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Characteristic of White Glutinous Sticky Rice "Kipang" added by Coconut Dregs

K Sayuti[1], C W Refdi[1] and P. Ramadani[1.]

[1] *Food and Agricultural Product Technology Department, Faculty of Agricultural Technology, Universitas Andalas, West Sumatra, Padang, Indonesia*

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CORRESPONDING AUTHOR

*E-mail: kesuma@ae.unand.ac.id

A B S T R A C T

This study aimed to determine the effect of coconut dregs addition on white glutinous sticky rice "Kipang" characteristics. The study used a CRD with six treatments and three replications. The treatments applied in this study is coconut dreg, consisting of A (0%), B (5%), C (10%), D (15%), E (20%), and F (25%). The data were analyzed using ANOVA and subsequently subjected to DNMRT at the 5% significance level. The study showed that adding coconut dreg affected moisture content, protein, fat, carbohydrates, crude fiber, total sugar, and organoleptic acceptance, such as color, taste, and crispiness. However, it did not significantly affect the ash content and the organoleptic acceptance of the aroma. The best treatment was F product (25%) with moisture content (6.44%), ash content (0.93%), fat content (13.4%), protein content (3.17%), carbohydrates content (75.73%), crude fiber (4.47%), total sugar (42.88%) and organoleptic acceptance for color 4.43 (like), aroma at 4.23 (like), taste 4,33 (like) and fragility at 4.23 (like). The glycemic index of the product was (67.92%)

1. INTRODUCTION

1.1. Research Background

Kipang is a traditional food generally made from the main ingredients of cereals such as corn and sticky rice; some also use nuts such as peanuts. "Kipang" is produced by mixing one of the main ingredients with liquid sugar. The presence of sugar as an ingredient in "kipang" is thought to cause this product to have a high glycemic index. People are starting to care about healthy food, including food with a low glycemic index. One effort to reduce the glycemic index is to add fiber to food products [1]. One food source of fiber that was is coconut residue. Coconut residue is a by-product of pressing coconut milk from grated coconut meat.

Coconut plants are one of the plantation crop commodities produced in Indonesia. Statistical data in 2020 shows that Indonesia is the country that occupies the first position as the largest producer of coconut, with a figure reaching 16.82 million tons [2]. Statistical data in 2021 shows that coconut plantations in Indonesia produced 2853.30 thousand tons of coconut [3]. Meanwhile, coconuts grown in the province of West Sumatra in 2020 amounted to 78,348.00 tonnes [4].

West Sumatra is also known for its majority of Minang people. Minang people generally have a distinctive cuisine rich in spices and coconut milk. The by-product of pressing coconut milk is called coconut dregs. From 100 coconuts, ± 19.50 kg of coconut dregs can be produced. Looking at the coconut dregs delivered daily in the community, whether from coconut dregs produced by households, Padang restaurants, or coconut milk processing businesses, this will create quite a bit of coconut dregs waste. In coconut milk processing businesses, coconut dregs are usually unused or thrown away. One effort to utilize coconut dregs waste is by processing it as an additional ingredient in food products, namely "kipang".

According to research by Ref. [5], coconut dregs flour has a fiber content of around 15.06%. Thus, coconut dregs can used as a food source of fiber. So, adding coconut dregs to "Kipang" is expected to increase dietary fiber.

Using coconut dregs in food products is an effort to increase the productivity of under-exploited and under-utilized agricultural products. Apart from that, the lack of basic information regarding the processing of coconut dregs in food products has resulted in the low use of coconut dregs in the food sector [6].

Glutinous rice contains fiber, but not as much as brown rice and other white rice. The fiber content in 100 g of sticky rice is only around 1 g [7]. So, coconut dregs are fiber enhancers to increase the fiber in the white sticky rice “Kipang” product, made from a mixture of sticky rice and sugar. In preliminary research, an attempt to find a formulation for white sticky rice “Kipang”. The 1:1 formulation between fried sticky rice and brown sugar produces a good texture of “Kipang”. So, proceed with determining the type of treatment, namely by adding roasted coconut dregs.

The type of treatment used in research on adding coconut dregs to the characteristics of white sticky rice kipang was adding 0%, 5%, 10%, 15%, 20%, and 25% coconut dregs. The selection of the type of treatment refers to preliminary research carried out. It found that with the addition of roasted coconut dregs above 25%, the resulting kipang did not blend with the added coconut dregs, so it did not meet the characteristics of the kipang, regarding texture, kipang, which more than 25% coconut residue has a surface that irritates the throat when eating.

1.2. Literature Review

Coconut dregs are a by-product of pressing coconut milk. As waste produced by industry and households, coconut dreg is a potential food ingredient because of its nutritional content. It presumes that coconut dregs still contain many nutrients such as protein, fat, and carbohydrates. However, the main advantage of coconut dregs is their high fiber content. [8]. One hundred coconuts were processed coconut oil using the wet method, ± 195 kg of coconut dregs were produced.

