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The Use of Coconut Dregs Flour as Food Fiber and its Application to Oyster Mushroom (Reviewed from its Nutrition)

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Abstract. The need of fiber is an important thing for a food since it eases the metabolism, places the bacteria in the intestines, and decreases the cholesterol. Coconut dregs has high cellulose to play the role in body's physiology. Cellulose is food fiber which is unable to be digested by enzymes of metabolism. Nevertheless, its role in metabolism is very important to shorten the transition time of food and decrease the risk of intestines cancer. Besides, it can bind the fats, protein, and carbohydrate to form the complexed fat-protein-carbohydrate-fiber. The final form of this complex compound is unable to be digested by digestive enzyme which is excreted with feces. Thus, the consumer can be spared from obesity, hyper-cholesterol, and coronary heart. Oyster mushroom as the substitute ingredients of healthy food has not been revealed to the society. Oyster is a food material which has an excellency of supporting the food security. It is supported by high production, process, and tools potential used in making it to become more useful products. It can be added to breads, food's recipe, and other products as health food to support food diversification. This research is aimed to know the fiber contained in oyster nuggets which has been added with coconut dregs oil. The analysis of the fiber was using Sohxlet methods. The level of fiber in the nuggets with the flour in 6% per 100g was 2.604g. If the nuggets was with white oyster with fiber in each 100 gram of nuggets with 10% flour was 3.644g. In 14% flour of nuggets, the fiber was 4.064g. It can be concluded that the consumption of 100 grams nuggets can give about 2.604-4.064grams of nuggets each day. It means the substitute of oyster to the level of fiber in oyster nugget per 100 grams was 2.604- 4.064 gram. Meanwhile, the necessity of food fiber each day is 6-15 grams.

INTRODUCTION

Wet process of coconut oil, 100 grains of coconut produces 19,50 kg of dregs. Coconut dregs flour is the flour produced by smoothing the pulp of coconut meat. The analysis of dry (fat-free) coconut husk contains 93% carbohydrate consisting of: 61% galactomanan, 26% mannose and 13% cellulose[1]. The coconut milk dregs contains of 12.2% fat, 18.2% protein, 20% crude fiber, 4.9% ash, and 6.2% water[2]. The results of the analysis on the coconut milk meal of Genjah Kuning Nias and In Tenga (GKN x DTA) are as follows: water 4,65%, protein 4.11%, fat 15,89% Crude fiber 30,58%, carbohydrate 79,34% and ash 0,66%[3].

Based on the analysis results, coconut dregs still has high value when used as a low-fat foods suitable for consumption by the obese consumer (obesity), who is high risked to cholesterol and coronary heart disease. Coconut dregs contains high enough cellulose which can play a role in the physiology of the body. Cellulose is a food fiber that cannot be digested by digestive enzymes. But its role in the digestive system is very important, because it can shorten the transit time of food scraps, thereby reducing the risk of colon cancer. In addition, fiber can bind fats, proteins, and other carbohydrates, resulting in a complex fat-protein-carbohydrate-fiber. Finally these complex compounds cannot be digested by digestive enzymes, which are then wasted with feces[4]. Thus consumers can avoid the risk of obesity, hypercholesterolemia and coronary heart disease.

Fiber intake has become a priority in making food product formulations because of its role in facilitating digestion, where bacteria develop in the colon and reduce the availability of cholesterol. Oyster mushroom as a

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substitute of health food so far has not been much revealed. Oyster mushroom is a source of fiber food that benefits as a supporter of food security sustainability. This is supported by the high production potential, simple and inexpensive processes and equipment used in production, it has the ability to be processed into higher quality products, can be added to bakery products, recipes, and other food products as food health so that it can support food diversification.

Oyster mushrooms are easy to get, Oyster mushroom (*Pleurotus ostreatus*) is a food fungus from the *basidiomycota* group and belongs to *homobasidiomycetes* class with the general characteristics of the fruit body is white to broken white and the hood is semicircular shaped oyster shell with the middle slightly concave. Oyster mushrooms are good for body health because of the high fiber content of food and protein and various essential amino acids in it. Mushrooms contain nutrients such as protein (10.5-30.4%), carbohydrates (50-60%), amino acids, vit B1 (*thiamin*), B2 (*riboflavin*), B3 (*Niacin*), B5 (*panthotenic acid*), B7 (*biotin*), Vit C and calcium minerals, Iron, Mg, Phosphorus, K, P, S, Zn[5].

