# THE PRODUCTION OF DIET 'ZOBO' DRINK FROM HIBISCUS SABDARIFFA PETALS USING SACCHARIN

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## ABSTRACT

Zobo drink, which is indigenously gotten from *Hibiscus* plants (Roselle), has been shown to be good source of natural carbohydrate, protein and vitamin C. Many medicinal applications of the Roselle plant have been developed around the world; Roselle also has certain therapeutic properties. The diet Zobo drink was prepared using saccharin and then preserved with kola nut extract. The extract was remarkably effective in preserving the diet Zobo drink from bacterial spoilage with a mean value of 7 x $10^2$ cfu/ml while the diet Zobo samples without the kola nut extract recorded a mean value of 45 x $10^2$ cfu/ml, after a 24hr incubation period on Nutrient agar. The pH value was 4, moisture content was 90%, the brix and alcohol contents both recorded a Zero value and the temperature of the product was 37.0 ºC respectively. The calorific value of the diet Zobo drink was 2.40Kcal for a 0.6g of saccharin used in the preparation of 1L of the drink while the calorific value of the sucrose-laden Zobo drink was 193.5Kcal for a 50g (about 5cubes) of table sugar used in the preparation of the sucrose-laden Zobo drink. By this investigation, it can thus be deduced that saccharin is indeed highly effective for dieting, as well as useful as a sweetener mainly because of its non-calorific property. Further studies on the health implication, if any, of artificial sweeteners could be carried out to ascertain their health safety mainly because of the controversies surrounding their use as food additives.

**Keywords:** *Hibiscus sabdariffa*, saccharin, artificial sweeteners, food additive, calorific value.

## INTRODUCTION

*Hibiscus sabdariffa*, a dicotyledonous plant, has over 300 species which are distributed in tropical and subtropical regions around the world (El-sherif and Sarwat, 2007). Most of them are ornamental plant species but many are believed to have certain medicinal properties; among them is *Hibiscus sabdariffa* (Yadong *et al.,* 2005). In many tropical areas, the red, somewhat acidic calyxes of *Hibiscus sabdariffa* varieties, are used locally for beverages, jellies, sauces and preservers; the leaves and stalks are consumed as salad or cooked vegetables. The fresh calyx (the outer whorl of the flower) is eaten raw in salads, is cooked and used as a flavoring in cakes etc and is also used in making jellies, soup, sauces, pickles, puddings etc. (Scoh, 2003).

*Hibiscus sabdariffa,* commonly known as Roselle, is an aromatic astringent cooling herb that is much used in tropics. It is said to have the diuretic effect to help lower fever and it is also anti-scorbutic. The leaves and flower are used internally as tonic tea for digestive and renal functions (Chen *et al*., 2003).

Although, a perennial Roselle is usually grown as an annual plant and propagated from the seed, it grows best in loamy soil mainly in tropical climate and requires rainfall averaging about 10 inches (25 cm) each month throughout the growing session. Their stalks and leaves are dark green to reddish in colour while their flowers are creamy white or pale yellow (Scoh, 2003).

Zobo drink, an indigenously non-alcoholic local beverage, is produced from the dried petals of *Hibiscus sabdariffa*. Zobo drink has been shown to be a good source of natural carbohydrates, proteins and vitamin C (Oginehor *et al.,* 2007). These calyces can also be used to produce herbal concoctions and other foods products (Akanya *et al.,* 1997). The juice drink which is usually obtained by the extraction of the calyx of *Hibiscus* contains about one percent solid.

The word ‘diet’ has numerous meanings, which include both “weight-loss diets” and “healthy diets” (with no intent of weight loss). Success in dieting intervention has traditionally been

defined as weight loss. It is implicit in this definition that losing weight will lead to improved health, and yet health outcomes are not routinely included in studies of diets (Essien *et al.,* 2011).

Sugar substitutes refer to sweet substances that have little or no calories or other nutrients. They include: Saccharin, aspartame, sucralose, neotame, stevia etc., all of which are hundreds of times sweeter than table sugar (sucrose) (Mclean, 1993).

Saccharin was discovered in the late 1800s at John Hopkins University by a scientist working on a coal-tar derivative. Saccharin has been used to sweeten food and beverages without calories or carbohydrates for over a century. It is particularly important to those whose diets require a restriction of caloric or carbohydrate intake, such as persons with diabetes.

Additionally, research indicates that saccharin may help to reduce risk of dental caries. It is used in such products as soft drinks, tables top sweeteners, baked goods, chewing gum e.t.c.