Coconut dregs have a protein content of 4.12%, fat of 12%, water content of 0.33%, and crude fiber of 37.1% [9]. Analysis results from dried coconut dregs (fat-free) contained 93% carbohydrates consisting of 61% galactomannan, 26% mannose, and 13% cellulose [10].

White glutinous sticky rice is a rice variety belonging to the Graminiae family. Glutinous rice is widely available in Indonesia, producing around 42,000 tons annually. Sticky rice (or glutinous rice) is not transparent and has a distinctive smell; all or almost all of the starch is amylopectin. Sticky rice is almost entirely dominated by amylopectin, making it very sticky. [11]. The distinctive smell produced by glutinous rice comes from its highly volatile compounds. [12].

White sticky rice is milky white, with a reasonably solid appearance and a shape that tends to be round and short. Meanwhile, regular rice or pera rice tends to have an ivory-white color, transparent appearance, and a thinner shape that tends to be elongated. [13]. Processed products made from white glutinous rice include “rengginang”, “lemper”, “opak”, “fried uli” and “kipang” [14].

White sticky rice contains carbohydrates, protein, vitamins, and minerals. The substance that is the main constituent of white glutinous rice grains is starch, which is a complex carbohydrate. Cooked sticky rice has a soft and slightly sticky texture because the amylopectin content is quite high in sticky rice. Amylopectin is a polymer of α-(1,4) glucose units with side chains of α-(1,6) glucose units [15].

Kipang ketan is a snack made from glutinous rice (Oryza sativa glutinosa), which is processed by frying, baking, or puffing or first steamed, dried, and fried until fluffy, mixed with sugar with or without the addition of permitted and molded food ingredients. Kipang is a light food or snack made from the essential ingredients of ordinary rice or sticky rice and pre-caramel or caramel sugar [16]. In making kipang, the rice is puffed using high pressure and temperature, roasted, or fried in oil. As a traditional food widely known by the public for a long time, kipang has a sweet and crunchy taste.

Various factors can cause the GI of one food to be different from other foods. Different plant varieties also cause differences in GI. Factors such as the processing process, amylose and amylopectin ratio, sugar content, food osmotic power, fiber, fat, and protein content influence GI value [17].

1.3. Research Objective

This research aims to study the effect of adding coconut dregs on the characteristics of white sticky rice kipang and determine the best product physically, chemically, and organoleptically.

2. MATERIALS AND METHODS

2.1. The Materials

The raw materials used in this research were white sticky rice, coconut dregs, and brown cane sugar. The white sticky rice and brown sugar cane used come from traditional Padang Markets. The coconut dregs come from the Restu Bunda Malindo 1 pure coconut milk production site on Jl. Prof. Mahmud Yunus, Lubuk Lintah, Kec. Kuranji, Padang City. The materials used for chemical analysis tests are distilled water, NaOH (Pro analysis. Smartlab), hexane (Technical Brataco), HCl, K2SO4 (Pro analysis. Smartlab), H_2SO4 (Pro analysis. Smartlab), KI solution, 96% ethanol. The material used in the glycemic index test is pure glucose.

The tools used in making white sticky rice "kipang" are scales, stoves, knives, pots, pans, spoons, spatula, stainless steel baking pans measuring 22×22×2 cm, and plastic gloves. The tools used for chemical analysis are desiccators, cup clamps, beakers, measuring flasks, Soxhlet extraction tools complete with condensers and fat flasks, electric heaters or steam baths, filter paper, Kjedhal tools, distillation tools, burettes, Erlenmeyer, analytical balances, dropper pipette, test tube, measuring cup, aluminum cup, porcelain cup, ashing furnace, oven, funnel, latex gloves, spatula, autoclave, vortex, beaker glass, and magnetic stirrer. The tool used for the IG test is a blood sugar checking tool (Autocheck brand), complete with blood sugar strips and a blood lancet.

2.2. The Design

The research design was completely randomized design (CRD) with six treatments and three replications. The product observation data was analyzed using ANOVA and followed by Duncan's New Multiple Range Test (DNMRT) at a 5% significance level. The treatment was the addition of coconut dregs. The treatments treatment were;

A = 0% (control)
B = 5 %
C = 10 %
D = 15 %
E = 20 %
F = 25 %

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2.3. Research implementation

2.3.1. Formulation determination.

The formula used in this research is determined based on the procedure carried out in previous research. The formulation of white sticky rice kipang is shown in Table 1.

Table 1. White Sticky Rice "Kipang" Formulation

Material (g)	Treatment					
	A	B	C	D	E	F
White sticky rice puffing	100	100	100	100	100	100
Roasted coconut dregs	0	5	10	15	20	25
Brown Sugar	100	100	100	100	100	100

2.3.2. Making of White Glutinous Rice Puffing

The process of making white sticky rice popcorn in this research was as follows: Prepare white sticky rice. White sticky rice is washed and then soaked in clean water for ± 5 hours. White sticky rice that has been absorbed and then steamed for ± 30 minutes. White sticky rice is dried by drying it in the sun. Dried white sticky rice dried in the sun is fried in hot oil until the rice expands (puffing). Drain the fried white sticky rice from the remaining oil. White sticky rice puffing is produced.

