

# Using Stevia Powder to Make Low Calorie Bolu Kemojo (Kemojo Cake)-Traditional Snack in Riau Province, Indonesia

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**Abstract** Kemojo cake is one of the traditional foods in Riau Province, Indonesia, which is highly favored by the public, especially teenagers. It is known for its shape that resembles frangipani flower and its specific green color. This food has a very sweet flavor. For the development of food products from kemojo cake, the use of low-calorie sugar as the sweetener was developed, which can make this food more functional. In this study, the utilization of stevia for the sweetener of Kemojo cake was carried out. The research aimed to evaluate the effect of stevia low calorie sweetener on the physicochemical and sensory properties of traditional Kemojo cake. This research covered the optimization of sweetener extraction techniques from stevia and the formulation of the use of stevia for the production of more functional kemojo cake. The concentration of stevia was added sequentially at 0%, 0.5%, 1%, 1.5%, and 2%. The result showed as follows: in physicochemical properties, it had a significant effect on several aspects such as moisture, ash, carbohydrate, calories, texture and color value. But, it does not have a significant effect on protein and fat content. Sensory evaluation had a significant effect on color and texture parameters. However, it does not have a significant effect on aroma, sweetness and aftertaste. The best treatment based on chemical analysis, physical analysis and sensory evaluation was the addition of 1% stevia with moisture content (40.46%), ash (1.27%), protein (4.96%), fat

(39.72%), carbohydrate (13.59%), texture (21.29 N/m<sup>2</sup>), color index (dark green). The utilization of stevia as a low-calorie sweetener for the development of a more functional kemojo cake is very promising for the public society application.

**Keywords** Kemojo, Characteristics, Extraction, Natural Sweetener, *Stevia rebaudiana*

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## 1. Introduction

According to the World Health Organization (WHO), the consumption of foods containing high amounts of sugar causes obesity and subsequently developed diabetes mellitus. Diabetes mellitus affects 350 million people worldwide and it is expected that the global prevalence of type II diabetes mellitus will increase to 592 million by 2035 [1-3].

Stevia is a substitute for sucrose in food products that meets the need for low-calorie and high-intensity sweeteners. Stevia contains 7 steviol glycosides, namely stevioside, rebaudioside A, rebaudioside C, dulcoside A, rubusoside, steviolbise, and rebaudioside B [4]. The most essential characteristics of steviol glycosides were that they normalized blood glucose levels and stimulated insulin

secretion, which is especially beneficial for diabetics.

In addition, the stevia sweetener has good stability at temperature, pH, and good solubility in water [5]. The food industry has also tried to reduce calories in foods produced using low-calorie natural sweeteners. Stevia (*Stevia rebaudianna* Bertoni) is a safe natural sweetener for food and beverage products. Several researchers have also studied the possibility of using the stevia sweetener in the formulation of bakery products such as muffins [6], cakes [7], cookies and lemon cake [8-9].

The Food and Agriculture Organization/World Health Organization's Joint Expert Committee on Food Additives (JECFA) determined that steviol glycosides are safe for use in food and beverages and are designated as Generally Recognized as Safe (GRAS). It has 0-4 mg/kg body weight/day [10]. Extraction of stevia sweetener has been suggested for its beneficial effects on human health, including antihypertensive, antioxidant, prebiotic, antimicrobial, antibiofilm, anti-human activity of rotavirus [11-15].

Based on the data above, it is stated that stevia can be used as a natural sweetener in food products and used in the manufacture of cake products. Kemojo cake has a traditional cake from the Riau Malay tribe, Indonesia that has a sweet taste with the use of high sugar. Therefore, in this study, sugar was substituted with stevia sweetener. Evaluation was carried out on the physicochemical properties of Kemojo cake with stevia sweetener substitution, the aim was to study the nutritional content of the composition of four different Kemojo cake formulations, with the incorporation of *Stevia rebaudiana*, which was also carried out through a sensory analysis to ask the acceptance of the use of *Stevia rebaudiana* as a sweetener substitute for granulated sugar by society.

## 2. Materials and Methods

The materials used in this study include stevia leaves obtained from Sawahlunto, wheat flour, eggs, coconut milk, margarine, sugar, pandan leaves and vanilla. The chemicals used were distilled water, 96% ethanol, n-hexane, H<sub>2</sub>SO<sub>4</sub>, K<sub>2</sub>SO<sub>4</sub>, HCl and activated charcoal.

The tools used in this study are knives, sieves, thermometers, aluminum foil, digital scales, measuring cups, active charcoal, filter paper and kemojo cakeprints and plastic containers. While the tools used for analysis are UV spectrophotometer (Shimadzu), oven, desiccator, furnace, aluminum dish, kjedahl flask, petri dish and stationery.

### Stevia Extraction

Stevia leaves are washed and dried or aerated. Then the stevia leaves are ground using a blender to reduce the size. Stevia leaves were added with 96% ethanol in a ratio of 1:10 (w/v). The solution was ultrasonicated at a temperature of 40-45°C for 2 hours. The solution was

filtered using a filter cloth. The solution was heated at 70°C for 3 hours using activated carbon. The solution was filtered using filter paper. The extract was dried in a cabinet dryer at a temperature of 50°C until it became a powder. Stevia powder has been tested for antioxidant content (DPPH) and water content.

