

Formulation of Food Bar Based on Banana, Oat, and Spinach Flour as a Source Fiber Snack for DASH Diet (Dietary Approaches to Stop Hypertension)

FORMULASI FOOD BAR BERBASIS PISANG RAJA, OAT, DAN TEPUNG BAYAM SEBAGAI SELINGAN SUMBER SERAT UNTUK DIET DASH (DIETARY APPROACHES TO STOP HYPERTENSION)

Annisa Inas Ariyanti¹, Hidayah Dwiyanti², Teguh Jati Prasetyo^{1*}

¹Department of Nutrition Sciences, Jenderal Soedirman University, Purwokerto, Indonesia

²Department of Food Technology, Jenderal Soedirman University, Purwokerto, Indonesia

Abstract: *The prevalence of high blood pressure (hypertension) in Indonesia has increased. One of the best dietary recommendations for people with hypertension is Dietary Approaches to Stop Hypertension (DASH). Various product innovations have been developed to support the implementation of the DASH diet, one of them is a food bar. Potential ingredients that support the diet are banana, oat, and spinach. In addition to containing high fiber and potassium, these three ingredients are also low in sodium, so they are good for heart health. This study aims to determine the formulation of a food bar that has an acceptable sensory characteristic and high fiber content. The research design was non-factorial experimental study using a randomized block design (RAK). The treatment that was tried was the proportion of raja banana : composite flour (oat : spinach flour = 1 : 3) consisting of 4 formulas: P1 (90%:10%), P2 (85%:15%), P3 (80%:20%), and P4 (75%:25%). The result was analyzed using SPSS software. Proportion of banana with composite flour has a significant effect on the results of hedonic variables (taste, aroma, flavor, overall) and hedonic quality (texture quality, color quality, taste quality, aroma quality, flavor quality). The highest fiber content was found in the product formula P4 (3.8g/100g), while the lowest food fiber content was in the food bar formula P1 (1.57g/100g). The result of Effectiveness Index to determine the best formula was P1. The higher amount of composite flour, the lower sensory value of the food bar. However, the higher amount of composite flour, the higher dietary fiber content in the food bar.*

Key words: Food bar, Snack, DASH diet, Hypertension

1. INTRODUCTION

High blood pressure or hypertension is a global health problem that increases morbidity, mortality, and the burden of health costs. The Silent Killer has the potential to be a risk factor for damage to important organs such as the brain, heart, kidneys, retina, large blood vessels (aorta), and peripheral blood vessels. RISKESDAS data (2018) Indonesia shows an increase in the prevalence of hypertension population from 27.8% in 2013 to 34.1% in 2018. The prevalence of hypertension generally occurs in the 31-44 years old (31.6%), age group 45-54 years (45.3%), 55-64 years (55.2%). Based on the health profile of Central Java in 2019, hypertension still occupies the largest proportion of all non-communicable diseases (NCDs) reported, which is 68.6%, while the second highest is diabetes mellitus at 13.4%.

One of the best dietary recommendations for people with hypertension is Dietary Approaches to Stop Hypertension (DASH). The DASH diet is recommended by the

American Heart Association and the National Heart Lung and Blood Institute to maintain blood pressure and protect heart health. The characteristics of the DASH diet are high consumption of fruits and vegetables that contain much dietary fiber (30g/day) and minerals (potassium, magnesium, and calcium), low-calorie dairy products, low total fat and saturated fat, low sodium, and low cholesterol (3). The DASH diet is beneficial on an evidence-based basis. A systematic review study and meta-analysis of all randomized controlled trials (RCTs) up to 2013 in 2561 participants showed that implementing the DASH diet could reduce systolic blood pressure and diastolic blood pressure to normotensive (25).

Various product innovations have been developed as a snack to support the implementation of the DASH diet, one of which is a food bar. Food bar are product generally made with various ingredients, such as cereals or nuts, then formed into a solid and compact form (14, 20). Potential food ingredients that have a potential to be used for making a food bar also aligned with the composition of the DASH diet are banana, oat, and spinach. In addition to containing high fiber and potassium, these three ingredients are also low in sodium, so they are good for heart health.

