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Preference and Nutritional Content of Black Wheat Snack Bar with Hibiscus Flavor

Afifah Nurul Hannan
Akademi Kesejahteraan Sosial Ibu Kartini, Semarang, Indonesia

Esteria Priyanti
Akademi Kesejahteraan Sosial Ibu Kartini, Semarang, Indonesia

Corresponding email: esteria@aksibukartini.ac.id

Abstract.*. The development of snack bar products using black wheat as the base ingredient and hibiscus flavoring is expected to yield new variations of snack bar products. This study aimed to: Determine the preference levels for the color, aroma, texture, and taste of black wheat snack bars with hibiscus flavor; 2 Determine the carbohydrate, fat, and fiber content of snack bars that are accepted by consumers. The research employed experimental methods, sensory evaluation, and laboratory testing. Three experimental designs were used, involving the addition of hibiscus powder at 5%, 10%, and 15% of the weight of black wheat flour. Data obtained from sensory evaluations were analyzed descriptively, while data from nutritional content test were compared with Recommended Dietary Allowances (RDAs). The research results indicated that the black wheat snack bar with 15% hibiscus powder addition was the most preferred product among the panelists, with 60% of panelists choosing this product. The nutritional content per 30g serving of the black wheat snack bar with hibiscus flavor included 21.9g of carbohydrates, 4.4g of fat, and 1.6g of fiber. Therefore, by consuming this snack bar, 7% of the RDA for carbohydrates, 7% of the RDA for fat, and 5% of the RDA for fiber can be met. In conclusion, this product can be recommended to individuals who want to maintain their health despite frequent snack consumption.*

Keywords*: Black Wheat; Hibiscus; Snack bar*

INTRODUCTION

Snack bars have become a well-known food product among the public today. Commonly labeled as "Healthy Snacks" due to their low calorie content, snack bars are not only low in calories but also rich in nutritious ingredients, enjoyable in taste, and undoubtedly safe for consumption (Pradipta, 2011).

Extensive research has been conducted in the development of snack bar products. Indrastati and Anjani (2016) produced snack bars using red beans and arrowroot flour as the primary ingredients. Fauzia (2016) formulated snack bars using red rice flour and green bean flour. In 2017, Maulina (2017) developed snack bars utilizing breadfruit and green bean flour with the addition of jackfruit flavor. In 2019, Pamungkas and Priyanti (2019) created snack bars based on goji berry flour. Despite the numerous studies conducted, there is still limited research on the development of snack bar products using black wheat and hibiscus as flavoring agents.

Black wheat (Secale cereale L.), also known as rye, is a type of cereal often utilized as livestock feed or in bread processing. The composition of black wheat grains differs from

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* Afifah Nurul Hannan , esteria@aksibukartini.ac.id

regular wheat, being higher in fiber content and lower in fat and protein (Buksa et al., 2012). Consequently, food products featuring black wheat as a primary ingredient can be suitable for dietary and healthy snack purposes. Additionally, for flavor enhancement in black wheat-based products, hibiscus flowers can be employed as a flavoring agent.

Hibiscus (Hibiscus sabdariffa L.) is frequently utilized in beverage production, specifically the hibiscus flower. Hibiscus flower-infused beverages are believed to have curative properties for various ailments, including diabetes, hypertension, and diuretic effects (Patel, 2014). When presented in beverage form, hibiscus flowers yield a distinctive tart flavor. This unique tartness of hibiscus can be harnessed to enhance the flavor of snack bar products.

