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ANALYSIS OF FIBER AND PROTEIN LEVELS ON SNACK BAR BASED ON JACKFRUIT (*Artocarpus heterophyllus* L.) AND FLOUR-BASED FLOUR GREEN BEAN (*Vigna radiata* L.)

Analisis Kadar Serat dan Protein pada Snack Bar Berbasis Nangka (Artocarpus heterophyllus L.) dan Kacang Hijau (Vigna radiata L.) Berbasis Tepung

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ABSTRACT

Snack bars are alternative foods that can fulfill nutritional needs and can delay hunger. Currently, cheaper local food ingredients are needed, one of which is jackfruit seeds. Jackfruit seeds are generally underutilized, while jackfruit seeds that have been processed into flour have a high protein content. To support the need for fiber content in the snack bar of this study, it is necessary to add nuts such as mung beans. This study ware conducted to determine the crude fiber and protein levels in snack bars based on jackfruit seed flour and mung beans. This type of quantitative research with a descriptive research design. Test parameters in this study include organoleptic tests, water content, ash content, crude fiber content, and protein determination qualitatively and quantitatively using the UV-Vis spectrophotometer Lowry method. The organoleptic test of the snack bar ware brown for the color, have a distinctive aroma of cake and mung beans, and has a sweet taste and soft texture. The qualitative test of protein snack bar using the Xantoprotein method obtained a positive result marked by the formation of yellow-orange colored ring. The nutritional content of the snack bar is water content of 18.16 ± 0.025%; ash content of 1.83 ± 0.062%; crude fiber content of 7.67 ± 0.142%; protein content of 9.48 ± 0.015%. Determination of fiber and protein content in snack bars based on jackfruit seed flour and mung beans was appropriate with USDA 25048 parameters.

Keywords: *snack bar, jackfruit seed flour, mung beans, crude fiber content, protein content*

INTRODUCTION

Winarno and Felicia, people's lifestyles tend to be less aware of the importance of health. The high level of activity which ultimately causes the need for food is not limited to fulfilling conventional nutrition for the body, but food is also expected to function to maintain health and body fitness, is safe for consumption and practical in its presentation (Rahman *et al*., 2011). This emergency situation requires food that can delay hunger. One of the food products that can delay hunger and have good nutritional value for the body is a snack bar.

Snack bars are snacks in the form of bars made from a mixture of various ingredients such as cereals, nuts. Snack bars are a source of energy for the body because the main ingredients are flour, sugar, and fat (Pontang & Wening, 2021). Snack bars circulating in the commercial market are made from soybean flour and wheat flour (wheat) which are imported commodities in Indonesia (Pratiwi, 2017).

Currently, cheaper local food ingredients are needed, one of which is jackfruit seeds. Jackfruit seeds are generally underutilized, while currently the processing and use of jackfruit seed flour is still not widely known by the public. Jackfruit seeds that have been processed into flour have a protein content of 12.19% per 100 gram (Fahnur, 2017). To support the need for fiber content in snack bars, it is necessary to add nuts.

Mung bean is the most widely cultivated type of legume besides soybeans and peanuts and has a fairly high fiber content. The Food Composition Table of 2017, states that the fiber content in green beans per 100 grams is 7.5% higher than soybeans which is only 3.2% per 100 grams (Kemenkes RI, 2017).

Snack bars made from jackfruit seed flour and green beans need to be tested for quality to determine water content, ash content, fiber content and protein content. The analytical method used is the gravimetric method and UV-Vis spectrophotometry. The gravimetric method is used because it has the advantage that it does not require a comparison substance and is the simplest method of analysis compared to other analyzes (Adawiyah, R., 2017).

METHODS

This research uses quantitative research because it includes statistical or quantitative data. The research design used in this research is descriptive quantitative research. This study uses a single variable with two sub variables. The single variable was the analysis of fiber and protein content in snack bars based on jackfruit seed flour and green beans.

