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Nutritional analysis and acceptability of banana kepok flour and red bean flour cookies

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Abstract

School children need nutritious food to fulfill their nutritional needs. Banana kepok flour and red bean flour can be utilized as raw materials for cookies as well as an alternative to wheat flour. Cookies from these two flours can be used as a snack for school children. This study aims to analyze nutrients and determine the acceptability of cookies made from kepok banana flour and red beans. The method used was experimental with three treatments: F1 (75%: 25%), F2 (50%: 50%), and F3 (25%: 75%). Organoleptic test was used to determine panelists' acceptance of color, aroma, taste, and texture. Nutrient analysis used proximate test to determine carbohydrate, protein, fat, ash content, and water content. Organoleptic results showed the highest percentage in F1 (75%: 25%) with 47.8% carbohydrate content, 9.34% protein, 29.2% fat, 1.37% fiber, 1.81% ash content, and 4.78% water content. Friedman test showed there was an effect on the acceptability of aroma, but not on color, taste, and texture. For further research, it is recommended to modify the shape of cookies to make them more attractive to school children.

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INTRODUCTION

Elementary school-age children are children who enter the age of 6 to 12 years (Damayanti, Lutfiya, & Nilamsari, 2019). Based on the World Health Organization (WHO) school-age children are children who enter the age of 7-15 years. Good nutritional status will affect the process of growth and development of children, one of which can improve intellectual abilities, so that the phase of school-age children is a phase where children really need nutritious food intake to support growth and development (Lestari, Ernalia & Restuastuti, 2017). Balanced nutrition is very important for children during growth and development. Food intake in accordance with the principles of balanced nutrition is needed to support growth and development (Heluq & Mundiastuti, 2018). One of the components of balanced nutrition for school children that must be met is the consumption of diverse foods, such as carbohydrates, protein, fat, water, vitamins, minerals, and fiber. Nutritional problems that are often experienced in school children, namely malnutrition and excess nutrition, can affect the physical and mental aspects of children (Kulsum, 2021). If this is not handled as early as possible, it can affect children's health in the future (Octaviani, Izhar & Amir, 2018)

The use of local flour is an alternative way for industry because of the high potential of local food raw materials as a substitute for wheat flour, so that its use can be studied as a diversification of food ingredients and to increase the desire of producers to innovate and utilize local or non-wheat flour (Putri, 2019). Local food ingredients that can be used and utilized as raw materials for local or non-wheat flour as a source of diversification include local foods such as kepok banana fruit and red beans (Ramdany et al. 2021). Banana production in West Kalimantan Province in 2015 amounted to 144,735 tons in West Kalimantan Banana is a fruit crop with the highest production compared to other fruit crops. Banana production is very abundant from various regions, especially those in West Kalimantan, one of which is in the North Kayong Regency area which is a high production of bananas in 2015, which amounted to 1092 tons.

Pisang kepok is the best banana used as a flour ingredient. The results of processed banana flour produce the whitest flour color and have a high starch and carbohydrate content compared to other bananas (Putri et al., 2019). Bananas tend to have low protein levels, so to increase protein levels can be done by combining with ingredients from nuts. One of the nuts that has high levels of protein and potassium is red beans (Praptiningrum, 2015). Kidney bean is a potential source of vegetable protein as well as a source of high energy. When compared to wheat flour which only has a protein content of 10 g/100 g and 22 mg/100 g of calcium, kidney beans have a higher protein content of 22.1 g/100 g and 502 mg/100 g of calcium. Kidney bean has a good protein content, one of the indicators is that it has a leucine content of 76.16 mg (Heluq & Mundiastuti 2018).

According to SNI 01-2973-1992, cookies are a type of biscuit made from soft dough, with high fat and sugar content, relatively crunchy when broken and solid texture (Hardiyanti, Kadirman & Rais, 2018). Snacks are foods that are favored by various age groups, ranging from children to adults. Interlude is generally in small portions with nutrient content ranging from 10%-20% of daily energy needs (Jauhariah & Ayustaningwarno, 2013). Snacks for children are expected to have nutritional quality standards that are in accordance with the PMT-AS Program recommendations of approximately 200-300 kcal and 5-7 grams of protein for each feeding (Febry, 2006). This study aims to analyze nutrients and determine the acceptability of cookies made from kepok banana flour and red beans.