### Kemojo Cake Making

The kemojo cake was made by mixing 250 g of flour, 150 g of sugar and 1 tablespoon of vanilla into a bowl. Melt 200 g of butter and add pandan extract which has been dissolved in 500 mL of coconut milk. Slowly beaten eggs are added to the mixture. The ingredients are stirred with a spatula until well blended. Furthermore, the roasting was carried out using an oven at 175°C for 45 minutes. The kemojo cake was then tested at proximate levels, antioxidants, reduced sugar content, total calories, color index, texture, organoleptic, and total plate number.

### Quality Analysis

The characteristics of kemojo cake such as proximate analysis, calory, colour and sensory were determined by using Indonesian's National Analytical Method [16-18].

## 3. Results and Discussion

The extraction process of the sweetening agent (stevioside) from stevia leaves was an interesting challenge during this research. The process of extracting active ingredients was generally performed using ethanol solvents where chlorophyll which is a color substance in the leaves was also be extracted [19]. The use of sweeteners that still contain chlorophyll was highly disliked by panelists due to of the bitter and astringent taste produced by chlorophyll. Therefore, in this study, the chlorophyll removal was performed through an adsorption process using activated charcoal. This process succeeded in reducing the chlorophyll levels to 70% which can make the product taste more acceptable to panelists.

A comparison of the proximate levels for each sample can be seen in Table 1. The results of this study showed that the water content of the kemojo cake product in the control was 37.52%. Meanwhile, the addition of stevia in the manufacture of kemojo cake resulted in increasing humidity. The water content of this cake product according to SNI is less than 40%. The ash content in this study on cake was 1.65%, which is less than 3%. The moisture content and ash content of kemojo cake products obtained in this study were in accordance with the Indonesian National Standard (SNI 01-4309-1996). The obtained protein content was 5.01%. This was not much different from previous research [20] on instant kemojo cake flour with a protein content of 6.30%. The fat content in this study was 39.56% and the carbohydrate content (by different) was 16.26%.

The trends of calory value of produced kemojo cake are shown in table 2. There was a decrease in the calory value during increment of stevia. The results of the caloric value test on kemojo cake in the control without the use of stevia (0% stevia and 100% sugar (sucrose)) were 7,650,209 cal/g. While the product of kemojo cake with the addition of stevia as a natural sweetener at a concentration of 0.5% is 6,710,710 cal/g. Stevia concentration 1% has calories 6,549,068 cal/g, cake product with stevia concentration 1.5% has calories 3,569,068 cal/g, and 2% concentration is 6,243,808 cal/g. Complete replacement of sucrose with stevioside reduces calorie levels by up to 15% in biscuit formulations [21].

Calories of kemojo cake products are obtained from ingredients such as wheat flour, coconut milk and margarine. This material has a fairly high calorie, so the resulting product is also high calorie. The calories content of granulated sugar according to Darwin is 364 kcal/g. While the calories in blueband margarine are 600 kcal/g and coconut milk calories are 234 kcal/mL [22].

Stevia as a sweetener can lower the calorie content of the resulting kemojo cake product. Theoretically, the sweetness level of stevia has a value 20 times greater than the use of sugar. Stevia is known to be low in calories even

though it tastes sweeter than sugar. This is certainly very good for the development of kemojo cake products which are highly favored by teenagers. Developing this product will be able to make teenagers avoid diabetes or obesity

The colour observation of produced kemojo cake indicates in table.3 Colour is one of the visual on product acceptance by consumers. The parameters in the color test are L\* which is a measure of brightness or darkness, a\* is a measure of red indication and b\* is a bluish yellowish measure. The results of this study indicate that the use of stevia in the manufacture of sponge cake products reduces the brightness of the product or L. This decrease in brightness causes the product to be darker in color than the control. This is due to the presence of flavonoid compounds, especially the presence of chlorophyll and tannins which affect the color of the product. In addition, changes in the product can also occur due to the melanoidin phenomenon produced by the Maillard reaction [23].

Moreover, the color change in the product was significantly affected by the presence of stevia. The green color was the specific identity of bolu kemojo, so while removing the chlorophyll, the adsorption process was not carried out maximumly because it is perfect. Thus, green is kept in this context.






**Table 1.** Proximate analysis of kemojo cake

Sample	Moisture	Ash	Protein	Fat	Carbohydrate
Control Bolu Kemojo	37.52%	1.65%	5.01%	39.56%	16.26%
Concentration stevia 0.5%	39.72%	1.24%	4.92%	39.00%	15.12%
Concentration stevia 1%	40.46%	1.27%	4.96%	39.72%	13.59%
Concentration stevia 1.5%	41.55%	1.31%	4.96%	40.62%	11.56%
Concentration stevia 2%	43.95%	1.33%	4.93%	40.59%	9.20%

**Table 2.** Calory value of produced kemojo cake

Sample	Total (cal/g)
Control Bolu Kemojo	7,650.209
Concentration stevia 0.5%	6,710.710
Concentration stevia 1%	6,549.068
Concentration stevia 1.5%	6,478.786
Concentration stevia 2%	6,243.808

