POTENTIAL LOCAL FOOD MATERIAL BASED ON FLOUR (CATFISH, RED BEANS, AND KEPOK BANANA) AS AN ALTERNATIVE SNACK FOR YOUNG WOMEN WITH ANEMIA

Widi Hastuti [1)], Mimin Aminah[2)], Gurid Pramintarto Eko Mulyo[3)], Shilka Amelia[4)], Alika Khoerunnisa[5)],Muna Nur Aeni[6)]
[1,2,3,4,5,6*)]Nutrition Department, Bandung Health Polytechnic Ministry of Health, Indonesia
Email : widihas77@gmail.com

Abstract,

Background : The main nutritional problem experienced by young women is anemia. The prevalence of anemia in productive age (15-49 years) according to WHO in Indonesia in 2019 was 31,2% increase from 2018 which was 30.4%. This happens because young women menstruate every month so that they lose iron ± 1,3 mg per day. Young women also tend to go on a diet, causing reduced intake of nutrients including iron. Therefore, it is necessary to increase iron intake by giving snacks containing iron. The products made are snack bars based on local ingredients, namely catfish flour Pangasius Sp), red bean flour (Phaseolus vulgaris), and kepok banana flour (Musa acuminata).

Method: The design of this study is an experimental study with a one-factor Complete Randomized Design (formulation). Product quality analysis includes organoleptic properties, macronutrients, iron, dietary fiber, water content, and omega 3. Organoleptic test using the hedonic test on 3 snack bar formulations with a ratio of catfish flour, red bean flour, kepok banana flour, namely F1 (10%:40%:50%), F2(20%:50%:30%), and F3(30%:30%:40%).

Result: Based on the results of organoleptic tests by 30 panelists, it was shown that the best formula of catfish, red beans, and kepok banana snack bar was F2(20%:50%:30%) with panelist ratings of somewhat like 20%, likes 46.7%, and very likes 30.0%, for a total of 96.7%. The nutritional value of the best snack bar for serving doses of 40 grams compared to AKG snack aged 10-15 years, namely energy 123,93 Kcal (62,75%), protein 5,14 grams (85.67%), fat 1,77 grams (26,03%), carbohydrates 21,86 (75.38%), dietary fiber 0,49 grams (17.50%), iron 0,74 mg (61,67%) and omega 3 as much as 69,04 mg (657,52%).

Keywords: *snack bar, catfish, red beans, kepok banana, anemia*

Introduction

The main nutritional problem experienced by young women is anemia. Young women are prone to anemia because they menstruate every month, and lose iron ± 1.3 mg per day, so the need for iron is increased. Young women tend to go on a diet that causes a reduced intake of nutrients including iron. [1.2]

The impact caused by anemia is a decrease in motor ability, decreased IQ score, decreased cognitive, and mental abilities, decreased productivity, pregnancy and fetal complications in pregnant women, growth disorders, immunity, and susceptibility to toxins from heavy metals.[3]

The prevalence of anemia in productive age (15-49 years) according to WHO in Indonesia in 2019 increased from 2018 which was 30.4%. The prevalence of anemia in 2018 at the age of 15-24 years in Indonesia was 32% an increase from 2013 which was 22.7%.[4,5]

Iron deficiency anemia is caused by foods that contain less iron. Therefore, it is necessary to increase iron intake by giving snacks or iron-enhancing snacks. One of the products that can be consumed as a snack is a snack bar. Snack bar is a practical snack, with complete nutritional value is and is, durable to store. According to research by

Rahmat R, Hastuti W, and Darniadi S (2019), snack bar-shaped interlude foods are easy to modify with other foodstuffs. According to Hakim (2013), snack bar consumption in Indonesia is still small, namely 34.5%.[6,7,8]

Catfish, red beans, and kepok bananas are local foods in West Java whose utilization has not been maximized. Catfish is a source of animal protein that has a bioactive component of unsaturated fatty acids that can improve immune function. Nutrients contained in 100 grams of energy catfish 135 kcal, protein 17 grams, fat 6,6 grams, carbohydrates 1,1 grams, and Fe 1,6 mg. National catfish production in 2018 was 391,151 tons, up 22,25% from 2017.[9,10]