Tools and materials

The tools used in this study include a cabinet dryer (*Sense*), 80 mesh sieve, oven, analytical balance (*OHAUS Pioneer*), desiccator, weighing bottle, cup clamp, porcelain cup, crucible, mortar stamper, test tube, tube rack. reaction, beaker, erlenmeyer, funnel, measuring cup, hot plate, petri dish, coarse filter paper, dropper, micropipette (*Dragon Onemed*), blue tip, yellow tip, measuring flask, stopwatch, centrifuge tube, cuvette, UV spectrophotometer -Vis (*Raptor*), centrifuge (*Smart R1* 7).

The materials used in this study included green beans, water/aquades, jackfruit seeds, blender, eggs, sugar, margarine, salt, raisins, concentrated H_2SO_4 (*Merck*), NaOH p.a (*Sigma Aldrich*), acetone p.a (Sigma Aldrich) , concentrated HNO_3 (*Merck*), BSA p.a (*Merck*), Lowry's reagent A, Lowy's reagent B, Lowry's reagent C, Lowry's reagent D, Lowy's reagent E.

Research procedure

Raw material preparation

The raw material for jackfruit seeds used was obtained from a garden located in Dandang Village, Jumapolo Village, Jumapolo District, Karanganyar Regency. The selection of green beans was carried out at one of the traders at Jungke Market by choosing green beans that were bright green in color with evenly large grains.

Production of jackfruit seed flour.

The 1 kg jackfruit seeds are sorted and then washed using running water to remove the sap that is still attached or other impurities. Jackfruit seeds boiled at a temperature of 70 ^{0}C for ± 30 minutes and drained. The skin of the jackfruit seeds is peeled and cut using a knife. The cut jackfruit seeds were dried using a cabinet dryer at ^{0}60 C for 12 hours. The dried jackfruit seeds were ground and sieved using an 80 mesh sieve *(*Modifikasi Ma'rufah *et al*., 2016).

Manufacture of whole green beans

100 g of green beans were cleaned of impurities, then the green beans were washed thoroughly and soaked for 3 hours. Green beans are boiled for 15 minutes, drained and cooled (Rezkianda, 2019).

Making snack bars

The snack bar formulation in this study can be seen in Table 1.

Table 1. Snack bar formula

Ingredient	Formula 0 (control)	Formula 1
Flour	100 g	-
Jackfruit seed flour	-	70 g
Mung beans	-	30 g
Egg	1 item	1 item (57 g)
Sugar	15 g	15 g
Margarine	30 g	30 g
Salt	1 g	1 g
Raisins	50 g	50 g

Snack bars are made from beaten eggs and granulated sugar, added margarine and salt until the dough is evenly mixed. Jackfruit seed flour and green beans were added according to the treatment. The dough that has been mixed evenly then added the raisins. The snack bar dough is then put into a mold that has been smeared with margarine. Thedough is baked in an oven at 150 C for 45 minutes, after which the snack bar is cut to the desired size (modification Rumenser *et al*., 2021).

Organoleptic testing

This test was carried out by observing the color, aroma, taste and texture of jackfruit seed flour and snack bars based on jackfruit seed flour and green beans (Mibda, 2019).

Proximate testing

Water content test

A total of 2 g samples of jackfruit seed flour or snack bars were put into a crucible with known weight. Samples and crucibles were dried in an oven at 105 C for 3 hours and cooled in a desiccator. The sample and crucible were weighed and this procedure was repeated until a constant weight was obtained. Samples were replicated 3 times. Water content calculation formula:

$$\% \text{ Moisture content} = \frac{W2 - W1}{W} \times 100\%$$

Information:
W = sample weight (g)
W1 = sample weight after drying + crucible (g)
W2 = sample weight before drying + crucible (g)
(rumenser *et al*., 2021).