2.3.3. Making of "Kipang"

The process of making white sticky rice kipang in the research was as follows: Prepare white sticky rice popcorn, roasted coconut dregs, brown sugar, and water. Weigh the sticky rice popcorn, roasted coconut dregs, and brown sugar for each treatment. Brown sugar is dissolved in 100 ml of water and then cooked over medium heat until it becomes caramel. Fried white sticky rice is placed in a pan containing caramelized sugar and stirred until the ingredients are evenly mixed. Roasted coconut dregs are added to a pan containing a mixture of sugar and fried white sticky rice while stirring until evenly mixed. The mixture of ingredients that have been stirred well is put into a stainless-steel baking pan, compacted using a roller, and then molded. White sticky rice "kipang" cut into appropriate sizes. The white sticky rice "kipang" is ready to be tested.

2.4. Observations

2.4.1. Observation on the Raw Materials

Observations made on the raw material in this research, namely roasted coconut dregs, included water, fat, crude fiber, and protein content. Observations made on white sticky rice popcorn were water content. Observations on fried white sticky rice include water, fat, and protein. Observation cane brown sugar, the total sugar content was observed.

2.4.2. Observation of the "Kipang"

Observations on white sticky rice kipang included chemical analysis of water, ash, carbohydrates, protein, fat, crude fiber, and total sugar content. Next, an analysis of the glycemic index is carried out by using 10 persons. An organoleptic test was carried out using a hedonic scale, including color, aroma, taste, and fragility.

3. RESULT AND DISCUSSION

3.1. Raw Materials Analysis

The raw materials used in this research were white glutinous rice popcorn, roasted coconut dregs, and brown cane sugar. The results of the raw material analysis can be seen in Table 2.

Based on the results of raw material analysis of roasted coconut dregs, a water content of 8.44 ± 0.22 was obtained. The water content obtained from the raw material test on roasted coconut dregs was higher than the research [18], Which states that coconut dregs flour has a water content of 2.5%. The difference in water content could be caused by the treatment given to coconut dregs. In this research, coconut dregs were used using the roasting method, while the research was conducted by [19] In this research, coconut dregs were dried using an oven and then made into coconut dregs flour. Treatment, shape, size, and surface area can also affect the product's water content. The roasting coconut dregs aims to remove or remove most of the water contained in coconut dregs and produce a better aroma, inactivate enzymes, kill microorganisms, and produce a new taste for white sticky rice kipang [20].

Table 2. The Raw Materials Analysis

Variable	Value			
	Brown Sugar Cane	Coconut Dregs Roasted	White Glutin ous Dry	White Glutinous Puffing
Water (%)	-	8.44 ± 0.22	7.8 ± 0.14	4.7 ± 0.36
Fat (%)	-	31.4 ± 2.96	-	15.8 ± 2.26
Crude Fiber (%)	-	28.16 ± 0.15	-	1.85 ± 0.01
Protein (%)	-	3.05 ± 1.17	-	1.69 ± 0.48
Total Sugar (%)	99.75 ± 0.17	0.90 ± 0.01	-	-

Note: (-) = no testing

The water content of dry white sticky rice obtained was 7.8 ± 0.14. Meanwhile, the water content obtained from analysis of the raw material for white sticky rice puffing was 4.7%.

The fat content of the roasted coconut dregs raw material obtained was 31.4 ± 2.96, where the results of this fat analysis were lower than the fat content of coconut dregs flour 42.6%. The fat content of white sticky rice puffing was 15.8%.

The protein content obtained from the roasted coconut dregs raw material analysis was 3.05 ± 1.17. The results of protein levels obtained in this study were not much different from the research [21] which states that the protein content of coconut dregs is 3.09%. The results of protein levels obtained in this study were lower than in the research by [22] which stated that the protein content in coconut dregs flour was 5.78%. The study that had been done by [9] stated that the protein content of coconut dregs using the freeze-drying method was 4.12%. The protein content obtained from the fried white sticky rice analysis was 1.69%.

The crude fiber content obtained from analysis of roasted coconut dregs raw material was 28.16 ± 0.15. The crude fiber content results obtained in this study were higher than in research [19] which states that the natural fiber content in coconut dregs flour is 23.2%. However, the analysis results of roasted coconut dregs raw materials were lower when compared with research by [9] stating that the crude fiber of coconut dregs using the freeze-drying method was 37.1%.[21]

The total sugar content obtained for raw materials analysis for cane brown sugar was 99.75%. Sucrose in brown sugar cane was 99,8% [18].