Hastuti W, 2020 research produced Crispy Catfish products. This product contains protein but lacks fiber content. To process products that contain protein and fiber, it is necessary to add fiber source foodstuffs, namely red beans with a fiber content of 4,0 grams/ 100 grams. Red beans have as much iron as 10,3 mg/100 grams. Red bean production in West Java in 2019 amounted to 46,785 tons.[11,12,13]

Kepok banana (Musa acuminata) is an easily available food ingredient. Banana production in Indonesia in 2019 was 7.820.568 tons. Bananas have quite complete nutrients. The banana content per 100 grams is 108 kcal, protein 1 gram, carbohydrates 24,3 grams, calcium 20mg, phosphorus 30 mg, and iron 0,2 mg. Bananas contain Inulin and Fructooligosaccharide (FOS) compounds that act as natural prebiotics. Research by Ratih Hardisari (2016) states that the more banana flour is added, the higher the number of Lactobacillus casei bacteria. The nutritional content of kepok banana flour is based on research conducted by Indah Kusumaningrum (2018), namely in 100 grams containing 3.04% protein, 82.86% carbohydrates, 15,24 mg of dietary fiber, and 769 mg of potassium.[13,14,15]

The purpose of the study was to obtain the best formula high in protein and iron made from local foods as an alternative snack for young women with anemia.

Method

The design of this study is an experimental study with a one-factor Complete Randomized Design (RAL) (formulation). The formulation of optimization of temperature treatment and roasting time of 13 formulas was carried out using *Response Surface Methodology* (RSM), temperature range 60-120^0 Celsius and time range 60-120 minutes. The formulation of the optimization of the composition of flour as many as 16 formulas is carried out using *a mixture design*, with a composition range of catfish flour 10–5 0%, red beans 20–30%, and kepok banana 20–40%. The formulation uses a design expert by running as many as sixteen formulas of catfish flour, red beans, and kepok bananas, and selected 3 formulas for organoleptic testing to obtain the best 1 formula. Product quality analysis includes organoleptic properties, macronutrients, iron, dietary fiber, water content, and omega 3. Organoleptic test using the hedonic test on 3 snack bar formulations with a ratio of catfish flour, red bean flour, kepok banana flour namely F1(10%:40%:50%), F2(20%:50%:30%), and F3(30%:30%:40%).

The products are snack bars based on local ingredients, namely catfish flour (*Pangasius Sp*), red bean flour (*Phaseolus vulgaris*), and kepok banana flour (*Musa acuminata*). Additional ingredients are eggs, sugar, maltodextrin, isolates of soy protein, inulin, and candied star fruit. The selected products will be packaged in metalized aluminum foil packaging.

Tools used in the manufacture of snack bars are basins, knives, grinders, sieves, ovens, spoons, forks, digital food scales, baking sheets, bowls, pots, plates, and cutting boards. The tools used in organoleptic tests are organoleptic test forms, pens, pins, and souvenirs.

In making catfish flour, the first step is to wash the catfish without a head and drain it. Then, the catfish (without the skin is cut in thickness by 1 cm. Then, soaked with 5% brine and 10% lemon juice for 10 minutes. After that, the fish meat is squeezed and dried in the oven for 8 hours at a temperature of 70^{o}C. Dried fish meat is ground using a grinder and sifted with a 100 mesh sieve.

To make red bean flour, the first is to wash and slice the red beans. Then, the red beans are boiled at a temperature of 70^{o}C for 90 minutes. Then, the red beans are oven-dried at a temperature of 6 0^{o}C for 6 hours. Dried nuts are ground with a grinder and sifted with a 100 mesh sieve.

In making kepok banana flour, the first step of peeled the kepok banana. After that, the kepok banana is sliced and oven-dried for 6 hours at a temperature of 70^{o}C. After drying, the kepok banana is ground with a grinder and then sifted with a 100 mesh sieve.

The organoleptic test conducted on catfish flour snack bars, red bean flour, and kepok banana flour is a hedonic test that includes color, aroma, taste, texture, and overalls. The hedonic scale used is 1-7, with (1) Strongly Disliked, (2) Disliked, (3) Somewhat Disliked, (4) Neutral, (5) Somewhat Like, (6) Like, and (7) Very Like. The test is conducted by a well-trained panel of 30 people.

