Jurnal Eduhealth
Volume 15 , Number 04, 2024, DOI 10.54209/eduhealth.v15i04
ESSN 2808-4608 (Online)
https://ejournal.seaninstitute.or.id/index.php/healt

Analysis Of Macro Nutritional Content Of Chicken Nuggets Substitution Of Young Jackpots And Soy Flour As An Alternative To A High Fiber Snack For Obese Teenagers

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Article Info
Keywords:
Nugget,
Young Jackfruit,
Soybean Flour,
Fiber,
Organoleptic

ABSTRACT
Obesity is a disorder characterized by excessive accumulation of fat tissue in the body. Therefore, additional food with high daily fiber intake is needed. One of them is by providing additional food in the form of young jackfruit and soy flour substitute nuggets. This study aims to determine the macronutrient content and acceptability of nuggets as an alternative high-fiber snack. This study used the True Experimental Design method with a Completely Randomized Design (CRD) with 4 levels of young jackfruit and soy flour substitution treatment, namely F0 (100:0:0), F1 (45:45:10), F2 (35:50:15) and F3 (15:65:20). Preliminary research, namely organoleptic quality tests of 30 panelists and ranking tests to show the best formulation, continued with proximate analysis and nugget fiber content. The results of the study showed that there was an effect of increasing fiber content in nuggets, with the highest fiber content in the F3 treatment. Significant effect on the color and texture of young jackfruit substitution and Kruskal Wallis soybean flour (P Value <0.05). The best treatment was in F2. The conclusion of this study is that young jackfruit and soybean flour substitution nuggets show an effect on the levels of calories, protein, fat, carbohydrates, ash, water, fiber, and acceptability in the color and texture categories of nuggets. Obese adolescents are advised to consume 100 grams of fried F2 nuggets per day to meet 95.58% of fiber needs.

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INTRODUCTION

Overnutrition or obesity occurs due to an imbalance between the amount of energy consumed and the amount expended by the body. Obesity in adolescents is characterized by excessive body weight compared to the age or height of adolescent peers due to excessive fat accumulation in body fat tissue. The threshold for obesity is a BMI value ≥25 kg/m^2 (Riskesdas, 2013). The problem of obesity will have an impact on women and the emergence of other diseases. Significant lifestyle changes such as too much consumption of instant and sweet foods also encourage people with obesity to increase (WHO, 2020). In addition, the selection of unhealthy food types, and high-fat *snacking* habits can also cause adolescents to become obese. Teenagers tend to like foods that are practical, and taste good such as *fried*

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chicken, instant noodles, egg martabak, bright moon and so on, so that with the habit of consuming these snacks two to four times a day more will be at risk of obesity. Adolescents prefer snacks to vegetables because of the strange texture, unpleasant taste and even think that all vegetables taste bitter (Keast *et al*, 2010).

The incidence of obesity currently affects 78.6 million people (33%) in the United States and is expected to increase to more than 50% of the population by 2030 (Andolfi and Fisichella, 2018).. The prevalence of obesity in obese adolescents in Indonesia has increased starting from 2018. The incidence of obesity increased significantly from 2013 (0.4%) to 2018 (9.5%) (Riskesdas, 2018). Meanwhile, East Java Province in 2018 was included in the provinces with the prevalence of obese adolescents exceeding the national prevalence, namely adolescents aged 13-15 years in East Java the prevalence was 13.3% and 11.3% in adolescents 16-18 years (Setyawati, 2019). The prevalence of obesity (Body Mass Index or BMI ≥25 - 27 and BMI ≥27) in the population aged ≥ 15 years was 35.4%, while the obese group with BMI ≥27 alone was 21.8% (East Java Provincial Office, 2019).

The habit of adolescents who often consume practical foods will have an impact on low fiber intake. The role of fiber for someone with *overweight* and obese nutritional status is to delay gastric emptying, reduce hunger, digestive problems and can reduce the occurrence of *overweight* and obesity. The adequacy of fiber intake in the body is recommended to be high, because fiber has many beneficial benefits for the health of the body, especially in the digestive system (Tala, 2009). According to the 2019 Nutrient Adequacy Guidelines (NAC), the fiber requirement for adolescents ranges from 27-29 grams/day (Indonesian Ministry of Health, 2019). Thus, changes in fiber consumption patterns per day are needed in order to meet the recommended fiber needs. Fiber needs can be met by consuming vegetables (Hayudanti *et al.,* 2016).

The body needs adequate fiber in the digestive tract. Dietary fiber intake is known to be beneficial in controlling obesity, managing diabetes, reducing cholesterol levels and lowering blood pressure. High fiber intake is strongly associated with lower incidence of metabolic syndrome in adolescents. This suggests that a high-fiber diet is important (Septiana and Sudargo, 2018). Fiber in the gut will affect lipid, glucose and cholesterol metabolism through effects on G protein-coupled receptors, suppressing appetite (through increased release of incretin [*glucagon-like peptide-1, GLP-1])* and increasing insulin sensitivity then exerting direct effects on the regulation of metabolic and appetite pathways in the hypothalamus (Barber, 2020).