Crude fiber content test

Samples of jackfruit seed flour or snack bar as much as 0.5 g were put into a 100 ml beaker and added 25 ml of 0.3 N H_2SO_4 then heated at 70 °C for 30 minutes,

then added 12.5 ml of 1.5 N NaOH and heated for 15 minutes at 70 °C. The solution was filtered using a glass funnel. During filtration, the precipitate was washed successively with sufficient hot distilled water, 25 ml of 0.3 N H2SO4 and 12.5 ml of acetone. The filter paper containing the residue was put into a porcelain dish and dried in the oven for 30 minutes at 105°C, then cooled and weighed. Samples were replicated 3 times. Formula for calculating crude fiber content:

$$\% \text{ Crude fiber content} = \frac{W1 - W2}{W} \times 100\%$$

Information :
W = sample weight before incubation (g)
W1 = sample weight + crucible after drying (g)
W2 = empty crucible weight (g)
(Rumenser *et al*., 2021)

Crude fiber content test

Samples of jackfruit seed flour or snack bar as much as 0.5 g were put into a 100 ml beaker and added 25 ml of 0.3 N H2SO4 then heated at 70 °C for 30 minutes, then added 12.5 ml of 1.5 N NaOH and heated for 15 minutes at 70 °C. The solution was filtered using a glass funnel. During filtration, the precipitate was washed successively with sufficient hot distilled water, 25 ml of 0.3 N H2SO4 and 12.5 ml of acetone. The filter paper containing the residue was put into a porcelain dish and dried in the oven for 30 minutes at 105°C, then cooled and weighed. Samples were replicated 3 times. Formula for calculating crude fiber content:

$$\% \text{ Crude fiber content} = \frac{W1 - W2}{W} \times 100\%$$

Information :
W = sample weight (g)
W1 = weight of filter paper + sample after baking (g)
W2 = weight of filter paper (g)
(modification Mozin *et al*., 2019)

Qualitative testing of protein method

The sample solution was made with a concentration of 2% w/v in 10 ml of distilled water. 1 ml of the sample was taken and added 1 ml of concentrated HNO3, then heated for 1 minute and cooled. The positive reaction is the formation of a white precipitate which immediately turns yellow. 40% NaOH solution was added in the tube slowly until the color change in the boundary area was orange or dark yellow (modification Rosaini *et al*., 2015).

Testing protein content with UV-Vis spectrophotometer Lowry method

Preparation of 500 ppm . BSA mother liquor

A total of 5 mg of BSA crystals were weighed, then dissolved in distilled water up to 10 ml so that the concentration of the mother liquor was 500 ppm.

Determination of the maximum wavelength of 120 ppm BSA solution with UV-Vis spectrophotometer

A total of 1.2 ml of 500 ppm BSA solution was pipetted, then dissolved in distilled water to 5 ml so that the solution content was 120 ppm. The solution was put into a test tube, then 1 ml was taken, added 1 ml Lowry D reagent, then allowed to

stand for 20 minutes and 3 ml Lowry E reagent was added. For 30 minutes, it was allowed to stand until a constant blue color was formed, then the absorbance was measured at the length the 740-790 nm band. The maximum wavelength obtained is recorded.

Making a calibration curve of BSA solution

BSA mother liquor with a concentration of 500 ppm was diluted with a series of concentrations of 80, 100, 120, 140, and 160 ppm. The standard solution was put into each test tube as much as 1 ml, added 1 ml Lowry D reagent, then allowed to stand for 20 minutes and added 3 ml Lowry E reagent. For 30 minutes, it was allowed to stand until a constant blue color was formed, then the absorption was measured at the maximum wavelength. (Prasetyo modification *et al*., 2021).