Result

Laboratory analysis of Catfish flour

Temperature Formulation and Snack bar Manufacturing Time

The formulation of optimization of temperature treatment and baking time of snack bar products is carried out using Response *Surface Methodology* (RSM), temperature range 60-120^0 Celsius and time range 60-120 minutes, the formulation results are obtained in Table 1. below:

Table 1. Flour-Based Snack bar Temperature and Roasting Time Optimization Formulation (Catfish, Red Beans, and Kepok Banana

No	Roasting Temperature (^{0}C)	Baking Time (Minutes)
1	90	90
2	60	120
3	100	80
4	120	60
5	60	120
6	120	60
7	60	120
8	110	70
9	70	100
10	70	100
11	120	60
12	110	70
13	90	90

The best temperature and time of snack bar roasting is 120^{o}C for 60 minutes.

Formulation of the Composition of Catfish flour, Red Beans, and Kepok banana in Snack bar Making

Making snack bar products using the *Response Surface Methodology* (RSM) method. The formulation of flour composition optimization is carried out using *a mixture design*, with a range of catfish flour composition of 10-50%, red bean flour 20-30%, and kapok banana flour 20-40%, the formulation results are obtained in the following table:

Table 2. Formulation of *Mixture Design of* Flour-Based Snack bar Products (Catfish, Red Beans, and Kepok banana

Run	Catfish flour (%)	Red Bean Flour (%)	Kepok Banana Flour (%)
1	16	38	46
2	30	30	40
3	10	50	40
4	20	40	20
5	10	40	50
6	30	36	34
7	20	50	30
8	27	43	30
9	23	33	44
10	19	31	50
11	10	40	50
12	30	30	40
13	20	50	30
14	19	31	50
15	17	47	36
16	10	50	40

Panelist Assessment Spread

An organoleptic assessment of color, taste, flavor, texture and *overalls* was carried out on 30 panelists of students and lecturers of the Department of Nutrition using the hedonic test method. The results of the organoleptic test can be seen in the following table.

DOI 10.34011/icihcce.v4i1.235

Table 3. Distribution of Panelists' Assessment of Flour-Based Overall Snack bar Catfish, Red Beans, and Kepok Banana)

The Formula of Catfish flour, Red Bean Flour, Kepok Banana Flour	Panelists' Assessment of *Overall* Snack bar							
	Really Like It	Like	Kinda Like	Neutral	Kinda Dislike	Dislike	Strongly Dislike	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
F1 (10%:40%:50%)	4 (13.3,)	11 (33,3)	10 (33,3)	3 (10,0)	2 (6.7)	0 (0,0)	0 (0,0)	30 (100,0)
F2(20%:50%:30%)	9 (30.0)	14 (46,7)	6 (20.0)	1 (3,3)	0 (0,0)	0 (0,0)	0 (0,0)	30 (100,0)
F3 (30%:30%:40%)	3 (10,0)	14 (46,7)	4 (13.3)	3 (10,0)	5 (16,7)	1 (3,3)	0 (0,0)	30 (100,0)

A figure of the distribution of panelists' assessment of overall snack bars is presented in figure 1

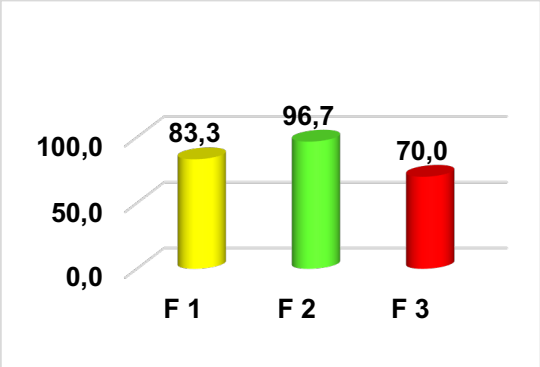

Figure 1 Distribution of Panelists' Assessment of Flour-Based Overall Snack bar(Catfish, Red Beans, and Ambon Banana)

Snack bar Nutritional Value Test Results

The results of the snack bar nutritional value test are presented in the following table.

