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THE USE OF STEVIA SUGAR (*Stevia Rebaudiana*) IN THE PRODUCTION OF ROBUSTA COFFEE JELLY CANDY (*Coffea Canephora)*

Pemanfaatan Gula Stevia (Stevia Rebaudiana) pada Pembuatan Permen Jelly Kopi Robusta (Coffea Canephora)

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ABSTRACT

Jelly candies made from robusta coffee and stevia sugar are a creative and healthy snack made from natural ingredients. Because of the nutritional benefits contained in Robusta coffee, which is rich in caffeine, phenols, flavonoids, saponins, tannins, and antioxidants. This snack is suitable for all groups of people. This nutrition can help keep the body healthy and prevent long-term diseases. Known as a natural sweetener, stevia sugar has a sweetness level between 150 and 300 times that of regular sugar, yet it remains safe for diabetics because it can help regulate their blood sugar. This study aims to determine the water content and preference for jelly candies made from a mixture of Robusta coffee (Coffea canephora) and stevia (Stevia rebaudiana). This experiment applies a completely randomized design (CRD). As many as 40 panelists with semi-trained skills to try this product. This study took place from February to April 2025. The hedonic test results show that formula F3 is preferred for its aroma, taste, and texture, while formula F1 is preferred for its color. For water content, the results are 53.53% for F1, 58.41% for F2, and 47.06% for F3, each above the Indonesian national standard for jelly candy. It has been proven that changes in formulation affect color, aroma, and taste, but do not significantly affect texture.

Keyword : *coffea stevia; jelly; jelly candy*

ABSTRAK

Permen jelly yang terbuat dari kopi robusta dan gula stevia adalah camilan yang kreatif dan sehat yang terbuat dari bahan-bahan alami. Karena manfaat gizi yang terkandung dalam kopi Robusta, yang kaya akan kafein, fenol, flavonoid, saponin, tanin, dan antioksida. Nutrisi ini dapat membantu tubuh tetap sehat dan mencegah penyakit jangka panjang. Dikenal sebagai pemanis alami gula stevia memiliki kadar manis antara 150 dan 300 kali lipat daripada gula biasa akan tetapi tetap aman untuk penderita diabetes karena dapat membantu mengatur gula darah mereka. Studi ini bertujuan untuk mengetahui kandungan air dan preferensi permen jelly yang terbuat dari campuran kopi Robusta (Coffea canephora) dan stevia (Stevia rebaudiana). Eksperimen ini menerapkan desain acak lengkap (RAL). Sebanyak 40 orang panelis yang memiliki keterampilan semi-terlatih untuk mencoba produk ini. Studi ini berlangsung dari bulan Februari hingga April 2025. Hasil uji hedonik menunjukkan bahwa formula F3 lebih disukai karena aroma, rasa, dan

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teksturnya, sementara formula F1 lebih disukai untuk warnanya. Untuk kandungan air, hasil F1 adalah 53,53%, F2 adalah 58,41%, dan F3 adalah 47,06 persen, masing-masing di atas standar nasional Indonesia untuk permen jelly. Terbukti bahwa perubahan dalam formulasi mempengaruhi warna, aroma, dan rasa, akan tetapi tidak banyak mempengaruhi tekstur.

Kata Kunci : permen jelly; kopi robusta; stevia rebaudiana

INTRODUCTION

For years, coffee has been a favored beverage for many due to its unique taste and aroma. Numerous compounds are contained within it, such as aldehydes, ketones, alcohols, and various acids, which contribute to coffee beans' distinctive aroma. However, the most significant component is caffeine, which acts as the primary antioxidant in coffee (Damayanti, 2023). Healthy snacks are foods that have a balanced nutritional content, such as protein, carbohydrates, fats, minerals, and fiber, which are needed by the body. Consuming healthy snacks can provide benefits like supplementing daily energy, nutrient, and vitamin intake (Fitriani, 2022). Healthy snacks must also meet nutritional requirements based on specific age groups, types of food ingredients, and processing methods. The criteria for healthy snacks encompass the content of energy, protein, fat, carbohydrates, minerals, vitamins, and water. Furthermore, such snacks should consider the characteristics of the food materials, both in terms of texture (liquid, solid, hard, or soft) and individual preferences for certain ingredients. Food ingredients that can be processed into innovative products include underutilized local resources, those with high nutritional value, or those rarely used, whether from plant or animal sources (Adolph, 2016).