By the chewy and soft texture of oyster mushroom, it can be used as substitute of chicken meat. Food making needs to be developed and its utilization is done by diversing the food. Continuing the previous research, it needs further research to examine the content of food fiber on food product of oyster mushroom nugget applied by addition of coconut dregs meal.

Problem Identification and Formulation

a. What is the level of food fiber of oyster mushroom nugget that is applied by adding coconut dregs from the research result?
b. What is the level of public's preference for coconut dregs oyster mushroom nugget in terms of quality of color, taste, texture and aroma?
   How much does the food fiber contribution of oyster mushroom nugget with substitution of coconut dregs flour?

Research Purposes

Based on the formulation of the above problems, this study aims to obtain information about:

a. To find out the level of food fiber of oyster mushroom nuggets applied with the addition of coconut dregs from research result.
b. What is the level of public's preference for coconut dregs oyster mushroom nugget in terms of quality of color, taste, texture and aroma.
   To find out the food fiber contribution of oyster mushroom nugget with substitution of coconut dregs flour?

LITERATURE REVIEW

Coconut Dregs Flour

Coconut dregs flour is the flour obtained by smoothing the dried coconut dregs. Coconut dregs flour can be made from dry shredded coconut which some of its fat is released through pressing process[6]. It was further explained that from this process, other than coconut flour, it also produced high quality oil.

Flour is the main raw material for making various kinds of food (cakes). Other than being the source of starch (nutrition), flour is also a structure shaper. Physical aspect of flour that needs to be notified is to be white, not clotting and not sticky. Associated with the chemical properties of hybrid coconut flesh, the role of physical properties of flour is the content of galactomanan and phospholipids. Physicochemical properties of coconut meat that affect the processing of copra, oil, dry grated coconut, coconut milk and flour. Coconut dregs flour is dried coconut dregs, mashed to become flour using 100 mesh sieve, and processed hygienically for food ingredients. Coconut dregs flour is essentially made from VCO industrial coconut waste pulp.

Coconut dregs flour can be used as raw material for bread, brownies or solvent extraction to produce fat-free flour and last longer in storage. Drying is done to reduce the water content to 2.5-3.5%. The drying process is carried out at 60-70 for 20-45 minutes or dried under the sun to dry. The dry coconut dregs is pounded until it becomes smooth by using pestle and mortar or by using a flour mill. To produce a smooth and clean flour, the yield of the crushed coconut was filtered using a 100 mesh flour strainer. The final drying is done so that the flour is completely dry and

has a relatively high shelf life. Coconut dregs flour are packed and stored in a dry, clean, well-ventilated room, and not exposed to direct sunlight. Flowchart of coconut dregs flour making can be seen on the Fig. 1.

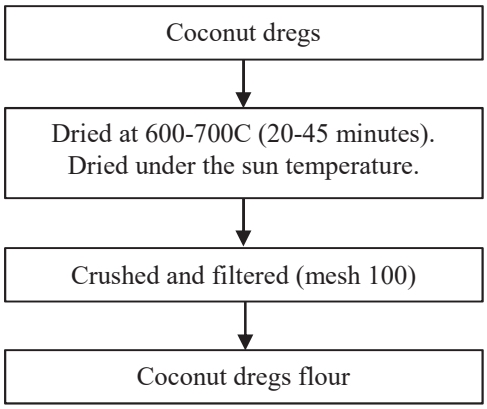

FIGURE 1. Flowchart of making coconut dregs flour

Definition of Oyster Mushroom Nugget

Nugget is a high-protein side dish made from animal based ingredients and mixed from other ingredients through the process of heat extraction and frying. Nugget is also one of the frozen ready-to-eat food products, which has been heating up to precooked, then frozen[7]. This frozen ready product requires only frying time for 1 minute at 150ºC.

Nugget texture depends on the material origin[8]. The ingredients in the manufacture of nuggets include animal basic materials commonly used in the manufacture of nuggets in the market namely chicken, beef, shrimp, and fish, but the most popular in the community is chicken nugget. Nuggets are usually made of chicken, egg, tapioca flour, bread flour, while the additives and the ingredients are salt, garlic, onions, pepper, and nutmeg. In addition, the binders used are eggs and tapioca flour. The materials to be used in making nuggets are selected with good quality materials.

Nugget Criteria

The criteria of a food ingredient or product is physically visible and can be easily recognized, but there are some other hidden properties. Physical criteria include color, taste, texture and aroma. While the hidden criteria include nutritional value, microbial safety, and metal contamination[9].