Table 4. Flour-Based Snack bar Laboratory Analysis Test Results (Catfish, Red Beans, Kepok Banana) in 100 grams

No	Types of Examinations	Result
1	Energy (kcal)	309.82
2	Protein (g)	12,85
3	Fats (g)	4,42
4	Carbohydrates (g)	55,66
5	Moisture content (%)	18,38
6	Ash content (%)	1,32
7	Dietary fiber (g)	1,23
8	Iron (mg)	1,84
9	Omega 3 (mg)	172,60
10	Shelf life (days)	12

Source: Primary lab data. Saraswanti, 2022

Table 5. Comparison of Nutritional Content of Flour-Based Snack bars (Catfish, Red Beans, KepokBanana) with Commercial Snack bars in 25 grams

No	Jenis Pemeriksaan	Hasil Zat Gizi	Komersial*
1	Energi (kkal)	77,46	80
2	Protein (g)	3,21	1
3	Lemak (g)	1,10	2,5
4	Karbohidrat (g)	13,92	14
5	Serat pangan (g)	0,31	2
6	Zat besi (mg)	0,46	-
7	Omega 3 (mg)	43,15	-

*WRP Fruit Bar, Nutrifood [20]

The results of testing the nutritional value of flour-based snack bars (catfish, red beans, and kepok banana) per serving dose of 40 grams, are presented in the following table.

Table 6. Nutritional Value Test Results of Flour-based Snack bars (Catfish, Red Beans, and Kepok Banana) per Serving Dose of 40 grams Compared to the Nutritional Adequacy Rate (AKG)

No	Types of Tests	Lab Test Results per serving dose 40 grams	AKG Mean Interlude Food age 10 - 15 years	% AKG
1	Energy (kcal)	123,93	197,50	62,75%
2	Protein (g)	5.14	6,00	85.67%
3	Fats (g)	1,77	6,80	26.03%
4	Carbohydrates (g)	21,86	29,00	75.38%
5	Dietary fiber (g)	0,49	2,8	17,50%
6	Iron (mg)	0,74	.,M	61.67%
7	Omega 3 (mg)	69,04	10,5	657,52 %

*Laboratory Tests

Based on the results in table 6. flour-based snack bar products (catfish, red beans, and kepok banana) contributed to the nutritional adequacy of snacks in the age group of 10-15 years, especially protein adequacy of 5.14 grams contributed 85,67% and omega 3 of 69.06 mg contributed 657.52% to the recommended nutritional adequacy.

Discussion

The yield of catfish flour obtained was 26,8% higher than Nirmalasari's research in 2017, which was 24,6%. The yield of red bean flour obtained is 85,7% higher than Widiawati's research, 2022, which is 80,37%. The yield of kepok banana flour obtained is 19,2% higher than that of Nairfana's research in 2022, which is 18,62%.[16,17,18]

The results of the snack bar organoleptic test showed that most of the panelists expressed liking for the overall snack bar products in formula 2 with the panelists' rating of somewhat like 20%, like 46,7%, and very like 30,0%, for a total of 96,7%. This means that snack bar products can be accepted and liked by panelists.

Comparison of the protein content of the best formula snack bar with commercial snack bar in 25 grams, namely more protein with a protein content of 3,21 grams while commercial products are 1 gram, in the best formula snack bar there is an omega 3 content of 43,15 mg. The protein content contained in snack bar products can be an alternative snack for young women with anemia. [19]

Conclusion

1. The results of processing raw materials for catfish, red beans, and Kepok Banana into catfish flour with a yield of 13%, red bean flour with a yield of 85%, and kepok banana flour with a yield of 12%.
2. The optimum conditions of the temperature and baking time of snack bars selected from RSM technology are 120^{o} C temperature treatment and 60 minutes time.
3. The selected snack bar formula for catfish meal, red beans, and Kepok Banana is formula I with a composition of 10%:40%:50%, Formula II with a composition of 20%:50%:30%, and Formula III with a composition of 30%:30%:40%.
4. The results of the snack bar organoleptic test showed that most of the panelists expressed liking for the overall snack bar products in formula 2 with the panelists' rating of somewhat like 20%, like 46,7%, and very like 30,0%, for a total of 96,7%. This means that snack bar products can be accepted and liked by panelists.
5. The results of testing the nutritional value of the best snack bar for serving doses of 40 grams compared to AKG snack aged 10-15 years, namely energy 123,93 Kcal (62,75%), protein 5,14 grams (85.67%), fat 1,77 grams (26,03%), carbohydrates 21,86 (75.38%), dietary fiber 0,49 grams (17.50%), iron 0,74 mg (61,67%) and omega 3 as much as 69,04 mg (657,52%)
6. Comparison of the protein content of the best formula snack bar with a commercial snack bar of 25 grams, namely more protein with a protein content of 3,21 grams while commercial products are 1 gram, in the best formula snack bar there is an omega 3 content of 43,15 mg.