Fiber plays a role in preventing the buildup of low-density lipoprotein (LDL) in blood vessels by binding to cholesterol which will later be excreted through feces. The good impact is that it can reduce the risk of increasing blood pressure due to cholesterol blockage (6). The increased potassium intake in our body can reduce systolic and diastolic blood pressure due to a decrease in vascular resistance. This vascular resistance is caused by dilatation of blood vessels and an increase in the loss of water and sodium from the body, resulting from the sodium and potassium pump (21).

Indonesian Food Composition Data (2021) shows that the nutritional value of 100 g *raja* banana contains of 582.2 mg potassium, higher than other types of bananas, namely *kepok* banana (300 mg), *mas* banana (392 mg), *ambon* banana (370 mg). Banana has a fiber content of 5.3 g/100 g. In addition, banana also contributes to the aroma and flavor of food bar. Oat contains high fiber (10.6 g/100 g). The Food and Drug Supervisory Agency (BPOM) of the Republic of Indonesia, number 13 of 2016, states that food can be categorized and claimed as a source of fiber if it contains not less than 3g/100g of dietary fiber, otherwise, high-fiber food should contain not less than 6g/100g of dietary fiber. Oat can also increase the texture of the food bar to be denser. Spinach flour was chosen as a substitute for wheat flour because spinach also has a reasonably high potassium content, amounting to 456.4 mg/100 g.

Banana, oat, and spinach can be processed into food bar products as a distraction innovation to improve people's healthy lifestyles. According to Nopianti et al. (2019), food bar formulation is to combine *kepok* banana and spinach flour, but in her research, she did not analyze fiber content, otherwise iron (Fe). Another research on bar products conducted by Kusumaningrum (2018) used *kepok* banana; Nurhayati et al. (2018) used a variant of *agung* banana and has different supporting ingredients that not correlate with the DASH diet. Therefore, this study aims to formulate a food bar using *raja* banana, oat, and spinach flour which has acceptable sensory characteristics and high fiber content.

2. METHODS

Research Location and Time

This research was conducted from August to October 2021. Formulation and sensory testing were carried out at the Food and Culinary Processing Laboratory of the Department of Nutrition, Faculty of Health Sciences, Jenderal Soedirman University. Furthermore, analysis of dietary fiber content was carried out on all formulas, while proximate, sodium, and potassium analyzes were carried out only for the best formula. The location of the proximate analysis was Agricultural Technology Laboratory, Jenderal Soedirman University, while the fiber, sodium, and potassium content were analyzed at the Food and Nutrition Studies Laboratory, Gadjah Mada University.

Materials and Tools

The ingredients in this study were brought from the P&D Aroma shop, Pasar Manis, and Pasar Wage Purwokerto. The main ingredients used in this study include *raja* banana, oat (brand: *Haverjoy*), and spinach. Additional ingredients are needed to make a food bar such as honey, baking powder, vanilla, wheat flour, eggs, butter, and water. The tools used in this study include a basin, baking sheet, stove, oven, digital scale, pan, blender, 80 mesh sieve, spoon, and knife.

Research Design

The research design used was a non-factorial experimental study using a randomized block design (RAK). The treatment tried was the proportion of *raja* banana : composite flour (oat : spinach flour = 1 : 3). The proportion of composite flour was obtained from a preliminary study, while the proportion of *raja* banana : composite flour refers to the research conducted by Nopianti et al. (2019). Therefore, the factors that are tried in this research are as follows: P1 = 90% *raja* banana and 10% composite flour; P2 = 85% *raja* banana and 15% composite flour; P3 = 80% *raja* banana and 20% composite flour; P4 = 75% *raja* banana and 25% composite flour.

The repetitions of research were determined from: $(n-1)(t-1) \geq 15$.

n = a number of repetitions; t = a number of treatments

The result are 5 times repetitions and 20 experimental units in total. The repetition was divided into 5 blocks; each block consisted of 4 treatments (P1, P2, P3, P4). The independent variables in this study were the proportions of banana, oat, and spinach flour. At the same time, the dependent variable is hedonic analysis (texture, color, taste, aroma, flavor, overall acceptance), hedonic quality (texture, color, taste, aroma, flavor, unpleasant aroma of spinach), and dietary fiber. Total number of non-standard panelists in this research is 50 people.