One of the food ingredients that has high fiber content is young jackfruit. Young jackfruit in Indonesia is used as raw material for making processed vegetables. Young jackfruit is a food commodity that is usually processed into various dishes for vegetables and side dishes. The nutrient content in 100 grams of young jackfruit is 8.3 g fiber and 2 g protein (TKPI, 2017). One form of processed young jackfruit is jackfruit vegetable cooked with thick coconut milk or called lodeh vegetable. There is a crude fiber content in young jackfruit fibers of about 1.94%, while the crude fiber content in young jackfruit pulp is 1.58%. Young jackfruit is a fruit with low economic value, has a shape that can resemble meat fibers so that it can be used as

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an alternative to meat that can be processed into *nuggets* (Muchtadi, 2010). Bangilan sub-district is one of the sub-districts in Tuban Regency which is the highest producer of young jackfruit, reaching 745 tons/2019 (BPS Tuban, 2019).

In addition to fiber, a plant-based protein diet has the effect of reducing body weight and body fat (Navas, 2019). The decrease occurs because there is a relationship with a decrease in animal protein intake. The mechanism occurs due to differences in the secretion of gastrointestinal hormones and the sensation of satiety depending on the protein source. Based on research by Daibert, 2019, the cause of higher satiety feelings in obese patients is due to GLP1 and amylin levels, which are the effects of vegetable protein. Protein is known to increase satiety. One of the mechanisms of satiety triggered by an increase in GLP 1 and PYY (peptide tyrosine-ty rosine) hormones is assisted by protein which also stimulates the vagus nerve, thereby reducing food intake resulting in energy expenditure. Energy expenditure triggers a negative energy balance, leading to weight loss. It is thought that protein also prevents obesity and obesity-related diseases, such as metabolic syndrome, non-alcoholic fatty liver disease, type 2 diabetes (Moon and Koh 2020). Protein sources can be obtained from a variety of food sources, including nuts.

Soybean is one type of legume that is easily available and is an economical local food. Soybeans contain about 40% protein, 20% oil, 35% soluble carbohydrates (sucrose, stakiose, raffinose) and insoluble carbohydrates (dietary fiber), and 5% ash. Soybeans are a better source of vitamin B compared to other leguminous commodities. There are several processed products from soybeans such as tempeh, tofu, soy milk, soy sauce, and snacks. Seeing so many nutrients contained in soybeans, there is a need for food innovation in the utilization of soybeans to overcome nutritional problems (Krisnawati, 2017).

Soy flour is flour made from pure soybean raw materials. Soy flour is generally small soybean particles. The process of making soy flour begins with soaking, boiling, drying, stripping the seed coat, and grinding (Gozali, 2015). The advantage of soy flour is that it produces products that have high water binding capacity, which can be influenced by the presence of hydrophilic groups and polar amino acids in proteins. Soy flour itself contains ionic amino acids, such as glutamate, aspartic acid and lysine so that it is believed to increase water binding capacity (Astawan, 2016), therefore soy flour is considered to be the raw material for making snack foods.

One alternative snack food that is commonly consumed by teenagers is nuggets. Nuggets generally do not contain fiber and are only made from meat. *Nugget* is known as a delicious food and has a relative price according to various groups. The selection of food ingredients to substitute the use of young jackfruit as *nuggets* also aims to increase its selling value because of the economic and abundant availability of raw materials.

In addition, Sadewa's research (2019) related to the making of young jackfruit *nuggets* showed low protein levels. So as to meet the needs of additional protein content in these *nuggets* can be added with soybeans which are expected to fulfill important proteins for the body. The addition of other vegetable protein ingredients such as soybean tempeh, tofu, peas,

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kidney beans and other vegetable proteins. The low protein is due to the greater proportion of young jackfruit, which is 75%.

Based on this background, researchers are interested in analyzing the macronutrient content of young jackfruit *nuggets* and soy flour as a high-fiber snack for obese people. The alternative material for *nuggets* is the substitution of young jackfruit and soybeans. The use of plant-based food ingredients in *nuggets* has high fiber. There are many benefits that can be obtained from consuming dietary fiber for health, including Eating foods high in dietary fiber can provide a longer sense of satiety, thus helping to control appetite. This can help in weight management and obesity prevention.

METHODS

Research Design, Place and Time

This research is an experimental research or experiment. The design used is a complete randomized design (RAL). The research time was conducted in October 2023 until completion. Making chicken *nuggets* will be carried out in the Culinary and Food Processing Laboratory of the Bachelor of Nutrition Study Program at the Nahdlatul Ulama Institute of Health Sciences, Tuban. Analysis of macronutrients and fiber of young jackfruit chicken *nuggets* and soy flour at the Chemistry Laboratory, Faculty of Science and Mathematics, Setya Wacana Christian University. Organoleptic quality test based on hedonic test of young jackfruit chicken nuggets and soy flour at the Culinary and Food Processing Laboratory of the Bachelor of Nutrition Program, Nahdlatul Ulama Institute of Health Sciences, Tuban.

