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Nutrient content of banana peel candy to reduce blood pressure in patients with mild hypertension

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Abstract

Background: Banana peels are waste from abundant bananas, rich in nutrients and still rarely used. Banana peels contain quite high levels of nutrients, especially vitamins and minerals such as water, fiber, carbohydrates, protein, fat, potassium, calcium, phosphorus, iron, vitamin B and vitamin C. Banana peels can be used to make soft candy. Nutrient content of soft candy from *Ambon* banana peel to reduce blood pressure in patient with hypertention is arranged.
Purpose: To analyze the nutrient content of banana peel candy to reduce blood pressure in patients with mild hypertension.
Method: Experimental research with a complete random design. The treatment is to make soft candy from *ambon* banana peels with the addition of gelatin. In this study, a group Random design was used with three one-time repeats so that there were three experimental units (25 gr; 37,5 gr; 50 gr). The product, soft candy, is tested by 25 trained panelists for hedonic rating test. After that, the product was analyzed by proximat analysis method to find the nutrient content.
Results: The nutritional content of soft candy banana peel products were total energy 126.49 kcal, carbohydrates 21.49%, protein 9.16% and fat 0.25%. For mineral nutrients, the highest content was sodium at 61.25 mg, phosphorus at 59.53 mg, potassium 27.3 mg, calcium 15.94 and magnesium 3.5 mg. Determining the formula in the organoleptic test was found to be the best, namely sample 3 was the selected formula seen from the fairly high attribute values in the sensory test of taste, color and aroma.
Conclusion: The nutritional content showed that this soft candy could not fullfill the daily requirements for these minerals, each of which was recommended per day. However, it was important to consume other foods that were rich in potassium, calcium and magnesium.

Keywords: *Ambon* Banana Peel; Blood Pressure; Hypertention; Nutrient; Soft Candy.

INTRODUCTION

Food waste has been an environmental problem for the past ten years. It is estimated that a third of the edible components of the food produced for human eating or used are received, misplaced, or wasted globally, amounting to approximately 1.3 billion tons over a year (Jain, Newman, Cepeda-Márquez, & Zeller, 2018; Blakeney, 2019). According to the United Nations Food and Agriculture Organization (FAO), fruit and vegetable losses and waste are the greatest of all food types, reaching up to 60% (Sagar, Pareek, Sharma, Yahia, & Lobo, 2018). Most of the waste comprises seed, peel, rind, and pomace, which are high in bioactive compounds such as carotenoids, polyphenols, dietary fibres, vitamins, enzymes, and oils (Ansari, Ramly, Faujan, & Arifin, 2023).

Banana peel is a waste from bananas that is abundant, rich in nutrients. Banana peel contains

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quite high nutrients, especially vitamins and minerals such as water, fiber, carbohydrates, protein, fat, calcium, phosphorus, iron, B vitamins, and vitamin C. In addition, banana peel extract also contains substances that have the potential to be phytoestrogens (Fatemeh, Saifullah, Abbas, & Azhar, 2012; Pratama, Gilang, Riata, Hermawan, Ikawati, & Meiyanto, 2011). Banana peels contain lutein and carotenoids which are fat-soluble compounds. The content of this substance can also help fight inflammation and inhibit aging. Banana peel contains pectin found in the skin layer of the fruit. The pectin content in banana peels is four times greater than in the pulp. Banana peels also contain vitamin C, vitamin E, potassium, zinc, iron, and manganese (Hidayat, 2021). Hence, the goal is to use banana by-products in various food and nonfood applications and sources of natural bioactive compounds. It can be concluded that banana peel can be successfully used in food, pharmaceutical, and other industries. Therefore, banana residues may provide new avenues and research areas for the future (Hikal, Said-Al Ahl, Bratovcic, Tkachenko, Sharifi-Rad, Kačániová, Elhourri, & Atanassova, 2022).

