

# NUTRITIONAL COMPOSITION AND PROXIMATE ANALYSIS OF SUGAR CANDY (SAIL) IN BISCUIT FOR OPTIMUM CONSUMPTION

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## Abstract

The study assessed nutritional composition and proximate analysis of sugar sail (sugar candy) in the production of biscuits. Ingredients used in production include; corn flour (250g), icing sugar (250g), margarine (350g), sugar, glucose, colouring, honey (for sugar sail) and wheat flour (750g). Steps involved in production process include sieving of flour and mixing of margarine with the flour; silicone shapes were made for the biscuit shapes and these were oven dried under correct temperature. Sampled biscuit was subjected to sensory evaluation using twenty (20) trained taste panelists; the biscuit appearance was considered, aroma, colour, crunchiness, taste and overall acceptability using 9-point hedonic scale. Results reveal that appearance had the highest score of 13(65.0%), aroma 13(65.0%), colour 10(50.0%), crunchiness 11(55.0), taste 11(55.0) and overall acceptability had 11(55.0). This indicated that biscuit was liked by the panelists. Laboratory analysis of the biscuit showed that moisture content of the biscuit is 2.00% which indicated that biscuit is low in water thus prevents early deterioration, ash (2.60%), crude fat (8.20%), crude fibre (3.70%), crude protein (8.25%), dry matter (98.00%) and carbohydrate (75.25%). Hence it can be concluded that biscuits produced with sugar candy had the highest nutritional benefits and it is therefore recommended in food processing industry to maximize consumers' degree of likeness.

**Keywords:** Nutritional; Composition; Proximate; Biscuit; Sugar candy; Production.

## Introduction

Sugar Candy is any candy whose primary ingredient is sugar and the main types of sugar candies are hard candies, caramels, fondants, jellies and nougats. Broad category of sugar candies are called sweets candy or sugar candy is used only for hard candies that are nearly solid sugar. Sugar candy is a sub-type of candy which includes chocolate, chewing gum and sweet foods. It is a sub-type of confectionery which also includes sweet potatoes and sometimes ice-cream (Necco, 2014). The consumption of sugar candy on a regular basis increases the level of hemoglobin in the body and enhance blood circulation is also right (Wallance and Micha 2010).

Sugar candy commonly known as "mishri", is an unrefined form of sugar commonly used for culinary as well as medicinal purposes and made from crystallized and flavoured sugar. It is less sweet than refined sugar which is a variation not taste in comparison to traditionally used white sugar also provided energy to the body moisture and shelf life in sugar confections (Hartel, *et al.*, 2010). It is also made from the solution of sugarcanes and the sap of palm tree which is loaded with essential vitamins, minerals and amino acids and it has been used as a natural

remedy to various health related problems since the ancient days in India Persia. Sugar candy helps to control breathing problem when consumes with black pepper and milk cream. Medicinal properties of sugar candy can relieve cough (Edwards, 2000). It can help to stop nose bleeding through the consumption of sugar candy with water. It is particularly good for health if consumed daily with milk and also helps to improve and release mental fatigue. Sugar candy with black sesame seed improves the breast milk of lactating mothers. It also works as an anti-depressant which prevents poor eyesight and formation of cataract in the eyes. Drinking of sugar candy water after a meal or sip throughout the day improves the vision and increase the memory of an individual, It also treats headache. Sugar candy provides carbohydrate that enters the bloodstream with some glucose which is essential for the brain, central nervous system and red blood cells to function properly, it's also a hard confection made by cooling sugar syrup into large crystals (Jean and Mirea, 2013).

It can be made with different types of sugar, including white granulated sugar, sugar cane and brown sugar. Sugar candy is especially common in Asia cuisines and is used to sweeten teas, desserts and

even savory dishes. It is less sweet than comparable volume of granulated, white table sugar, making it an ideal, mild sweetener for many drinks and dishes. According to Alan Davidson (2003), biscuit is a flour-based baked food products in most countries which is typically hard, flat and unleavened, it is usually sweet and may be made with sugar, Chocolate, icing, jam, ginger or cinnamon which can also be savoury and similar to crackers, the types of biscuits include sandwich biscuits, digestive biscuits, ginger biscuits, shortbread biscuits, chocolate chip cookies, chocolate-coated marshmallow treats, Anzac biscuits, biscotti and speculaas. In most of North America, nearly all hard sweet biscuits are called “cookies” while the term “biscuit” refers to a soft, leavened quick bread similar to a scone. Biscuits are a quick source of carbohydrate thus keeping hunger away. Chocolate biscuits, made with whole wheat or oats are a rich source of B-complex vitamins and dietary fibre. In U.S.A., is usually a small flat sweet cake sweet cake (a biscuit in U.K), but locally a name for small cakes of various form with or without sweetening (Alan Davidson; 2003).