Research Tools and Materials

The research tools include plastic basin, large bowl, small bowl, tablespoon, teaspoon, spatula, Teflon, knife, cake pan, steamer pan, measuring cup, digital scale. Chemical Test Analyzer

1. Protein Content
   Analytical balance, kjeldhal tube, spatula, measuring pipette, dropper pipette, hot plate, measuring flask, beaker glass.
2. Fat Content
   Soxhlet device (extraction tube, condenser and extraction tube holder), extraction solvent, heating device.
3. Carbohydrate Content
   Analytical balance, test tube, spectrophotometer, heater, pipette, container for boiling water, desiccator.
4. Water Content
   Mounsture balance, weighing cup, water bath or desiccator, oven, tweezers gloves.
5. Ash Content
   Oven, porcelain cup, desiccator, analytical balance, cup tongs, bursen burner, furnace.
6. Fiber Content
   Beaker, buchner funnel, filter paper petri dish, oven and enymeyer

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The ingredients in this research are chicken meat, young jackfruit, soy bean flour, chicken eggs, garlic, wheat flour, cornstarch, sugar, salt, water, wheat flour, cooking oil.

Research Steps

a. Procedure for Making Mashed Young Jackfruit

The young jackfruit was peeled off the skin, washed under clean running water, and cut into small pieces to facilitate the softening of the flesh. The cut young jackfruit was steamed for 20 minutes to remove the sap and soften the pulp. The young jackfruit was then pulverized using a blender to obtain a soft, paste-like texture of the fruit pulp. (Sartika, Nainggolan and Julianti, 2018)..

b. Soybean Flour Pressing Procedure

The first stage in making soy flour is sorting by selecting soybeans that are of good quality (undamaged and free from contaminants), then cleaned by washing with running water and soaking for 30 minutes. After soaking, they are drained and boiled for 15 minutes, then the charcoal is removed and dried in the oven for 20 hours at a temperature of 60^0 C. The dried soybeans are then pulverized. The dried soybeans were then pulverized with a blender and then sieved with a 60 mesh sieve to obtain soy flour. (Rani and Ekawati, 2021).

Data processing and analysis

The data analysis used in this study was statistical analysis with SPSS 23.0 *for Windows*. The organoleptic data results in this study were processed using the *Saphiro Wilk* test because the number of samples <50 samples. Data is called normally distributed if the p value is> 0.056. If normal, it is continued with the *One Way Anova* test to determine whether or not there is a difference in fiber content in different formulations. Products with the highest organoleptic quality test results and fiber content will be selected as the best formula for obese people. whereas if the data is not normally distributed using the *Kruskal Wallis Test*. In the organoleptic test, if there is a significant difference, it is continued using the *Mann Whitney* test to determine the specific differences between the four treatments.

RESULTS AND DISCUSSION

Panelist Characteristics

Panelists in this study amounted to 30 people with the criteria of untrained panelists. The characteristics of the panelists in this study are as follows:

Table 1. Panelist Characteristics

Characteristics	Frequency	Percentage (%)
Gender		
Male	20	67
Female	10	33
Age		
12-15 years	2	7
15-18 years	25	83
18-21 years old	3	10

(Source: Primary Data Researcher, 2024)

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Based on table 1, the distribution of panelists in this study shows that most of the 20 (67%) panelists are male and the rest are female with 10 (33%) panelists, and the age distribution of panelists in this study shows that most panelists are 12-15 years old, namely 2 (7%) panelists, 15-18 years old, namely 25 (83%) panelists and 18-21 years old, namely 3 (10%) panelists. The selection of panelists was carried out randomly by taking into account the ability of the panelists' sense of taste and sense of smell so that they could provide a good assessment.

Organoleptic Quality of Chicken *Nugget* Substituted with Young Jackfruit and Soy Flour

The Hedeonic test or liking test aims to determine the level of panelist preference for chicken *nuggets* with substitutions of young jackfruit and soy flour. There are 4 treatments that will be assessed by panelists on taste, color, aroma and texture.

1. Panelists' Level of Preference for Taste in Each Formulation

Taste is a parameter in the hedonic test to determine consumer decisions to accept or reject a product. Panelists' acceptance of the taste of chicken *nuggets* substituted with young jackfruit and soy flour in each treatment can be seen in Table 2.

Table 2: Panelists' level of liking for the taste of *nuggets*

Treatment	Organoleptic test for flavor								Total	
	Very Favorable		Like		Regular		Dislikes			
	N	%	N	%	N	%	N	%	N	%
F0	10	33,3	11	36,7	9	30	0	0	30	100
F1	8	26,7	7	23,3	11	36,7	4	13,3	30	100
F2	12	40%	9	30	8	26,7	1	3,3	30	100
F3	7	16,7	13	43,3	6	20	4	13,3	30	100

Primary Data Source (2024)

Based on table 2, the results of the distribution of 30 untrained panelists found that in the F1 treatment, almost half of the panelists, namely 11 panelists (36.7%) stated that they usually liked the taste of *nuggets* substituted with young jackfruit and soy flour. In the F2 treatment, almost half of the panelists, namely 12 panelists (40%) stated that they really liked the taste of *nuggets* substituted with young jackfruit and soy flour. Meanwhile, in the F3 treatment, almost half of the panelists, namely 13 panelists (43.3%) stated that they liked the taste of *nuggets* substituted with young jackfruit and soy flour.

