

PRODUCTION OF NUGGETS FROM *Euthynnus affinis* FISH WITH ADDITION OF PURPLE SWEET POTATO FLOUR (*Ipomoea batatas* (L.) Lam.) AS EFFORT TO IMPROVE NUTRITIONAL VALUE AND QUALITY IN FOOD CHEMISTRY TECHNOLOGY

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Abstrak

Keywords:

Tongkol Fish,
Nuggets,
Euthynnus Affinis,
Ipomoea Batatas,
Purple Sweet Potato.

Nuggets are foods whose main ingredient is chicken meat. However, with advances in technology, people are now able to produce nuggets from a variety of ingredients, such as beef and fish. The fish referred to here is Euthynnus affinis, one of which is the tongkol fish, a type of fish that can be used to make foods or snacks, including nuggets. In accordance with the basic ingredient of fish, it is necessary to analyse the nutritional value of the fish, analysing the nutritional value and quality through the addition of purple sweet potato (Ipomoea batatas (L.) Lam.). The addition of purple sweet potato (Ipomoea batatas (L.) Lam.) has an effect on the content. The contents found are proximate substances contained in processed foods, namely nuggets, amounting to 4.78%, fat 0.41%, crude fibre 1.55%, ash content 1.14%, water content 47.10% and carbohydrates 44.13%. However, there are several proximate substances that have undergone changes, namely a decrease in fat content.

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INTRODUCTION

Indonesia is a country rich in biodiversity, one example of which is its famous foods and snacks. Nuggets are one of the most popular snacks, loved by many people. Basically, nuggets are made from chicken meat, but with the advancement of technology, many people now make nuggets from ingredients such as beef and even fish (Akbar et al. (2020) and the Department of Agriculture and Food (2021)). Indonesia is a country with rich biodiversity, one of which is its famous foods and snacks. Nuggets are one of the favourite snacks that are widely loved by many people. Basically, nuggets are made from chicken meat, but with the advancement of technology today, many people



make nuggets from ingredients such as beef and even fish (Akbar et al. (2020) and the Ministry of Agriculture and Food (2021)).

The fish referred to here is the Tongkol fish, also known as *Euthynnus affinis*. *Euthynnus affinis* has experienced rapid growth, resulting in increased productivity. According to Sutanto & Fahmi (2012), the nutritional content of *Euthynnus affinis* per 100 grams consists of 25.00% protein, 0.03% carbohydrates, 1.50% fat, 2.25% minerals, and 69.42% water. The *Euthynnus affinis* fish contains Omega-3 and Omega-6, which serve to strengthen heart muscle endurance, improve brain function, and prevent blood clotting.

The fibre and protein content is quite high, ranging from 27-29% and 2-5% fibre content respectively. In terms of its potential uses and benefits, *Euthynnus affinis* fish is particularly suitable for long-term consumption and is excellent for children's brain development.

Purple sweet potato (*Ipomoea batatas* (L.) Lam.) contains 27.9% carbohydrates and 68.5% water, but it is processed into flour. Purple sweet potato flour contains 85.25% carbohydrates and 7% water (Ministry of Health, 1981).

According to Zuraida & Supriati (2001) in Sormin et al. (2020), purple sweet potato flour not only has a high carbohydrate content, but also contains high levels of ash and fibre. According to Sormin et al. (2020), the carbohydrate content contained in purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) is almost the same as that contained in regular wheat flour.

Nuggets are a type of snack that comes in moulded and cut pieces made from meat. Nuggets have a relatively long shelf life and can be refrigerated or frozen. Nuggets made from *Euthynnus affinis* fish have the advantage of being healthy, nutritious, and soft in texture. To improve the texture and softness of nuggets, fillers made from ingredients such as cornflour, tapioca, tubers, mushrooms, and green beans are added (Huzaiyah et al. (2018); Musa & Ansokowati (2020); Nurhayati & Ihsannudin (2022); Sendari et al. (2020)).

RESEARCH METHODS

Research Location

This research was conducted at the Food Research Laboratory, University of Sumatera Utara (USU) Medan. The research was carried out from February 2024 to March 2024, or until completion, starting from the initial stage of grinding *Euthynnus affinis* fish meat and making purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) until completion.

Research Design

This research method was conducted experimentally with three treatment levels, namely comparisons of purple sweet potato and *Euthynnus affinis* fish concentrations, including comparisons between purple sweet potato (*Ipomoea batatas* (L.) Lam.) 50% : 50% *Euthynnus affinis* fish, without the use of wheat flour 50% : 50% *Euthynnus affinis* fish, 100% without purple sweet potato flour (*Ipomoea batatas* (L.) Lam.).

The main ingredients used were *Euthynnus affinis* fish and purple sweet potato (*Ipomoea batatas* (L.) Lam.). The test parameters consisted of organoleptic testing (comprising aroma, taste, and texture) and proximate testing (comprising water, ash, protein, fat, and carbohydrates).