Measurement of protein content of samples by UV-Vis . spectrophotometry

Samples of jackfruit seed flour or snack bar as much as 1 g were mashed and added with 40 ml of distilled water, then filtered. The solution was centrifuged at 6000 rpm for 20 minutes. A sample of 1 ml was diluted 10 times in a measuring flask using distilled water, then 1 ml of Lowry D reagent was added, allowed to stand for 20 minutes and 3 ml of Lowry E reagent was added. For 30 minutes, it was allowed to stand until a constant blue color was formed, then the absorption was measured at the maximum wavelength (Prasetyo *et al*., 2021 modification).
The concentration can be calculated by entering the concentration value into the following formula:

$$\% \text{ Protein content} = \frac{X \times V \times Fp}{W} \times 100\%$$

Information:
X = Concentration of sample solution (mg/L)
V = Total volume of sample solution (L)
Fp = Dilution factor
W = Sample weight (mg)

RESULTS AND DISCUSSION

Making Jackfruit Seed Flour

The manufacture of jackfruit seed flour starts from fresh jackfruit seeds, then the process of boiling, peeling, drying, refining and sifting so that it becomes fine grains. It is known that 1002 g of fresh jackfruit seeds become 412 g of dry jackfruit seed weight, after being sifted using an 80 mesh sieve, it produces 284 g of jackfruit seed flour.

Organoleptic Test

Organoleptic testing is carried out using the human senses by observing color using the sense of sight, aroma is carried out using the sense of smell, taste is carried out using the sense of taste and texture is carried out using the sense of touch (Adawiyah, Rabiatul & Abduh, 2019). The results of the organoleptic test of jackfruit seed flour are brownish white, have a distinctive aroma of flour, have a bland taste and smooth texture. This brownish white color is due to the jackfruit seed still has the remaining epidermis attached. The results of the organoleptic test on the snack bar control were yellowish in color, had a distinctive cake aroma, had a sweet taste and a soft texture.

The snack bar based on jackfruit seed flour and green beans is brown because of the addition of the perfect jackfruit seeds. The aroma of the snack bar is typical of cakes and green beans, because according to Budi *et al.* (2019) is basically a cake made from flour, sugar and eggs. The aroma of green beans itself is caused because green beans have a dominant and strong aroma (Lestari, 2017). This snack bar has a sweet taste due to the addition of raisins and a soft texture because it is made from flour and eggs.

Test Moisture Content

The results of the water content test on jackfruit seed flour and snack bars based on jackfruit seed flour and green beans can be seen in Table 2.

Table 2. Water Content of Jackfruit Seed Flour and Snack Bar

Type	Water content ± SD (%)
Jackfruit seed flour	7,77 ± 0,385
Snack bar control	10,76 ± 0,127
Snack bar based on jackfruit seed flour and green beans	18,16 ± 0,025

This test uses the gravimetric method with the principle that there is a loss of sample weight when heating at a temperature of 105 ºC which is considered as the water content contained in the sample (Rohman & Sumantri, 2013). The results of testing the water content of jackfruit seed flour obtained the results of 7.77 ± 0.385%. The water content of jackfruit seed flour in this study was in accordance with the flour quality requirements according to SNI No. 3751 : 2009 for flour the maximum moisture content is 14.5%. The results of this study are not much different from previous research conducted by Rakhmawati & Musdholifah (2019), which obtained a water content of 7.5%. Flour that has a low water content will affect the shelf life (Zahiroh, 2016).

The results of the snack bar control water content test were 10.76 ± 0.127%. The control water content of the snack bar is in accordance with the quality requirements of the snack bar referring to the commercial snack bar (Soyjoy), which is a maximum water content of 11.40%. The results of the water content test on the snack bar based on jackfruit seed flour and green beans showed the results of 18.16 ± 0.025%. The water content of this snack bar was higher than the control because the water content of jackfruit seed flour was higher than that of wheat flour. The water content of the snack bar in this study is higher than the quality requirements of the snack bar which refers to the commercial snack bar (Soyjoy), but lower than the research by Annisa (2017) which obtained a water content of 24.21%.

Ash Level test

The results of the ash content test of jackfruit seed flour and snack bars based on jackfruit seed flour and green beans can be seen in Table 3.