2. Panelists' Level of Preference for Color in Each Formulation

Color is a characteristic that determines consumer acceptance or rejection of a product. Panelists' acceptance of the color of chicken *nuggets* substituted with young jackfruit and soy flour in each treatment can be seen in Table 3.

Table 3. Panelists' Level of Preference for Color in *Nugget*

Treatment	Organoleptic test for color								Total	
	Very Favorable		Like		Regular		Dislikes			
	N	%	N	%	N	%	N	%	N	%
F0	6	20	13	43,3	11	36,7	0	0	30	100

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Treatment	Organoleptic test for color								Total	
	Very Favorable		Like		Regular		Dislikes			
	N	%	N	%	N	%	N	%	N	%
F1	1	3,3	10	33,3	14	46,7	5	16,7	30	100
F2	5	16,7	12	40	13	43,3	0	0	30	100
F3	9	30	11	36,7	5	16,7	5	16,7	30	100

Primary Data Source (2024)

Based on table 3, the results of the distribution of 30 untrained panelists found that in the F1 treatment, almost half of the panelists, namely 14 panelists (46.7%) stated that the color of nuggets with substitutions of young jackfruit and soy flour was normal. In the F2 treatment, almost half of the panelists, namely 13 panelists (43.3%) stated that the color of the nuggets substituted with young jackfruit and soy flour was normal. Meanwhile, in the F3 treatment, almost half of the panelists, namely 11 panelists (36.7%) stated that they liked the color of the nuggets substituted with young jackfruit and soy flour.

Based on the results of the Kruskal Wallis test, the level of liking for the color of chicken nuggets substituted with young jackfruit and soy flour showed a significant difference in liking for taste between treatments ($p<0.05$). Then further tests using *Mann-Whitney* in the flavor category showed that all treatments between groups showed significant differences indicated by the *P value* <0.05.

Table 4. Mann-Whitney Test of Color in Nugget

Parameters	Treatment	N	Mann-Whitney	Asym.Sig
Color	F0-F1	30	279.000	0,007
	F0-F2	30	416.500	0,593
	F0-F3	30	437.000	0,840
	F1-F2	30	308.500	0,024
	F1-F3	30	298.000	0,019
	F2-F3	30	411.000	0,544

Primary Data Source (2024)

Further tests using Mann-Whitney in the color category showed that there was a significant difference in the F1-F2 and F1-F3 treatments with a significant value indicated by the P Value value <0.05. While in the F2-F3 treatment there was no significant difference with a P Value>0.05.

This shows based on the Mann-Whitney test of the color of the most similar treatments, namely in the F2 and F3 treatments. So it can be concluded that the highest formulation of flavor is F2, namely 12% stated (very like), 9% stated (like), 8% stated (normal) and 1% (dislike).

3. Panelists' Favorability of Aroma in Each Formulation

Panelists' acceptance of the aroma of chicken *nuggets* substituted with young jackfruit and soy flour in each treatment can be seen in Table 5.

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Table 5. Panelists' Level of Preference for Aroma in *Nugget*

Treatment	Organoleptic test for aroma								Total	
	Very Favorable		Like		Regular		Dislikes			
	N	%	N	%	N	%	N	%	N	%
F0	8	26,7	8	26,7	11	36,7	3	10	30	100
F1	3	10	9	30	18	60	0	0	30	100
F2	6	20	8	26,7	15	50	1	3,3	30	100
F3	5	16,7	10	33,3	13	43,3	2	6,7	30	100

Primary Data Source (2024)

Based on table 5, the results of the distribution of 30 untrained panelists found that in the F1 treatment, most of the panelists, namely 18 panelists (60%) stated that they were used to the aroma of nuggets substituted with young jackfruit and soy flour. In the F2 treatment, half of the panelists, namely 15 panelists (50%) stated that the aroma of nuggets substituted with young jackfruit and soy flour was normal. Meanwhile, in the F3 treatment, almost half of the panelists, namely 13 panelists (43.3%) stated that the aroma of nuggets substituted with young jackfruit and soy flour was normal .

Based on the results of the Kruskall Wallis test on the aroma of nuggets substituted with young jackfruit and soy flour, there was no effect on aroma between significant treatments (P>0.05). So there is no need for further tests using *Mann Whitney.*

4. Panelists' Level of Preference for Texture in Each Formulation

Texture is one of the important things that affect consumer acceptance besides aroma, taste, and color.