Reference

1. Akib A, Sumarmi S. Eating Habits of Young Women Associated with Anemia: A Study of Positive Deviance. Amerta Nutr.2017; 1 No2: 105-116.
2. Irianti B. Relationship of Blood Volume During Menstruation with the Incidence of Anemia in Pekanbaru International Midwifery Academy Students in 2014. Encycl J. 2019;1(2):257–61.
3. Fadila I, Kurniawati H. Efforts to Prevent Anemi in Young Women as a Pillar towards Improving Maternal Health. FMIPA-UT National Seminar Pros. 2018;78–89
4. WHO. Prevalance of Anaemia Women of Reproductive Age (15-49) (%). 2021.
5. Ministry of Health RI. National Report on Basic Health Research. Ministry of Health of the Republic of Indonesia. 2018;1–582.
6. Syahwal S, Dewi Z. Pemberian Snack Bar Meningkatkan Kadar Hemoglobin (Hb) pada Remaja Putri. Action Aceh Nutr J. 2018;3(1):9.
7. Rachmat R, Hastuti W, Darniadi S. Characteristics of Snack Bar "banaris" from Fortified Non Cereal Flour as Emergency Food for Toddler. IOP Conf Ser Earth Environ Sci. 2019;309(1).
8. Hakim VP, Fitriyono A. Analysis of Antioxidant Activity, Content of Macro and Micronutrients Snack bar Rice Color as Interlude Food for Patients with Diabetic Nephropathy. J Nutr Coll. 2013;4(2):431
9. Rohmah MN. a comparative study of catfish and corn starch and drying duration to the characteristics of corn dry paste. Teggling. 2017;12
10. Directorate General of Aquaculture. Supporting Catfish Exports, KKP Encourages

Industrialization of Sustainable Patin Cultivation. KKP.go.id. 2019.
11. Hastuti W, Aminah M, Mulyo GP. Interventions for Providing Cookies Based Red Nuts, Banana, and Snakehead Fish as an Emergency Food AlternativeTowards Nutritional Status of Children. Sapporo Med J. 2020;54(08):1–11.
12. Ministry of Health of the Republic of Indonesia. Table of Indonesian Food Composition. 2017
13. Badan Pusat Statistika. Produksi Buah-Buahan 2018 & 2019. bps.go.id. 2019
14. Hardisari R, Amaliawati N. Benefits of Prebiotic Kepok BananaFlour (Musa paradisiaca formatypica) against the Growth of Lactobacillus casei Probiotics in Vitro. 2016;5(2).
15. Kusumaningrum I, Rahayu NS. Snack Bar Formulation High in Potassium and High in Fiber Made from Seaweed, Banana Kepok, and Mocaf as an Alternative Snack for People with Hypertension. Argipa. 2018;3(2):102–10.
16. Nirmalasari M, Asih ER. Acceptability of Sago Cookies with Catfish Meal Subtritution (Pangasius hypopthalmus). Journal of Health Protection.2017;6(1):52-63
17. Widiawati D, Govani S, Liana SP. Formulation and Characterization of Dried Noodles Substitution of Red Bean Flour High in Fiber.Journal of Al Azhar Indonesia Science and Technology Series. 2022;7(2): 80-86
18. Nairfana I, Rizaldi LH. Physicochemical Properties of Kepok Banana Flour (Musa Paradisiaca L.) Which is planted in different locations in Sumbawa Regency. Pro Food (Journal of Food Science and Technology).2022;8(1):44-52
19. Hastuti AR, Afifah DN. Antioxidant Activity Analysis, Nutritional Content Analysis, Organoleptic Test of Snack Bar Sesame Seed and Yellow Pumpkin Flour as Alternative Interlude Foods with High Antioxidants. Journal of Nutrition College.2019;8(4):219-230. https://doi.org/10.14710/jnc.v8i4.25835
20. Nutrition Fact WRP Fruit bar, Nutrifood. https://www.fatsecret.co.id/kalori-gizi/wrp/fruit-bar/1-bungkus