

Nutritional Quality of Bread from Mixture of Arrowroot Flour (*Marantha arundinacea L.*) and Wheat Flour

Etti Sudaryati¹, Ernawati Nasution², Fitri Ardiani³
 Departement of Public Health Nutrition, Faculty of Public Health
 University of Sumatera Utara, Indonesia
 etysudaryati@gmail.com

Abstrak --- *Marantha arundinacea L.* or arrowroot is a tropical plant that can be taken tuber as processed food product. This plant bulbs can be made flour to produce food, such as fresh bread done in this study. The research was conducted in 2017 at the Nutrition Lab of the Faculty of Public Health of the University of North Sumatra for making of fresh bread and *Balai Penelitian Standardisasi Industri (Baristan) Medan* for the examination of nutritional quality, from the production of bread from flour bulbs *Marantha arundinacea L.* and wheat flour. Nutritional analysis performed include moisture content, ash content, fat content, carbohydrate levels, protein content. The results found that the quality of nutrition examined varied. The addition of more arrowroot flour in the production of fresh bread will increase the levels of crude fiber, and carbohydrates. It is expected that arrowroot flour can be used as a mixture in the manufacture of food such as fresh bread added to the ingredients of about 10-30%, and arrowroot flour can exchange of wheat flour commonly used in the production of bread.

Keyword --- Arrowroot,; Fresh Bread; Nutritional Quality

I. INTRODUCTION

Marantha arundinacea L. is a local plant growing in the tropics including Indonesia. Local name in Indonesia is tubers 'garut', it's name around the world is arrowroot. This plant was used the rhizome and processed into flour or starch that can be used as the raw material for processed food. Flour or starch from a rhizome these plants as sources of carbohydrate [1]. Flour estimated from arrowroot can be used as of ingredients mixed with other ingredients used to make food as cookies, biscuit, cakes, dessert, and others [1,2,3]. Carbohydrate as a food source is food consumed more than another food source in Indonesia. The carbohydrates from tuber arrowroot is 85.2% and 355ccal energy [1]. Carbohydrate and protein from the rhizome in 100 g material is 7200mg and 1200mg [4]. Content of ashes 2.5% and water 25,1 % [5].

Flour from a rhizome arrowroot can be combined into other food that have been reviewed in the Philippine, on food called 'puto seko' and snack by combination flour of arrowroot into food is 50%, 75% and 100%. Other material get mixed with

flour of arrowroot is white flour and flour versatile, the results food that uses 100% flour of arrowroot more favored or given attribute sensory better than food with its original material [6].

Flour or starch that results from a rhizome of arrowroot fresh was carried out around 13% or 390 gram of flour or starch arid from 3 kg fresh rhizome [3]. The manufacture of from a rhizome become starch or flour to increase the size of economic value, and in Indonesia there are flour of a rhizome arrowroot in the market but have not been widely known in various regions. Except the rhizome, the leaves from this plant for anti diarrhea [17]. The other benefit is to give the effect of better health, and this benefit have been put in order to be research for the rats, supplement from the arrowroot pollen in food increase the size of the bacteria and the source is of the chemical properties of the digestive [8].

In Indonesia, many studies for the arrowroot in local contexts at some universities in the last few years. It is expected the arrowroot can be food exchange of wheat flour much used as raw materials in the manufacture of a variety of food. Food based on the results of research made or modified with arrowroot flour is much liked by people. One of research in numerous local flour arrowroot Indonesia stated that can be used as a mix in making cookies but still used 25 % flour that cookies produced is not hard [9].

The old rhizomes of arrowroot many containing fibers and more taken starch to make flour arrowroot as a source of carbohydrates. In addition, starch of arrowroot can be mixed with cassava and sweet potato for making gelatin.

The addition of arrowroot starch to cassava and sweet potato flour proved to improve the stability of the gel and can be used inmodulate the nature of a thickener starch in commercial products [10].

Except that, food can be made from flour arrowroot is bread. Bread is a popular food in many countries. Variety of making bread today more developed in technology food and culinary. Raw materials in making bread are generally wheat flour made from wheat, but wheat not yet cultivated in Indonesia. Because of that, through research is expected wheat flour can substituted or get mixed with flour arrowroot already cultivated in Indonesia.

