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Analysis of physical quality and proximate test of cookies with substitution of belor flour (eel and moringa leaves) as snacks

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Abstract. Background: Snacks are foods that are consumed between main meals. One of the foods that is very famous and has the potential to be used as a snack that is rich in nutrients is pastries or cookies. In this study, cookies made from eel and moringa leaves, which are food plants and are high in nutrients, grow fast, are resistant to extreme hot conditions, come from tropical and subtropical regions. Purpose: to analyze the physical quality and nutritional content of cookies by substituting belor flour (eel and moringa leaves). Eels are animal protein which is higher than other fish. Eels live in shallow and muddy waters, lakes with a depth of less than 3m, with a silt content of 80%. Methods: This study was an experimental study with 3 treatments. Results: Physical tests include color, aroma, texture, taste. Proximate test: ash content 7.44%, moisture content 2.89%, carbohydrates 68.6%, fat 0.14%, crude fiber 6.63%, protein 14.3%. Conclusion: The most preferred cookies are eel and moringa substitutions, each as much as 5 gr. Moringa plants really need to be cultivated because they can be used as a basic ingredient for making other food products.

1. Introduction

The need for nutritional intake is the most important thing for humans to meet their daily needs. The food that humans need is very diverse. Currently there are many nutritious and quality food products that can be accepted by various groups of people [1]. The cookies are made from eel and moringa leaves which are food plants and highly nutritious, plants that can grow quickly, live long, flower all year round, and are resistant to extreme hot conditions. This plant comes from tropical and subtropical regions [2]. This plant is nicknamed by the name of food and medicinal plants in Indonesia. One form of food intake that is often consumed by people in their spare time is snacks.

Interludes are snacks that are eaten before the main meal. This snack that is liked by all groups, especially toddlers and school children, is generally consumed around 2 to 3 hours of main meal time, which is from 10 am to 4 pm [3].

Foods that are very famous and have the potential to be used as snacks that are rich in nutrients are pastries [4]. Cookies are savory food products made by a mixed roasting process made from wheat flour, fat, where generally cookies have a small size and generally have a sweet taste and crunchy texture. The purpose of making these pastries is to add nutritional value and variety that toddlers and school children really like.

The use of local flour as an alternative for various industries is due to the high potential of local food raw materials to replace wheat flour, so that its use can be studied as food diversification and increasing



the desire of producers to innovate and innovate. utilise. local or non-wheat flour [5]. Local food ingredients that can be used and used as standard local raw materials and non-wheat flour are eels and Moringa leaves.

Eels live in shallow and muddy waters, river banks, lakes with a depth of less than 3m. Eel is a fishery product that has high economic value. Eels are already known to the public and have been used as food, but not many people like animals that are similar to this snake. Therefore, people tend to disgust / do not want to consume it. Actually, eel is an animal protein that is higher than other fish and contains nutrients needed by the body, such as protein, vitamins, calories, fat, and phosphorus [6].

The protein content in eel has a savory and delicious taste. The protein contained in the eel has a function for growth, as a substitute for damaged body cells and also as an antibody [7].

Eel flour (*Monopterus albus* Zuiew) is very beneficial for health because of its high nutritional content [8]. 100 g of eel contains 303 Cal; 27 g of fat; with omega-3 unsaturated fatty acid content ranging from 4.48 g to 11.80 g; 18.4 g of protein; with types of amino acids including leucine, lysine, aspartic acid, glutamic acid, calcium, zinc, iron, and vitamin A [9]. Eels are one of the native Indonesian fish, because eels contain essential nutrients for growth in stunted children [10].

Moringa leaves are a food plant and are high in nutrients, plants that can grow quickly, have a long life, flower all year round, and are resistant to extreme heat conditions. This plant comes from tropical and subtropical regions [11]. This plant is nicknamed by the name of food and medicinal plants in Indonesia. Moringa leaf plants are fresh plants that rot quickly. Utilization of Moringa leaves into flour can extend the shelf life of Moringa leaves. Moringa leaf flour is used as a substitute for food ingredients [12]. Moringa leaves are rich in iron, protein, carotenoids, B carotene, vitamin C and ascorbic acid. In terms of highly digestible nutrition, consumption of Moringa leaves is recommended in some underdeveloped countries around the world, Moringa leaves can be consumed fresh or roasted and preserved as dry powder [13].

Moringa leaves are one of Indonesia's local foods which have abundant nutritional content. Moringa can be used as a nutritional supplement for pregnant women to reduce the incidence of anemia and stunting in children [14]. Nutrition for the growth and development of children, especially those who are still in their infancy, researchers conducted research to find out whether Moringa leaves are effective as snacks for children with developmental delays [15]. Its high nutritional content makes moringa useful for health and overcome nutritional deficiencies.