The nutritional content of banana peel is quite complete, such as carbohydrates, fats, proteins, calcium, phosphorus, iron, B vitamins, vitamin C and water. These nutritional elements can be used as a source of energy and antibodies for the human body. Based on chemical analysis, banana peels can be used as raw materials for making food (Wilar, Indiyanti, & Subarnas, 2014).

Banana peels can be used as raw materials in food and can add value to nutritional content when processed into various food products (diversified products). One of the food products that can be produced from banana peels is candy. Candy is a type of processed food product that is widely popular. According to the Indonesia Industrial Standard (SSI), candy or confectionery is a type of interlude food in the form of a solid form of sugar or other sweeteners (Savage, Harris, Bleser, & Rollins, 2019). Candy has a sweet taste, interesting colors, and varied shapes. Soft candy is a candy with a soft texture and has peculiarities in taste, shape, chewiness and elasticity of the product. Soft candy from *ambon* banana peel contains high nutrients so it can be useful for people with degenerative diseases such as hypertension.

Hypertension is diagnosed when blood pressure is consistently ≥130 and/or ≥80 mmHg. Dietary modifications can lower blood pressure in hypertensive patients. The recommended diet for hypertensive patients is high in calcium, potassium, magnesium and low in sodium. Based on the description above, it is necessary to analyze the nutritional content of soft candy from *ambon* banana peels in an effort to reduce blood pressure in hypertensive patients (Flack & Adekola, 2020).

This study is aimed to analyse the organoleptic test of soft candy from *ambon* banana peels, (namely taste, aroma, texture, and color); and analyse the nutritional content of soft candy from *ambon* banana peels (total energy, energy from fat, carbohydrates, fats, proteins, fiber, potassium, calcium, magnesium, phosphorus, vitamin C) in an effort to reduce blood pressure in hypertensive patients.

RESEARCH METHODS

Experimental research with a complete random design. The treatment is to make soft candy from *ambon* banana peels with the addition of gelatin. The research was carried out in the food technology laboratory of the Health Polytechnic in the manufacture *of soft candy* and organoleptic tests, while the analysis of nutrient content was carried out in the Saraswanti Bogor laboratory, from May until September 2024. In this study, a group Random design was used with three one-time repeats so that there were three experimental units. The treatment in the study was: F1, F2, and F3 with 25; 37.5; 50 grams of banana peel and 100 grams of gelatin. Research tools and materials are adjusted to the activities carried out, the following: washing of banana peels, making *Ambon* banana candy with the addition of gelatin. Data collection in organoleptic test is taken by filling out an organoleptic test form to trained panelists (25) on the tested banana *ambon* soft candy. The tested is aimed to test the color, flavor (aroma), taste and texture by the following scale 1-5 (1: very dislike; 2: dislike; 3: neutral; 4: likes; and 5: really like). These physical properties are related to the characteristics of the materials and the functional components in them. The physical

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properties testing in this study was carried out subjectively by researchers in covering color, aroma, texture and taste. The Test is Used A Hedonic Rating Test by 25 Trained Panelist to test preference in color, scents (aroma), texture, and taste. The first indicator for organoleptic test is a color preference. Figure 1 is a color preference level. Color is the first sensory property that the panelists assess. Color plays a very important role in considering other parameters that will be evaluated from a product. The overall assessment of organoleptics was carried out by calculating the average of the panelists' assessment for each sample and the attributes of organoleptic properties, this was done to find out which sample was more accepted by the panelists. The nutrient content is tested by proximat method.