The study of bread has been widely practiced, but the study of bread from arrowroot flour and wheat flour has not been done. One study, the production of bread from a mixture of cassava starch and soy flour, produce the bread more hard than bread from wheat flour. Content of bread's water of flour of cassava and soybean flour greater than the bread from wheat flour. Nutrition from the bread of cassava flour and soybean flour greater than bread of white flour [11]. Other studied said that proteins bread fresh and whole meal to exert an influence upon the rate of the growth of a rat [12]. Another study said that the more mixture of starch arrowroot in making the bread is increasing the density and hard of bread[13].

The study of several previous studies this indicates that arrowroot has the potential to be food for functional in that it has value the benefits that bad for the health. Through this study researchers want to point out that arrowroot can be used as a mix with wheat flour in the manufacture of bread, and they had good nutrition. Score of nutrition that have been analyzed in this research is a carbohydrate, proteins and fats. The level of ashes, the water level and coarse fiber also analyzed. The benefits that it is hoped that through this research so that arrowroot which is widely known in Indonesia or in the other tropical country, known the benefits and cultivated as starch producer and flour, to be further processed into a wide variety of foods.

II. METHODS

This research using bread to analysis bread as a unit, and it is a experiments research with three treatments. Treatment 1 (P1) using mixture of 10 % flour arrowroot and 90 % wheat flour, treatment 2 (P2) using a mixture of 20% flour arrowroot, and treatment III (P3) use 30% and flour arrowroot and 70% wheat flour. Material used to making bread has taken from the good quality, and can be seen in the following table 1.

TABLE 1 TYPE AND MEASURE OF INGREDIENTS IN TREATMENT

Ingredients	Treatment's Group		
	P1 (10% arrowroot)	P2 (20% arrowroot)	P3 (30% arrowroot)
Arrowroot flour	50g	100g	150g
Wheat Flour	450g	400g	350g
Yeast	7.5g	7.5g	7.5g
Sugar	40g	40g	40g
Milk Powder	20g	20g	20g
Water	300ml	300ml	300ml
Margarine	250g	250g	250g
Salt	7.5g	7.5g	7.5g

The determination of material for treatment in research this before to get a mix of flour arrowroot and wheat flour. Prescription basic we will try to treatment obtained from a collection of a prescription for bread [14], and from this recipe modified to make the exchange wheat flour with flour arrowroot. a prescription for treatment done from discharging arrowroot in exchange 50% with wheat flour, the results show performance bread not maximal, bread less propagate. Next

reduced to within 10 % exchange, and in exchange 40% will weak performance.

On the 30% exchange according to the researcher the results of the performance acceptable, and used as the treatment of flour substitution arrowroot maximum limit. In addition, the consideration of mixing of arrowroot flour and wheat flour is also based on the results of previous research.

The equipment used in the research is still in good condition and hygienic. Equipment used to making the bread : mixer, as a tool to mixel all the ingredients, measure to sizing all the ingredients, bread mold , the oven to bake the bread.

Arrowroot flour that is used is a ready flour have been made from Yogyakarta, and wheat flour purchased from a market in Medan. Next of making bread from arrowroot flour and wheat flour as follows:

1. All materials used are wheat flour, arrowroot flour, yeast, sugar and milk powder, stirred evenly.
2. After all mixed, add ice water ice little by little then knead until mixed with the hand. Ice water use to make the temperature of the batter does not increased with the temperature of the body when the dough mixed with the hand.
3. Put margarine and salt it while continuing to mixed until the dough become elastic. Then let the dough until 10 minutes.
4. After that, the dough ground and will be rolled up, and do it two times.
5. Next, the dough placed within a loaves or mold bread a sandwich (closed loaves) the size of 26x12x10 cm and smeared with margarine.
6. A mold with the dough will not close with tight, but let 1/4 mold/loaves not close.
7. Next keep the dough in 50-75 minutes until the dough expands or as high as the cover of mold. High the dough does not until the covering of loaves.
8. Loaves and the dough put inside the oven for 30-45 minutes with 190°C.