#### **Techniques used in making sugar candy**

Sugar candy making is the preparation and cookery of candies and sugar confections such as hard candies, jelly beans, gumdrops, taffy, cotton candy, chocolates, caramel candy also made by dissolving sugar in water or milk to form syrup which is boiled until it reaches the desired concentration or starts to caramelized. The type of candy depends on the ingredients and how long the mixture is boiled. Candy comes in a wide variety of textures, from soft and chewy to hard and brittle. Sugar candy was considered sweet and dainty, so making it at home, giving it away to friend and perhaps selling small amount in the local area and the Intakes of added sugar candy and its selected nutrients in the national health (Marriott and Olsho, 2010).

#### **Benefits of sugar candy in human diet**

**Quick source of energy:** Sugar candy is a simple carbohydrate which metabolize quickly in the body. They are rapidly broken down into glucose after consumption causing swift spikes and droops in blood sugar levels. As a result, sugar candy services as a quick source of energy for your body’s cells, tissues, and organs.

**Restore will power:** For any difficult task, take a short sugar, it makes people preserve linger and keeps them focused. A few piece of candy while taking on a big project.

**Boost haemoglobin levels:** People suffering from low haemoglobin levels may also suffer from problems

like anemia, pale skin, dizziness, fatigue and weakness among others. Sugar candy come to the rescue by increasing haemoglobin levels, but also regenerates blood circulation in the body.

**Helps in digestion:** Sugar candy is not only used as a mouth freshener but also help in digestion when had with fennel seeds. It has digestive properties that start the process of digestion immediately. So, to prevent indigestion consume a few pieces of sugar candy after meal.

**Energy Booster:** Sugar candy has a refreshing taste, which provides and energy boost when had after a meal. After a meal, you tend to become sluggish, but sugar candy will boost energy.

**Good for the Brain:** Sugar candy is also used as a natural medicine for the brain. Sugar candy helps to improve memory and release mental fatigue.

**Useful for lactating Mothers:** Sugar candy is also known to be useful for lactating mother. It is because it works as an anti-depressant and increases the production of breast milk.

**Improve Vision:** Sugar candy is good for eyes sight. To prevent poor vision and formation of cataract in the eye, consume sugar candy more often.

**Relieve cough:** Cough can occurs when throat are attacked by germs or when there is fever. Sugar candy contains medical properties that can relieve you from cough instantly. (Kearas and Schmidt, 2016)

#### **Objective of the Study**

The broad objective of the study is to assess the nutritional composition and sensory evaluation of sugar (sugar sail) in biscuit production.

The specific objectives are to:

- i. produce sugar candy biscuit
- ii. assess the sensory attribute of sugar candy (sugar sail) in biscuit production
- iii. examine the proximate composition of sugar candy (sugar sail) in biscuit production.

#### **Preparation Method of Sugar Candy**

\*Prepare the sugar solution. The sugar solution is made from crystalline (table) sugar (sucrose). Sometimes along with its close relative such as glucose or corn syrup (invert sugars), dissolved in water.

\*Cook (Boil) the sugar solution into a concentrated sugar syrup. It is then, cooked (boiled) into a concentrated sugar syrup to a codified density and temperature, indicated on the Candy-Syrup Temperature Chart



\*Cooling and Beating (Optional): It is allowed to cool and any kneading, beating, and manipulation may follow.

### Preparation of Sugar Solution

This step is basically the same for crystalline and non-crystalline candy. There are different ingredient (formulas) used depending upon the candy recipe. All sugar based candies, whether creamy or chewy or brittle, typically start out with crystalline sugar (sucrose) sometimes along with its close relatives such as glucose or corn syrup (invert sugars), as its main ingredient. What determine the type of candy being made is done through the type and proportion of ingredients that make up the initial sugar solution typically sugar dissolved in water. Sugar sweetened beverages and risk metabolic Syndrome (Malik, 2010).