It continues to be important for a wide range of low-calorie and sugar-free food and beverage applications. It is used in such products as soft drinks, tabletop sweeteners, baked goods, jams, chewing gum, canned fruit and candy (Lainbourne, 1993).

Additionally, saccharin is used in health and beauty products including tooth pastes, hygiene/cosmetic products, vitamins and pharmaceuticals.

Saccharin is useful for people trying to control their weight. It may be useful for people with diabetes. It is both calorie and carbohydrate free. It has a long history (more than 100 years) of safe use. It contributes no calories to the diet because it is not metabolized by the human body.

Consumer research shows that low-calorie foods and beverages have become part of the lifestyle of millions of men and women who want to stay in better overall health, control their weight, or simply enjoy the many low-calorie products available. With the growing popularity of light foods and beverages, saccharin will continue to play a significant role confirming the world's oldest low-calorie sweetener, which still has plenty of "new" in it, even after all these years (Wasserman, 2015).

## MATERIALS AND METHODS

### Sample Collection

Dried *Hibiscus sabdariffa* petals were purchased at a local market (Sayedero market) in Ilaro, Yewa South local government, Ogun state, Nigeria. They were kept dry; moisture free, until the commencement of work on them.

### Sterilization

70% alcohol swab was used to disinfect the work surface to minimize contamination. Unwanted and indiscriminate movements were kept minimally to reduce air flow, thereby minimizing contamination by contaminated air currents. Beakers, test tubes and some other glassware were sterilized using hot air-oven at a temperature of $160^0$C for one hour.

### Preparation of the Kola nuts Extract

The kola nuts were washed and then weighed. 80grammes of the kola nuts was wet milled by adding l00ml of distilled water. Thereafter, it was fine sieved to remove unwanted materials. Centrifugation was carried out at 10,000 rpm for 20minutes to extract the kola nut extract from the kola nuts. About 100ml of the extract was stored in a clean plastic bottle (Nwachukwu*et al*., 2007).

### Production of the Zobo Drink

The samples were prepared by sorting which involves the removal of unwanted particles such as dirts, stones e.t.c. The calyces of the *H. sabadriffa* were extracted for their anthocyanin component using hot water extraction. One litre of hot water was added to 200g of the calyces of *H. sabdariffa* and then boiled for 15minutes; commercial pineapple flavor was then added as flavoring. This was then left to cool for some time to allow for sieving of calyces. Thereafter, 0.6g of saccharin was added in place of table sugar (sucrose) and also the kola nuts extract

was introduced in the production of the Zobo drink. The mixture was stirred homogeneously to dissolve the saccharin tablets, then kept and packaged in clean bottles. Sucrose-laden Zobo was also produced to comparatively test its calorific value with that of the diet Zobo.

### Determination of Physico-chemical Parameters

The Zobo extract was subjected to analyses to determine the following parameters:

- pH, measured with a pH meter
- Brix, measured with a refractometer
- Alcohol content, measured with an alcohol meter
- Temperature, measured with a thermometer
- Moisture content, determined analytically

Mean values were recorded for the samples.

### Calorific Value Determination

The calorific value of the diet Zobo beverage was determined, using a bomb calorimeter and then compared with that of the Zobo prepared with table sugar, according to a method described by Benedict and Fox (2005).

## RESULTS AND DISCUSSION

Nutrient agar, a general purpose bacteriological medium, was prepared to test the efficacy of the extract as a bacteriostatic or bactericidal agent. Agar plates were prepared in duplicates, with the first two containing the Zobo drink without the kola nut extract and the last two containing the Zobo drink with the kola nut extract. They were then subjected to a 24hr incubation period. A control experiment was also set up. Table 1 below shows the result of the test conducted.

Table 1: Bacterial load of the Zobo samples

| Sample | TVC (cfu/ml) | Remark |
|---|---|---|
| Zobo with preservative | $7 \times 10^2$ | Sparse contaminants |

| | | |
|---|---|---|
| Zobo without preservative | 45 x $10^2$ | Heavy contaminants |

Key: TVC = Total viable count

The kola nut preservative, as a food additive, was remarkably effective in preserving the diet Zobo drink from microbial spoilage with the mean value being 7 x $10^2$ Cfu/ml while the diet Zobo samples without the kola nut extract recorded a mean value of 45 x $10^2$ Cfu/ml after a 24hr incubation period on Nutrient agar, as shown in table 1.