Table 6. Panelists' Level of Preference for Texture in *Nugget*

Treatment	Organoleptic test of texture								Total	
	Very Favorable		Like		Regular		Dislikes			
	N	%	N	%	N	%	N	%	N	%
F0	7	23,3	13	43,3	8	26,7	2	6,7	30	100
F1	1	3,3	11	36,7	15	50	3	10	30	100
F2	5	16,7	13	43,3	9	30	3	10	30	100
F3	10	33,3	11	36,7	6	20	3	10	30	100

Primary Data Source (2024)

Based on table 6, the results of the distribution of 30 untrained panelists found that in the F1 treatment half of the panelists, namely 15 panelists (50%) stated that they liked the texture of the nuggets substituted with young jackfruit and soy flour. In the F2 treatment, almost half of the panelists, namely 13 panelists (43.3%) stated that they liked the texture of the nuggets substituted with young jackfruit and soy flour. Meanwhile, in the F3 treatment, almost half of the panelists, namely 11 panelists (36.7%) stated that they liked the texture of the nuggets substituted with young jackfruit and soy flour.

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The results of the *Kruskal Wallis* test on the level of liking for the texture of chicken *nuggets* substituted with young jackfruit and soy flour showed a significant difference in liking for the taste between treatments (p<0.05). Then further tests using *Mann-Whitney* in the flavor category showed that all treatments between groups showed significant differences indicated by a *P value* <0.05.

Table 7. Mann-Whitney Test of Texture on Nugget

Parameters	Treatment	N	Mann-Whitney	Asym.Sig
Texture	F0-F1	30	301.000	0,019
	F0-F2	30	404.000	0,470
	F0-F3	30	414.500	0,580
	F1-F2	30	348.000	0,106
	F1-F3	30	279.000	0,008
	F2-F3	30	372.000	0,225

Primary Data Source (2024)

Further tests using *Mann-Whitney* in the flavor category showed that there was a significant difference in the F1-F3 treatment with a significant value indicated by a P Value <0.05. While in the F1-F2 and F2-F3 treatments there was no significant difference with a P Value>0.05.

This shows based on the *Mann-Whitney* test of the texture of the most similar treatments, namely in all treatments F1, F2 and F3. So it can be concluded that the highest formulation of texture is F3, namely 10 states (very like), 11% states (like), 6% states (ordinary) and 3% (dislike).

Discussion

Proximate Analysis of Chicken Nugget Substituted with Young Jackfruit and Soy Flour

1. Energy Content Test

Based on the test results of the energy content of chicken nuggets substituted with young jackfruit and soy flour in F1, F2 and F3 have low energy. However, the energy of nuggets without additional ingredients is even lower at 177.32 kcal/100 g. The lowest energy content is in the F1 treatment with 45% chicken meat, 45% young jackfruit and 15% soy flour. The highest energy content was 195 kcal/100 g in treatment F3 with 15% chicken substitution, 65% young jackfruit and 20% soy flour.

Lumatized young jackfruit is a product that is processed through washing, boiling to remove sap and pulverizing using a blender/chopper. The characteristics of pulverized young jackfruit after processing are soft, smooth and dark gray in color. The increase in energy in nuggets can occur due to the addition of fat, carbohydrates and protein in the processing process. In addition, the energy content of young jackfruit, which has an energy content of 57 kcal/100 g, can be a factor in increasing energy in nuggets (TKPI, 2020).

Soy flour is one of the second additives in making *nuggets*. Soy flour goes through a drying process. Drying is a method that can reduce damage during storage. In the drying process if too long can cause loss of energy substances, but the addition of the number of

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ingredients in the F3 formulation can affect the high energy content, namely the amount of young jackfruit which is more dominant than chicken meat and soy flour (De Souza *et al.,* 2021).

The results of the increase in energy in the study are in line with Kurni (2019), namely in young jackfruit substitution nuggets increased from FI to FV 200.93 kcal to 335.55 kcal. So it can be concluded that the addition of young jackfruit nuggets and soy flour the more the proportion of ingredients added to replace chicken meat in nuggets will affect the level of nuggets produced.

The results obtained are in accordance with the supporting theory which states that the addition of young jackfruit and soy flour can affect the energy content of *nuggets*. In addition to the substitution of young jackfruit and soy flour, heating processes such as processing with the *deepfrying* method can affect the energy content of an ingredient.

2. Protein Content Test

Protein is a macronutrient that is essential for the human body. Humans need protein because it has a role as a building block that can benefit the growth and development of body tissues. In addition, protein functions include transportation and storage, immune/antibody support, acid and base regulation and substance transportation. In 1 gram of protein will produce 4 kcal of energy so that adolescent intake is needed 70-75 grams / day so that protein needs are met (AKG, 2019).

The results of the protein content test using the kjeldahl method. This method is a quantitative determination of protein content to measure crude protein content. Crude protein is a compound containing nitrogen elements can be protein and not protein. The stages in the Kjeldahl method are deconstruction, distillation and titration. The Kjeldahl method has the principle that the organic material in the sample is deconstructed (broken down) using a strong acid, namely sulfuric acid and added with a catalyst to accelerate the reaction (Rassem et al., 2016).