According to Krisnadi's research, the chemical quality of Moringa leaves (dried, mashed) can be beneficial for improving nutrition, namely they contain 9 times the protein equivalent to yogurt, 15 times the potassium in bananas, and 17 times the iron in spinach. In addition, Moringa leaves are easy to get, the ingredients are cheap, very easy to plant and grow fast [16].

Diseases caused by unsuitable food can attack all ages, such as the elderly or young children or toddlers. a modification that combines eel flour and moringa leaves to increase the nutritional content of these snacks. Adding eel flour and moringa leaves improves the nutritional composition of the cookies, and improves their bioavailability, thus making them a functional food [17].

Belor cookies is a food source of protein. This product is processed from eel and Moringa leaves which are formulated to produce a high protein product with a high content of essential and non-essential amino acids [18]. Stunted children have fewer amino acids in their blood than non-stunting children. Polyunsaturated Fatty Acid (PUFA) found in belor cake can be used for the process of tissue growth and immune function. Compared to children who are not malnourished, PUFA levels are higher [19].

2. Methods

The type of research conducted was an experiment with 3 (three) treatments and 2 (two) repetitions on measuring the physical quality and nutritional content of cookies with substitutions of eel flour and moringa as a snack.

The ingredients for making cookies are: margarine, powdered sugar, salt and baking powder, stir until a smooth and white dough is obtained. Next, add the egg yolks and stir until a homogeneous dough is formed, then add milk powder and flour, then knead until a smooth and elastic dough is obtained.

After that, the dough is formed and printed. The dough that has been formed is then smeared with a little margarine on the surface. The basic ingredients that have been mixed are then put into the oven with a temperature of 150°C for 20 minutes, with modifications with 3 treatments, namely:

A: 70% wheat; 15% eel; 15% moringa

B: 80% wheat; 10% eel; 10% moringa

C: 90% wheat; 5% eel; 5% moringa

Approval of the Research Ethics Commission on conducting research in the health sector number 01.1121/KEPK/Poltekkes Kemenkes Medan.

3. Results and discussion

3.1 Physical quality

3.1.1. Color. Color is an important criterion that can affect a person based on the initial perception received from his preference for what the product displays. Cookies are very nutritious, tasty and hold an excellent shape [20]. Even if a food is considered tasty but has an unattractive color or seems to deviate from its original color, it should not be eaten.

Panelist descriptive assessment of color between 2.9–3.67. In this study, in terms of color, treatment C was preferred, namely light green with brown spots from eel flour. While treatments A and B both got a dark green color. The more the addition of moringa greatly affects the color of the cookies, which is dark green.

3.1.2. Texture. Texture is an indicator that is directly observed by the panelist, because texture is a direct appearance that can be observed through the panelist's five senses, the texture indicator is divided into 3, namely texture seen from softness, pore cross-section and elasticity [21]. Food texture is one of the things that influence a person to like a food.

Panelists' descriptive assessment of texture between 2.95–3.37. In this study the preferred treatment for texture is treatment C, namely with soft and soft, in treatment A the texture is dense and rough, in treatment B with a solid and soft texture.

The texture is denser and coarser because the use of eel and moringa flour is increasing, whereas in a soft texture the use of eel flour and moringa is less, namely only 5 grams [22]. This was also caused by the use of eel flour and moringa which resulted in a lower water content of 7.44%, so that the texture of the cookies dough became dense and coarse as in treatment A, this was also strongly influenced by the amount of protein contained in the cookies because the more addition of protein causes the texture of the cookies to become dense and coarse.

3.1.3. Flavor. Taste is the most important part of consumer judgment. Several factors can affect taste, namely nutrient content, air, concentration and influence with other flavors [23]. If the prepared food stimulates the nerves through the sense of sight, it can make the taste buds taste the food, then the next process, the taste of the food is determined by the stimulation of the sense of smell and taste.

The panelists' descriptive assessment of taste was between 2.47–3.57. In this study the preferred treatment for taste is treatment C, namely the taste is sweet and delicious because the use of eel flour and moringa leaves is less, whereas in treatment A with a bitter taste this is probably due to the use of more moringa flour causing a bitter taste, while treatment B is slightly bitter. Moringa flour, the more Moringa flour is added, the more bitter the taste of the cake will be. The sweet and delicious taste in treatment A was caused by the slightly less moringa leaf flour which was also influenced by the addition of other additives in making cookies such as sugar, salt and margarine.

3.1.4. Scent. Scent is a way to get delicacy in the food consumed. Scent testing really needs to be done because the smell of food can determine the delicacy of a food and can also determine whether it is acceptable or not.

Panelists' descriptive assessment of scent is between 2.9–3.5. In this study the preferred treatment for scent was treatment C, namely Moringa-scented and fragrant, possibly from the addition of other additives such as sugar, baked margarine, treatments A and B, adding more eel flour than treatment C. The panelists didn't like it.

