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Podam cookies source of fiber and high protein based on porang glucomannan flour (amorphophallus oncophyllus) and edamame flour (glycine max (l) merrill)

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Abstract. One of the high nutritional problems in Indonesia is obesity. Obesity, if not prevented early, can reduce a person's quality of life due to several very deadly degenerative diseases. Podam Cookies made from Porang and Edamame flour as an alternative for diet, also suitable for diabetics and obesity. Glucomannan can be obtained from porang tubers which has high fiber content, and combined with edamame. Edamame flour has high protein, dietary fiber content and low carbohydrates. This study aims to develop a dietary formula for a source of fiber and protein using porang flour and edamame as ingredients for podam cake. Methods this study uses experimental laboratory. The results showed that edamame flour and glucomannan had a significant effect on fiber and protein content. Podam cookies affect the hedonic quality organoleptic properties of color, aroma and sweetness cookies. But it doesn't affect the texture and hedonic cookies. The organoleptic properties of cookies and protein content comply with SNI 2973:2011 standards, Podam cookies contain energy of 71,05 kcal and can be consumed by obese people as a snack as much as 10 pieces (100 grams) once and consumed 2 times a day as much as 20 pieces (200 grams).

1. Introduction

Obesity is a condition of a person due to malnutrition problems caused by abnormal or excessive fat accumulation due to an imbalance between energy intake and energy expenditure for a long time. Obesity strikes children, adolescents and adults. Obesity affects children, teens, and adults. Many factors can contribute to excess weigh gain including eating patterns, not enough sleep, physical activity levels, genetics, and environment. Long-term effects of obesity is various chronic degenerative diseases such as cholesterol, hypertension, coronary heart disease, stroke, cancer and type 2 diabetes as well as bone disorders due to the many diseases that can be caused by obesity and makes the morbidity and mortality rates of obese people quite high. Based on the 2018 Basic Health Research (Riskesdas) data, the prevalence of obesity in Indonesia over the age of 18 is around 21.8%. This data tends to increase from 2007 which was 10.5% to 11.5% in 2013 and increased to 21.8% in 2018[1]. This problem encourages efforts to make low-fat food with high-fiber, especially soluble fiber which is can reduce weight. Cookies are a type of snack that is small in shape, has a sweet taste, a less dense and crunchy texture that is favored by people both in urban and rural areas from children to adults. Basically making cookies, using low protein flour. The principle of making and forming cookies is divided into three stages, namely making, molding and baking the dough[2].Cookies are one of the

food choices that can be consumed by obese people, but with certain conditions cookies must contain with high fiber and protein. Porang is a tuber plant of the species Amorphopallus muelleri. Porang tubers enjoy the benefits due to their high fiber content, especially solvent fiber which is 64% of the dry weight so that porang tubers can meet individual needs for quality food sources with high fiber[3]. Previous studies have shown that Porang contains carbohydrates, very low calories, rich in fiber and low glycemic index contained in porang can be used as an alternative to diet as well as for diabetes and obesity [4]. Glucomannan in porang flour can reduce body weight and food intake in rats induced by a high-fat diet [5]. Soya bean the type of edamame has the advantage of content high and complete protein, where the content of edamame protein reaches 36%, higher compared to other soybeans[6]. Protein in edamame flour was more higher than protein content in wheat flour that is only 8-14% [7]. The use of porang flour and edamame flour is expected to reduce imports of wheat in Indonesia and reduce dependence on wheat by substituting flour made from local ingredients[8]. Seeing this situation, the author is interested in making snacks such as cookies that use porang flour and edamame flour as a basic ingredient. Porang plant can be used as an alternative flour because it contains a lot of glucomannan and does not contain carbohydrates and gluten, making it suitable for people who are allergic to gluten, diabetics, and people who are on a low-calorie diet. The use of glucomanna flour and edamame flour aims to reduce the use of wheat flour and prevent various diseases.