Table 1. The Scale of Hedonic Test

Scale	Category
1	Dislike very much
2	Dislike
3	Slightly like
4	Like
5	Like very much

Table 2. The scale of Hedonic Quality Test

Scale	Category					
	Texture	Color	Taste	Aroma	Flavor	Unpleasant Spinach Aroma
1	Very hard	Very dark brown	Very not sweet	Very unpleasant	Very not delicious	Very strong
2	Hard	Dark brown	Not sweet	Unpleasant	Not delicious	Strong
3	Slightly soft	Slightly dark brown	Slightly sweet	Slightly pleasant	Slightly delicious	Slightly strong
4	Soft	Brown	Sweet	Pleasant	Delicious	Not strong
5	Very soft	Yellowish-brown	Very sweet	Very pleasant	Very delicious	Off flavor

Stages of Making Food Bar

Stages of food bar production begin with making spinach flour and composite flour.

A. Spinach Flour (Salim *et al.*, 2019)

- 1) Spinach is washed until clean
- 2) Spinach is steam blanched using a pot of boiling water for 60 seconds
- 3) Spinach is dried in an oven at 150°C for 45 minutes
- 4) Dried spinach is blended for 3 minutes
- 5) Spinach flour is sieved with 80 mesh

B. Composite Flour (Tanuwijaya *et al.*, 2016 with a modification)

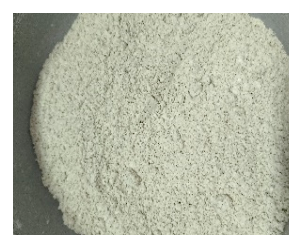
- 1) Spinach flour + oat are weighed and mixed in a ratio of 1:3
- 2) Spinach flour + oat are blended for 3 minutes
- 3) Composite flour is sieved with 80 mesh



A



B



C

Picture 1. Spinach Flour (A), Oat Flour (B), Composite Flour (C)

C. Making Food Bar (Kusumaningrum, 2018 with a modification)

- 1) Bananas are peeled
- 2) Bananas are steamed-blanching for 2 minutes to avoid the browning effect
- 3) Bananas are crushed until the texture is smooth
- 4) Composite flour is mixed into banana dough according to the treatment proportion
- 5) The dough is added with supporting ingredients such as honey, baking powder, vanilla, flour, eggs, butter, and water
- 6) The dough is poured into a baking dish that has been smeared with butter
- 7) The food bar dough is put in the oven at 140°C for 45 minutes

- 8) The food bar is lifted from the oven when it is finished (done), then chilled and cut into small pieces so it is ready to be served
- 9) The food bar was tested for sensory (hedonic and hedonic quality) by 50 non-standard panelists

Data Analysis

Analysis of the effect from proportion of food bars on the hedonic test and hedonic quality using the Friedman Test continued with the Duncan Multiple Range Test (DMRT). The effect of the proportion of food bars on dietary fiber was analyzed using the Anova test and continued with the Duncan Multiple Range Test (DMRT). The best formula is determined based on the Effectiveness Index. All formulas were analyzed for dietary fiber content, but only the best formulas were analyzed for potassium, sodium, and proximate content.

3. RESULTS AND DISCUSSIONS

A. Proportion Effect of Food Bar on Sensory Characteristics

Friedman test results influence the proportion of banana with composite flour on a hedonic test (texture, color, taste, aroma, flavor, and overall) and hedonic quality (texture, color, taste, aroma, flavor, and unpleasant aroma spinach) had a very significant effect on most of the food bar sensory variables ($p < 0.01$). Furthermore, continued by Duncan Multiple Range Test (DMRT).

Table 3. Friedman Test Results Effect of Combination Treatment of Food Bar Proportion on Hedonic and Hedonic Quality

	Variables	P
a	Hedonic	
	1. Texture	NS
	2. Color	NS
	3. Taste	**
	4. Aroma	**
	5. Flavor	**
b	Hedonic Quality	
	1. Texture	**
	2. Color	**
	3. Taste	**
	4. Aroma	**
	5. Flavor	**
	6. Unpleasant Spinach Aroma	NS

P = proportion of banana: composite flour; NS = no significant effect; * = significant effect; ** = very significant effect.