The hidden criteria covering nutritional value, microbial safety, and metal contamination are known by conducting laboratory research and must be in accordance with the provisions set by the Ministry of Industry. Nugget criteria is a nuggets made from protein food with spices. Regarding the state of color, aroma, texture and taste, it should be in normal circumstances.

White Oyster Mushroom

Oyster mushrooms are high in protein, high in fiber, rich in vitamins and minerals, low in carbohydrates, fats and calories. Oyster mushrooms have properties for various diseases, such as liver, diabetes, anemia, as antivirus and anti-cancer and lower cholesterol levels. In addition, oyster mushrooms also help weight loss due to high fibrous and digestive help. The nutritional content of oyster mushrooms per 100 grams can be seen in Table 1.

Food Fiber

Utilization of oyster mushroom as a substitution of health food so far has not been much revealed. Oyster mushrooms have a high enough fiber content. A fiber-rich diet will help protect the body from various developing diseases in developed countries such as diabetes mellitus, coronary heart disease, obesity, and colon cancer. Food

fiber has been shown to play an important role in the prevention of carcinogenesis and arterosclerosis risk. These food fibers also control the release of glucose over time, helping control and regulate diabetes mellitus and obesity. Food fiber in sufficient quantities in the diet is great for good digestion in the gut. Therefore, food fiber plays a role in health.

Table 1. Nutritional content of oyster mushrooms per 100 grams[10]

Nutrition	Content
Calorie (energy)	367 kal
Protein	10.5-30.4 %
Carbihydrate	56.6 %
Fat	1.7-2.2 %
Tianin	0.2 mg
Riboflavin	4.7-4.9 mg
Niasin	77.2 mg
Ca (calsium)	314 mg
K (calium)	3.793 mg
P (phosporus)	717 mg
Na (natrium)	837 mg
Fiber	7.5-87 %

Fibers derived from fruits and vegetables ferment faster than the fiber derived from beans. Food fiber generally consists of complex carbohydrates of plant cell walls, such as cellulose, hemicellulose, pectin and lignin as well as intracellular polysaccharides such as gums and mucilage that are not hydrolyzed by human digestive enzymes. Food fiber cannot be digested and is not absorbed by the human digestive tract, but it has a very important function for health maintenance, disease prevention and as an important component in nutritional therapy[8]. It is also explained that according to physical characteristics and its effect on the body, food fiber is divided into two groups namely soluble food fiber and insoluble fiber food. The influence of fiber types on the work of food fiber can be seen in Table 2.

Table 2. Influence of fiber type to fiber food work[8]

	Soluble Fiber	Insoluble Fiber
Component	Gum, mucilage, pectin, some hemicellulose	Celluloce, lignin and some hemicellulose
Benefit	Lower blood cholesterol and control blood glucose	Prevents colon cancer and constipation
Source	Barley, oat, vegetables, fruit, seaweed, gelatin	Whole grains, cereals, fruit skins like apples, and vegetables

Fiber Consumption Requirement g/day

Determining the amount of fiber consumption in a community is quite difficult. The consumption level of food fiber varies widely between countries, regions, seasons, and between individuals. This is caused by differences in environmental conditions, purchasing power, gender, and eating patterns. The average consumption of Indonesian food fiber is 10.5 g per day. It further explained that the recommended food fiber requirement is 25-30g per day or 6-15g of crude fiber per day. This figure indicates that the new Indonesian population meets the fiber requirement about one-third of the ideal requirement of 30g every day.

RESEARCH METHOD

Analysis Method

a. Determination of food fiber content of oyster mushroom nuggets is applied by adding coconut milk powder that is result of research by using Sohxlet Method.
b. The test of the public's preference level of coconut dregs oyster mushroom nugget is evaluated from the quality of color, taste, texture and aroma by Hedonic Scale method.

Test Design

In this research, the design of Randomized Complete Design is used. Repeated test and analysis trials are repeated three times. The result of the analysis is then analyzed statistically.

RESULT AND DISCUSSION

This research begins with the production of oyster mushroom nuggets. Data of nugget oyster research results can be seen in Table 3.

Table 3. Material of coconut dregs mushroom nuggets composite

Material	Control	6% Coconut Dregs	10% Coconut Dregs	14% Coconut Dregs
Mushroom	250 g	235 g	225 g	215 g
Coconut Dregs Flour	-	15 g	25 g	35 g
Chicken	100 g	100 g	100 g	100 g
Tapioca Flour	35 g	35 g	35 g	35 g
Egg	30 g	30 g	30 g	30 g
Onion	15 g	15 g	15 g	15 g
Salt	5 g	5 g	5 g	5 g
Nutmeg	1 g	1 g	1 g	1 g
Pepper	2 g	2 g	2 g	2 g
Bread crumbs	100 g	100 g	100 g	100 g

The experimental study of white oyster mushroom nugget used 3 samples which were sample A (white oyster mushroom nuggets with 6% of coconut dregs flour), sample B (white oyster mushroom nuggets with 10% of coconut dregs flour), sample C (white oyster mushroom nuggets with 14% of coconut dregs flour), and sample K (control).