RESEARCH RESULTS

Tabel 1. Physical Properties of Soft Candy *Ambon* Banana Peel

Sample	Color	Flavor	Taste	Texture
1	Red is a bit intense	Typical of gelatin (+)	Sweet	Supple
2	Frostbite	Typical of gelatin (++)	Sweet	Very chewy
3	Deep red	Typical of gelatin (+)	Sweet	Supple

Description: the more (+) signifies the stronger the level of peculiarity

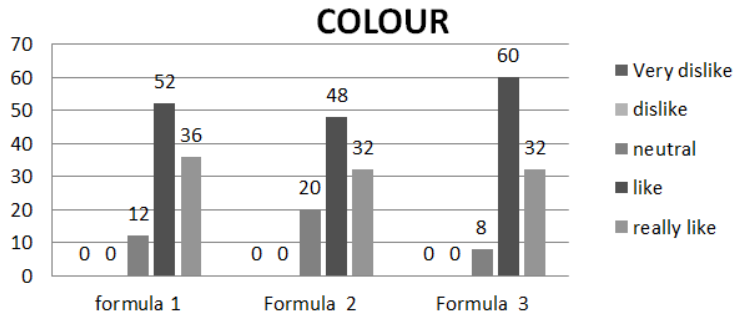


Figure 1. Results of the preference test on the color attribute of soft candy

The figure above shows that the percentage of the most liked category is sample 3, which is 60%, while the least like category is found in sample 2, which is 48%.

The second is scent's preference level. Scents are the most difficult sensory traits to classify and explain because of their huge variety. The food industry considers that odor testing is very important because it can quickly provide results regarding consumer preferences for products.

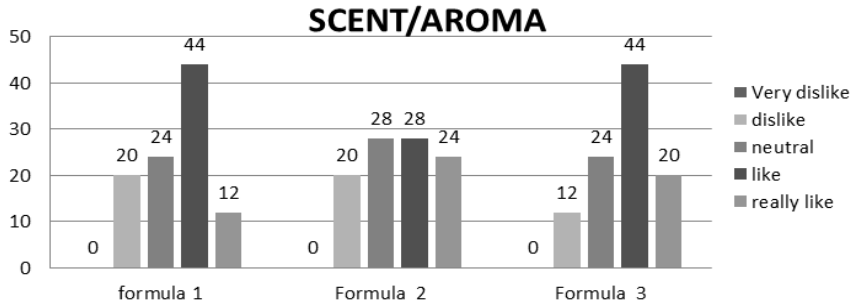


Figure 2. Results of the preference test on the soft candy aroma attribute

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Based on the results, organoleptic properties in scents showed the highest category, namely in the like category with samples 1, 2 & 3 of 44%, 28% and 44% respectively. Therefore, the sample that has the highest percentage is found in samples 1 and 3 with the same value, which is 44%.

The third was texture preference level. Texture is an important aspect of food quality.

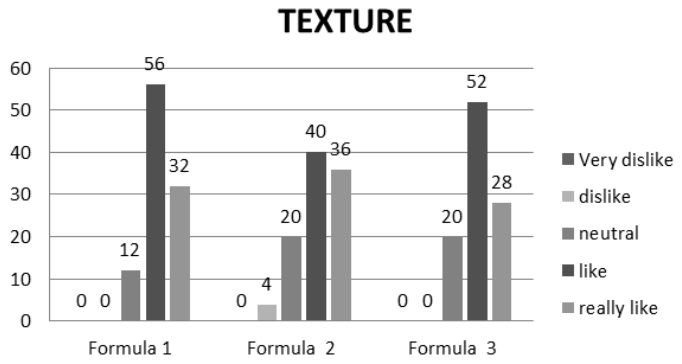


Figure 3. Results of the preference test on the texture attribute of soft candy

The figure above shows that the percentage of the most liked category is sample 1, which is 56%, followed by samples 3 (52%) and 2 (40%).

The forth was taste preference level. Taste is one of the most important sensory properties in the development of a product because taste is the final decision where consumers will accept or reject a product on the market.