3.2. *Chemical Characteristics of "Kipang"*

3.2.1. Water Content

The water content of food products is an essential factor determining a product's quality and shelf life. Water content is used to determine the product's dry weight [23]. Water is a component that influences food's appearance, texture, and taste [24].

The analysis of variance showed that the addition of coconut dregs concentration was statistically significantly different (α=5%) from the water content of the product produced. The analysis results showed that the water content of white sticky rice kipang ranged from 2.82-6.44%. The water content of the white kipang product produced meets SNI; whereas the water content of rice kipang is based on SNI 8416:2018 [25] the maximum water content is 8%. The highest water content was obtained from treatment F with a 25% addition of coconut dregs. In comparison, the lowest water content was obtained from treatment A with a formulation of 0% addition of coconut dregs.

Table 2. Water Content of "Kipang"

Treatment	Value (mean ± SD)
A (0%)	2.82 ± 0.168 a
B (5%)	3.31 ± 0.102 ab
C (10%)	4.20 ± 1.205 abc
D (15%)	5.26 ± 1.213 bc
E (20%)	6.15 ± 1.333 c
F (25%)	6.44 ± 2.103 c
CV = 4.38%	

Note: Numbers in the same column, followed by different lowercase letters, show significant differences at the 5% Duncan's New Multiple Range Test (DNMRT) level.

The water content of white sticky rice kipang with the addition of coconut dregs increased along with the increasing percentage of added coconut dregs. The increased product water content can be caused by the water content in the roasted coconut dregs raw material used. Based on analysis of the raw material for roasted coconut dregs, the water content value was 8.44 ± 0.22, so differences in the concentration of coconut dregs used in each treatment will affect the water content, and the product's water content will increase. It follows the research conducted by [26] that adding coconut dregs flour can increase the water content in making bread. The fiber content in coconut dregs is hydrophilic, so it can bind water, so the more coconut dregs are used, the higher the water that can be bound [27].

An increase in water content in some processed foods can indicate a decrease in quality, affecting the product's shelf life. Increased water content can be caused by vapor absorption from the environment. Increasing the water content in food products can affect changes in characteristics to their initial quality.

3.2.2. Ash Content

Ash content is the organic residue remaining after the combustion or oxidation process of inorganic materials from a product. Ash content describes an effect's overall or total mineral content [23]. The results of the kipang ash content analysis can be seen in Table 4.

The analysis of variance showed that the difference in concentration of added coconut dregs was not statistically significant (α=5%) on the ash content of the product produced. The product ash content ranges from 0.69-0.93%. The highest ash content was obtained from treatment F, adding 25% coconut dregs with an ash content value of 0.93%. In contrast, the lowest ash content was obtained from treatment A, namely the addition of 0% coconut dregs with an ash content value of 0.69%.

Table 3. Ash Content of "Kipang"

Treatment	Value (Mean ± SD)
A (0%)	0.69 ± 0.101
B (5%)	0.76 ± 0.077
C (10%)	0.80 ± 0.200
D (15%)	0.87 ± 0.116
E (20%)	0.89 ± 0.192
F (25%)	0.93 ± 0.115
CV = 2.86%	

The increase in the ash content value obtained from the white sticky rice "kipang" produced can be caused by the mineral content in coconut dregs. Based on research carried out by Ref. [21], The ash content contained in coconut dregs is 0.59%. The ash content value of white sticky rice kipang obtained was lower when compared to the ash content value of rice jipang SNI 01-4451-1998, where the minimum ash content of rice jipang is 1%. Thus, the ash content in this study's white sticky rice kipang product has met the ash content standards and follows SNI 01-4451-1998.

3.2.3. Fat Content

Fat is a chemical component insoluble in water; fat also has a higher energy content than protein and carbohydrates. One gram of fat produces nine kcal/g of energy, while protein and carbohydrates produce 4 kcal [24]. The analysis results of the fat content of white sticky rice kipang can be seen in Table 5.

The analysis of variance showed that differences in coconut dregs concentration produced statistically significantly different fat levels (α=5%). The higher the concentration of coconut dregs, the higher the fat content of kipang, where the fat content in the product ranges from 6.47-13.40%. The highest fat content was obtained from treatment F (25% addition of coconut dregs), while the lowest fat content was obtained from treatment A (0% addition of coconut dregs).

Based on the analysis results, the fat content of white sticky rice kipang in treatment A (the same as the common kipang on the market) was 6.47%. Fat plays an essential role in the characteristics of food products because it determines the savory

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nature of food. Fat also affects product odor, mouthfeel, and texture [28].

Table 4. Fat Content of "Kipang"

Treatment	Value (Mean ± SD)
A (0%)	6.47 ± 0.577 a
B (5%)	6.93 ± 1.286 a
C (10%)	8.60 ± 0.917 ab
D (15%)	10.4 ± 0.987 bc
E (20%)	12.6 ± 1.301 cd
F (25%)	13.4 ± 2.078 d
CV = 0,72%	

Note**:** Numbers in the same column followed by different lowercase letters, show significant differences at the 5% Duncan's New Multiple Range Test (DNMRT) level.