METHOD

This study uses experimental research with the test used in this study is an organoleptic test on panelists which aims to determine the panelists' acceptance of the color, aroma, taste, and texture of kepok banana flour cookies and red bean flour, as well as testing the protein content, fat, carbohydrates, ash content, water content contained in the cookie

product. In this study, the panelists used were moderately trained panelists as many as 25 students of the Pontianak Polytechnic Nutrition Department who had received material on how to conduct hedonic tests to test acceptability according to their preferences who were willing to become panelists.

The type of data used in this study is primary data in the form of organoleptic test results. Primary data was obtained from the results of panelists' assessment in the acceptability test using the organoleptic test form and analysis of nutrient content. Then the data obtained will be grouped and tabulated, which is then analyzed using the Friedman test. The results of this analysis will then be presented in the form of narratives, tables, graphs, and images.

RESULTS AND DISCUSSION

Banana kepok and red bean *cookies* are one of the food products that use food ingredients from banana kepok flour and red bean flour, wheat flour, margarine, sugar, milk powder, eggs and vanilla. These *cookies* are flat round like *cookies* in general which are processed through roasting or frying. In terms of product color, it becomes brownish yellow, the aroma of *cookies* is fragrant and distinctive because there is a roasting process and the addition of other ingredients, crispy texture when broken. The *cookies* produced weigh 10gr / fruit, in 1 cookie recipe producing 50 pieces. To collect research data, these cookies were tested organoleptically by panelists and in the acceptance test. The following are the results obtained:

Organoleptic Test

Color

The results of the organoleptic test for level of liking based on color in *cookies* made from kepok banana flour and red bean flour can be seen in the following figure.

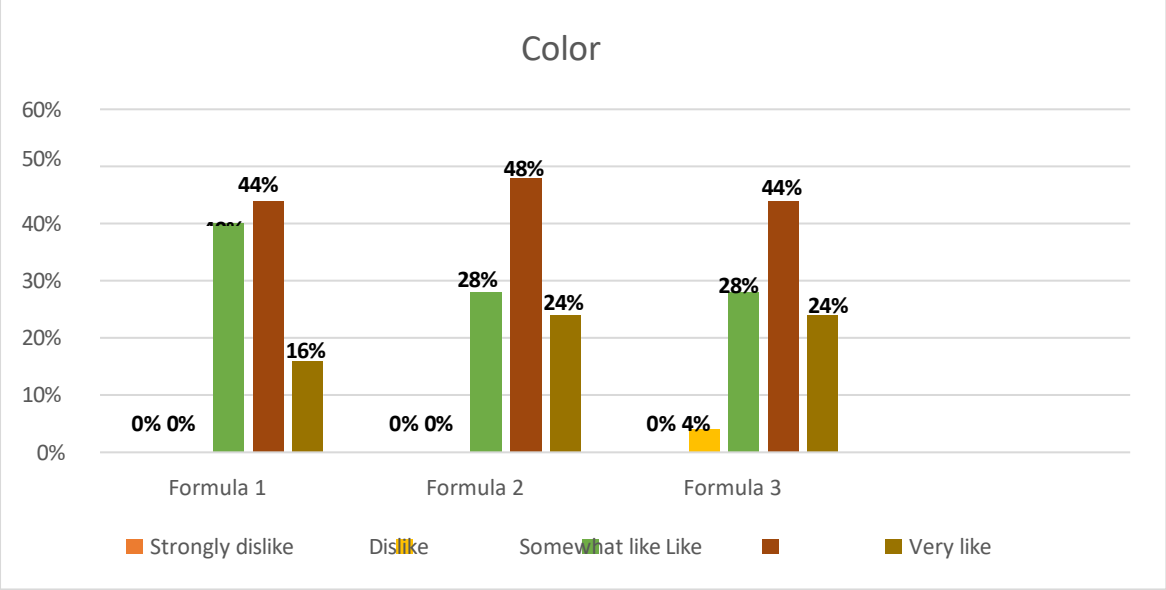

Figure 1. Organoleptic Test Results Based on Color on Banana Kepok Flour Cookies and Red Bean Flour