Prepare the ingredients, pan and you work surface weighing ingredients is the most accurate way to measure solids, such as sugar but it can also be measured in dry measuring cup. Measure liquids in a liquid measuring cup or weigh. Prepare all equipment and tools in advance, you won't be able to once the candy making steps start. All pots and utensils must be spotless and dry. Prepare your work-surface if using a buttered pan or mold at the end always have it ready. Keep a container of ice water handy, if you accidentally spill hot ingredients on your hand, immediately plunge it into the ice water to stop the burn. Dissolve the sugar (a solute) in liquid, typically water (a solvent) and optionally mixed with other ingredient to create sugar solution. Sugar have a strong affinity for water, sucrose is the second most soluble sugar and two parts can readily dissolve in one part water called a sugar solution, whereby forming temporary but strong bonds to water molecules in their vicinity. The sugar and water ingredients are put into pot large enough so boiled sugar doesn't overflow and placed over medium heat. Stir the mixture constantly until sugar is dissolved. The science of Sugar candy confectionary (Edward, 2000).

### Cook (Boil) the sugar solution into concentrated sugar syrup

Sucrose tolerates the high heat of boiling, after a sugar solution is formed. It can be heated an boiled to certain temperature concentrating the solution as a sugar syrup, whereby chemical changes or reaction in the sugar crystals take place Sugar candy and body weight regulation (Hill, Prentice, 2000). Most candy recipes

require that the sides of the pot be washed down early in the cooking process either with a wet pastry brush or by putting the lid on the pan for a few minutes to remove any sugar crystals clinging to the container walls. Afterward, clamp or place a candy thermometer on the side of the pan asserted by Kawash, Samira, (2012).

Depending on the candy being made, the syrup is boiled to a codified temperature, measured with a candy thermometer, and/or to the syrup's specific concentration indicated on the candy-syrup Temperature chart. Keep the temperature constant, never try to rush a candy mixture by cooking it at a higher temperature than the recipe directs, or slow it down by reducing the heat. The high heat dissolves the sugar evaporates the water and breaks apart the sugar's molecules, causing the sugar syrup to get hotter and denser resulting in sugar syrup with concentrated sugar molecules. At this point, the sugar molecules, causing the sugar syrup to get hotter and denser resulting in sugar syrup with concentrated sugar molecules. At this point, the sugar molecules are tightly concentrated in the water reaching a super saturation state, while at the same time more unstable. Any unnecessary jarring, stirring or bumping of the pot during the boiling phase, will cause the unorganized sugar molecules to re-crystallize, or form an ordered sugar crystalline structure, running the whole batch. The sources of sugar candy confectionary (Edward, 2010). Even without heat, crystallized sugar will dissolve in water up to a certain point, that is. The general principle with candy making is that at a particular temperature, a given solvent (in this case, water) can dissolve only so much of a particular solute (sugar), reaching its saturation point where no more sugar can be dissolved. In other words, sugar crystals added to the solution after saturation point where no more sugar can be dissolved. But heating the sugar/water solution will increase the amount of sugar that can be dissolved. That is because heat disrupts sugar's crystalline structure, breaking apart the sugar's molecule's which allow more of it to dissolve in the water. As you have probably already found out. Sugar dissolves more readily in hot liquids than in cold.

As the sugar solution continues to be heated, the sugar molecules move faster and become faster apart, enabling the solution to dissolve more and more sugar molecules until it boils. Here, the sugar solution turns into a clear, syrup substance called sugar syrup.