Table 2: Physical parameters analysis of the diet Zobo beverage

| Parameter | Value (Mean) |
|---|---|
| ph | 4.00 |
| Moisture (%) | 90.0 |
| Brix ($^0$) | 0.00 |
| Alcohol content (%) | 0.00 |
| Temperature (°C) | 37.0 |

Table 2 shows the mean value for the physical parameters analysis carried out on two Zobo samples. The pH value was 4 which shows that the beverage is slightly acidic. The moisture content was 90%, which might have been because of the watery nature of the beverage. The brix and alcohol contents both recorded a Zero value, this is not far-fetched as no product (fermentable sugar) was fermented. This could point to the low calorific content of saccharin as compared with table sugar (sucrose). The temperature of the product was 37.0 °C, the beverage was maintained at room temperature.

Table 3: Calorific values of the diet Zobo and the sucrose-laden Zobo beverages

| Nutritional Content | Diet Zobo drink | Sucrose-laden Zobo drink |
|---|---|---|
| Carbohydrates (g) | 0.60 | 50.0 |
| Fat (g) | 0.00 | 0.00 |
| Protein (g) | 0.00 | 0.00 |
| Energy/Calorie (Kcal) | 2.40 | 193.5 |

Table 3 shows the calorific value of the diet Zobo drink to be 2.40Kcal for a 0.6g of saccharin used in the preparation of 1L of the drink while the calorific value of the sucrose-laden Zobo drink was 193.5Kcal for a 50g (about 5cubes) of table sugar used in the preparation of the sucrose-laden Zobo drink. The huge difference in their values is a pointer to the fact that saccharin is indeed non-calorific i.e. has no food energy and no nutritional value. This makes it a sweetener of choice for diabetics, as even honey contains 3.04Kcal/g which is close to that of sucrose which is 3.87Kcal/g or 16Kcal per teaspoon (Swinburn, 2008).

To decrease calorific intake, many health-conscious people choose to use sucrose substitutes. Each substitute has its own advantages and disadvantages. High amounts of dietary sugar can increase the risk of tooth decay, nutritional deficiencies, diabetes, obesity and coronary diseases (Wasserman, 2015). Diets high in sugars could make one overweight.

Diets high in sugars, saturated and trans fats, low fibre foods and high-sugar drinks contribute to non-communicable diseases (NCDs) and other health problems. High intake of fast food and processed foods increases these health risks.

Saccharin continues to be important for a wide range of low-calorie and sugar-free food and beverage applications. It is used in such products as soft drinks, tabletop sweeteners, baked goods, jams, chewing gum, canned fruit, candy, dessert toppings and salad dressings.

Additionally, saccharin is used in health and beauty products including tooth pastes, mouthwash, hygiene/cosmetic products, vitamins and pharmaceuticals (Bankole *et al*., 2013). Saccharin is useful for people trying to control their weight.

Saccharin may be useful for people with diabetes. Saccharin produces no glycemic response and may help control caloric intake. Saccharin is both calorie and carbohydrate free. Saccharin has been deemed appropriate for medical and nutrition therapy (MNT) for people with diabetes, and dietetic professionals may incorporate saccharin into the individualized meal plans of their patients who have diabetes (Marina, 2015).

Sucrose binds fairly well to T1r3 (a receptor protein which appears to be the primary receptor for sweet substances) which has a well-defined pocket where smaller molecules may enter and perhaps bind and hence leads to a sweet sensation in the brain. Enzymes readily metabolize sucrose releasing energy but not saccharin, which on the other hand, also binds to T1r3 but much strongly than sucrose owing to the differing structures of the two molecules. Therefore, humans sense saccharin as being approximately 300 times as sweet as the same amount of sucrose. Moreover, saccharin passes through the body without being metabolized and thus has no calorific content (Purves, 2017).

## CONCLUSION

It is a known and acceptable fact that Zobo drink is an indigenous beverage enjoyed by all and sundry but health-conscious consumers tend to be wary of its consumption, particularly if prepared by the addition of table sugar (calorific).

By this investigation, it can thus be deduced that saccharin is indeed highly effective for dieting, as well as useful as a sweetener mainly because of its non-calorific property.

## RECOMMENDATIONS

Considering the fact that obesity is highly on the increase, even among the adolescents, it is recommended that diet Zobo could be taken as a leisure drink either commercially or home-

prepared, as well as for its medicinal purpose, without the fear of unnecessary weight gain and complications associated with obesity but in moderation too.

Further studies on the health implication, if any, of artificial sweeteners could be carried out to ascertain their health safety because of the controversies surrounding their use as food additives.

An easier method known as the Atwater system could be used in the place of the bomb calorimeter method for the determination of calorific values as the latter is more expensive, cumbersome and would sometimes lead to over-estimation in calorific values due to the presence of indigestible components like fibers when present.

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