Based on the Friedman test, the results show T count< F table (1.37 < 3.19), which means that there is no effect of the addition of banana kepok flour and red bean flour on the color acceptability of *cookies* as a snack for school children.

Aroma

The results of the organoleptic test for level of liking based on aroma in *cookies* made from kepok banana flour and red bean flour can be seen in the following figure.

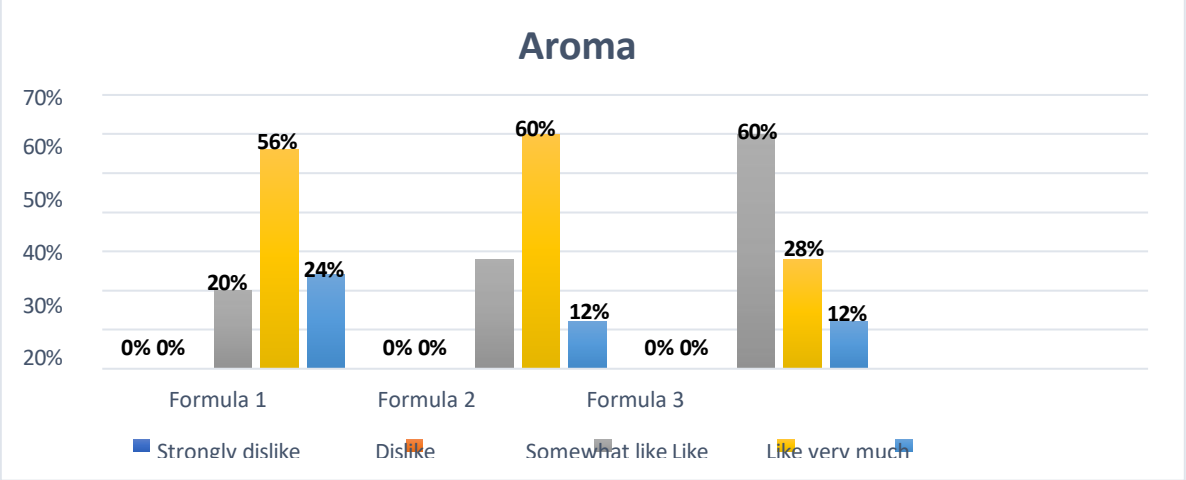

Figure 2. Organoleptic Test Results Based on Aroma on Banana Kepok Flour Cookies and Red Bean Flour

Based on the Friedman test shows the results of T count> F table (4.16 > 3.19), which means there is an effect of the addition of kepok banana flour and red bean flour on the acceptability of the aroma of *cookies* as a snack for school children.

Taste

The results of the organoleptic test for level of liking based on taste in *cookies* made from kepok banana flour and red bean flour can be seen in the following figure.