Table 4. Hedonic Test Result

Variables	P1	P2	P3	P4
Texture	3,58 ^a	3,42 ^a	3,38 ^a	3,24 ^a
Color	3,56 ^a	3,42 ^a	3,36 ^a	3,42 ^a
Taste	3,8 ^a	3,48 ^{ab}	3,5 ^{ab}	3,28 ^b
Aroma	4 ^a	3,78 ^{ab}	3,62 ^{bc}	3,42 ^c
Flavor	3,78 ^a	3,56 ^{ab}	3,54 ^{ab}	3,24 ^b
Overall Acceptance	3,86 ^a	3,64 ^{ab}	3,46 ^{ab}	3,32 ^b

Note: Numbers followed by the same letter are not significantly different based on the 5% DMRT follow-up test after Friedman's test.

Table 5. Hedonic Quality Test Result

Variables	P1	P2	P3	P4
Texture	4,2 ^a	3,64 ^b	3,46 ^{bc}	3,16 ^c
Color	4,52 ^a	4,06 ^b	3,66 ^{bc}	3,3 ^c
Taste	3,42 ^a	3,08 ^{bc}	3,14 ^{ab}	2,82 ^c
Aroma	3,82 ^a	3,58 ^{ab}	3,52 ^{ab}	3,4 ^b
Flavor	3,76 ^a	3,46 ^a	3,64 ^{ab}	3,28 ^b
Unpleasant	4,1 ^a	3,96 ^a	3,9 ^a	3,76 ^a
Spinach Aroma				

Note: Numbers followed by the same letter are not significantly different based on the 5% DMRT follow-up test after Friedman's test.

1) Texture

The study showed that the highest texture hedonic score was 3.58 (like) resulting from the P1, while the lowest texture hedonic score was 3.24 (slightly like) resulting from formula P4. The highest texture hedonic quality score is 4.20 (soft) resulting from the P1, while the lowest hedonic texture quality score is 3.16 (slightly soft) resulting from the P4 formula. The higher percentage of banana on the food bar formula, the softer texture of the product and the more preferred by the panelists, and vice versa. Flour contains 25% amylose and 10 g of fiber (29). The presence of amylose and high fiber will cause the texture to be harder. Amylose is starch with straight chains so that after gelatinization will be easily retrograded and produce a rigid structure and produce a hard texture.

2) Color

The study showed that the highest color hedonic score was 3.56 (like) resulting from the P1, while the lowest color hedonic score was 3.36 (slightly like) resulting from formula P3. The highest color hedonic quality score is 4.52 (yellowish-brown) resulting from the P1, while the lowest color hedonic quality score is 3.30 (slightly dark brown) resulting from formula P4. The more spinach flour was added to the food bar formula, the darker color of the product the less preferred by the panelists vice versa. The reason is spinach has a natural green color (chlorophyll). If too much spinach is added and mixed, the green color in spinach will affect the color density which gives the food a darker color effect (2).

3) Taste

The study showed that the highest taste hedonic score was 3,80 (like) resulting from the P1, while the lowest taste hedonic score was 3.28 (slightly like) resulting from formula P4. The highest taste hedonic quality score is 3.42 (slightly sweet) resulting from the P1, while the lowest taste hedonic quality score is 2.82 (slightly sweet) resulting from formula P4. The sweet taste from formula P1 can be caused by the composition of banana being higher than in the other formulas. The higher percentage of banana on food bar, the stronger sweet taste and the more preferred by the panelists, and vice versa. According to Nurhayati and Eko (2016), *raja* banana has a 20.82g/100g of sugar content, which is higher than the *berlin* banana 12.12g, *ambon* green banana 15.91, *kepok* banana 17.3g.

4) Aroma

The study showed that the highest aroma hedonic score was 4 (like) resulting from the P1, while the lowest aroma hedonic score was 3.42 (slightly like) resulting from

formula P4. The highest aroma hedonic quality score is 3.82 (pleasant) resulting from the P1, while the lowest aroma hedonic quality score is 3.4 (slightly pleasant) resulting from formula P4. The pleasant aroma of banana dominates the food bar. The more the added of banana, the stronger the aroma produced and the more preferred by the panelists. In addition, banana contribute to the amount of reducing sugars that affect the rate of the Maillard reaction as well as the degradation of the starch to produce an aroma component.