Fat in food is one of the factors that can influence the glycemic index. Foods with high fat content slow down the rate of digestion in the intestines. Thus, food with a high fat content tends to have a lower GI when compared to similar food products that have a lower fat content [17].

3.2.4. Protein Content

Proteins are complex organic compounds that contain amino acids bound to each other via peptide bonds [29]. The results of the analysis of protein content in white sticky rice "kipang" with the addition of coconut dregs can be seen in Table 6.

The analysis of variance showed that differences in pulp concentration resulted in statistically significantly different protein levels in "Kipang" (α=5%), which ranged between 2.27%-3.17%. The highest protein content was obtained from the formulation with the addition of 25% coconut dregs. In contrast, the lowest protein content was obtained from treatment A, namely the addition of 0% coconut dregs. The protein content in "kipang" increased along with the increasing percentage of coconut dregs flour added. According to [26], 20% substitution of coconut dregs flour can increase protein content by 2.05%. Based on research conducted by [30] the protein content in 100 g of coconut dregs is 4.7%.

Table 5. Protein Content of "Kipang"

Treatment	Value (Mean ± SD)
A (0%)	2.27 ± 0.031 a
B (5%)	2.56 ± 0.021 b
C (10%)	2.65 ± 0.062 c
D (15%)	2.76 ± 0.062 d
E (20%)	2.87 ± 0.060 e
F (25%)	3.17 ± 0.025 f
CV = 0.29%	

Note**:** Numbers in the same column followed by different lowercase letters, show significant differences at the 5% Duncan's New Multiple Range Test (DNMRT) level.

Food protein is one factor that can influence the glycemic index. Foods with high protein levels tend to slow down the rate of digestion in the intestines. Thus, food with high protein content tends to have a lower GI than similar products with lower protein content [17].

3.2.5. Carbohydrate

Determination of carbohydrate content in this study used a different method where carbohydrate content was obtained from the calculation of water, ash, fat, and protein minus 100%. The results of the analysis of carbohydrate levels with various treatments can be seen in Table 7

Table 7. Carbohydrates of "Kipang"

Treatment	Value (Mean ± SD)
A (0%)	87.75 ± 0.456 a
B (5%)	86.17 ± 0.045 ab
C (10%)	83.89 ± 2.473 abc
D (15%)	81.18 ± 1.031 bc
E (20%)	78.42 ± 1.887 c
F (25%)	75.73 ± 7.797 c
CV = 0.70%	

Note**:** Numbers in the same column, followed by different lowercase letters, show significant differences at the 5% Duncan's New Multiple Range Test (DNMRT) level.

The analysis of variance showed that differences in coconut dregs concentration produced "Kipang" with statistically significantly different carbohydrate levels (α=5%), ranging from 87.75%-75.73%. The highest carbohydrate content was found in treatment A with the addition of 0% coconut dregs, and the lowest carbohydrate content was found in treatment F with the addition of 25% coconut dregs. Table 10 shows that the decrease in carbohydrate content in white sticky rice "kipang" is in line with the increase in the concentration of coconut dregs used.

3.2.6. Crude Fiber

Crude fiber is the part of food that cannot be hydrolyzed by certain chemicals such as sulfuric acid (H2SO4) and NaOH [20]. Crude fiber is a group of food fibers that is very important in determining the glycemic index. The value of crude fiber contained in white sticky rice "kipang" can be seen in Table 8.

Table 6. Crude Fiber of "Kipang"

Treatment	Value (Mean ± SD)
A (0%)	1.81 ± 0.015 a
B (5%)	2.47 ± 0.025 b
C (10%)	2.83 ± 0.045 c
D (15%)	3.58 ± 0.030 d
E (20%)	4.32 ± 0.050 e
F (25%)	4.47 ± 0.075 f
CV = 0.22%	

Note**:** Numbers in the same column followed by different lowercase letters, show significant differences at the 5% Duncan's New Multiple Range Test (DNMRT) level.

The analysis of variance showed that differences in coconut dregs concentration produced products with statistically significantly different crude fiber content (α=5%), which ranged from 1.81-4.47%. The highest fiber content was in treatment F (addition of 25% coconut dregs), with a value of 4.47% fiber content. The fiber content increases as the percentage of coconut dregs added increases. It follows research by [26], where substituting 20% coconut dregs flour for bread produced 5.98% crude fiber. The rise in product fiber content can be influenced by the amount of fiber contained in the raw material, where the crude fiber content in 100g of roasted coconut dregs is 24%.

A product can be claimed to be rich in fiber if it contains 6 grams of fiber per 100 g in solid form [31]. So, the resulting product cannot be claimed as a high-fiber product because the highest fiber in the product is 4.47%. Even though it cannot be claimed to be a high-fiber product, the "kipang" product produced in research has been able to reduce its GI value.