Observation Variables

The nutritional content of the nugget snack food samples was determined by analysing the nutritional content using proximate tests consisting of moisture (water), ash, crude protein, ether extract (crude fat), and carbohydrate tests.

Table 1. List of ingredients used in the production of nugget foods or snacks with added moringa leaves per 1000 g (Permadi et al. 2012 with modifications)

No.	Name of Material	Accuracy (g)
1	Tongkol Fish Meat	350
2	Moringa Leaf Flour	100
3	Tapioca Flour	300
4	Garlic	45
5	Ground Pepper	25
6	Salt	10
7	Egg	60
8	Bread Flour	110

Table 2. List of ingredients used in the production of nuggets or snacks with the addition of purple sweet potato per 1000 g

No.	Name of Material	Accuracy (g)
1	Tongkol Fish Meat	350
2	Sweet Potato Flour	270
3	Tapioca Flour	130
4	Garlic	45
5	Ground Pepper	25
6	Salt	10
7	Egg	60
8	Bread Flour	110

RESULTS AND DISCUSSION

Protein Content

Based on laboratory analysis results, the proximate test for protein content can be seen in Table 3 as follows:

Table 3. Protein Content of *Euthynnus affinis* Fish

Sample Code	Protein Content (%)
N ₁	10,7523
N ₂	9,9311
N ₃	8,2212

Description: N₁ = Purple Sweet Potato Flour Nugget Snack, N₂ = Sweet Potato Flour Nugget Snack, N₃ = Nugget Snack without Purple Sweet Potato Flour

The results of the analysis in Table 3 prove that the nutritional content of Nugget Snacks formulated with the addition of Purple Sweet Potato (*Ipomoea batatas* (L.) Lam.) has good results, where the protein content is higher than that without the use of purple sweet potato flour (*Ipomoea batatas* (L.) Lam.). The nutritional content causes differences in the protein content produced. The amount of protein contained in purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) per 100 g produces 7.7 g of protein.

The high content found in purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) can be substituted for processed meat products because it has beneficial nutritional content. This is why the protein content of food or snacks such as nuggets made from *Euthynnus affinis* fish formulated with purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) is higher than those made with wheat flour alone.

Protein is one of the main components in the composition of all living cells, both in plants and animals. In most body tissues, protein is the largest component after water. It accounts for 50% of the dry weight of cells, making it one of the organic compounds consisting of 50-55% carbon, 7% hydrogen, 13% oxygen, and 16% nitrogen (Krisnadi, 2017).

Protein sources from foods such as *Euthynnus affinis* fish and eggs are high in protein. Protein plays a very important role in the human body, one of which is as a building block or structure-forming substance that can strengthen cell tissue, for example in the formation of skin, muscle, hair, cell membranes, heart, kidneys and several other organs. Several other organs also have specific functions, namely active proteins.

Fat Content

Based on laboratory analysis results, the proximate test for fat content can be seen in Table 4 as follows:

Table 4. Fat Content of *Euthynnus affinis* Fish Nuggets

Sample Code	Fat Content (%)
N ₁	0,49881
N ₂	1,17822
N ₃	1,20189

Description: N₁ = Purple Sweet Potato Flour Nugget Snack, N₂ = Sweet Potato Flour Nugget Snack, N₃ = Nugget Snack without Purple Sweet Potato Flour

Fat is an organic compound that is insoluble in water but soluble in non-polar solvents. Fat has several functions, including protecting organs, treating cancer, forming cells, assisting in cell apoptosis, and generating heat in the body. Other roles include being a source of essential fatty acids and a solvent for fat-soluble vitamins (Rustamaji & Ismawati, 2020).

Fat is a dense source of energy, producing 9 kilocalories (kcal) per gram. Adding fat to fried foods enhances their flavour and strengthens the taste of the ingredients (Rieuwpassa, 2016).

The fat content in nugget foods formulated with the addition of purple sweet potato flour is lower than in nuggets without purple sweet potato flour. This is because the higher the utilisation of purple sweet potatoes as an alternative to meat consumption

due to their low fat content, the better it is for the low fat and cholesterol content in purple sweet potatoes (Tjokrokusumo, 2018 in Diantoro et al., 2018).

Crude Fibre Content

Based on the laboratory analysis results, the proximate test on crude fibre content can be seen in Table 5 as follows:

Table 5. Crude Fibre Content of *Euthynnus affinis* Fish Nuggets

Sample Code	Coarse Fibre (%)
N ₁	0,97217
N ₂	0,52119
N ₃	0,32615

Description: N₁ = Purple Sweet Potato Flour Nugget Snack, N₂ = Sweet Potato Flour Nugget Snack, N₃ = Nugget Snack without Purple Sweet Potato Flour

From the analysis in Table 5, it is known that the high fibre content can be used as an alternative diet programme in raw materials when compared to vegetables that have a meat-like texture (Tjokrokusumo et al. 2018).