5) Flavor

The study showed that the highest flavor hedonic score was 3.78 (like) resulting from the P1, while the lowest flavor hedonic score was 3.24 (slightly like) resulting from formula P4. The highest flavor hedonic quality score is 3.76 (delicious) resulting from the P1, while the lowest flavor hedonic quality score is 3.28 (slightly delicious) resulting from formula P4. Flavor in food products is influenced by the composition of the ingredients (11). The highest flavor score on food bar P1 was due to the higher percentage of banana and less composite flour compared to other formulas. Banana affects the aroma characteristics of P1 to be more pleasant, sweeter taste, and softer texture.

6) Unpleasant Spinach Aroma

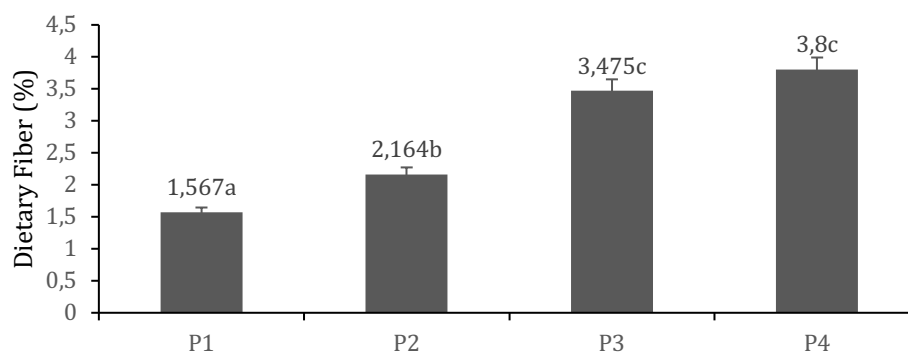
This study combines spinach and oat flour as composite flour. The higher amount of composite flour affects the unpleasant aroma of spinach. The results showed that the panelists favored the overall proportion because the unpleasant aroma of spinach was included in the not strong category and it has no significant effect on the hedonic quality of food bar. The highest hedonic quality score for unpleasant spinach aroma was 4.1 (not strong) resulting from the P1 and the lowest hedonic quality score for unpleasant spinach aroma was 3.76 (not strong) resulting from the P4. Blanching process can remove gas or air so that volatile compounds (aroma-forming) decrease (9).

7) Overall Acceptance

The study showed that the highest overall hedonic score was 3.86 (like) resulting from the P1, while the lowest overall hedonic score was 3.32 (slightly like) resulted from P4. This is aligned with the result of hedonic and hedonic quality test. Panelists preferred characteristics of the P1 formula due to its soft texture, yellowish-brown color, slightly sweet taste, pleasant aroma, delicious flavor, and the smell of spinach was not strong.

B. Proportion Effect of Food Bar on Dietary Fiber

The analysis of variance showed that the proportion of food bar (P1, P2, P3, P4) affected dietary fiber content ($P=0.000$). The Duncan Multiple Range Test (DMRT) was continued to find the significant groups.



Picture 2. Average Score and Proportion Effect of Food Bar on Dietary Fiber

Note: Numbers followed by the same letter are not significantly different based on the 5% DMRT-test

The higher the proportion of composite flour added, the higher the dietary fiber content in the food bar. Dietary fiber is a carbohydrate resistant to digestion in the small intestine and undergoes fermentation in the large intestine (26). The increase in dietary fiber content occurs along with the increase in the content of composite flour in the food bar. Dietary fiber was analyzed using the multienzimatis method AOAC 2005. The highest fiber content was found in P4 with a value of 3.8g/100 g, while the lowest food fiber content was in P1 (1.57g/100g).

The ingredients for the food bar in this study that play an important role in fiber content are oat, banana, and spinach. The fiber content in 100g of oat is 10g (29), banana 5.3g, and spinach 0.7g (17). The Food and Drug Supervisory Agency (2011) states that a food is a source of fiber if it is not less than 3g/100g and is said to be high-fiber if it is not less than 6g/100g. The two food bar formulas P1 and P2 in this study cannot be claimed as sources or high in fiber, but the food bar formulas P3 and P4 can be claimed as sources of fiber.

Effort needed to increase the dietary fiber content of the product along with considering the dark effect color due to spinach is by adding composite flour that has been reformulated previously with a higher ratio of oat. Dietary fiber provides a high viscosity in the digestive system that can reduce cholesterol absorption and the risk of increasing blood pressure, therefore consuming foods that contain a source and high fiber is highly recommended (6).