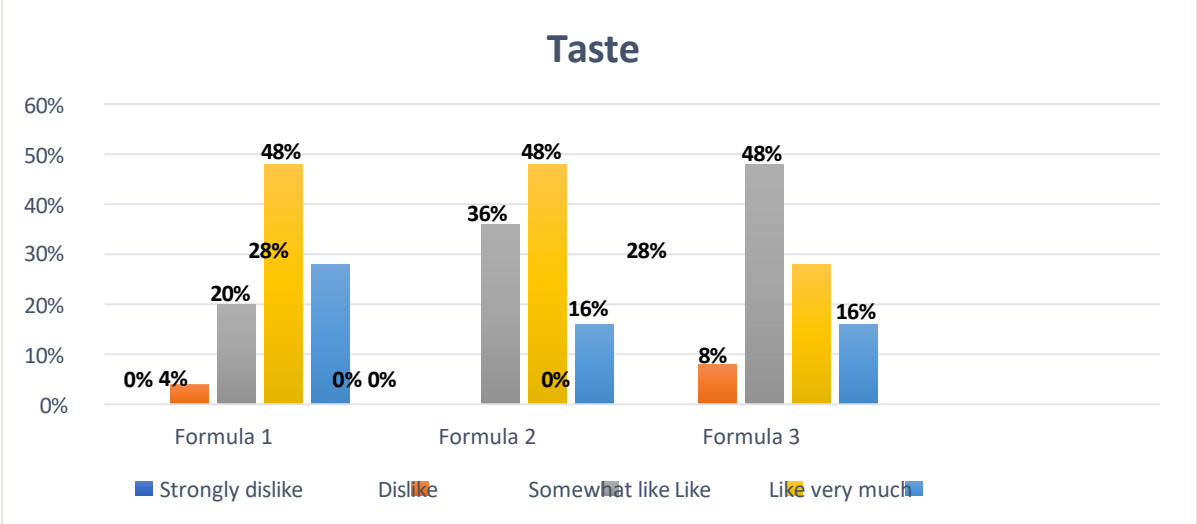

Figure 3. Organoleptic Test Results Based on Taste in Banana Kepok Flour Cookies and Red Bean Flour

Based on the Friedman test, the results show T count< F table (2.8 < 3.19), which means that there is no effect of the addition of kepok banana flour and red bean flour on the acceptability of *cookies* as a snack for school children.

Texture

The results of the organoleptic test for level of liking based on texture in *cookies* made from kepok banana flour and red bean flour can be seen in the following figure.

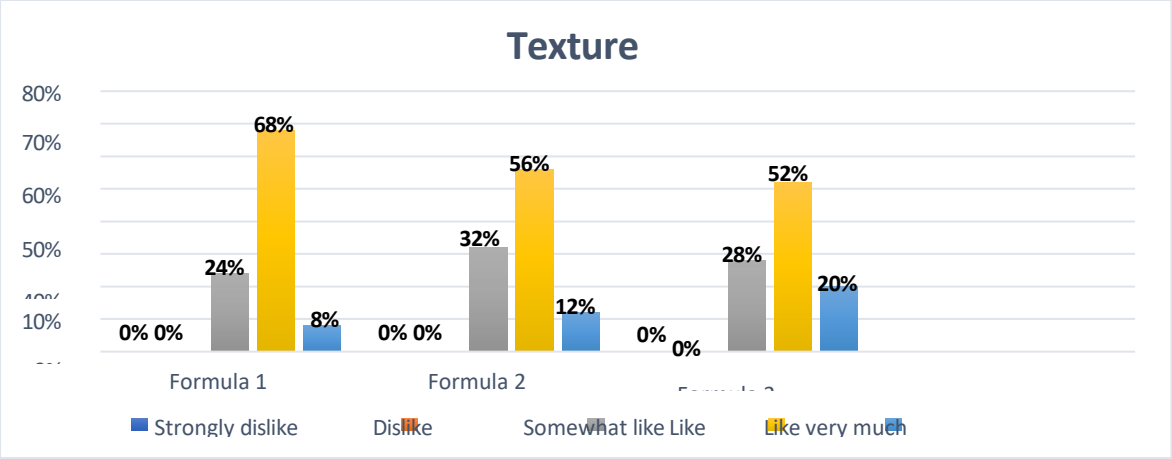

Figure 4. Organoleptic test results based on texture in banana kepok flour cookies and red bean flour.

Based on the Friedman test shows the results of T count< F table (0.28< 3.19), which means there is no effect of the addition of banana kepok flour and red bean flour on the acceptability of the texture of *cookies* as a snack for school children.

Acceptability Test

The results of the organoleptic test of three formulas on *cookie* formulations using kepok banana flour and red bean flour with different concentrations. Assessment by showing the rank of the panelist criteria which includes color, aroma, taste, and texture which can be seen in the following table.