The objectives of this research are as follows: 1) To assess consumer preferences regarding the color, aroma, texture, and taste of black wheat snack bars with hibiscus flavor, and 2) To determine the carbohydrate, fat, and fiber content of black wheat snack bars with hibiscus flavor that are most preferred by consumers. The development of snack bar products using black wheat as the base ingredient and hibiscus as a flavor enhancer is expected to yield a novel range of snack bar products. Consequently, this product can be recommended to individuals seeking to maintain a healthy diet while indulging in snack

RESEARCH METHODS

This research was conducted at the Main Laboratory of the Culinary Arts Program, Ibu Kartini Social Welfare Academy, located at 77 Sultan Agung Street, Gajah Mungkur Village, Gajah Mungkur District, Semarang City. The research methodology employed a combination of experiments, sensory evaluations, and laboratory tests. The experimental phase consisted of two stages: a preliminary investigation and the main research phase. During the preliminary research stage, a modified recipe for snack bars was tested to ascertain its suitability for the main research. Subsequently, in the main research stage, the production of black wheat snack bars with hibiscus flavor was experimentally carried out with two repetitions. Three experimental designs were used, involving the addition of hibiscus powder at levels of 5%, 10%, and 15% of the black wheat flour's weight. The composition of the snack bar ingredients can be found in Table 1, and the manufacturing process for black wheat snack bars with hibiscus flavor is illustrated in Figure 1.

Table 1: Composition of Snack Bars with Hibiscus Flavor in the Preliminary Research

Materials	Hibiscus Powder Addition Percentage		
	5%	10%	15%
Black wheat flour	100 g	100 g	100 g
Olive oil	50 g	50 g	50 g

Honey	50 g	50 g	50 g
Coconut sugar	40 g	40 g	40 g
Egg yolk	15 g	15 g	15 g
Raisins	10 g	10 g	10 g
Quinoa	10 g	10 g	10 g
Flaxseed	5 g	5 g	5 g
Chia Seed	5 g	5 g	5 g
Salt	0.5 g	0.5 g	0.5 g
Hibiscus powder	5 g	10 g	15 g