C. Determination of the Best Product

Determination of the best product is based on effectiveness index of De Garmo (1994) calculated from hedonic aspects (texture, color, taste, aroma, flavor, unpleasant aroma of spinach and overall), hedonic quality aspects (texture, color, taste, aroma, flavor) and dietary fiber content. The stages best formula analysis are determining the weighted score, calculating the weight value (BN), calculating the effectiveness value (NE), and calculating the product value (NP).

The final result showed that P1 formula with the highest total product value of 0.861 was chosen as the best formula. This is because the value of panelists' sensory acceptance of the P1 formula is higher than other formulas. Even though the P4 formula

has the lowest product value (0.019), however, it has the highest dietary fiber content (3.8g/100g) compared to the other formulas.

D. Nutritional Content of the Best Formula Food Bar (P1)

Table 6. Nutritional Content Results

No.	Categories	P1	Standar Nasional Indonesia (SNI)	USDA Standard	Snack Standard for DASH Diet (210 kcal/day)
1	Water	14,5%	-	11,26%	-
2	Ash	2,16%	-	-	-
3	Protein	4,67%	25-50%	9,3%	37,8 g
4	Fat	20,76%	1,4-14%	10,91%	56,7 g
5	Carbohydrate (by difference)	57,9%	-	-	115,5 g
6	Potassium	52,66mg/100g	-	-	470 mg
7	Natrium	0,22%	-	-	230 mg
8	Energy (kkal)	437 kkal/100g	120 kkal/portion	120,93%	210 kkal

1) Water

Water content was analyzed using Oven method AOAC 2005. The results showed that the water content of the food bar P1 was 14.5%. This value does not fulfill the standard set by the United States Department of Agriculture (USDA), which is 11.26%. The high percentage of water content in the food bar has a correlation with the high proportion of banana in P1 compared to other formulas. Banana contains water and pectin, in the heating process, pectin can trap water so that the evaporation process is hampered. According to the Indonesian Food Composition Data (2021), the water content in banana is 65.8g/100g. Efforts that can be made to achieve the water's standard is by considering use a dry technique with a food dehydrator after the food bar product is cooked.

2) Ash

Ash content was analyzed using Oven method AOAC 2005. The results of this study indicate that the ash content of food bar P1 is 2.16%. The Indonesian National Standardization Agency (SNI) and the United States Department of Agriculture (USDA) have not determined the ash content standard for food bars. However, this value is aligned with the minimum value in Natalia's research (2010) analysis of food bar products on the market. by 2.2-2.5%.

3) Protein

Protein content was analyzed using Kjeldahl method. The results showed that the protein content of the food bar P1 was 4.67%. This value is still not fulfilled with the requirements of SNI 25-50%, USDA 9.3%, and the DASH diet 37.8 g. The low protein content is suspected because the composition of the ingredients does not contain high protein. The protein content in 100 g of banana is 1.2 g, oat 12.82 g, and spinach 0.9 g. Effort that can be made to achieve the protein's standard is by adding sources of high protein foods that come from animal and vegetable sources. The research results on the manufacture of snack bar products by Sarifudin et al. (2015) stated that one of the main sources of protein comes from eggs and skim milk.

4) Fat

Fat content was analyzed using Soxhlet method. The results showed that the fat content of the food bar P1 was 20.76% or 20.76 g. This value does not fulfill the maximum requirement of SNI 14% and USDA 10.91%, but it still fulfilled the DASH diet standard for snacks because the value is below 56.7g. The high-fat content is thought to be due to the addition of 20 g of margarine and 25 g of eggs in the process of making food bars. Nevertheless, the number of additions is lower than the previous research of Kusumaningrum (2018) and Janah (2017). The margarine used serves as a source of fat, making the resulting product ripen evenly and form a tough texture on the product (13). The use of eggs serves to obtain a soft texture. According to Sarifudin et al. (2015) the decrease in the hardness level of the snack bar is due to the foaming ability of eggs.

5) Carbohydrate

Carbohydrate content was calculated by the difference method. The results showed that the carbohydrate content of the food bar P1 was 57.9% or 57.9 g. Until now, there are no SNI and USDA policies that regulate the percentage and limit of the carbohydrate content in processed food bar products. The National Heart Lung Blood Institute (NHLBI) recommends a maximum of 115.5 g of carbohydrates in snacks (10%). The carbohydrate value of the P1 food bar product is fulfilled with the DASH diet standard.