III. RESULTS

The result of making bread eat fresh fish and extract with the ratio of to 10 % , 20 % and 30 % flour of arrowroot shows that the performance of fresh bread open. The addition of arrowroot flour as many as 40 % produce bread slowed ever so slightly of its development , the same thing applies to the mixing of the flour arrowroot 50 % the development of bread playing less and less of, and also the bread down also reflected by the high or easily fall down in its place and is ruptured.

The nutrition quality analysis of the bread from a mixture of arrowroot flour (*Marantha arundinacea L.*) and wheat flour. Indicating the result as shown in table 2, 3 and 4 about content macro nutrient substance on a mixture of 10% arrowroot flour consisting of carbohydrates, proteins and fats in a unit % (w/w) produce carbohydrates 39.6% (w/w), protein 7.13% (w/w) and fat 8.28% (w/w).

TABLE 2. TREATMENT I (P1) USE MIXTURE OF 10% ARROWROOT FLOUR AND 90% WHEAT FLOUR

Macro Nutrients	Unit	Results
Carbohydrate	% (w/w)	39.6
Protein	% (w/w)	7.13
Fat	% (w/w)	8.28

On treatment (P2) a mixture of 20 % flour of arrowroot and 80 % of wheat flour, produce carbohydrates 44.6% (w/w), a protein 6.67% (w/w), and fat 8.41% (w/w). Table 3 shows a number of macro nutrients on a bread to P2 treatment being handed out.

TABLE 3. TREATMENT II (P2) USE MIXTURE 20% ARROWROOT FLOUR AND 80 % WHEAT FLOUR

Macro Nutrients	Unit	Results
Carbohydrate	% (w/w)	44.6
Protein	% (w/w)	6.67
Fat	% (w/w)	8.41

In the treatment (P3) for a mixture of 30% arrowroot flour and 70% wheat flour produce carbohydrate 46.6% (w/w), 6.78% protein (w/w), and 6.36% fat (w/w). Table 4 shows the macro nutrient analysis for P3 treatment..

TABLE 4. TREATMENT III (P3) USE MIXED 30% ARROWROOT FLOUR AND 70% WHEAT FLOUR.

Macro Nutrients	Unit	Results
Carbohydrate	% (w/w)	46.6
Protein	% (w/w)	6.78
Fat	% (w/w)	6.36

In addition to macro nutrients, also analyzed water content, ash and fiber content in fresh bread from a mixture of arrowroot flour and wheat flour. The analysis results for moisture content, ash and crude fiber are shown in Table 4.

TABLE 5. WATER CONTENT, ASH AND FIBER IN BREAD WITH MIXED ARROWROOT FLOUR AND WHEAT FLOUR

Other content in the bread	Unit	Treatments		
		P1	P2	P3
Moisture content	% (w/w)	35.5	34.5	32.7
Ash content	% (w/w)	0.82	0.84	1.14
Crude Fiber	% (w/w)	0.76	2.27	6.33

IV. DISCUSSION

Arrowroot flour can substitute wheat flour in bread making, but can not replace all wheat flour. The results of this study indicate that arrowroot flour can replace wheat flour up to 30%, and can give good results on bread.

The results of the production of bread with a ratio of 10%, 20% and 30% arrowroot flour showed that the performance of bread was good. Arrowroot flour is added as much as 40% produces slightly reduced in height, as well as the mixing arrowroot flour to 50% resulting in reduced breadth and bread down the high, or easily collapsing and breaking.

This happened may be due to pertaining to gluten levels low, in a mixture of ingredients arrowroot growing up will reduce the level of gluten. Reduced gluten causes the dough's ability to maintain its consistency to decrease, resulting in decreased dough stability. Of the nature of dough that if fermented expands, but the nature of hold gas properties weak, and when baked easily collapse or rupture, so that the product did not fulfill the requirements. Hence bread with a mixture of flour arrowroot 40 % and on it is not appropriate for bread [13].

The addition of flour arrowroot sent down protein content. The results of the study showed that the decrease in the womb a protein on P1 and P2 namely 7.13 % and 6.67 %, while in P3 give the womb a protein hamper similar to P2 (6.78 %). Reduced protein causing a diminution the formation of gluten and to reduce the interaction between gluten with other components at the time when the batter. Reduced the interaction results in bread fresh with force reduced internal. Besides, the decline in gluten sent down elasticity bread, because the elastic is especially contributed by gluten [1, 13].