**Nutritional Composition of Sugar Candy**

| Nutritional Facts             |     | %                          |
|-------------------------------|-----|----------------------------|
| For serving size of 25 pieces |     | (15g)                      |
| Calories 60                   |     | Calories from Fat 0 (0%)   |
|                               |     | % Daily Value <sup>x</sup> |
| Total Fat                     | 0g  | -                          |
| Sodium                        | 0mg | 0%                         |
| <b>Carbohydrate 16g</b>       |     | -                          |
| Net Carbs                     | 16g | -                          |
| Sugar                         | 16g | -                          |
| Fiber                         | 0g  | 0%                         |
| Protein                       | 0g  | -                          |
| <b>Vitamin and Minerals</b>   |     |                            |
| Vitamin A                     | 0mg | 0%                         |
| Vitamin C                     | 0mg | 0%                         |
| Calcium                       | 0mg | 0%                         |
| Iron                          | 0mg | -                          |
| Fatty Acid                    |     | -                          |
| Amino acids                   |     | -                          |

**Source:** Kearns, C.E, Schmidt and Glantz (2016)

**Materials and methods**

|                |               |
|----------------|---------------|
| Powdered Sugar | 250g          |
| Corn flour     | 3 quarter cup |

**Materials procurement**

½ cup of sugar, water, glucose, flour, powdered sugar, butter, corn flour were purchased from Towobowo Market, Igboora, Oyo State.

**Procedure for making Sugar Candy (Sugar Sail);**

- Measure water and put into a pot
- Measure sugar, glucose and cook for 4-5 minute
- Reduce the heat
- Add colouring and stir for 1 minute
- Remove the mixture from heat and mold to give shape

**Procedure for making biscuit**

- Measure butter and mix till fluffy
- Sieve flour and add to the fluffy butter
- Measure sugar and mix for some minutes
- Measure and sieve corn-flour
- Mix thoroughly
- Leave for 4-5 minutes
- Use silicon shape to bring out the desired shape
- Place it in the oven
- Leave for about 20minutes
- Remove from heat and serve

**Materials and Quantity used for biscuit production**

Materials that were used for biscuit production and quantity used are listed below;

| Recipe | Quantity |
|--------|----------|
| Butter | 350g     |
| Flour  | 750g     |

**Sensory Evaluation**

Sensory evaluation was conducted on production of sugar candy. The evaluation was based on colour, taste, appearance. Twenty (20) Panelists who participated in the study included lecturers and students of Oyo State College of Agriculture and Technnology, Igboora.



## Result

### Proximate analysis of Sugar sail cookies

| Sample             | % Moisture content | % Ash | % Crude fat | % Crude fibre | % Crude protein | % Dry matter | % Carbohydrate |
|--------------------|--------------------|-------|-------------|---------------|-----------------|--------------|----------------|
| Sugar sail cookies | 2.00               | 2.60  | 8.20        | 3.70          | 8.25            | 98.00        | 75.25          |

Source: O. Elerewe, 2000

#### Moisture content determination

The sugar sail cookies' degree of wetness of the fried plantain chips was found to be 2.00%. This was below the work reported by Oyet and Chicor (2020).

#### Ash determination

Ash refers to the inorganic residue remaining after either ignition or complete oxidation of organic matter in a sample food. Result shows that, sugar sail cookies have 2.60% ash content which was higher to the work done by Oyet and Chicor (2020).

#### Fat determinations

The fat composition of the sugar sail cookies was found to be 8.20%.

**Crude fibre content determination:** Crude fiber is the insoluble residue of an acid hydrolysis followed by an alkaline one. This residue contains cellulose and insoluble lignin. The value of crude fibre obtained in the sugar sail cookies was reported to be 3.70%. This result is higher than 1.27 reported by Oyet and Chicor (2020).

**Crude protein determination:** Crude Protein is the amount of protein in food. Crude protein depends on the nitrogen content of the food proteins. The presence of crude protein with the value of 8.25% was found in the sugar sail cookies which is closely related to the report of Oyet and Chicor (2020), who reported between 8.93 – 12.27 for biscuit produced from composite blends of wheat, coconut and defatted fluted pumpkin

**Dry matter:** Dry matter is calculated as the difference between the total weight and the moisture content. It is the measurement of the mass of something when completely dried. With regards to the sugar sail cookies, result shows 98.00% value of dry matter.

**Carbohydrate determination:** A carbohydrate is a bio-molecule consisting of carbon (C), hydrogen (H) and oxygen (O) atoms, usually with a hydrogen-oxygen atom ration of 2:1 (as in water). Result revealed that sugar sail cookies contain 75.25% of carbohydrate. This result was higher when compared to 62.21 – 72.25 given by Oyet and Chicor (2020).