6) Potassium

Potassium content was analyzed using Gravimetri method. The results showed that the potassium level of the food bar P1 was 52.66 mg/100g. Until now, there are no SNI and USDA policies that regulate the percentage and minimum level of potassium in processed food bar products. The National Heart Lung Blood Institute (NHLBI) recommends that potassium in snacks (10%) is 470 mg. Even though potassium content in 100 g of banana is 582.2 mg, oat 350 mg, and spinach 456 mg, however potassium value of the P1 food bar still not fulfilled with the DASH dietary standards. Efforts that can be made to achieve the potassium's standard is by adding some sources of food that have high potassium levels.

7) Sodium

Sodium content was analyzed using Argentometry Titration method. The results of this study showed that the sodium content of the food bar P1 was 52.66 mg/100. Until now, there is no policy from the Indonesian National Standardization Agency and USDA regarding the percentage and maximum levels of sodium in processed food bar products. The National Heart Lung Blood Institute (NHLBI) recommends sodium in snacks (10%) is 230 mg. The sodium value of the P1 food bar product already fulfilled the DASH dietary standards.

8) Energy

Energy calculations in this study were carried out by converting each gram of nutritional content, namely the conversion of protein into 4 calories, 9 calories of fat, and 4 calories of carbohydrates (1). The result of the calculation of the energy of the food bar P1 is 437 kcal/100g. The energy content has exceeded the limit for snacks, which is 10% or ± 210 kcal of daily calorie needs and is not fulfilled with the requirement from SNI 120 kcal, USDA 120.93%, and the DASH diet 210 kcal. The high calories in the food bar in this study were related to the addition of margarine, honey and eggs during the manufacture of the food bar. The energy content in 100g of margarine is 720 kcal, honey 294 kcal, and eggs 154 kcal. Effort that can be made

to achieve the energy's standard is by reducing the amount of margarine and honey as supporting materials.

E. Serving Size Food Bar

The product's serving size is set at the best formula (P1) with a dietary fiber content of 1.567g. The amount of fulfillment must be adjusted to the standard requirements for snacks, namely the fulfillment of 10% of needs. According to the DASH dietary standard, the daily fiber requirement is 30g, therefore the amount that must be met from snacks is 3g. The weight of one piece of food bar is 50g, so the food bar that needs to be consumed in order to achieve the daily fiber requirement is 3-4 pieces/day. However, the application of the DASH diet, especially in dietary fiber, cannot be imposed on snacks only which only has 10% of the total daily requirement, it needs to be balanced by consuming main foods that also contain high fiber.



Picture 3. Food Bar Weighing 50g (A), Food Bar (B)

Research Limitations

This study did not conduct a preliminary laboratory test of the nutritional content of each main ingredient before being processed into food bars. References for nutritional values are obtained from journals and the official website of Indonesian Food Composition Data, consequently, it is not known the significant difference in value with the raw materials used during the study, as well as the possibility of a reduction or increment in nutrient content during the processing.

4. CONCLUSIONS AND SUGGESTIONS

Conclusions:

- The higher amount of composite flour, the lower sensory value of the food bar. However, the higher amount of composite flour, the higher dietary fiber content in the food bar.
- The best formula food bar P1 with a ratio of banana : composite flour = 90% : 10% contains 437kcal of energy, 14,5% water, 2.16% ash, 4.67% protein, 20.76% fat, carbohydrates 57.9%, 1.57% dietary fiber, 52.66 mg/100 potassium and 0.22% sodium.
- Serving size of food bar which has the potential as a snack to support the DASH diet is 3-4 pieces/day.

Suggestions:

It is necessary to make adjustments so that the nutritional content of the P1 food bar product is close to the DASH diet standards, including:

- Effort to increase the dietary fiber content of the product along with considering the dark effect color due to spinach is by adding composite flour that has been reformulated previously with a higher ratio of oat.
- Efforts to reduce water content through drying technique with a food dehydrator after the food bar product is cooked.
- Efforts to increase protein and potassium levels are by adding other food ingredients that contain animal and vegetable protein sources as well as high in potassium.
- Efforts to reduce the number of calories are by reducing the amount of margarine and honey as supporting materials in the process of making food bars.

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