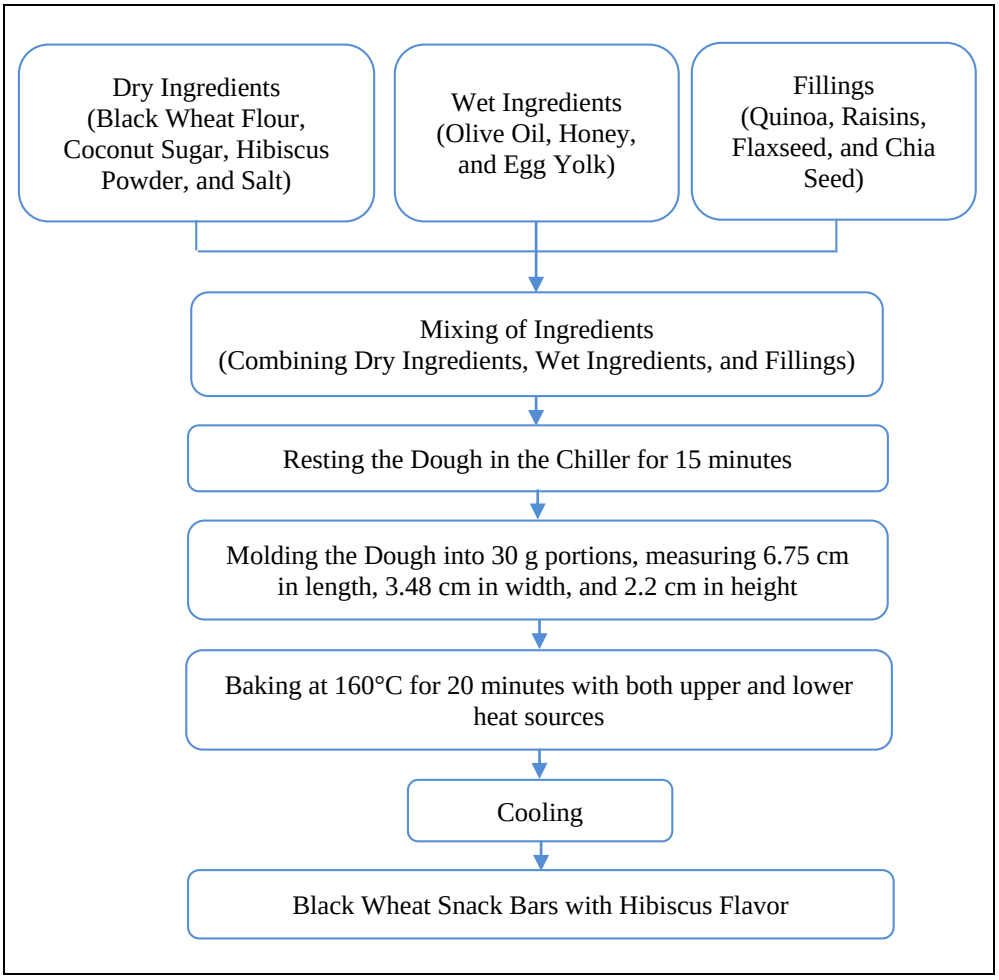

Figure 1: Flowchart of Snack Bar Making process

Sensory evaluation in this research was conducted using two methods: hedonic and ranking tests. Hedonic testing was employed to assess preferences for the color, aroma, texture, and taste of the snack bar products. This evaluation involved 35 untrained panelists who were presented with three product samples and a questionnaire utilizing a 7-point hedonic scale (ranging from "Very Dislike" to "Very Like"). Panelists assigned scores of 1 to "Very Dislike," 2 to "Dislike," 3 to "Somewhat Dislike," 4 to "Neutral," 5 to "Somewhat Like," 6 to "Like," and 7 to "Very Like." Additionally, panelists were asked to rank the products according to

their perceived quality. This testing aimed to determine the best black wheat snack bar with hibiscus flavor.

Laboratory tests were conducted on the snack bars that received the highest scores in both hedonic testing and ranking. These tests aimed to determine the carbohydrate, fat, and fiber content of the black wheat snack bars with hibiscus flavor. Laboratory tests were performed at the Catholic Polytechnic Laboratory, located at 104 Sriwijaya Street, Wonodri, South Semarang, Semarang City (50242).

Data obtained from sensory evaluation results were analyzed descriptively using Microsoft Excel 2019. Data from nutritional analysis of the snack bars were compared to the Recommended Dietary Allowance (RDA).

RESULT AND DISCUSSION

Figure 2 presents the mean values of hedonic test for color, aroma, txture, and taste.

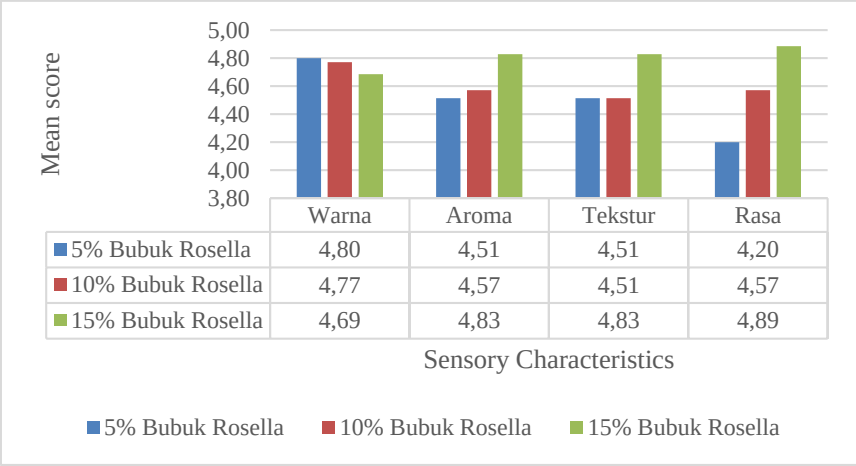

Figure 2: Mean Values of Hedonic Test for Color, Aroma, Texture, and Taste

Based on the average values of hedonic testing for the attribute of color, it can be concluded that the most preferred product was the one with 5% hibiscus powder addition. The obtained score was 4.80±1.18, falling within the range of "Neutral" to "Somewhat Like." The lowest score was observed for the product with 15% hibiscus powder addition, with a value of 4.69±1.02, also within the range of "Neutral" to "Somewhat Like."