2. Materials and methods

2.1. Materials
The materials used in this study consisted of edamame flour, glucomannan flour, skim milk, stevia sugar, egg yolks, margarine, canola oil, fine salt, baking soda and baking powder.

2.2. Methods
This research consists of several steps that is from edamame flour, glucomannan flour, making Cookies, testing for fiber content, protein, organoleptic tests for hedonic tests and hedonic quality tests, effectiveness tests to find out the best treatment, and statistical analysis.

2.2.1 Preparation of edamame flour.
Fresh edamame was blanched at 80^0C for 5 minutes, peeled edamame, then dried using a dehydrator. Dried edamame is processed using a flour grinder and a sieving process is carried out to get edamame flour with good quality [9].

2.2.2 Preparation of glucomannan flour.
Fresh porang are washed, peeled, sliced and soaked using NaCl. Porang is dried using a dehydrator machine and floured to produce porang flour which contains glucomannan and oxalic acid. Porang flour is weighed and put into a beaker glass with the addition of 40% ethanol concentration; 60% and 80% gradually with a ratio of flour and ethanol ± 1:9 and stirred for ± 4 hours. The washed flour was filtered and then put into a petri dish, and dried in an oven at 40˚C for ± 24-36 hours, and analysis to obtain glucomannan flour [3] [4].

2.2.3 Preparation of cookies.
Mix porang glucomannan flour and edamame flour, skimmed milk, salt, stevia sugar, margarine, egg yolks, oil and 1 tablespoon of baking soda solution, mix well until the dough can be scavenged. Take a small round of dough, press it flat with a spoon, spread it and sprinkle the cookies with chocolate chips and bake the cookies at 150^0C until cooked [2].

2.3. Statistical analysis

The methodology in this study is an experiment with Completely Randomized Design consisting of 5 treatments. Data processing uses the one way anova test followed by Duncan's test at 5% level if there is a difference and organoleptic test using a likert scale with ordinal data types. The best treatment used Microsoft Excel 2017 which was compared with SNI 2973: 2011 and the portioning was calculated as a snack.

3. Result and discussion

Cookies usually use wheat flour which is low in protein. Previous studies used edamame flour and porang flour separately and showed that Porang has a carbohydrate content, very low calories, rich in fiber and a low glycemic index so that it can be used as an alternative to diet as well as for diabetes and obesity[4]. Edamame flour is a binder that can increase the water holding capacity of foodstuffs, because edamame flour contains starch and protein that can bind water. As the water holding capacity increases, the availability of water needed for the growth of microorganisms decreases, and the activity of bacteria in foodstuffs that can cause spoilage decreases. Edamame contains 38.50 grams of protein, 19.57 grams of fat, 33.85 grams of carbohydrates, 327 grams of fiber, a high antioxidant content of around 37.5%, and is a functional food with great potential because of its dietary fiber content[9]. Based on that studies, the researchers tried to combine porang glucomannan flour and edamame flour into cookies. These cookies are named PODAM Cookies, healthy snacks that have high fiber and protein sources for obese people or for people who are on a diet. The use of porang flour and edamame as ingredients in making Podam cookies, also aims to reduce the use of wheat flour. Before finding the best ratio of cookie formulations, the five formulas were tested first. Determination of the formulation of glucomannan porang flour and edamame flour using Completely Randomized Design (CRD). The determination can be seen in table 1.