In chicken nuggets, the substitution of young jackfruit and soy flour has the highest protein content in treatment F3 9.89 g/100 g with 15% chicken formulation, 65% young jackfruit and 20% soy flour and the lowest protein content test results are in treatment F1 7.98 g/100 g with a formulation of 45% chicken meat, 45% young jackfruit and 10% soy flour. This is because the higher the substitution of soy flour can help increase protein in F1 where the composition of chicken meat is lower than in other formulas. Protein levels in chicken *nuggets*, young jackfruit and soy flour experienced a very slight increase of 1-2 g. This is because young jackfruit has lower protein compared to the protein levels of chicken and soy flour.

The increase in protein content in treatments F1 to F3 was influenced by additional ingredients in each formulation, one of which was the addition of eggs and bread flour in making *nuggets*. Eggs function as a binder for *nugget* dough, adding a fragrant aroma and as a source of animal protein in *nuggets*. Meanwhile, bread flour is part of coating the *nuggets* in the process of making *nuggets*. The content of bread flour is 13.4 gr/100gr. By using bread flour, the *nuggets* can increase the protein content (TKPI, 2020).

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According to Sari and Ayu's research (2021), the combination of tofu and young jackfruit in making *nuggets* with an average increase of 9.03-10.08 grams but based on the results of research that has been done the average increase in protein is 6.34-9.89 grams. In contrast, the content of young jackfruit has a protein of 2.0-2.6 grams/100 grams and soy flour 31.43 grams/100 grams. By using young jackfruit and soy flour to replace some of the chicken meat in the nugget recipe, it can maintain the protein in the nuggets.

The results showed an increase in protein in line with research by Faujan (2022) that the substitution of young jackfruit nuggets in sausage products can increase protein levels. Young jackfruit with 100% composition in sausage products has the highest protein content of 14.23 g / 100 g compared to sausages with control treatment. Thus the use of young jackfruit can help increase chicken meat protein in the substitution of young jackfruit nuggets and soy flour.

Based on the results of the study, F1 7.98 gr/100 gr and F2 8.34 gr/100gr have not met the specified quality standards of at least 9 gr/100gr, which can be caused by the weight of chicken meat and substitutes that affect protein levels. While F3 9.89 gr/100 gr has met the quality standards of chicken nuggets with a combination of at least 9 gr/100 gr.

In accordance with the results of research conducted on chicken nuggets with substitutions of young jackfruit and soy flour with previous research, there are significant differences in protein levels in nuggets. The protein content in the *nuggets* of young jackfruit substitution and soy flour increases according to the ratio of young jackfruit substitution and soy flour in each treatment. High protein levels are caused by additional ingredients and have the advantage of being able to help the satiating effect on the gluconeogenic process which plays a role in postpradial amino acid metabolism.

3. Carbohydrate Content Test

Carbohydrates are nutrients that are only produced by plants through photosynthesis consisting of the elements carbon (C), hydrogen (H), and oxygen (O). These elements are compounds of carbon dioxide (CO2) and water (H2 O). The important role of carbohydrates in nutritional science includes a source of energy, regulating fat metabolism, saving protein, giving natural sweetness to food, helping with the elimination of feces. (Famelia, 2020).

The results of carbohydrate analysis on chicken nuggets with substitutions of young jackfruit and soy flour are significant differences, the highest carbohydrate content is in treatment F3 with 15% chicken formulation, 65% young jackfruit and 20% soy flour. The cause of the high carbohydrate is the additional ingredients and formulations in the F1, F2 and F3 treatments. The main ingredients, namely young jackfruit and soy flour, are both sources of starch, namely 11.3% while the starch content of soy flour is 38.18% (TKPI, 2020).

In F1 (38.36 grams), F2 (47.31 grams) and F3 (54.25 grams) have not met the quality standards of chicken nuggets with a combination of a maximum of 25 grams/100 grams. Based on the cause of the cause is because it refers to the standard recipe book of the meat processing industry so that in order to meet protein standards, 200 grams of chicken meat is needed in making *nuggets*.

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Volume 15 , Number 04, 2024, DOI 10.54209/eduhealth.v15i04
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https://ejournal.seaninstitute.or.id/index.php/healt

The results showed that there was an increase in carbohydrates in F1 to F3, namely 38.46 - 54.25 g. So it is in line with Faujan's research (2020) on beef and young jackfruit substitution sausages there is an increase in carbohydrates in the control, A, B, C and C treatments. So it is concluded that carbohydrates increase with less chicken meat and more young jackfruit and soy flour.

Based on facts and theories, researchers can conclude that the increase in carbohydrates in nuggets is due to the carbohydrate content in young jackfruit and most of it is fiber with the highest content being starch. The carbohydrate content increases in line with the addition of young jackfruit and soy flour in *nugget* products. So it can be concluded that the higher the amount of addition of young jackfruit and soy flour given, the higher the carbohydrate content in the *nuggets.*

4. Fat Content Test

Fat is a hydrophobic organic substance that is insoluble in water, but can dissolve in organic solvents such as chloroform, ether, and benzene. The constituent elements of fat include Carbon (C), Hydrogen (H), Oxygen (O), and sometimes Phosphorus (P) and Nitrogen (N) (Hardinsyah, 2014). 1 gram of fat produces 9 calories. Based on the results of the analysis of fat content of chicken nuggets with young jackfruit and soybean substitutions, there is a difference, namely the highest fat content is found in treatment F3 with 15% chicken meat formulation, 65% young jackfruit and 20% soy flour compared to formulation F0 which is 100% chicken meat.