Panelists favored the color of the snack bar product with 5% hibiscus powder addition due to the resulting light brown color, which was brighter compared to the other products. Increased hibiscus powder addition led to a darker color of the snack bar. It can be concluded that a higher hibiscus powder addition resulted in a decrease in panelists' preference for the snack bar's color.

The variations in the color of the three products were attributed to the ingredients used.

The use of black wheat flour, honey, coconut sugar, and hibiscus powder induced non-enzymatic browning reactions during processing. The non-enzymatic browning reactions included the Maillard reaction, caramelization, and browning due to vitamin C (Arsa, 2016). The Maillard reaction in the snack bars was a result of the rich carbohydrate content in black wheat flour. Caramelization occurred due to the use of coconut sugar and honey. Browning due to vitamin C was caused by the high vitamin C content in hibiscus powder (Arsa, 2016).

The highest rating in the hedonic test of the aroma was observed for the snack bar product with 15% hibiscus powder addition. The obtained score was 4.83±1.12, falling within the range of "Neutral" to "Somewhat Like." The lowest rating was found for the snack bar product with 5% hibiscus powder addition, with a score of 4.51±1.31 within the "Neutral" to "Somewhat Like" range.

Panelists preferred the aroma of the snack bar with 15% hibiscus powder addition because the tart aroma produced by hibiscus powder was more pronounced compared to the other products. The aroma of hibiscus became less noticeable with reduced hibiscus powder addition. Hence, it can be concluded that decreased hibiscus powder addition resulted in a decrease in panelists' preference for the snack bar's aroma.

This finding aligns with the research by Pamungkas and Priyanti (2019), which stated that the aroma of snack bars is influenced by the choice of ingredients. The use of olive oil as a source of fat, grains as a source of protein, and coconut sugar and honey as sweeteners can significantly influence the quality of the snack bar's aroma.

The most preferred texture of the snack bar was observed in the product with 15% hibiscus powder addition, which had an average score of 4.83±1.18, falling within the "Neutral" to "Somewhat Like" range. The lowest scores were found for the snack bars with 5% and 10% hibiscus powder addition, both receiving the same score of 4.51 within the "Neutral" to "Somewhat Like" range.

Panelists favored the texture of the snack bar product with 15% hibiscus powder addition due to its overall compact, firm, and dry texture on the exterior, followed by a crisp bite without excessive crumbliness. With higher concentrations of hibiscus powder, the resulting texture became denser while crispness decreased. Less hibiscus powder usage led to a crumbly texture upon biting, which was less preferred by panelists. This observation aligns with Rahadian et al. (2017), who explained that an increased concentration of hibiscus powder leads to higher pectin content. This is because pectin is a hydrocolloid compound that falls under soluble fiber, a polysaccharide that readily dissolves in water. The presence of pectin in hibiscus powder significantly influences the texture of the resulting product.

Regarding the taste attribute of the snack bars, the most preferred taste was observed in the product with 15% hibiscus powder addition, which scored 4.89±1.25 within the "Neutral" to "Somewhat Like" range. The lowest rating was found for the snack bar with 5% hibiscus powder addition, which received a score of 4.20±1.30, also within the "Neutral" to "Somewhat Like" range.