Table 3. Ash Content of Jackfruit Seed Flour and Snack Bar

Type	Ash Level ± SD (%)
Jackfruit seed flour	2,56 ± 0,047
Snack bar control	2,17 ± 0,073
Snack bar based on jackfruit seed flour and green bean	1,83 ± 0,062

Ash content testing is carried out to represent the mineral content in a food ingredient. In this ash content test using the gravimetric method in a dry way, namely by oxidizing all organic substances at a high temperature, which is around 550 C, after that, the substances left behind after the combustion process are weighed. The results of testing the ash content of jackfruit seed flour obtained results of 2.56 ± 0.047%. The ash content of jackfruit seed flour in the study was said to have not met the flour quality requirements according to SNI No. 3751: 2009 for flour, the maximum ash content is not more than 0.7%, this is due to the high mineral content of jackfruit seeds such as phosphorus 200 mg, calcium 33 mg, and iron 1.0 mg (Hadi, 2015).

The results of the snack bar control ash content test result 2 of 2.17 ± 0.073%. The control ash content of the snack bar is not in accordance with the quality requirements of the snack bar, referring to the USDA 25048 snack bar regarding Nutri-Grain Fruit and Nut Bar, which is a maximum ash content of 1.9%. The results of the ash content test on snack bars based on jackfruit seed flour and mung bean obtained the results of 1.83 ± 0.062%. The water content of the snack bar in this study was in accordance with the quality requirements of the snack bar which refers to the USDA 25048 snack bar. The ash content in this snack bar was lower than the control because there was a green bean formula as a high contributor to water content, which method of processing was boiled, causing the water content to rise. which is higher than the control. According to Pramusita (2019), the decrease in ash content is inversely proportional to the water content, so the higher the water content, the lower the ash content. However, the results of this study are in accordance with the requirements of the USDA 25048 snack bar, and the results of this study are not much different from Annisa (2017) research (2017), which obtained an ash content of 1.97%.

The low ash content in the snack bar based on jackfruit seed flour and mung bean flour is due to the 70 g jackfruit seed flour formula, while the mung bean jackfruit seed flour is 30 g, where green beans donate very little minerals according to the research of Haeruddin *et al*. (2020).

Test the Crude Fiber Content

The results of the crude fiber content test of jackfruit seed flour and snack bars based on jackfruit seed flour and green beans can be seen in Table 4.

Table 4. Crude Fiber Content of Jackfruit Seed Flour and Snack Bar

Type	Crude Fiber Content ± SD (%)
Jackfruit seed flour	2,65 ± 0,025
Snack bar control	3,80 ± 0,047
Snack bar based on jackfruit seed flour and green beans	7,67 ± 0,142

This crude fiber content test is carried out to determine the part of the food that cannot be hydrolyzed by chemicals. In testing the crude fiber content of this study using the gravimetric method with the principle of binding water, cellulose and pectin. Crude fiber is all organic substances that are insoluble in H_2SO_4 and NaOH, respectively, cooked for 30 minutes. The results of testing the crude fiber content of jackfruit seed flour obtained results of 2.65 ± 0.025%. The crude fiber content of jackfruit seed flour in the study is said to be not much different from the flour quality

requirements according to the Departemen Perindustrian RI (2000) table of the composition of jackfruit seed flour content per 100 g for the crude fiber content of jackfruit seed flour which is 2.74%.

The results of the crude fiber content test for snack bar control obtained results of 3.80 ± 0.047%. The crude fiber content of the snack bar control is in accordance with the quality requirements of the snack bar which refers to the USDA 25048 snack bar regarding Nutri-Grain Fruit and Nut Bar, which is a maximum fiber content of 8.30%. The results of the crude fiber content test on snack bars based on jackfruit seed flour and green beans were found to be 7.67 ± 0.142%. The crude fiber content in this snack bar was higher than the control because of the addition of green beans, which according to Khairunnisa *et al.* (2018), green beans have a fairly high fiber content.

The results of the crude fiber content of the snack bar in this study were in accordance with the requirements of the USDA 25048 snack bar. The results of this study had a lower fiber content than the research conducted by Haeruddin *et al*., (2020) the crude fiber content was 18.47%. Fiber has a role in blocking the absorption of other nutrients such as carbohydrates, fats and proteins so that if foods contain low fiber content, almost all nutrients can be absorbed by the body (Hardiyanti & Nisah, 2019).