Table 1. Comparison of composition at each treatment level

Ingredients	P1	P2	P3	P4	P5
Porang flour	90 g	70 g	50 g	30 g	10 g
Edamame flour	110 g	130 g	150 g	170 g	190 g
Skimmed milk flour	20 g	20 g	20 g	3 g	3 g
Stevia sugar	85 g	85 g	85 g	85 g	85 g
Egg yolk	1 pcs	1 pcs	1 pcs	1 pcs	1 pcs
Margarine	60 g	60 g	60 g	60 g	60 g
Canola oil	100 ml	100 ml	100 ml	100 ml	100 ml
Fine salt	0,625 g	0,625 g	0,625 g	0,625 g	0,625 g
Baking soda	2,5 g	2,5 g	2,5 g	2,5 g	2,5 g
Baking powder	0,625 g	0,625 g	0,625 g	0,625 g	0,625 g

Based on the table 1 it is known that the ratio of glucomannan porang and edamame flour in formula 1 is 45%:55%, formula 2 is 35%:65%, formula 3 is 25%:75%, formula 4 is 15%:85% and formula 5 is 5%:95%. Cookies are made according to the composition of the formula then tested with organolaptic test. The result of organolaptic test can be seen in Table 2.

Table 2. Podam Cookies Difference Test Results

	Formulation	Variable	p-value
Hedonic Test	P1 vs P2 vs P3 vs P4 vs P5	Color	0,000
		Scent	0,000
		Flavor	0,000
		Texture	0,000
Hedonic Quality Test	P1 vs P2 vs P3 vs P4 vs P5	Color	0,078
		Scent	0,000
		Flavor	0,000
		Texture	0,000

Based on table 2 it is known that formulation have significant differences in aspects hedonic of color, scent, flavour, and texture. Hedonic quality test showed formulation have significant differences in scent, color,and texture aspects but have no significant differences in flavour aspects. The best treatment for the formulation is P3 with the percentage addition of porang glucomannan flour 75% and edamame flour 25%. Based on the results of the analysis, protein and fiber content in the formula 3 can be seen in table

Table 3 Podam Cookies portioning for obesity

Nutritional Content per Serving Measure		
Serving size 10 pieces (100 grams)		%AKG
Energy (kcal)	71,05	3,305
Protein (grams)	6,8411	10,52
Fat (grams)	19,57	32,58
Carbohydrates (grams)	33,85	9,96
fiber (grams)	10,7888	35,96

*Percent AKG based on energy needs of 2150 kcal. Your energy needs may be higher or lower.

Based on table 3, the Podam Cookies portioning for obesity Energy in the body serves as a source of energy to carry out an activity. The average energy sufficiency for Indonesians is 2150 kcal (ALG, 2016). The energy content of Podam cookies once consumed is 71,05 kcal. The resulting podam cookies weigh 10 grams per piece. To meet the needs of 10% of the protein and fiber needs of obese people who must be consumed as a snack is 10 pieces (100 grams) in one meal. so for 2 times consumption as a distraction requires 20 pieces (200 grams) a day. Consumption of snacks 2 times per day and other needs are obtained from the main food. Foods with high in fiber are foods that are needed for people with obese nutritional status [10] [11]. Besides coming from snacks to meet the needs of the day, they also come from main meals. Foods that are high in fiber are foods that are needed for people with obese nutritional status. Fiber has a role in obesity such as delaying gastric emptying, reducing hunger, helping the digestive process and reducing the occurrence of obesity. Porang has a carbohydrate content, very low calories, rich in fiber and a low glycemic index contained in porang can be used as an alternative for diet as well as for diabetes and obesity. The results shown that cookies podam has high protein. Protein is one of the prominent components in edamame. Edamame is rich in protein and amino acids that are good for consumption by our body as they can inhibit the accumulation of cholesterol in the lining of the blood vessels [6].

4. Conclusion

The hedonic test showed that there were significant differences related to aroma, color, taste, and texture in podam cookies. Based on the results of the analysis, it is known that the most preferred cookies are formula 3 with a composition of 50 grams of glucomannan flour and 150 grams of edamame flour. Cookies podam has weigh 10 grams per chip, to find the needs of 10% daily protein and fiber, obese people can consume 10 pieces (100 grams) cookies that be consumed 2 times a day. Foods that are high in fiber are foods that are needed for people with obese nutritional status.

Acknowledgment

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