### Result of sensory qualities of sugar sail production

| Parameter                | Score | Appearance        | Aroma            | Colour           | Crunchy           | Taste             | Over all Acceptability |
|--------------------------|-------|-------------------|------------------|------------------|-------------------|-------------------|------------------------|
| Like extremely           | 9     | 13 (65.0)         | 13 (65.0)        | 10 (50.0)        | 11 (55.0)         | 11 (55.0)         | 11 (55.0)              |
| Like very much           | 8     | 6 (30.0)          | 5 (25.0)         | 9 (45.0)         | 7 (35.0)          | 7 (35.0)          | 9 (45.0)               |
| Like moderately          | 7     | 1 (5.0)           | 2 (10.0)         | 1 (5.0)          | 2 (10.0)          | 2 (10.0)          | 0.0                    |
| Like slightly            | 6     | 0.0               | 0.0              | 0.0              | 0.0               | 0.0               | 0.0                    |
| Neither like nor dislike | 5     | 0.0               | 0.0              | 0.0              | 0.0               | 0.0               | 0.0                    |
| Dislike slightly         | 4     | 0.0               | 0.0              | 0.0              | 0.0               | 0.0               | 0.0                    |
| Dislike moderately       | 3     | 0.0               | 0.0              | 0.0              | 0.0               | 0.0               | 0.0                    |
| Dislike very much        | 2     | 0.0               | 0.0              | 0.0              | 0.0               | 0.0               | 0.0                    |
| Dislike extremely        | 1     | 0.0               | 0.0              | 0.0              | 0.0               | 0.0               | 0.0                    |
| <b>TOTAL</b>             |       | <b>20 (100.0)</b> | <b>20(100.0)</b> | <b>20(100.0)</b> | <b>20 (100.0)</b> | <b>20 (100.0)</b> | <b>20 (100.0)</b>      |

Source: Field survey, 2022

**Appearance:** On appearance, the plantain chips sampled were assessed based on the way the state, condition, manner, or style in which the plantain chips looks or appears. The tables 4.2 shows that 13 (65.0%)

of the respondents extremely like the sugar sail cookies, 6(30.0%) like very much, while 1(5.0%) like the sugar sail cookies moderately.

**Aroma:** On aroma, the candy was assessed based on sense of smell using their nostrils to assess the scent. 13(65.0%) like extremely, 5(25.0%) like very much while 2(10.0%) of the panelist like the sugar sail cookies moderately.

**Colour:** On colour, it was judged by panelist based on color brightness and attractiveness using eye retina. As presented in table 4.2 above, 10(50.0%) like extremely, 9(45.0%) like very much while 1(5.0%) likes the sugar sail cookies moderately.

**Crunchiness:** With regards to the crunchiness, it was judged by panelist based on the sensation of muffled grinding of the sugar sail cookies sample. It was revealed that 11(55.0%) like extremely, 7(35.0%) like very much while 2(10.0%) like the sugar sail cookies moderately.

**Taste:** On taste, the panelist judged using tips of tongue bud in assessing the sensation of flavour perceived in the mouth and throat on contact with the sugar sail cookies. As revealed in table 4.2 above, 11(55.0%) like extremely, 7(35.0%) like very much while 2(10.0%) like the sugar sail cookies moderately.

**Overall acceptability:** On overall acceptability, the sugar sail cookies sample was assessed based on other evaluated parameters by panelists. It was revealed that 11(55.0%) of the panelist extremely liked the sugar sail cookies while 9(45.0%) of the panelist likes the sugar sail cookies moderately.

### Conclusion

The study revealed that the sugar candy (sugar sail) in biscuit contains 2.00% of moisture content, 2.60% of ash content, 8.20% of crude fat content, 3.70% of crude fiber content, 8.25% of crude protein content, 98.0% of dry matter content and 75.25% of carbohydrate content with the sensory qualities of the sugar candy (sugar sail) biscuits. It was revealed based on the assessment of the panelist with regards to the overall acceptability of the sugar candy (sugar sail) biscuit, 11(55.0%) of the panelist extremely liked the sugar candy (sugar sail) biscuit while 9(45%) like the sugar candy (sugar sail) biscuit very much.

### Recommendations

Based on the result, it is recommended that sugar candy (sugar sail) should be consumed due to high presence of nutrients (Carbohydrate, protein and fat) protein and fat. Furthermore, the study recommends the use of sugar candy (sugar sail) in confectionary food production.

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