Protein Qualitative Test

This qualitative test of protein was conducted to determine the presence of protein in the sample. The protein qualitative test used in this study was the xantoprotein test. The xantoprotein test is used to detect the presence of active benzene rings in proteins, namely the presence of the amino acids tyrosine, tryptophan, or phenylalanine present in proteins (Putri *et al*., 2016). The results of the qualitative test of jackfruit seed flour protein and snack bars based on jackfruit seed flour and mung bean were positive for protein content because they were in accordance with the results of protein control, indicated by the formation of an orange-yellow ring.

Protein Quantitative Test

The results of the crude fiber content test of jackfruit seed flour and snack bars based on jackfruit seed flour and green beans can be seen in Table 5.

Table 5. Protein Content of Jackfruit Seed Flour and Snack Bar

Type	Protein Level ± SD (%)
Jackfruit seed flour	7,6 ± 0,035
Snack bar control	5,94 ± 0,006
Snack bar based on jackfruit seed flour and green beans	9,48 ± 0,015

Quantitative protein testing was carried out using a UV-Vis Spectrophotometer with the Lowry method. The principle of the Lowry method is the formation of complexes between peptide bonds, namely proteins and Cu2+ ions under basic conditions. Cu2+ ions are then reduced to Cu+ ions. Cu+ ions will reduce Folin Ciocalteu reagent to produce a blue color. The blue color formed is the reduction of molybdic acid and phosphotungstic acid by tyrosine and tryptophan which are protein residues (Nisa, 2018). Determination of protein content is done by measuring the

absorbance of the sample at the maximum wavelength obtained, which is 754 nm, this is still within the maximum wavelength range according to the research of Lowry *et al.* (1951). This difference is due to the different conditions of the tools and preparations. The protein standard used is BSA (Bovine Serum Albumin) derived from cow serum. The linear regression equation is obtained y = 0.0045x + 0.0012 with r2 = 0.9996.

The results showed that the protein content of jackfruit seed flour (Artocarpus heterophyllus L) was 7.60 ± 0.035%. The protein content of jackfruit seed flour (Artocarpus heterophyllus L) in this study was in accordance with the flour quality requirements according to SNI No. 3751: 2009 for flour, the minimum protein content is 7.0%. This study is not in accordance with the research of Andyarini & Hidayati (2017) the protein content of jackfruit seed flour is 12.19%, this can be due to the different processes used in the manufacture of flour.

The results of the snack bar control protein content test were 5.94 ± 0.006%. The control protein content of the snack bar is not in accordance with the quality requirements of the snack bar which refers to the USDA 25048 snack bar regarding the Nutri-Grain Fruit and Nut Bar, which is a minimum protein content of 9.30%. The results of the protein content test on snack bars based on jackfruit seed flour and mung bean obtained the results of 9.48 ± 0.015%. The protein content in this snack bar is higher than the control because the snack bar formula contains a combination of jackfruit seed flour and green beans, both of which have high protein content. According to (Hasnita *et al.*, 2021), along with the addition of jackfruit seed flour, the protein content obtained will increase, this is because jackfruit seed flour has a fairly high protein content. Green beans are a source of vegetable protein, because they contain high protein by 24% (Utafiyani, 2018).

The results of the snack bar based on jackfruit seed flour and green beans are in accordance with the USDA 25048 snack bar requirements, but in Pratiwi (2017) research the protein content of this snack bar is higher, the protein content is 4.54%. The low protein content in snack bars based on jackfruit seed flour and green beans can be caused by differences in protein testing methods. In Annisa (2017) research using the Kjeldahl method, where this method is the determination of total nitrogen in proteins and all nitrogen-containing compounds can be detected (Rahman *et al*., 2011). Modification of snack bar based on jackfruit seed flour and mung bean can increase protein content.