Fat content is one of the parameters that determine food quality. Fat content in chicken nuggets is highest in F3 3.06 gr/100 g. While the lowest fat content of chicken nuggets in F1 1.06 gr/100 g. The resulting fat content is in accordance with the fat content contained in each ingredient. The fat content of young jackfruit is 0.3 grams/100 grams while soy flour is 20.6 grams/100 grams. So the increase in fat content of each formulation shows an increase in accordance with the fat content of the selected ingredients (TKPI, 2020).

The difference in fat can be caused by processing factors and raw materials. In the processing process there is a high temperature frying process so that the F1, F2 and F3 treatments also meet the quality standards of chicken nuggets with a combination with a maximum of 20gr/100gr (SNI 6683: 2014).

The results of fat content in this study are in line with the results of Ayu *el al*'s research (2020) that the fat content has an impact on the difference in fat content produced, namely an average of 1.28-3.06 grams lower than the fat content of catfish *nuggets* and shrimp jackfruit with an average of 1.99-4.94 grams based on this, it shows that there are different levels of fat produced. This is also in line with the research of Hasanah *et al.,* (2020) using the same ingredients, namely young jackfruit nuggets with the addition of tempeh and tapioca flour. The results of the 20% tempeh substitution and young jackfruit produced a fat content of 7.27 gr/100 g while the 100% nugget formulation produced 5.52 gr/100 g. Based on the research data produced, it shows that there is an increase in fat content. So with the increase in the composition of young jackfruit, the higher the fat content in these food products.

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In accordance with the facts and results of several previous studies, it shows that there is a real effect of substituting young jackfruit and soy flour in making *nuggets*. The lower the addition of soy flour, the lower the fat content in the *nuggets*. In addition to the substitution of ingredients, it can also be due to high temperature processing. Oil during *nugget* processing undergoes oxidation, the cause of which is repeated heating such as oxidizing compounds in fried food.

5. Fiber Content Test

Crude fiber is part of food that cannot be hydrolyzed by chemicals or strong acids and strong bases (Hardiyanti & Nisah, 2021). The purpose of this crude fiber content test is to find out the crude fiber in food ingredients using the reflux method. The results of the analysis of fiber content in chicken nuggets with substitutions of young jackfruit and soy flour are significant differences, the highest fiber content is found in treatment F3 (32.16 g) with a formulation of 15% chicken meat, 65% young jackfruit and 20% soy flour, and the treatment that has the lowest fiber content is in treatment F1 (29.23 g) with a formulation of 45% chicken meat, 45% young jackfruit and 10% soy flour.

The choice of fiber in additional raw materials in making nuggets will affect the high fiber content in nuggets in treatments F1, F2 and F3. If more young jackfruit is added, the higher the fiber content produced. The reason is that young jackfruit has a cell wall in the fruit which is composed of cellulose, which is a fiber component. Based on the results of fiber content in line with the research of Ayu et al., (2020) if the difference in fiber content in nuggets is caused by differences in raw materials and additives used. Based on the analysis of fiber content in nuggets produced using 65% nugget raw materials is higher while in previous studies only 7.21%.

The results of the research on the average fiber produced are in line with Hidayatullah (2023) that the fiber content of tofu and jackfruit nuggets is significantly different between all treatments TN1, TN2, TN3, TN4 and TN5. This is due to the fiber content of the raw materials used. So that this is in accordance with Mahmud *et al.* (2018) tofu contains 0.10% fiber content and young jackfruit has 8.30% fiber content. Therefore, the higher the composition of young jackfruit added, the fiber content of the *nuggets* produced is also abundant.

These results are in accordance with the first hypothesis which reads that there is an effect of substituting young jackfruit and soy flour on the fiber content of chicken *nuggets*. There is an increase in fiber content in each formula so, it can be concluded that young jackfruit and soy flour have a significant effect on the fiber content of *nuggets*.

6. Moisture Content Analysis

Analysis of moisture content in food has important benefits for humans because it can provide information about the mineral content of the food consumed. The benefits of ash content analysis for humans are to evaluate the mineral content of food, monitor nutritional needs, prevent mineral deficiencies, and evaluate food quality (Ciptawati, 2021).

The results of the analysis of water content in chicken nuggets with substitutions of young jackfruit and soy flour are significant differences, the highest water content is in

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treatment F2 (54.05%) with a formulation of 35% chicken meat, 50% young jackfruit and 15% soy flour, and the treatment that has the lowest water content is in treatment F1 (41.35%) with a formulation of 45% chicken meat, 45% young jackfruit and 10% soy flour. High moisture content can affect the quality of food ingredients because it can cause bacterial development, appearance, freshness, and texture of the product. The more carrageenan added, the more ability to bind water, which results in an increase in water content (Afiyah and Muhimah, 2017).