**Table 3.** Colour index of produced kemojo cake

Sample	L*	a*	b*	Colour
Control Bolu Kemojo	54.88	-25.87	37.31	
Concentration stevia 0.5%	51.34	-20.64	34.03	
Concentration stevia 1%	48.18	-20.37	28.44	
Concentration stevia 1.5%	42.86	-19.09	25.21	
Concentration stevia 2%	38.90	-16.11	22.49	

Sensory is the main parameter in the acceptance of the product by consumers. Products with healthy and high nutritional value alone are not necessarily enough and to be accepted by consumers. This was a sensory test to determine the preference (hedonic) and hedonic quality using 25 panelists. The results of organoleptic tests with parameters of color, aroma, taste, texture and aftertaste can be seen in Figure 1.

From the results of the organoleptic test, it can be seen that the taste of the kemojo sponge product with the addition of stevia has a different taste with the addition of sugar. The concentration of added stevia affects the taste of the product. The texture of the kemojo sponge product was significantly different from the addition of stevia. The most preferred texture was the control of kemojo sponge, but the closest to the control was the addition of 0.5% stevia. The results of this texture indicate that the addition of stevia cannot replace the function of granulated sugar as a texture. Using stevia to replace sugar can increase the hardness and brittleness of a product [24-26]. The recapitulation of the organoleptic value of the kemojo cake was made using radar. Radar diagrams are used to simplify and compare the differences of several variables or products that will be compared to the level of preference or acceptance of the product by the panelists.

From the organoleptic radar chart for sponge cake, it can be seen that the most acceptable products in terms of color parameters of color, aroma, taste, texture and aftertaste

were treatment A (addition of stevia with a concentration of 0.5%) and treatment B (addition of stevia with a concentration of 1%). Panelist acceptance for kemojo cake products with the addition of stevia as much as 1% was the same as kemojo cake using sugar as a sweetener. The same sweet taste but with different caloric values was a very expected finding from this research. This will certainly be an added value for kemojo cake whose caloric value will be lower than the existing kemojo cake in the community so far.

#### 4. Conclusions

The addition of stevia as a sweetener in Traditional Kemojo Cake is known to affect the water content, ash content, and carbohydrate content but did not affect the protein and fat content of the product. The hedonic test results showed that the addition of stevia powder did not affect the aroma, but did affect the color, sweetness, texture, and aftertaste of Bolu Kemojo products. The best treatment that was accepted and favored by panelists is at a concentration of 1%. Generally, the utilization of stevia could be used as the sweetener for kemojo cake which is known as low calory snack. Future research on the feasibility study of using stevia as a sweetener should be considered. The general society demand to reduce sugar in food is urgent for a better generation.

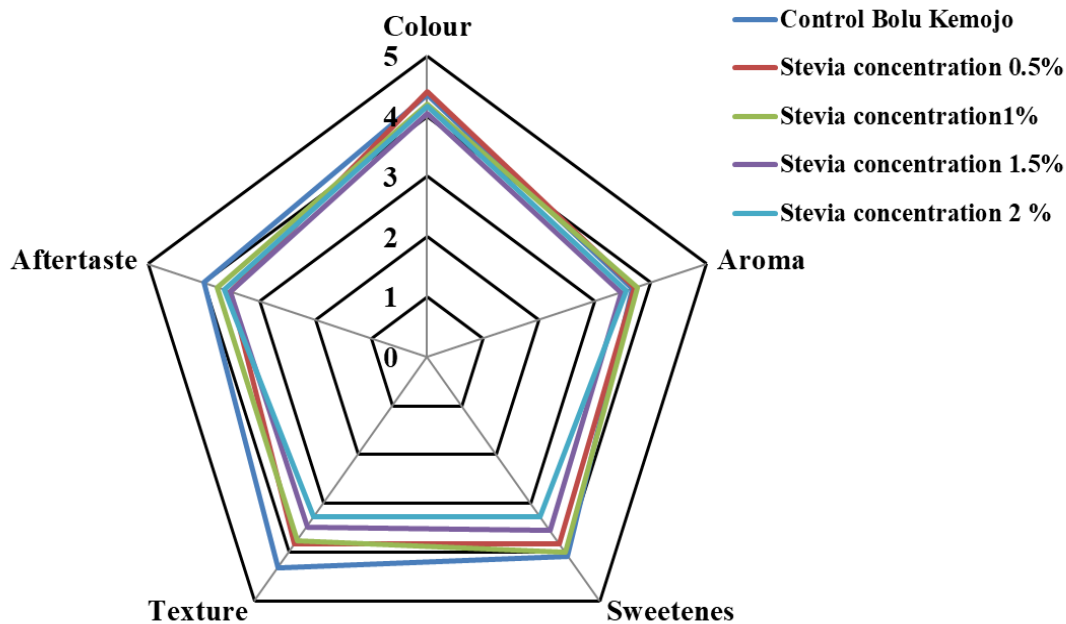


Figure 1. Sensory Radar Graph of the Effect of Stevia Addition on Kemojo cake

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