3.2.7. Total Sugar

The variance analysis results show that differences in coconut pulp concentration produce products with statistically significantly different total sugar values (α=5%), which range between 38.24 and 42.88%. The highest total sugar content was in treatment F, namely the addition of 25% coconut dregs, with a total sugar value of 42.88%. Meanwhile, treatment A had the lowest total sugar content, adding 0% coconut dregs with a total sugar value of 38.68%. The total sugar content of white sticky rice "Kipang" with the addition of coconut dregs increased along with the increasing percentage of added coconut dregs flour. According to [19] coconut dregs have a sugar content of 7.1%.

The increase in sugar content in “Kipang” products is assumed to be due to the carbohydrate content in coconut dregs, so these carbohydrates are hydrolyzed into sugar in making kipang products. According to [19], coconut dregs from pressing coconut milk contain 19.2% carbohydrates. Research conducted by [19] on coconut dregs from squeezing coconut milk found that the sugar content contained in the coconut dregs was 7.1%.

1.3 Organoleptic Test

The organoleptic testing on "kipang" (Figure 1) was a preference test, including observations of color, aroma, taste, and texture by 30 semi-trained panelists. Organoleptic analysis was carried out using a hedonic test with a hedonic scale of 1-5, namely 5 = really like, 4 = like 3 = normal, 2 = don't like, 1 = don't like. The results with the highest scores are declared as the products most liked by the panelists and are used as one of the parameters in determining the product with the best formulation.

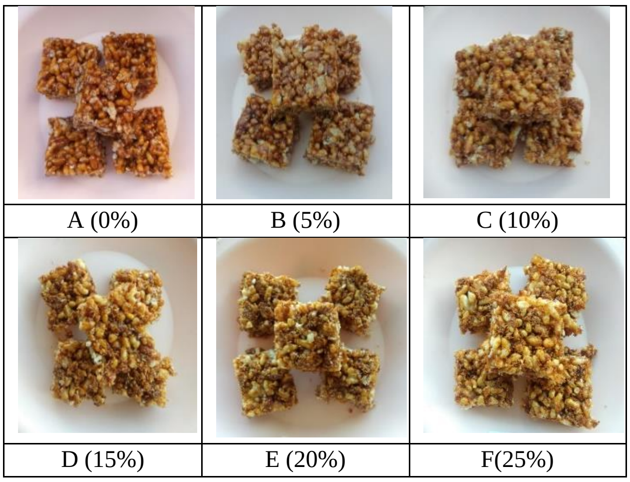

Figure 1. Visuals of Kipang with Different Treatment

1.3.1 Color

Color is a visual appearance observed with our sight of the product. Color is one of the critical parameters in a product because it is the first thing seen. Based on the research, the average value of the organoleptic test for the color of white sticky rice "Kipang" can be seen in the table.

Table 10. Panelists' Acceptance of “Kipang” Color

Treatment	Value (Mean ± SD)
A (0%)	3.83 ± 0.949 a
B (5%)	3.96 ± 0.718 a
C (10%)	4.16 ± 0.698 b
D (15%)	4.26 ± 0.583 c
E (20%)	4.26 ± 0.520 d
F (25%)	4.43 ± 0.678 d
CV = 2.82%	

Note: 1 = really don't like, 2 = don't like, 3 = normal, 4 = like, 5 = really like. Numbers in the same column followed by different lowercase letters are significantly different according to DNMRT at the 5% level.

Table 10 shows differences in the panelists' acceptance of products with adding coconut dregs, which are statistically different at the level (α=5%). The panelists' assessment of the white sticky rice "Kipang" color ranged between 3.83-4.43. The analysis results also show that the highest level of panelist preference is in treatment A, 4.43, while the lowest is in treatment F, namely 3.83. Judging from the values, it shows that all products with different treatments are still acceptable.

The color produced in the product is caramel brown to slightly lighter caramel brown. The more coconut dregs are added, the less dense the brown sugar caramel color produced in the product will be.

1.3.2 Aroma

Aroma is the characteristic smell of a product that arises after going through the processing process. The results of research on aroma values are in Table 11.

Statistical analysis at the level (α=5%) shows that adding coconut dregs does not naturally affect the aroma. The panelists assessed the product's aroma between 3.93 and 4.23. The highest level of panelist preference was in treatment F (addition of 25% coconut dregs) at 4.23, while the lowest was in treatment F (addition of 0% coconut dregs) at 3.93. The data shows that the acceptance of the aroma is at the liking level. The brown sugar caramelization process influences the aroma of the product. Heating sugar will cause aroma formation [28]. The aroma of sugar caramel affects the aroma of the "Kipang" produced.

Table 11. Panelists' Acceptance of “Kipang” Color.