Dietary fibre is a component of plant-based foods that is very important in the process of hydrolysis by human digestive enzymes. The components found in dietary fibre are located in plant cell walls. These components consist of cellulose, hemicellulose, pectin, and lignin.

The nutrients contained in dietary fibre are essential for health, helping to prevent constipation, cancer, colon cancer and lower cholesterol levels, as well as helping to control blood sugar, prevent haemorrhoids and lose weight.

Dietary fibre has benefits including weight control and prolonged satiety. In addition, dietary fibre is non-nutritive but very beneficial for intestinal flora as a prebiotic, stimulating the growth of bacteria that are better for the intestines, resulting in better and cleaner absorption.

Ash Content

Based on the laboratory analysis results, the proximate test on ash content can be seen in Table 6 as follows:

Table 6. Ash Content of *Euthynnus affinis* Fish Nuggets

Sample Code	Ash (%)
N ₁	0,93412
N ₂	0,52013
N ₃	0,41121

Description: N₁ = Purple Sweet Potato Flour Nugget Snack, N₂ = Sweet Potato Flour Nugget Snack, N₃ = Nugget Snack without Purple Sweet Potato Flour

From the laboratory test results, it can be seen in Table 6 that the high ash content found in the test indicates that it originated from the process of grinding purple sweet potatoes (*Ipomoea batatas* (L.) Lam.) into fine flour. The mineral content in *Euthynnus affinis* fish consists of magnesium, phosphorus, iodine, fluorine, iron, copper, zinc, and selenium.

This ash content refers to the inorganic residue left behind after oxidation occurs. The ash content contains a large amount of minerals. Ash content is a mineral material that cannot be burned but evaporates easily. These minerals or ash content are a food ingredient used in the form of ash to destroy organic compounds (Handayani, 2019).

Ash content is a determining factor in nutritional content, which is closely related to the mineral content of *Euthynnus affinis* fish nuggets.

Water Content

Based on the laboratory analysis results, the proximate test for water content can be seen in Table 7 as follows:

Table 7. Water Content of *Euthynnus affinis* Fish Nuggets

Sample Code	Water (%)
N ₁	45,27320
N ₂	39,12100
N ₃	32,12156

Description: N₁ = Purple Sweet Potato Flour Nugget Snack, N₂ = Sweet Potato Flour Nugget Snack, N₃ = Nugget Snack without Purple Sweet Potato Flour

Water is one of the most important elements in life, not only as a component of living things. Water plays a role in food ingredients, where the high or low water content in food will affect the shelf life of the product. This is because water can affect the appearance, texture and taste of the food being tested.

The water content in *Euthynnus affinis* fish nuggets and purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) formulations tends to increase compared to those without purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) formulations. This is because purple sweet potatoes (*Ipomoea batatas* (L.) Lam.) have a high water content. This also explains why the more purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) is added, the higher the water content in the product. This study confirmed that the higher the fibre content in purple sweet potatoes (*Ipomoea batatas* (L.) Lam.), the higher the water content.

The moisture content added to purple sweet potatoes (*Ipomoea batatas* (L.) Lam.) resulted in 45.27320%, which is higher than without the addition of purple sweet potatoes (*Ipomoea batatas* (L.) Lam.), which was 32.12156%. Basically, the high moisture content in nuggets with the addition of purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) reduces the shelf life of the product. One way to store nuggets with the addition of purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) is to store the product in a refrigerator at a cool temperature.

Carbohydrate Content

The carbohydrate content in food or snacks made from *Euthynnus affinis* fish nuggets with the addition of purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) is 44.121%, while *Euthynnus affinis* fish nuggets with the addition of wheat flour alone only provide a carbohydrate content of 52.127%.

This is because a small decrease in carbohydrate content may lead to an increase in the concentration of purple sweet potato (*Ipomoea batatas* (L.) Lam.), so that when the water, protein and ash content increases, the carbohydrate content decreases.

According to Rahmawati et al. (2024), frying nuggets in hot oil causes the carbohydrates to heat up, breaking down the polysaccharides into simpler compounds.

CONCLUSION

Based on the results of research and discussion regarding the nutritional value and quality of *Euthynnus affinis* fish nuggets, the following conclusions can be drawn:

1. The nutritional value is higher than when purple sweet potato flour (*Ipomoea batatas* (L.) Lam.) is not used.
2. The protein content is higher than without the addition of purple sweet potato flour (*Ipomoea batatas* (L.) Lam.).
3. The ingredients used in the production of *Euthynnus affinis* fish nuggets include purple sweet potato flour (*Ipomoea batatas* (L.) Lam.), which contains vitamins A, B, C, calcium, potassium, and high levels of iron.

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