Table 1. Acceptability Test Results Based on the Number of Ranks According to Color, Aroma, Taste, Texture on Banana Kepok Flour *Cookies* and Red Bean Flour as a Snack Food for School Children.

Formula Type	Color	Aroma	Taste	Texture	Total
F1	46	58	56.5	49	209.5
F2	54.5	51	50.5	47	203
F3	49.5	41	43	52	185.5

From the table 1, it can be seen that based on the number of levels of liking in each treatment based on the color, aroma, taste, and texture of the cookies as a whole, the highest result is obtained in the F1 treatment, which is 209.5, which means that this treatment is the most preferred by panelists.

Table 2. Results of Proximate Analysis of Cookies with kepok banana flour and red bean flour.

Sample	Carbs	Protein	Fat	Fiber	Ash Content	Water Content
F1	47.8%	9.34%	29.2%	1.37%	1.81%	4.76%
F2	45.5%	11.4%	25.7%	1.91%	1.90%	4.63%
F3	44.2%	12.8%	31%	1.86%	2.04%	4.43%
SNI Cookies	Min.70%	Min.9%	Min.9.5%	Max.0.5%	Max. 1.5%	Max. 5%

The proximate results of banana kepok flour and red bean flour cookies that have the

highest percentage of carbohydrate content are in formula 1 at 47.8%, the highest protein content is in formula 3 at 12.8%, the highest fat content is in formula 3 at 31%, while the highest fiber content is in formula 2 at 1.91%. The test results of ash content and water content in banana kepok flour *cookies* and red bean flour in table 8 show the lowest ash content in formula 1 at 1.81%, while the lowest water content in *cookies* is in formula 3 at 4.43%.

DISCUSSION

Organoleptic Test

Organoleptic tests on a product need to be carried out to assess how much consumer interest in the resulting product. Panelists will give a special assessment of the color, aroma, taste and texture of *cookies* using a hedonic scale. Color is the first sensory that can be seen directly by panelists. Determination of the quality of food ingredients generally depends on the color it has, a color that does not deviate from the color that should give the impression of a separate assessment by the panelist. The results of the organoleptic test on the color of *cookies* made from kepok banana flour and red bean flour showed that the panelists' acceptance of the selected color of the three formulas obtained the highest percentage in treatment F2 with the criteria of liking 48% or 12 people who were liked by the panelists. However, based on the Friedman test conducted, the color of the three cookie treatments did not affect the color of the kepok banana flour cookies and red beans by showing that T count < F table (1.37 < 3.19). The brown color in the F2 treatment formulation produced is influenced by the type of flour, namely banana kepok flour and brownish red bean flour. This is because the treatment is both balanced between banana kepok flour and red bean flour, which is as much as 50%. The color of cookies made from banana flour and red bean flour is formed due to the presence of browning reactions, namely the Maillard reaction and the caramelization reaction. addition, brown pigments can be thought to experience real color changes in the color of foodstuffs, which generally occur in foodstuffs that are heated (Latifah, 2019).

Aroma is one of the parameters in testing sensory properties (organoleptic) using the sense of smell. Aroma is acceptable if the material produced has a specific aroma (Lamusu, 2018). Aroma is the smell of food products, the smell itself is a response when volatile compounds from a food enter the nasal cavity and are perceived by the olfactory system (Tarwendah, 2017). The results of the organoleptic test on the aroma of banana kepok flour *cookies* and red bean flour show that the panelists' acceptance of the selected aroma of the three formulas obtained the highest percentage in treatment F2 with the criteria like 60% or 15 people who were liked by the panelists. However, based on the Friedman test conducted, the aroma in the three *cookie* treatments affects the aroma of kepok banana flour cookies and red beans by showing that T count> F table (4.16 > 3.19). The aroma produced by banana flour substitution cookies with various concentrations is influenced by the distinctive aroma of caramel possessed by banana flour and red beans. Red beans contain water, so if exposed to heat it will evaporate and will produce a distinctive aroma of red beans. According to Kaltari, Setyowati, & Dewi, (2016) the aroma of a product can also be influenced by margarine, eggs and milk in the product ingredients.