In the early stages of this research, jackfruit seed flour (Artocarpus heterophyllus L.) was made by selecting ripe jackfruit and taking 1 kg of fresh jackfruit seeds, sorting and then washing using running water. Jackfruit seeds boiled at a temperature of 70 C for ± 30 minutes and drained. The skin of the jackfruit seeds is peeled and cut using a knife. Jackfruit seeds that have been cut are dried using a cabinet dryer at a temperature of 60 C for 12 hours (Ma'rufah *et al*., 2016). The dried jackfruit seeds were ground and sieved with an 80 mesh sieve to obtain a fine flour (Putri *et al*., 2018). In the process of making mature jackfruit seed flour (Artocarpus heterophyllus L.) it was found that 1002 g of fresh jackfruit seeds turned into 412 g of dry jackfruit seed weight, after sifting using an 80 mesh sieve to produce 284 g of jackfruit seed flour.

Making snack bars is done by beating eggs and sugar, adding margarine and salt until the dough is evenly mixed. Jackfruit seed flour and green beans were added according to the treatment, namely 70: 30. The dough that had been mixed evenly was then added with raisins. The snack bar dough is then put into a mold that has

been smeared with margarine. The dough is baked in an oven at 150 C for 30 minutes, after which the snack bar is cut to the desired size (Rumenser *et al*., 2021).

Making snack bars based on jackfruit seed flour (Artocarpus heterophyllus L.) and mung bean (Vigna radiata L.) with a ratio formula of jackfruit seed flour and mung bean flour (70 g : 30 g) obtained 10 pieces of snack bar weighing about 25 grams.

Organoleptic test of jackfruit seed flour (Artocarpus heterophyllus L.) which is brownish white, has a characteristic aroma of flour, has a bland taste and smooth texture. This brownish white color is due to the jackfruit seed still has the remaining epidermis attached. The organoleptic test on the snack bar control was yellowish in color, had a distinctive aroma of cake, had a sweet taste and a soft texture.

The snack bar based on jackfruit (Artocarpus heterophyllus L.) and mung bean (Vigna radiata L.) flour is brown in color due to the addition of perfect jackfruit seeds. The aroma of the snack bar is typical of cakes and green beans, because according to Budi *et al*. (2019) is basically a cake made from flour, sugar and eggs. The aroma of green beans itself is caused because green beans have a dominant and strong aroma (Lestari, 2017). This snack bar has a sweet taste due to the addition of raisins and a soft texture because it is made from flour and eggs.

Testing the moisture content of jackfruit seed flour (Artocarpus heterophyllus L) which has been replicated 3 times, the results are 7.43%; 7.77%; and 8.16% with an average value of 7.77 ± 0.385%.

Snack bar control water content test which has been replicated 3 times, the results are 10.81%; 10.62%; and 10.86% with an average value of 10.76 ± 0.127%. water content test on snack bars based on jackfruit seed flour (Artocarpus heterophyllus L.) and green beans (Vigna radiata L.) which have been replicated 3 times, the results are 18.14%; 18.19%; and 18.17% with an average value of 18.16 ± 0.025%.

Testing the ash content of jackfruit seed flour (Artocarpus heterophyllus L) which has been replicated 3 times, the result is 2.58%; 2.51%; and 2.60% with an average value of 2.56 ± 0.047%.

Snack bar control ash content test which has been replicated 3 times, the result is 2.09%; 2.20%; and 2.23% with an average value of 2.17 ± 0.073%. The control ash content of the snack bar is not in accordance with the quality requirements of the snack bar, referring to the USDA 25048 snack bar regarding Nutri-Grain Fruit and Nut Bar, which is a maximum ash content of 1.9%. ash content test on snack bar based on jackfruit seed flour (Artocarpus heterophyllus L.) and mung bean (Vigna radiata L.) which has been replicated 3 times, the result is 1.90%; 1.81%; and 1.78% with an average value of 1.83 ± 0.062%. The water content of the snack bar in this study was in accordance with the quality requirements of the snack bar which refers to the USDA 25048 snack bar. The ash content in this snack bar is lower than the control because there is a green bean formula as a high contributor to water content, which is how to process it by boiling, causing water content. which is higher than the control. According to Pramusita (2019), the decrease in ash content is inversely proportional to the water content, so the higher the water content, the lower the ash content.