3.2 Belor cookies proximate test results. The nutritional value of a food product is a factor that is vulnerable to changes in previous treatment. during and after processing [24]. Generally, during the processing process, nutritional damage occurs gradually in foodstuffs, for example, protein undergoes a process of damage or denaturation. However, processing and adding other food ingredients can improve the aroma and taste of food. Proximate test is a test in which product quality is measured objectively based on the chemical content contained in the product.

Table 1. Nutritional content of belor cookies.

No.	Composition	Belor Cookies Nutrition	Unit
1.	Ash content	2.89	%
2.	Water content	7.44	%
3.	Carbohydrate	68.6	Gr
4.	Total fat	0.14	Gr
5.	Coarse fiber	6.63	%
6.	Proteins	14.3	Gr

Chemical quality analysis is carried out to determine the amount of nutrients in certain food ingredients, such as ash content, water, carbohydrates, total fat, crude fiber, protein. The nutritional content of the product is very necessary to get the amount of energy contained in the product, it is known that the nutritional content of Belor Cookies is ash content (2.89%), water content (7.44%), carbohydrates (68.6 g), total fat (0.14 g), crude fiber (6.63%), and Protein (14,3). These cookies can be used as snacks for stunting toddlers

3.2.1. Ash content. rate. Ash is the rest of the ashes like the minerals found in the food. Based on the data generated by the researchers, the ash content of cookies is 2.89%, while the quality of cookies according to SNI.012973-2011 is a maximum of 1.5%. In the opinion that the more ash content in the cookie product, the better, because the ash content will affect the level of stability of cookies.

3.2.2. Water content. Rate. Water is important in the manufacture of food because the water content greatly affects the shape and taste of food. The water content in the product greatly affects the acceptability, freshness and level of food security [25]. The data obtained by researchers for testing the moisture content of cookies is 2.89%. Based on the quality requirements of Cookies according to SNI.01-29732011 is a maximum of 5% for Belor Cookies. Research states that the amount of water content in Cookies products will affect the texture and taste.

3.2.3. Carbohydrate. Carbohydrates are an energy producer, but they are very necessary to get food components, both in terms of taste, color, texture [26]. The amount of carbohydrates in belor cookies is 68.6% based on the Cookies quality requirements according to SNI.01-2973-2011 at least 70% [27]. According to the calculated carbohydrate content, Distinctive is determined by the nutritional content, the lower the nutritional component, the higher the carbohydrate yield. Vice versa. The nutritional part greatly affects the amount of carbohydrates such as protein, fat, fat, and ash content.

3.2.4. Total fat. Fat is an ester compound of glycerol and fatty acids. Fat as a source of calories for the body can contribute more calories, namely 9 kcal/g compared to carbohydrates and protein. Fat can give it a mild taste and texture. The results of research that has been done on cookies fat content of 0.14 gr.

3.2.5. *Coarse fiber*. Dietary fiber is not the same as crude fiber. Crude fiber is a compound that can be analyzed in the laboratory, namely a compound that cannot be hydrolyzed by acids or bases. In the Food Composition List Book, what is listed is crude fiber nutrition, not food fiber. However, the content of dietary fiber can be used as an index of dietary fiber content, because generally there are as many as 0.2-0.5 parts of total dietary fiber. The data obtained in this study is that the fat content in cookies is 6.63% based on the cookie quality requirements according to SNI.01-2973-2011 at least 0.5%. The large amount of crude fiber is probably due to the use of eel and Moringa leaves which affect the increase in fiber.

3.2.6. *Proteins*. Protein as food is very important to consume [28]. The protein content in Belor Cookies is 14.3% based on the quality requirements of cookies according to SNI.01-2973-2011, which is at least 9% [27]. The amount of protein in belor cookies is due to the addition of eel flour which contributes more protein and affects the protein content of cookies.

3.2.7. *Energy*. The amount of energy can be calculated by changing the chemical content (carbohydrate content, protein content, fat content with the conversion factor of each ingredient. Carbohydrates and proteins each have a conversion factor of 4 kcal/gr, while fat has a conversion factor of 9 Kcal/gr. Results research conducted on cookies the amount of energy obtained is 332.86. Energy cookies obtained adjusted to the quality of cookies according to SNI.01-2973-2011 is a minimum of 400 calories/100 g [27].

4. Conclusion

The most preferred taro cookies in terms of color, texture, taste and aroma are treatment C, namely cookies with the addition of eel and moringa as much as 5 grams and has an ash content of 2.89%, water content of 7.44%, carbohydrates 68.6%, fat total 0.14%, crude fiber 6.63%, protein 14.3%. Belor biscuits can be used as a snack because of their high nutritional content. Further research needs to be done by cultivating moringa plants because they are very good as ingredients for making various high-nutrition products.

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