Taste is something that is received by the tongue. In sensing human taste, there are four main tastes, namely sweet, bitter, sour and salty and there are additional responses when modified (Lamusu, 2018). The results of the organoleptic test on the taste of banana kepok flour *cookies* and red bean flour showed that the panelists' acceptance of the selected taste of the three formulas obtained the highest percentage in the F1 treatment with the criteria like 48% or 12 people who were liked by the panelists and F2 with the criteria like 48% or 12 people who were liked by the panelists. However, based on the Friedman test

conducted, the taste of the three cookie treatments did not affect the taste of kepok banana flour *cookies* and red beans by showing that T count< F table (2.8 < 3.19). According to Rahmadani & Holinesti (2021), the addition of sugar, margarine, and egg yolks can improve the taste of cookies, because sugar tends to give flavor to cookies because it caramelizes during baking, baking can give cookies a distinctive taste.

Texture is a sense that is associated with touch. Sometimes texture is also considered as important as smell, taste and aroma as it affects the image of the food. Texture is most important in soft and crunchy foods. The most common characteristics are hardness, cohesiveness, and water content (Lamusu, 2018). The results of the organoleptic test on the texture of banana kepok flour *cookies* and red bean flour showed that the panelists' acceptance of the selected texture of the three formulas obtained the highest percentage in the F1 treatment with 68% or 17 people who liked the panelists. However, based on Friedman test conducted, the texture of the three cookie treatments did not affect the texture of kepok banana flour cookies and red beans by showing that T count < T table (0.28 < 3.19). The higher the banana flour substitution, the crispier the cookies. This is because the higher the substitution of banana flour causes crispness in the cookies due to the water content contained in banana flour being lower than wheat flour. The higher level of banana flour substitution makes the texture value of the cookies crispier. This is due to the fiber content. Fiber is one of the food ingredients formed from hard plant cell walls that affect the crispness of cookies. After the organoleptic test, researchers will conduct an overall acceptability test.

Acceptability Test

Acceptability is a person's attitude in accepting something or approving formulas and comparisons in a processed product, item or object. Aspects of consumer acceptance that will be tested in this study include aspects of color, aroma, taste, and texture. Based on the results of the organoleptic test conducted, panelists preferred banana kepok flour cookies and red bean flour with a concentration of 75%: 25% or formula 1. Cookies in formula 1 have an aroma that panelists like. In this study, the acceptability of color, taste, and texture in cookies with kepok banana flour and red bean flour with concentrations of the three formulas did not have a significant effect. According to the researcher, too much concentration of kepok banana flour in formula 1 makes the resulting flavor more typical of bananas so that many panelists like it.

Nutrient Analysis

Proximate analysis is an analysis conducted to determine the nutritional content of food based on needs and does not require sophisticated technology in its testing. Proximate analysis has the advantage of knowing the chemical composition of food ingredients, does not require sophisticated technology, produces outline analysis results and can provide a general assessment of the utilization of a food ingredient. In this study, proximate analysis was carried out including carbohydrates, protein, fat, fiber content, ash content, water content

Carbohydrates are one of the nutrients that play an important role in nature because they are the main source of energy for humans. In addition, carbohydrates act as a sweetener in food, save the use of protein, as a regulator of fat metabolism and help in the excretion of feces (Almatsier 2010) . Banana kepok flour *cookies* and red bean flour in formula 1 have a carbohydrate content of 47.8%, formula 2 has a content of 45.5% and formula 3 has a content of 44.2%, from the SNI value of carbohydrates in *cookies* at least 70%, which means that the carbohydrate value in formula 1, formula 2 and formula 3 is below the SNI value limit. According to the researchers, this is because the composition of carbohydrate source materials in *cookies* is not too much, while kepok banana flour and red bean flour do not contribute too much carbohydrate content. The carbohydrate content of

cookies is determined by the by difference method. Carbohydrate levels calculated by difference are influenced by other nutritional components, the lower the other nutritional components, the higher the carbohydrate content. Vice versa, the higher the other nutritional components the lower the carbohydrate content. Nutritional components that affect the amount of carbohydrate content include protein, fat, water and ash content.