Testing the crude fiber content of this study used the gravimetric method with the principle of binding water, cellulose and pectin. Crude fiber is all organic substances that are insoluble in H2SO4 and NaOH, respectively, cooked for 30 minutes. Hydrolysis is a chemical reaction that breaks molecules into two parts with

the addition of water molecules (H2O), which aims to convert polysaccharides into simple monomers (Ratri, 2017).

Testing the crude fiber content of jackfruit seed flour (Artocarpus heterophyllus L) which has been replicated 3 times, the results are 2.63%; 2.68%; and 2.65% with an average value of 2.65 ± 0.025%. The crude fiber content of jackfruit seed flour (Artocarpus heterophyllus L) in the study was said to be in accordance with the flour quality requirements according to the Departemen Perindustrian RI (2000) table of the composition of jackfruit seed flour content per 100 g for the crude fiber content of jackfruit seed flour, which was 2.74%.

Crude fiber content test for snack bar control which has been replicated 3 times, the results are 3.82%; 3.75%; and 3.84% with an average value of 3.80 ± 0.047%. Crude fiber content test on snack bar based on jackfruit seed flour (Artocarpus heterophyllus L.) and green beans (Vigna radiata L.) which has been replicated 3 times, the results are 7.70%; 7.51%; and 7.79% with an average value of 7.67 ± 0.142%. The crude fiber content in this snack bar was higher than the control because of the addition of green beans, which according to Khairunnisa *et al.* (2018), green beans have a fairly high fiber content.

Qualitative test for protein in jackfruit seed flour (Artocarpus heterophyllus L.) and snack bar based on jackfruit seed flour (Artocarpus heterophyllus L.) and mung bean (Vigna radiata L.) were positive for protein content because they were in accordance with the results of protein control, indicated by the formation of a yellow-orange ring. This result is in accordance with the statement of Wikantantri (2018), a positive reaction for the xantoprotein test is marked by a yellow lump or ring.

The protein content of jackfruit seed flour (Artocarpus heterophyllus L) which has been replicated 3 times, the result is 7.56%; 7.62%; and 7.62% with an average value of 7.60 ± 0.035%. The protein content of jackfruit seed flour (Artocarpus heterophyllus L) in this study was in accordance with the flour quality requirements according to SNI No. 3751: 2009 for flour, the minimum protein content is 7.0%.

Snack bar control protein content test which has been replicated 3 times, the results are 5.94%; 5.93%; and 5.94% with an average value of 5.94 ± 0.006%. protein content test on snack bar based on jackfruit seed flour (Artocarpus heterophyllus L.) and mung bean (Vigna radiata L.) which has been replicated 3 times, the result is 9.48%; 9.47%; and 9.50% with an average value of 9.48 ± 0.015%. The protein content in this snack bar is higher than the control because the snack bar formula contains a combination of jackfruit seed flour and green beans, both of which have high protein content. According to (Hasnita *et al.*, 2021).

CONCLUSION

Jackfruit seed flour organoleptic brownish white, powdery aroma, bland taste and smooth texture. Jackfruit seed flour and mung bean flour snack bar has a brown color, cake and mung bean aroma, sweet taste and soft texture. The average moisture content of seed flour is 7.77 ± 0.385%. In snack bars jackfruit seed flour and mung bean flour an average of 18.16 ± 0.025%. The average ash content of jackfruit seed flour is 2.56 ± 0.047%. In snack bars of jackfruit and green bean flour, the average is 1.83 ± 0.062. The average crude fiber content of jackfruit seed flour is 2.65 ± 0.025%. In snack bars of jackfruit and green bean flour, the average is 7.67 ± 0.142%. The average protein content of jackfruit seed flour is 7.6 ± 0.035%. In the jackfruit seed flour and green bean snack bars, the average is 9.48 ± 0.015%.

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