Stevia is a natural sweetener that can be used in food and beverages. This plant contains approximately 4–15% stevioside, a compound potentially helpful in managing hyperglycemia, hypertension, and dyslipidemia. Additionally, stevia contains natural antioxidants capable of inhibiting the oxidation process of lipid compounds. Therefore, low-calorie sweeteners like stevia sugar are considered a safe alternative for long-term consumption (Jutrialni, 2024). The compounds in stevia include secondary metabolites with bioactive activities, such as alkaloids, chlorophyll, xanthophyll, amino acids, flavonoids, phenols, tannins, and ascorbic acid. Each gram of stevia leaf extract

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contains tannins or terpenes, which offer other health benefits (Putri et al., 2019). Each gram of stevia leaf extract contains stigmasterol, tannins, and terpenes (Setiawan, 2020). Based on research conducted by Frankson (2024), it was concluded that stevia leaves contain many active substances, such as alkaloids, flavonoids, tannins, and others. Furthermore, the research states that the antioxidant level of stevia leaves is nearly equivalent to that of vitamin E.

A solid and chewy textured snack is called jelly candy. It is typically made from fruit juice and sugar. Jelly composition consists of 45% fruit juice and 55% sugar, heated until the soluble solids content reaches at least 65%. Colorings and flavorings can be added to enhance the product's taste and appearance. Raw materials for jelly can include fruits that do not pass quality selection, such as overripe fruits or those of unsuitable size. The primary goal of making jelly is to produce a product with a clear appearance, uniform color, desirable taste, and appropriate texture (Wachyuni, 2019).

Research by Kurniawan (2023) shows that the ethanol extract from robusta coffee beans has fairly strong antioxidant activity with an IC50 value of approximately 47.77 µg/ml. Furthermore, research from Sofyanita et al., (2024) found that administering robusta coffee to rats with diabetes mellitus could lower blood glucose levels, especially at a dose of 2 ml/kg body weight, which was more effective compared to a dose of 1 ml/kg body weight. This effect is believed to originate from the chlorogenic acid and caffeine content in coffee.

Several prior studies have explored various aspects, ranging from the production of jelly candy, cookies, brownies, instant beverages, powdered drinks, and also jelly. Meanwhile, some research exists regarding sugar substitutes in the jelly-making process, such as research conducted by Sofyanita et al., (2024) on the process of making jelly candy based on robusta coffee with the addition of stevia, the addition of agar powder and CMC in making robusta coffee jelly (Brilliantina et al., 2023), and the addition of sucrose, gelatin, and carrageenan in the process of making robusta coffee jelly, as well as the effect of adding sugar and carrageenan on jelly quality.

Based on the above description, no water content test has been conducted; therefore, the researcher is interested in

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creating a jelly product based on robusta coffee and stevia sugar and performing a water content test.

METHODS

Design, Location, and Time

This research was conducted in the laboratory of the Bengkulu Health Polytechnic (Poltekkes Kemenkes Bengkulu), and water content testing was performed at the Chemistry Laboratory, Faculty of Mathematics and Natural Sciences (FMIPA), University of Bengkulu. The study took place from February to April 2025, employing a Completely Randomized Design (CRD).

Number and Sampling Technique / Equipment and Materials

The research subjects consisted of three jelly candy formulations: F1 (20 ml coffee solution: 30 ml stevia solution), F2 (15 ml coffee solution: 35 ml stevia solution), and F3 (10 ml coffee solution: 40 ml stevia solution). The primary ingredients used were Robusta coffee and *Stevia rebaudiana* leaves. Additional materials included gelatin, sucrose, and water.

Types and Methods of Data Collection / Research Procedures

The data collected included water content analysis. An organoleptic test was conducted to assess product acceptability based on color, aroma, taste, and texture attributes. Organoleptic data were obtained from 40 semi-trained panelists who evaluated the three jelly candy formulations.

Procedure for Preparing Robusta Coffee Solution

The preparation of the Robusta coffee solution began by heating 100 ml of water. Subsequently, 50 grams of coffee powder were mixed with the heated water (creating a 50% coffee solution). The mixture was then left to stand for 5-10 minutes to aid the infusion process. Finally, the coffee was filtered using a cloth filter to separate the liquid from the coffee grounds.

Procedure for Preparing Stevia Sugar Solution

The preparation of the stevia sugar solution started by mixing 1500 ml of hot water with 100 grams of stevia leaf powder (creating a 15% stevia solution). This mixture was left to steep for 15 minutes, yielding

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1500 ml of stevia solution. Subsequently, the solution was filtered using a cloth filter to separate it from any powder or leaf residue.

Procedure for Making Jelly Candy

In the process of making the Robusta coffee jelly candy with added stevia sugar, the following ratios of coffee to stevia solutions were used: F1 (20 ml : 30 ml), F2 (15 ml : 35 ml), F3 (10 ml : 40 ml). Each formulation contained 20 grams of gelatin, 10 grams of added sucrose (for F1, F2, F3), and 110 ml of water. The next step involved a cooking process where all ingredients for each treatment were mixed. The jelly mixture was then left to set at room temperature for 15 minutes before being molded into the desired candy shapes. Finally, the jelly candies were placed in a refrigerator to chill for 20 minutes.