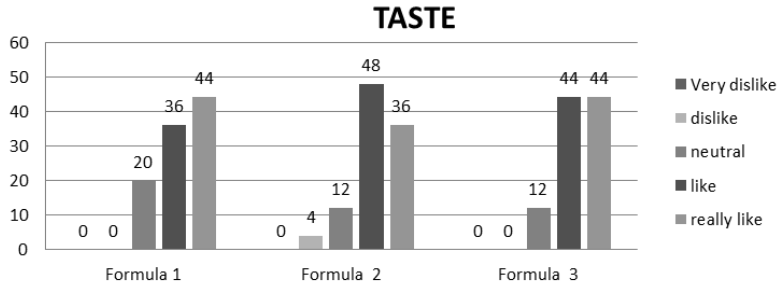


Figure 4. Results of the preference test on the taste attribute of soft candy

The image above is the result of an organoleptic test on taste attributes conducted by 25 untrained panelists. Based on the figure above, it shows that the percentage of the most likes category is sample 2, which is 48%, while the least like category is found in sample 1, which is 36%.

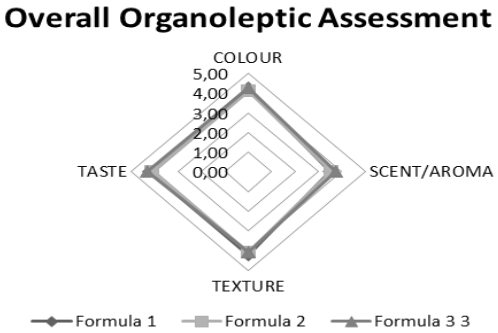


Figure 5. Overall results of the organoleptic test of soft candy

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In Figure 5 above, the results of the assessment of color, aroma, texture and taste in Soft candy are above 3.55. In the texture attribute, the highest result was obtained in sample 1 with an average value of 4.20, the highest result color and aroma attribute was preferred in sample 3, and it can be seen that sample 1 in the color attribute has a high value with the same value as sample 3, which is 4.24. Meanwhile, the taste attribute with the hghest average value of 4.32 is found in sample 3 which is the most preferred. Based on the average of the overall assessment, sample 3 is the selected formula seen from the high value of attributes in the sensory test of taste, color, and aroma.

Table 2. Nutrient Content of *Ambon* Banana Peel Soft candy per 100 grams

Parameter	Unit	Simplo	Diplo
Potassium	Mg	27.3	26.6
Magnesium	Mg	3.56	3.43
Phosphorus	Mg	59.53	57.02
Calcium	Mg	15.94	15.74
Up to abu	%	0.25	0.26
Energy from fat	Kcal	2.25	2.25
Total Fat	%	0.25	0.25
Up to air	%	68.44	68.59
Total energy	Kcal	126.49	125.85
Carbohydrates	%	21.9	21.94
Protein	%	9.16	8.96
Sodium	mg	61.25	60.25
Total sugar	%	17.33	17.06
Saturated fats	%	0.1	0.1
Dietary Fiber	%	1.63	1.56

DISCUSSION

Proximate analysis is a method to determine the percentage of nutrients in feed based on its chemical properties, including protein, fat, moisture content, ash content, carbohydrates, fiber, vitamin C, potassium, sodium, phosphorus, iron, calcium and vitamin D. Proximate analysis has benefits as an assessment, quality of feed or foodstuffs, especially the substances contained in it. From the results of the analysis of the nutritional content in table 2 above, it shows that in 100 grams of soft candy banana peel there is a total energy of 126.49 kcal, the highest macronutrients are found in carbohydrates at 21.19% then protein at 9.16% and the smallest is fat at 0.25%. For the mineral nutrients with the highest content, it is found in sodium of 61.25 by phosphorus of 59.53 mg, potassium of 27.3 mg, calcium of 15.94 mg and magnesium of 3.5 mg.

