palm sugar was developed at varying percentages of palm sugar such as 25%, 50%, 75% and 100% to obtain the benefits of both cocoa and palm sugar. Total sugar, reducing sugar, shelf life was determined and sensory attributes were evaluated. The percentage total sugar was found to be higher in 50% PSC. 75% PSC had the lowest percentage total sugar. The percentage reducing sugar was found to be higher in normal chocolate. 75% PSC had the lowest percentage reducing sugar.

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