Water Content Testing

Water content was determined using the gravimetric method. The procedure is as follows:

An analytical balance was used to weigh an empty bottle precisely, and the weight was recorded. The weighing bottle was heated in an oven at 105°C for thirty minutes, cooled in a desiccator for fifteen minutes, and then weighed (W_0). Two grams of the sample were placed into the pre-weighed bottle, and the total weight was recorded (W_1). The sample was dried in the oven at 105°C for three hours, cooled in the desiccator for fifteen to thirty minutes, and weighed again (W_2). The water content was calculated using the following formula:

Formula:

$$\text{Water Content (\%)} = \frac{W_1 - W_2}{W^1 - W_0} X\ 100$$

Note :

W_0 : Weight of empty dish

W_1 : weight of dish + initial sample (before heating)

W_2 : weight of dish + sample (after drying and cooling)

Organoleptic Test

The organoleptic test was conducted to evaluate product acceptability based on color, aroma, taste, and texture. The affective method was used to measure consumers' subjective attitudes toward the product based on its organoleptic properties. The hedonic test was performed using a scale with options such as *like very much, like, somewhat like, somewhat dislike, dislike*, and *dislike very much*. The hedonic scale was then transformed into a numerical scale for statistical analysis. A total of 40 semi-trained panelists participated in this

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organoleptic test. Each panelist was given an organoleptic evaluation form and asked to taste the jelly candy and rate it according to their personal preference, without influence from other panelists.

Data Analysis

Data processing was performed by inputting the organoleptic test results into Microsoft Excel to create a master data file, which was then imported into the SPSS application. The data obtained from the organoleptic test were analyzed statistically using the Kruskal-Wallis test. If the result was significant ($p < 0.05$), it was followed by the Mann-Whitney U test.

RESULTS AND DISCUSSION

Based on the research results, products of Robusta coffee (*Coffea canephora*) and stevia sugar (*Stevia rebaudiana*) jelly candy with various formulations (F1, F2, and F3) can be seen in the image below.

F1 F2 F3

Figure 1. Research Results of Jelly Candy

Acceptance Level of Color, Aroma, and Taste of Jelly Candy Formulas

Based on the assessment results from 40 panelists, 22 people (55%) stated they liked the color of the jelly in treatments F1 and F2. Meanwhile, product F3 was the least liked in terms of color. From the organoleptic assessment of aroma, taste, and texture, product F3 was the most preferred.

From the Kruskal-Wallis test results for formulas F1, F2, and F3, a significant difference in color assessment of the jelly candy was observed (p-value = 0.004). Products F1, F2, and F3 were brown, with gradations; the darkest brown was product F3. The resulting color originates from the coffee; a higher coffee content makes the product color darker. This occurs because

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coffee contains sugars and proteins that, when heated, can produce the Maillard reaction—a reaction between sugars and other compounds resulting in browning. Roasting temperature and duration can also cause the coffee powder color to become more intense (Adna Ridhani, 2021). The influence of temperature and roasting time on color is significant because higher temperatures and longer durations lead to darker coffee powder due to the Maillard reaction, caramelization of carbohydrates, and CO_2 formation during roasting(Brilliantina et al., 2023). Coffee also contains tannins, which can cause browning in processed coffee (Hastuti, 2018).

Table 1. Effect of Robusta Coffee Addition with Variations in Stevia Solution on Jelly Candy

Parameter	N	Modus Value	Mean ± (SD)			Kruskal Wallis Test P-Value
			F1	F2	F3	
Color	40	4	3,98 ± 0,73 [a]	3,75 ± 0,74 [a]	3,40 ± 0,77 [b]	0,004
Aroma	40	3	3,35 ± 0,73 [a]	3,30 ± 0,85 [a]	3,73 ± 0,71 [b]	0,045
Texture	40	4	3,58 ± 0,78	3,60 ± 0,77	3,75 ± 0,80	0,462
Taste	40	4	2,60 ± 0,90 [a]	3,30 ± 0,79 [b]	3,80 ± 0,79 [c]	0,000

Note:

- Different superscript letters (a, b, c) within a row indicate significant differences based on the Mann-Whitney U test ($p < 0.05$).
- Mean values are measured on a scale of 1–5 (1 = dislike very much, 2 = dislike, 3 = somewhat like, 4 = like, 5 = like very much).