Panelists favored the taste of the snack bar with 15% hibiscus powder addition due to the tart flavor produced by hibiscus powder. The combination of tartness from hibiscus, mixed with the sweetness of coconut sugar, honey, and raisins, resulted in a taste combination that was preferred by the panelists. This observation is in line with Zakaria and Nurdiani (2019), who noted that higher concentrations of hibiscus powder yield a more pronounced tart taste, while lower hibiscus powder additions result in a less pronounced tartness. Consequently, it can be concluded that reduced hibiscus powder addition led to a decrease in panelists' preference for the taste of the snack bar.

Based on the results of the ranking analysis, the black wheat snack bar with hibiscus flavor that was most preferred by the panelists was the one with 15% hibiscus powder addition, selected by 60% of the panelists. Consequently, the snack bar product with 15% hibiscus powder addition can be employed for laboratory testing to determine its carbohydrate, fat, and fiber content. The results of the analysis of carbohydrate, fat, and fiber content can be observed in Table 2. The image of the most preferred snack bar product is displayed in Figure 3.

Figure 3: Snack Bar Products with Hibiscus Powder Percentage of 5%, 10%, and 15% (from left to right)

Table 2: Carbohydrate, Fat, and Fiber Content of Black Wheat Snack Bars with 15% Hibiscus Powder Addition

NO	Nutrition	Mass (g) per 100g	Mass (g) per serving of 30g	Percentage RDA (%)	ALG (g)
1	Carbohydrate	73.2	21.9	7	325
2	Fat	14.6	4.4	7	67
3	Fiber	5.3	1.6	5	30

Table 2 reveals that per 100 g of black wheat snack bar with hibiscus flavor contains 73.1

g of carbohydrates, 14.6 g of fat, and 5.3 g of fiber, as determined through laboratory testing. The serving size determination for the black wheat snack bar with hibiscus flavor in this study follows the guidelines outlined in Regulation of the National Agency of Drug and Food Control Number 22 Year 2019 on Nutrition Information on Processed Food Labels, 2019." The serving size for this snack bar is 30 g. Based on this serving size, the content per serving of the black wheat snack bar with hibiscus flavor includes 21.9 g of carbohydrates, 4.4 g of fat, and 1.6 g of fiber.

The analysis of the nutritional contribution of this snack bar with hibiscus flavor is evaluated against the Recommended Dietary Allowance (RDA) according to the"Appendix of the National Agency of Drug and Food Control of the Republic of Indonesia, 2016" concerning the Nutritional Label Reference (ALG). The ALG value for carbohydrates for the general population is 325 g. This means that consuming the black wheat snack bar with hibiscus flavor can fulfill 7% of the RDA for carbohydrates. The ALG value for total fat for the general population is 67 g, so consuming the black wheat snack bar with hibiscus flavor can fulfill 7% of the RDA for total fat. The ALG value for fiber for the general population is 30 g, which implies that consuming the black wheat snack bar with hibiscus flavor can fulfill 5% of the RDA for fiber.

This study also compares the nutritional content of the black wheat snack bar with hibiscus flavor to a commercial snack bar weighing 30 g per serving. The differences in nutritional content between the black wheat snack bar with hibiscus flavor and the commercial snack bar is presented in Table 3.

Table 3. Comparison of Carbohydrate, Fat, and Fiber Content between Black Wheat Snack Bar with 15% Hibiscus Powder Addition and Commercial Product (Soyjoy Chocolate Almond Flavor)

No.	Nutrition	Black Wheat Snack Bar with Hibiscus Flavor	Commercial Product (Soyjoy Chocolate Almond)
1	Carbohydrate (g)	21. 96	12
2	Fat (g)	4.28	9
3	Fiber (g)	1.58	5

Table 3 shows that the carbohydrate content in the black wheat snack bar with hibiscus flavor is higher than that in the commercial product. This difference can be attributed to the use of black wheat flour, coconut sugar, honey, raisins, quinoa, flaxseed, and chia seeds in the recipe. However, the fat and fiber content in the black wheat snack bar with hibiscus flavor is lower than that in the commercial product. The research product can still be considered a good source of dietary fiber, as per the criteria for processed food claims, where a fiber content of 5.26 g per 100 g classifies a product as a dietary fiber source. The fiber content in the snack bar

is derived from the use of black wheat flour, raisins, quinoa, flaxseed, and chia seeds (Badan Pengawas Obat dan Makanan Republik Indonesia, 2016).