Nugget Food Fiber Contribution with Oyster Mushroom Supplements

An analysis of food fiber content on nuggets made with oyster mushroom substitution was performed. The test results of food fiber content of oyster mushroom nuggets can be seen in Table 4.

Table 4. Test result of food fiber content of oyster mushroom nugget

No.	Sample	Rough food fiber (%)
1	Oyster mushroom nugget control	2.094
2	Oyster mushroom nugget with 6% flour mushrooms	2.604
3	Oyster mushroom nugget with 10% flour mushrooms	3.644
4	Oyster mushroom nugget with 14% flour mushrooms	4.064

Based on the Table 4, the calculation of food fiber content of oyster mushroom nugget on white oyster mushroom nugget with the use of 6% coconut dregs flour per 100g is 2.604g, white oyster mushroom nugget with the use of 10% coconut dregs flour per 100g is 3.644g, and white oyster mushroom nugget with the use of 14% coconut dregs flour per 100g is 4.064g. It means, by consuming 100 gram of of nugget, there will be 2.604- 4.064 gram food fiber contribution of oyster mushroom that we get per day. This means that the substitution contribution of oyster mushroom to the fiber content of oyster mushroom nuggets per 100 grams is equal to 2.604- 4.064 grams. While the recommended food fiber is 6-15 grams of crude fiber per day. Further details can be seen in Table 5.

Average consumption of food fiber in Indonesia is 10.5g per day. It is further explained that the recommended food fiber is 25-30 grams per day or 6-15 grams of crude fiber per day. This figure indicates that Indonesian population only meets about one-third of the ideal requirement of fiber needs that is 30 gram every day. Fiber can be added in meat extract cooking to supply the food product due to its water retention and fat. In fried foods, fiber addition reduces lipid concentration and increases moisture content.

Table 5. Fiber content of oyster mushroom nugget and recommended fiber content/day

No.	Sample	Recommended fiber content/day	Average (%)
1	Oyster mushroom nugget control	6-15g	2.094
2	Oyster mushroom nugget with 6% flour mushrooms	6-15g	2.604
3	Oyster mushroom nugget with 10% flour mushrooms	6-15g	3.644
4	Oyster mushroom nugget with 14% flour mushrooms	6-15g	4.064

Some of the fiber-rich ingredients are used for their textural and stabilizing effects (water retention and fat). Non-fat coconut residue contains 63.24% food fiber (4.53% soluble fiber and 58.71% insoluble fiber). Similar results were also reported, the content of food fiber from coconut flour was 60.01g / 100g samples, (56% insoluble food fiber and 4% soluble fiber). It was further reported that daily consumption of 15% and 25% food fiber from coconut flakes can lower total serum and LDL cholesterol, triglycerides in humans. Furthermore, the analysis results of approximation nutritional content of oyster mushrooms nugget with 6% coconut dregs can be seen in Table 6.

Table 6. Approximation nutritional content of coconut dregs flour oyster mushrooms nugget

No	Code	Water %	Ash %	Fat %	Protein %	Carbohydrate %	Crude %
1	6%	64.714	1.847	2.378	5.975	25.086	2.604

CONCLUSIONS AND RECOMMENDATION

Conclusions

The content of food fiber content of oyster mushroom nugget on white oyster mushroom nugget with the use of 6% coconut dregs flour per 100g is 2,604g, white oyster mushroom nugget with the use of 10% coconut dregs flour per 100g is 3,644g, and white oyster mushroom nugget with the use of 14% coconut dregs flour per 100g is 4.064g. It means, by consuming 100 gram of of nugget, there will be 2,604- 4,064 gram food fiber contribution of oyster mushroom that we get per day. This means that the substitution contribution of oyster mushroom to the fiber content of oyster mushroom nuggets per 100 grams is equal to 2,604- 4,064 grams. While the recommended food fiber is 6-15 grams of crude fiber per day.

Recommendation

Further research is needed to determine the insoluble and insoluble content of food fiber from oyster mushroom nuggets. It is also required to evaluate the generated saving power of oyster mushroom nugget.

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