Carbohydrate analysis showed the levels that the more flour arrowroot in bread, carbohydrates bread levels fresh will be bigger. Arrowroot flour is about carbohydrates high, namely 46.6%, so the more flour of arrowroot, the carbohydrates will be bigger. A variation that results from steady is the ratio flour arrowroot : wheat flour = 30: 70. The womb flour of arrowroot and wheat flour same containing carbohydrates that high. An increase in carbohydrates in mixing flour arrowroot and wheat flour P1 in treatment, P2 and P3 is 39.6 %; 44.6 % and 46.6 %. The high carbohydrate in the bread content because carbohydrate in arrowroot flour and wheat flour are also high. Carbohydrates in arrowroot flour is 85.2 gr [15].

A fat content in improving mixture of flour treatment arrowroot P1 and P2 did not give the difference is 8.28 % fat of P1 and 8.41 % fat of P2. The treatment of P3 reduced fat content, which is 6.36%. High levels of fat in bread products are caused by other ingredients added in the making of this bread, namely milk powder and butter. The fat in dairy products is varies, between 3-26gr, and butter, which is included in the fat and fatty acids group of about 8-9gr [16]. Levels of fat in arrowroot itself also very small, which is approximately 0.2gr [16], when mixed with other materials containing the fatty higher than arrowroot product containing fatty food will be higher.

In addition to the content of macro nutrients examined also other contents such as ash content, moisture content and fiber. in bread made from arrowroot flour and wheat flour. The more arrowroot flour the moisture content decreases. In the treatment of P1, P2 and P3 the moisture content in the bread with the mixture of arrowroot 10%, 20% and 30% were 35.5%, 34.5% and 32.7%. According to Charley, the moisture content in fresh bread affects the texture of bread or the hardness of bread. Flour that binds a little water causes the dough is not elastic and stiff. The arrowroot flour has lower moisture content than wheat flour, so it affects the moisture content of bread products [17].

Level of ash content in the bread from the mixture of wheat flour and arrowroot flour on treatment of P1, P2 and P3 results of this study is the more arrowroots in the higher levels of ash. Ash in a product is a residue of some minerals such as Potassium, Sodium, Calcium and Silicate. The more the arrowroot flour in a mixture of bread, it make more inorganic or mineral residues in the bread [17].

The result of fiber content analysis in bread from this study is that more mixture of arrowroot flour will increase the fiber in bread. The crude fiber in the white bread with 10% arrowroot flour is 0.76%; and in the 20% mixture was 2.27%, in the 30% mixture was 6.33%.

The higher levels of fiber in bread from arrowroot flour because arrowroot contains high carbohydrates, and fiber is a complex carbohydrate that can not be digested by the human small intestine [18]. Diets high in carbohydrates and fiber show low fat and will reduce the risk of coronary heart disease, and insoluble fiber can relieve constipation. Fiber can bind carcinogenic substances and accelerate transit through the gut. Fiber also increases the amount of water in the dirt, thereby diluting the effects of each carcinogen, making the impurities softened [19, 20].

The use of arrowroot flour in the production of fresh bread can reduce the use of wheat flour. Wheat flour is a flour derived from wheat and is used as an ingredient to make food products, such as noodles, biscuits, bread, and others. Wheat flour contains high carbohydrate, as well as arrowroot flour. Wheat includes a group of grain foods, and arrowroots including a group of tuber or rhizome foodstuffs. Grains are consumed more than tuber groups, so it is hoped that the use of arrowroot flour can be improved in food products.

V. CONCLUSION

The results of nutritional quality analysis of bread made from arrowroot flour and wheat flour produce high carbohydrate. Other than that, ash and fiber content also increases. The more arrowroot flour added to the mixed ingredients of bread making will further increase the carbohydrate, fiber and ash content. Arrowroot flour can replace the wheat flour used in a mixture of bread-making ingredients in the ratio of 10:90, 20:80, and 30:70. Addition of arrowroot flour with mixture above 30% provides poor quality of product.

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