Treatment	Value (Mean ± SD)
A (0%)	3.83 ± 0.949 a
B (5%)	3.96 ± 0.718 a
C (10%)	4.16 ± 0.698 b
D (15%)	4.26 ± 0.583 c
E (20%)	4.26 ± 0.520 d
F (25%)	4.43 ± 0.678 d
CV = 2.82%	

Note: 1 = really don't like, 2 = don't like, 3 = normal, 4 = like, 5 = really like. Numbers in the same column followed by different lowercase letters are significantly different according to DNMRT at the 5% level.

1.3.3 Taste

Taste is the sensation obtained when tasting a product. This study obtained the panelists' acceptance values for the white sticky rice "Kipang" product as in Table 15.

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Table 12 Panelists' Acceptance of "Kipang" Taste

Treatment	Value (Mean ± SD)
A (0%)	3.83 ± 0.949 a
B (5%)	3.80 ± 0.664 ab
C (10%)	3.90 ± 0.758 ab
D (15%)	3.93 ± 0.827 ab
E (20%)	4.16 ± 0.666 bc
F (25%)	4.33 ± 0.660 c
CV = 2.78%	

Not: 1 = really don't like, 2 = don't like, 3 = normal, 4 = like, 5 = really like. Numbers in the same column followed by different lowercase letters are significantly different according to DNMRT at the 5% level.

The addition of coconut dregs had a statistically significant effect (α=5%) on the taste of "Kipang," which ranged from 3.80 to 4.33. The highest assessment was in treatment F, 4.33, while the lowest was in treatment B, 3.80. It shows that adding various concentrations of coconut dregs produces "Kipang" which the panelists like. The fat content also influences the taste of a product in the product. It follows [24] statement that a product's significant fat content will increase its savory taste. It aligns with the fat content analysis in this study, where the product fat content ranged from 6.47-13.40%. The highest fat content was in treatment F (addition of 25% coconut dregs), with a fat content value of 13.40%. So, the F treatment product (the addition of 25% coconut dregs) tends to be liked by panelists because it has crunchier characteristics than the A, B, C, D, and E treatment products.

1.3.4 Fragility

Fragility is the sensation we get when tasting a product. In this study, the panelists' acceptance scores regarding the fragility of the white sticky rice kipang product in Table 13.

Table 13. Panelists' Acceptance of "Kipang" Fragility

Treatment	Value (Mean ± SD)
A (0%)	3.83 ± 0.949 a
B (5%)	3.76 ± 0.935 ab
C (10%)	3.93 ± 0.944 ab
D (15%)	4.03 ± 0.850 b
E (20%)	4.13 ± 0.730 b
F (25%)	4.23 ± 0.773 b
CV = 3.75%	

Note: 1 = really don't like, 2 = don't like, 3 = normal, 4 = like, 5 = really like. Numbers in the same column followed by different lowercase letters are significantly different according to DNMRT at the 5% level.

The analysis results show that adding coconut dregs influences product fragility (α=5%), with values ranging between 3.76 and 4.23. The lowest value was in treatment B, with a value of 3.76, while the highest was in treatment F, namely 4.23%. Based on hardness tests, it is known that the greater the percentage of coconut dregs used, the panelists' assessment of hardness increases. It is thought to be caused by the fiber and fat content in coconut dregs, which makes products in treatment F have higher hardness than those in treatment A, which tend to be harder. Adding coconut dregs with various treatments (A, B, C, D, E, F) produced kipang that was acceptable to the panelists.

Considering the benefits of adding coconut dregs, a product with 25% coconut dregs with an average color value of 3.83, aroma 4.23, taste 4.33, and fragility 4.23. So, in this study, the researchers chose treatment F as the best formulation by considering chemical and organoleptic analysis. Products with treatment F tend to have higher levels of fiber, fat, and protein carbohydrates when compared with treatments A, B, C, D, and E, so it is assumed that these products have a low glycemic index.

*1.4 **Glycemic Index***

1.4.1 Determination of the amount of test food

The food ingredients that will be tested for their glycemic index are treatment A, namely white sticky rice kipang without the addition of coconut dregs (control), and treatment F, namely kipang with the addition of 25% coconut dregs (the best) with the standard food that will be used as a comparison is pure glucose.

Table 14 The amount of test food is equivalent to 50 g of carbohydrates

Sample	Carbohydrate (%)	The sample weight is equivalent to 50g of total carbohydrates. (g)
Kipang Control	87.75	57
Kipang (25% Coconut Dregs)	76.06	65

1.4.2 Blood Glucose Level

The food ingredients that will be tested for their glycemic index are treatment A, namely white sticky rice kipang without the addition of coconut dregs (control), and treatment F, namely kipang with the addition of 25% coconut dregs (the best) with the standard food that will be used as a comparison is pure glucose.