When compared with the daily nutritional adequacy figures for adult men aged 19-29 years in 100 grams of soft candy, *ambon* banana peel contains 27.3 mg potassium, meaning that the product produced is small. *Soft candy* from *ambon* banana peel is a product that not only offers a sweet taste and a pleasant texture, but also contains high

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nutrients. These nutritional contents, including calcium, potassium, and magnesium, make this *soft candy* useful as a food that can help lower blood pressure in hypertensive patients. Thus, *soft candy* from *ambon* banana peel not only serves as a delicious snack, but also as a healthy food alternative that can support health management, especially for individuals who have blood pressure problems (Amarasinghe, Wickramasinghe, Wijesekara, Thilakarathna, & Deyalage, 2021; Hidayat, 2021).

Banana peels are rich in potassium, which is known to help regulate blood pressure. The consumption of potassium-rich foods, such as bananas and their peels, can lower blood pressure by reducing the effects of sodium in the body and promoting fluid balance. A study indicated that eating two bananas a day could potentially reduce blood pressure by 10% over a week (Alshehry, 2022).

Chewing and compressing food, including *soft candy*, have been shown to increase parasympathetic activity in older adults. This is indicated by higher values of high-frequency (HF) power and total power on electrocardiogram (ECG) recordings, which are indices of parasympathetic nervous activity (Ohta, Ueda, & Sakurai, 2017). The parasympathetic nervous system plays a crucial role in regulating blood pressure. Increased parasympathetic activity can lead to a decrease in blood pressure. For instance, studies have shown that interventions that enhance parasympathetic tone, such as exercise and dietary changes, can lead to reduced blood pressure in hypertensive individuals(Edwards, Wilson, Sadja, Ziegler, & Mills, 2011; Marito, Hasegawa, Tamaki, Sta Maria, Yoshimoto, Kusunoki, Tsuji, Wada, Ono, Sawada, Kishimoto, & Shinmura, 2022). Chewing soft candy involves the mechanical stimulation of the mouth and the subsequent activation of sensory receptors. This stimulation can trigger a reflexive response that activates the parasympathetic nervous system (Sato, Asano, Hatakeyama, Mitomi, Kimura, Miyamoto, Suzuki, & Shibuya, 2018). The increased parasympathetic activity can then influence various physiological processes, including heart rate and blood pressure regulation. While the specific effect of chewing soft candy on blood pressure might not be extensively studied, the general principles of autonomic nervous system modulation suggest that increased parasympathetic activity could lead to a decrease in blood pressure. However, this effect would likely be mild and transient, and individual responses could vary based on factors such as overall health, dietary habits, and baseline autonomic function.

Another study on candy consumption patterns found no significant association between candy intake and cardiovascular risk factors, including blood pressure, in both adults and children. This suggests that while chewing candy may have some immediate cardiovascular effects, these effects are not necessarily tied to the hardness of the candy (Duyff, Birch, Byrd-Bredbenner, Johnson, Mattes, Murphy, Nicklas, Rollins, & Wansink, 2015)

Chewing gum during the workday was associated with higher productivity and fewer cognitive problems, raised cortisol levels in the morning, and did not affect heart rate. The results emphasise that chewing gum can attenuate reductions in alertness, suggesting that chewing gum enhances worker performance (Allen & Smith, 2015). Studies have shown that chewing, regardless of the hardness of the gum, can increase heart rate and blood pressure. For example, chewing hard gum was associated with significant increases in heart rate and blood pressure, with the increases being more pronounced with harder gums (Farella, Bakke, Michelotti, Marotta, & Martina, 1999).

CONCLUSION

The nutritional content of soft candy banana peel products were total energy 126.49 kcal, carbohydrates 21.49%, protein 9.16% and fat 0.25%. For mineral nutrients, the highest content was sodium at 61.25 mg, phosphorus at 59.53 mg, potassium 27.3 mg, calcium 15.94 and magnesium 3.5 mg.

Determining the formula in the organoleptic test was found to be the best, namely sample 3 was the selected formula seen from the fairly high attribute values in the sensory test of taste, color and aroma.

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