CONCLUSION

This study concludes that the black wheat snack bar with 15% hibiscus powder addition is the most preferred product by the panelists, with 60% of the panelists selecting this product. The nutritional content of the black wheat snack bar with hibiscus flavor per 30 g serving includes 21.9 g of carbohydrates, 4.4 g of fat, and 1.6 g of fiber. Therefore, by consuming the black wheat snack bar with hibiscus flavor, 7% of the RDA for carbohydrates, 7% of the RDA for fat, and 5% of the RDA for fiber can be fulfilled.

Suggestions for further research include the need to conduct protein content test for the black wheat snack bar with hibiscus flavor. In subsequent studies, black wheat flour can be replaced or substituted with other ingredients.

REFERENCES

Badan Pengawas Obat dan Makanan Republik Indonesia. 2016. "Peraturan Kepala Badan Pengawas Obat Dan Makanan Republik Indonesia Nomor 9 Tahun 2016 Tentang Acuan Label Gizi." 1–9.

Badan Pengawas Obat dan Makanan Republik Indonesia. 2019. Peraturan Badan Pengawas Obat Dan Makanan Nomor 22 Tahun 2019 Tentang Informasi Nilai Gizi Pada Label Pangan Olahan.

Buksa, K., A. Nowotna, R. Ziobro, H. Gambu, and S Kowalski. 2012. "The Influence of Oxidizing Agents on Water Extract of Rye Flour." Food Hydrocolloids 27:72–79.

Fauzia, Vania Ratnasari. 2016. Formulasi Dan Karakterisasi Snack Bar Berbasis Tepung Beras Merah (Oryza Nivara) Dan Tepung Kacang Hijau (Phaseolus Radiatus L.) Sebagai Alternatif Camilan Sehat. Surakarta.

Indrastati, Nandia, and Gemala Anjani. 2016. "Journal of Nutrition." 4(4):546–54.

Maulina, Septriandari. 2017. Karakteristik Fisiko-Kimia Sensoris Snack Bar Tepung Sukun (Artocarpus Communis) Dan Tepung Kacang Hijau (Artocarpus Communis) Dengan Flavor Buah Nangka (Artocarpus Heterophyllus). Surakarta.

Pamungkas, Kaleb, and Esteria Priyanti. 2019. "Karakteristik Sensori Dan Kandungan Gizi Dari Snack Bar Berbasis Tepung Goji Berry (Lycium Barbarum L.)." Jurnal Teknologi Pangan 13. doi: 10.33005/jtp.v13i2.1702.

Patel, S. 2014. "Hibiscus Sabdariffa : An Ideal yet Underexploited Candidate for Neutraceutrical Applications." Biomedicine & Preventive Nutriton 4:23–27.

Pradipta, Inna. 2011. Karakteristik Fisikokimia Dan Sensoris Snack Bars Tempe Dengan Penambahan Salak Pondoh Kering. Surakarta.

Rahadian, Robby, Noviar Harun, and Raswen Efendi. 2017. "Pemanfaatan Ekstrak Kelopak Bunga Rosella (Hibiscus Sabdariffa L) Dan Rumput Laut (Euchema Cottoni) Terhadap Mutu Permen Jelly." JOM Faperta 4(1):1–14.

Zakaria, Akhmad, and Niar Nurdiani. 2019. “Pengaruh Penambahan Variasi Konsentrasi Rosella (Hibiscus Sabdariffa Linn) Terhadap Sifat Organoleptik Cookies Almond Crispy.” Agroscience (Agsci) 9(2):189–203. doi: 10.35194/agsci.v9i2.783.