The Kruskal-Wallis test results showed that coffee addition significantly influenced taste assessment (p-value = 0.000). Formula F3 was the most preferred by panelists because it tasted sweeter. This is due to the lowest amount of coffee in product F3 and the addition of sucrose. Excessive coffee content can produce a more bitter taste. Stevia leaves themselves also have a slightly bitter aftertaste due to tannin compounds. Adding sucrose can mask this bitterness. This aligns with research by Brilliantina *et al.* (2023) Rasa stating that coffee flavor can change depending on roasting temperature and duration. Longer roasting times cause the coffee's sour taste to change to bitter. Additionally, bitterness can arise from chlorogenic acid, caffeine, and tannin content in coffee (Handayani, 2021). Observations showed that higher Robusta coffee usage made the jelly candy taste more bitter, which many panelists disliked.

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Furthermore, stevia leaves contain tannin, terpene, and stigmasterol compounds (Setiawan *et al.*, 2022).

This research also indicated a significant difference in aroma assessment (p = 0.045). Among all formulas, F3 was the most preferred in terms of aroma. This is because the amount of coffee in F3 is not excessive, making its aroma less sharp. Coffee itself contains volatile compounds like aldehydes, ketones, and alcohols that easily evaporate when heated, giving coffee its distinctive aroma (Hastuti, 2018). According to Handayani (2021) coffee aroma is released when brewed with hot water because natural compounds evaporate directly and reach the olfactory senses. Coffee also contains alkaloids that provide a slightly bitter taste and enhance its unique flavor. Essentially, aroma is an important factor assessed when tasting food, as scent signals are directly captured by olfactory nerves. Adding sucrose did not significantly affect the aroma because the Robusta coffee aroma is already strong. The scent perceived from food forms part of the flavor perception, thus influencing panelist assessment (Lamusu, 2018).

For texture assessment, a p-value of 0.462 indicates no significant difference among treatments. The texture of this jelly candy can be influenced by the amount of sugar and gelatin used. Sugar makes the jelly structure denser, while gelatin binds water. Insufficient gelatin content can make the jelly too soft. Additionally, adding jelly powder and gelatin can affect the texture of Robusta coffee jelly. Research by Grace (2021) shows that the combination of gelatin and sucrose influences jelly candy texture. If too little gelatin is used, the resulting jelly becomes very soft because gelatin's role is to bind water; insufficient amounts weaken its binding capacity.

Water Content Jelly Candy Formula

Table 2. Water Content Test Results for Each Jelly Candy Formula

Parameter	Formula	Result	Unit
Water Content	F1 (20 ml : 30 ml)	53,53 %	< 20%
	F2 (15 ml : 35 ml)	58,41 %	< 20%
	F3 (10 ml : 40 ml)	47,06 %	< 20%

Based on the research results, the water content of the jelly candy was found to be 53.53% for formula F1, 58.41% for F2, and 47.06% for F3. According to the Indonesian National Standard (SNI) 01-4547-2008, the produced jelly candy does not meet the quality requirements for water

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content, which must be less than 20% (National Standardization Agency, 2008). The water content in this study is very high, exceeding the quality standard for jelly candy. This high moisture level is likely due to unstable processing conditions, such as temperature control, where condensation occurred during the 30-minute cooling period, leading to water retention. Another contributing factor could be the use of dilute solutions in this study. Water content represents the percentage ratio of weight in liquid form to solid form. High moisture content in food materials increases the risk of spoilage as it accelerates metabolic degradation (Sari, 2024). Water content in food is always associated with its quality and is used to measure the solid or dry matter portion. It also serves as an indicator of stability during storage and determines organoleptic quality, particularly taste and tenderness (Prasetyo, 2019).

According to research by Fatmawati (2022), the concentration of agar did not significantly affect the water content of jelly candy, as its proportion in the formulation was relatively small, resulting in an insignificant impact on the final product. This indicates that the jelly product may not be marketable, as excessive water content can lead to issues such as reduced hardness, susceptibility to spoilage, and shortened shelf life. However, research by Marsigit (2019) suggests that increasing the amount of sugar and carrageenan can lower water content, as these ingredients have water-binding properties. The study used sugar concentrations of 10%, 20%, and 30% and carrageenan concentrations of 5%, 5.5%, and 6%. Furthermore, research by Hedyana, (2021) indicates that stevia leaves contain fiber that can absorb water, which may influence the moisture level in products such as dragon fruit jam.

CONCLUSION

From the research findings, variations in the jelly candy formula with added coffee significantly influenced panelists' preferences, particularly in terms of color, aroma, and taste. However, no significant difference was observed in texture evaluation. Regarding water content, all formulas exhibited high moisture levels: F1 at 53.53%, F2 at 58.41%, and F3 at 47.06%. According to the SNI 01-4572-2008 standard, the ideal water content for jelly

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products should range between 16.2% and 19.4%.

RECOMMENDATIONS

Future research is encouraged to further develop jelly candy formulations, identify their nutritional content, and evaluate product shelf life to comprehensively assess stability and overall quality.

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