The average water content in this study is quite high because meat is a perishable tissue and is a suitable medium for microbial growth, due to the high content of water and nutrients such as protein. This is in line with Tomasevic et al. (2018), which states that meat moisture content ranges from 65-80%. The difference in meat moisture content can be influenced by intramuscular fat content, if the fat content of meat increases, it will cause a decrease in moisture content. Muscle meat moisture content often has a significant negative relationship with meat fat content. Based on the results of the analysis of nugget moisture content in the F1, F2, and F3 treatments, it has also met the quality standards of chicken nuggets with a combination with a maximum of 60% (SNI 6683: 2014).

The results of the research analysis of the resulting water content are lower than the research of Suripto (2022) which is 56.37-58.89gr. The low water content in this study in the F1 treatment was caused by the use of dry raw materials. The less dry raw materials and the more young jackfruit added, the higher the water content.

Based on the results of the analysis, the highest water content is 53.37% F3 nuggets. This is in line with the research of Paramita, et al (2023) on tempeh meatballs with a maximum moisture content of 70% and has met the quality requirements of meatballs in general. So that the moisture content in food can determine the durability of the food, too high moisture content can cause microorganisms to easily multiply so that it can cause changes in nuggets both in terms of color, taste, aroma and texture. This is because the higher the water content, the slower the growth process of microorganisms multiplies, so the decay process will be slower.

Based on the facts and supporting the researcher's theory that chicken nuggets substituted with young jackfruit and soy flour were found to have an increase in water content. Water content can increase as the amount of pulverized young jackfruit given increases. The high water content is due to the large water binding ability of the young jackfruit fibers during the boiling process so that the higher the young jackfruit and soy flour added, the higher the water content in the *nuggets*.

7. Ash Content Analysis

Ash content is an inorganic substance in wheat flour that does not burn out and does not evaporate in the combustion process. Ash content can be used to evaluate the nutritional value of food ingredients and shows the total minerals that can be toxic contained in the material, where the higher the ash content, the worse the quality of the food ingredients (Pangestuti, 2021).

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The results of the analysis of ash content in chicken *nuggets* substituted with young jackfruit and soy flour showed significant differences, the highest ash content was found in treatment F2 (1.75%) with a formulation of 45% chicken meat, 45% young jackfruit and 10% soy flour. While the lowest ash content was in treatment F3 (0.53%) with a formulation of 15% chicken meat, 65% young jackfruit, 20% soy flour, The effect of processing on materials can affect the availability of minerals for the body. The use of water in the washing, soaking and boiling process can reduce the availability of minerals because minerals will be dissolved by the water used. Meanwhile, ash content is influenced by the mineral content of the food ingredients used (Andarwulan, 2011).

The analysis of ash content produced higher ash content in F1 to F3 and in line with research conducted by Simanjuntak and Pato (2020). The results showed that the ash content of nuggets increased with the higher use of soy flour. The ingredients used in making nuggets will affect the value of ash content produced.

The results of Kurni's (2019) research are in line with the results of the study that the decrease in ash content in chicken nuggets and young jackfruit that the more the composition of young jackfruit added, the lower the ash content. It is suspected that the decrease in ash content is caused by ingredients with low ash content. Soy bean flour contains 4 grams/100 grams of ash while young jackfruit is 0.9 grams/100 grams.

In accordance with the facts and results of several previous studies, it shows that there is a real effect of substituting young jackfruit and soy flour in making *nuggets*. The higher the young jackfruit and soy flour, the higher the ash content. The effect of ash content can also affect the processing process so that it produces different ash content in each product formulation.

CONCLUSION

Substitution of young jackfruit and soy flour in *nuggets* has an effect on macronutrient levels. The more the substitution of young jackfruit and soy flour, the higher the energy, protein, carbohydrate and fat content in the *nuggets*. Substitution of young jackfruit and soy flour in *nuggets* affects the fiber content of the *nuggets*. The more young jackfruit and soy flour, the higher the fiber content of the *nuggets*. Substitution of young jackfruit and soy flour had a significant effect on the acceptability of *nuggets*. The highest level of panelist liking was F2, namely *nuggets* with 15% chicken meat treatment, 65% young jackfruit and 20% soy flour. The more young jackfruit and soy flour the panelists' liking decreased. The best ranking test results and nutrient analysis of the 4 treatments that can be given to obese adolescents is F2.

ADVICE

Students are expected to research the determination of product shelf life to improve quality standards through laboratory tests. Through this research, it is hoped that the community will pay more attention to the benefits of high-fiber snack foods. It is necessary to utilize local food ingredients that are easily available, relatively cheap and have high nutritional value such as young jackfruit, soy flour and chicken meat in making *nuggets* as a snack that teenagers

like. It is hoped that the results of research on *nugget* products can contribute to institutions in the field of food nutrition and health, especially in utilizing local ingredients of young jackfruit and soy flour as an alternative to high-fiber healthy snacks for obese adolescents. This research is expected to be a reference for researchers with the same theme and is expected to further research the nutritional content of other local food ingredients that are utilized and can be processed into snacks that have high nutritional value and are liked by the community.

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