Table 15. Blood Glucose Level (mg/dL)

Sample	Time (minutes)				
	0	30	60	90	120
Kipang Control	76	142	106	89	72
Kipang (25% coconut dregs)	77	115	102	88	65
Glucose	82	144	111	96	79

Based on the analysis of the average blood glucose levels of volunteers after consuming the test product, it was found that the highest blood sugar levels were in the 30th minute; this could be because after consuming the test product, the blood sugar levels would increase. Because there was a supply of sugar from the food consumed. Blood sugar levels decreased gradually in the following minutes, namely minutes 60, 90, and 120, which could occur because the volunteers were still fasting at these minutes. The pattern of increase and decrease in blood glucose levels can be seen in Figure 1.

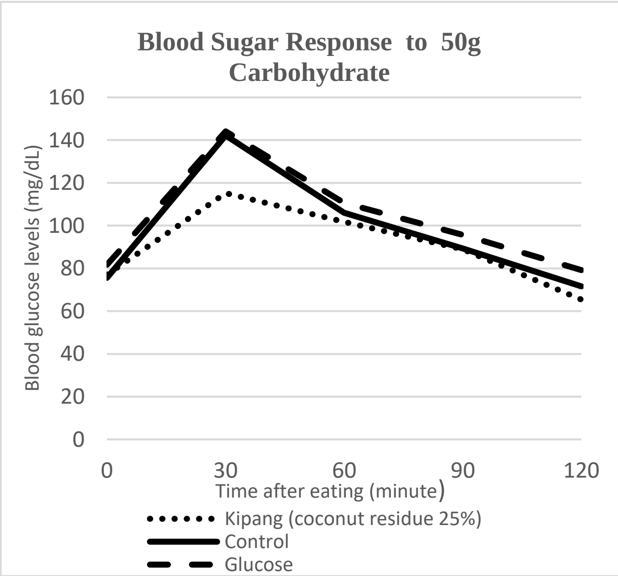

Figure 1. Graph of blood sugar response after consuming kipang control, best-formulated kipang, and pure glucose

Figure 1 shows that the peak increase in blood occurs 30 minutes after eating and decreases gradually in the following minutes. The peak increase in blood sugar levels decreased with the addition of coconut dregs in white sticky rice kipang products, so the addition of coconut dregs in white sticky rice kipang products reduced the product's glycemic index. The contents of coconut dregs, such as fat, protein, and fiber, can affect the GI value. In its intact form, fiber can act as an obstacle to digestion; as a result, GI tends to be lower. Fiber can slow down the rate of digestion so that the blood glucose response becomes low [17].

1.4.3 Glycemic Index of the "Kipang"

Table 16 shows that the GI of control white sticky rice kipang is higher than the GI of kipang with the addition of 25% coconut dregs. The glycemic index of the kipang control was 97.68%, which is included in the high glycemic index category. Meanwhile, the glycemic index of white sticky rice kipang with the addition of 25% coconut dregs was 67.92% and was included in the moderate glycemic index category. Low GI foods help people control hunger, appetite, and blood sugar levels.

Table 16. Glycemic Index of "Kipang"

	The area under the Curva	Glycemic Index (%)	Category*
"Kipang"Control	3366	97.68	High
"Kipang" with 25% Coconut Dregs	2341	67.92	Moderate
Glucose	3446		

Note: Category* = Low IG (< 55), Moderate IG (55-70), High IG (> 70)

The difference in the glycemic index value between the control kipang (without adding coconut dregs) and the best-formulated kipang (adding 25% coconut dregs) is influenced by several factors, including the fat, protein, and fiber content in each product. The analysis of white sticky rice kipang products shows that the fat, protein, and fiber content in the best treatment is higher than in the control treatment. Thus, the GI value of the best treatment product tends to be lower than that of the control treatment product. Coconut dregs contain crude fiber in the form of cellulose. The health benefits of fiber intake include reducing the risk of coronary heart disease, stroke, hypertension, diabetes, obesity, and digestive problems. Consuming fiber can also lower blood pressure, control blood sugar, and play a role in weight loss and immunity [32].

4. CONCLUSION

The following conclusions are based on research that has been carried out in making white sticky rice kipang with differences in the concentration of coconut dregs added to the characteristics of white sticky rice kipang. Adding coconut dregs significantly affects chemical properties such as water content, protein, fat, fiber, sugar, total carbohydrates, and organoleptic color, taste, and texture analysis. It has no significant effect on ash content and organoleptic analysis of aroma. The best treatment for kipang with adding coconut dregs is treatment F (Addition of 25% coconut dregs), with characteristics of water content (6.44%), ash content (0.93%), fat (13.4%), protein (3.17%), carbohydrates (75.73%), crude fiber (4.47%), glycemic index (67.92%) and organoleptic acceptance, for color 4.43 (like), aroma 4.43 (like), taste 4.33 (like), and fragility 4.23 (likes). The glycemic index of the control-treated white sticky rice kipang product has an IG value of 97.68% and is included in the high GI. In comparison, the IG value of the best-formulated product with the addition of 25% coconut dregs has an IG value of 67.92% and is included in the moderate GI.

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