Protein is the largest component in the body after water and has a unique function that cannot be replaced by other nutrients, namely building and maintaining body cells. Banana kepok flour cookies and red bean flour in formula 1 have a protein content of 9.34%, formula 2 has a content of 11.4% and formula 3 has a content 12.8%, from the SNI value of protein in cookies of at least 9%, which means that the protein value in formula 1, formula 2 and formula 3 meets the protein standard in cookies. Based on the PMT-AS Program recommendation of 5-7 grams of protein for each feeding. With the protein content in banana kepok flour cookies and red bean flour, the cookies can be used as an alternative snack even though they have a relatively high protein content.

Fat is a high energy substance. 1 gram of fat can provide 9 kcal of energy. This amount is certainly higher than the energy from carbohydrates and protein which amounts to 4 kcal. Fat serves as a source of flavor and gives a soft texture to a product. From the results of the analysis conducted, banana kepok flour *cookies* and red bean flour in formula 1 have a fat content of 29.2%, formula 2 has a content of 25.7% and formula 3 has a content of 31%, from the SNI value of fat in *cookies of* at least 9.5%, which means that the fat value in formula 1, formula 2 and formula 3 meets the standard of fat in *cookies.* High fat content can be caused by the composition of other ingredients outside the raw materials that cause an increase in fat content in banana kepok flour *cookies* and red bean flour, namely margarine, egg yolk and milk powder.

Dietary fiber, also known as dietary , is part of plants that can be consumed and is composed of carbohydrates that have resistance to digestion and absorption in the human small intestine and undergo partial or complete fermentation in the large intestine (Santoso, 2011). From the results of the analysis conducted, banana kepok flour *cookies* and red bean flour in formula 1 have a fiber content of .37%, formula 2 has a content of 1.91% and formula 3 has a content of 1.86%, from the SNI value of fiber in *cookies a* maximum of 0.5%, which means that the fiber value in formula 1, formula 2 and formula 3 meets the fiber standard in *cookies.* The fiber content in banana flour is 5.3 grams in 100 grams, so the higher the concentration of banana flour given, the higher the fiber content.

Next, the ash content of the cookies was analyzed, from the results of the analysis conducted, the banana kepok flour and red bean flour cookies in formula 1 had an ash content of 1.81%, formula 2 had a content of 1.90% and formula 3 had a content of 2.04%, from the SNI value of ash content in *cookies* a maximum of 1.5%, which means that the ash content value in formula 1, formula 2 and formula 3 has not met the standard ash content in *cookies.* The ash content produced by banana kepok flour and red bean flour *cookies* is quite high, which means that the more the addition of banana kepok flour and red bean flour, the higher the ash content of the cookie products produced and affects the stability level of the cookies

Water content is the amount of water contained in the material expressed in percent. Water is an important component in food because water can affect the appearance, texture, and taste of food (Hutomo, Swastawati, & Rianingsih, 2015). From the results of the analysis conducted, kepok banana flour *cookies* and red bean flour in formula 1 have a moisture content of 4.76%, formula 2 has a content of 4.63% and formula 3 has a content of 4.43%, from the SNI value of moisture content in *cookies a* maximum of 5%, which means that the value of moisture content in formula 1, formula 2 and formula 3 has not met the standard of moisture content in *cookies.* The baking process is able to evaporate and reduce the amount of water content in the *cookie* dough. In addition, low water content is also expected to

increase the shelf life of a product so that kepok banana flour *cookies* and red bean flour become more durable to store.

CONCLUSION

Based on the results of the study, it is known that there is no effect on the acceptability of color, taste, and texture of kepok banana flour cookies and red bean flour as a school snack. While on the aroma and nutritional standards of banana kepok flour cookies and red bean flour there is an effect of acceptability.

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