
Literature Review: Analysis of Protein and Fat in Processed White Oyster Mushroom (*Pleurotus Ostreatus*)

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Abstract: White oyster mushroom (*Pleurotus ostreatus*) has potential and many used by the community because of its high economic and nutritional value. *Pleurotus ostreatus* is rich in nutritional value, especially protein and fat. This study aims to determine the protein and fat content in processed white oyster mushrooms and determine the benefits of protein and fat in *Pleurotus ostreatus* in the health sector. The method used to compile this review article is a literature study of indexed and leading 24 research journals conducted on the Google Scholar database, Science Direct, and PubMed. This review article discusses the health benefit of protein and fat in *Pleurotus ostreatus*. The extraction method used in this research is the Kjeldahl method for protein content analysis and the Goldfish and Soxhlet methods for fat content analysis. The results showed that the longer the frying time, the lower the protein and fat content in processed white oyster mushrooms. Frying processed *Pleurotus ostreatus* done with variations of 2 minutes, 4 minutes, and 7 minutes. While the study results that based on the length of preservation carried out, the laboratory results prove that the longer processed products are preserved, so the fat and protein content in the processed product can be lower. The length of preservation is carrying with variations of two days, four days, and seven days. Based on the research that has been done, the highest protein and fat content obtainable at a time variation of 2 minutes and a preservation time of 2 days.

Keywords: *Pleurotus ostreatus*, protein, fat

Introduction

Indonesia has diverse mega biodiversity, abundant natural resources, and the potential to be used, one of which is white oyster (*Pleurotus ostreatus*) which has a high economic value and many in empowered by the people of Indonesia. Banyumeneng Village is one of the villages that cultivate white oyster mushrooms. This village is an area that coincides with the Mranggen District, Demak Regency, Central Java. Geographically, this village area is mainly covered by plantations, rice fields, and hills. Therefore, many people in Banyumeneng Village cultivate white oyster mushrooms.

In addition to having a relatively high economic value, the white oyster mushroom also has potential because it contains many phenolic compounds, proteins, antioxidants, and vitamin C (Jayakumar et al., 2006). The nutritional value of white oyster mushrooms is comparable to eggs, milk, and meat (Widyastuti, 2021). Dewi et al. (2018) research stated that the antioxidant activity and protein of white oyster mushrooms are pretty high. One hundred grams of dried white oyster mushrooms contain 7.8-17.72 grams of protein, 1-2.3 grams of fat, 57.6-81.8

grams of carbohydrates, and 328-367 Kcal of energy (Ardiansyah, 2014). Seeing this incident, many white oyster mushrooms that consumed.

BPS-Statistics Indonesia (2017) recorded that the consumption level of white oyster mushrooms in Indonesia reached 47,753 tons while the mushroom production was only 37,020 tons. The demand for white oyster mushrooms every day always increases by 10% (Rahmawati, 2015). Not only in Indonesia but other regions in the world also are interested in consuming white oyster mushrooms. This is because white oyster mushrooms are low in calories, high in sodium, fat, cholesterol, and protein, and equipped with sufficient amino acids, fiber, and vitamins (Ch et al., 2021).

As a food source with high protein content in Banyumeneng Village, the processing of white oyster mushrooms has processing done by the community Banyumeneng. White oyster mushrooms have started to be processed a lot at this time, ranging from white oyster mushroom nuggets, white oyster mushroom meatballs, and many more. Processed white oyster mushrooms, not much is known about the content in them. In connection with this, through this community service activity, research was carried out on the levels of protein and fat contained in white oyster mushrooms and their benefits in the health sector. This research aims to know the protein and fat content in processed white oyster mushrooms and the benefits of protein and fat in white oyster mushrooms in the health sector.

Methods

The data used in this study are primary data and secondary data. The primary data of this research was obtainable using an experimental laboratory research study of protein and fat content analysis using the Kjeldahl method and soxhletation, research conducted at the Chemical Engineering Laboratory, Faculty of Engineering, Diponegoro University. This research was conducted for one month, starting from May 31 to July 22, 2021. The mushroom samples were mushrooms obtained from the cultivation of the Banyumeneng village community, Mranggen District, Demak. The Secondary data is obtainable from the research method done by using a literature review. The literature review is done by collecting and summarizing data from previous studies. This literature review is carried out with guidelines using 24 research journal articles from the last ten years, accessible in national and international journals on the Google Scholar page, Scopus, Science Direct, PubMed.

Results

1. Protein and Fat Content of Processed White Oyster Mushroom

White oyster mushroom is a plant that has a relatively low calorific value. Palatability, satiety, and physical activity are not affected by the type of food (CDC, 2020), so this phenomenon indicates that consuming white oyster mushrooms makes it possible to reduce calories in nutritional intake without affecting satiety. Substitution of raw mushrooms instead of meat as processed food proves that mushrooms can increase fullness and accelerate hunger and prospective consumption when consuming pizza with meat (Ellefson, 2017; Hizon-fradejas et

al., 2019; Rizzo et al., 2021). White oyster mushroom is a plant with nutrients with various contents, one of which is protein and fat. The following table contains white oyster mushrooms.

Table 1. *Pleurotus ostreatus* Nutrient Content

Nutrient Content	Amount	Nutrient Content	Amount
Protein	27,25 g	Vitamin C	12,30 g
Fat	2,75 g	Vitamin D	0 mg
Total saturated fat	1,32 g	Iron	116 IU
Carbohydrate	0,20 g	Calcium	9,1 mg
Sugar	56,33 g	Sodium	20 mg
Fiber	18,10 g	Potassium	48 mg
Cholestrol	33,40 g	Selenium	2700 mg
Vitamin A	0 g	Niacin	54,30 mg
Thiamin	0 IU	Riboflavin	2,04 mg
Vitamin B5	0 IU	Ash	6,74 g

(Paul Stamel in Zulfarina et al., 2019)

In the present study, the protein test and fat do pad a refined oyster mushroom fried and pickled them in crispy mushrooms, meatballs, and dumplings. The following is an illustration of the effect of frying time on the fat and protein of processed white oyster mushrooms:

Figure 2. Effect of Frying Time on Total Fat

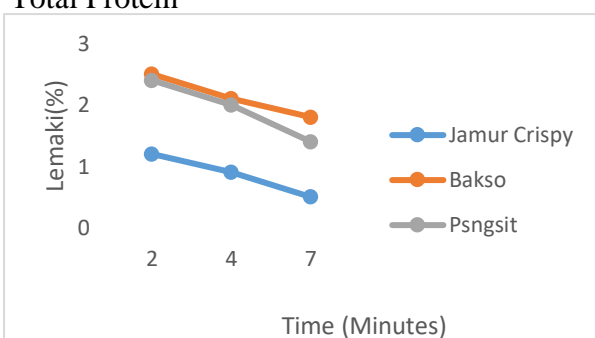
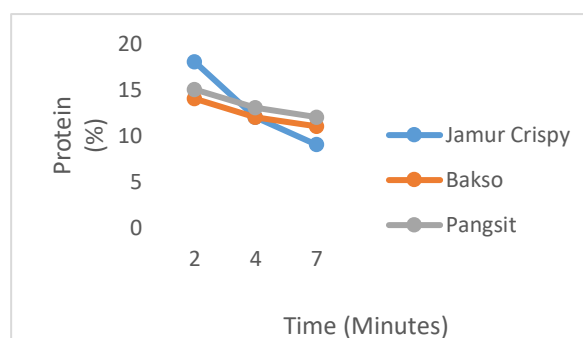
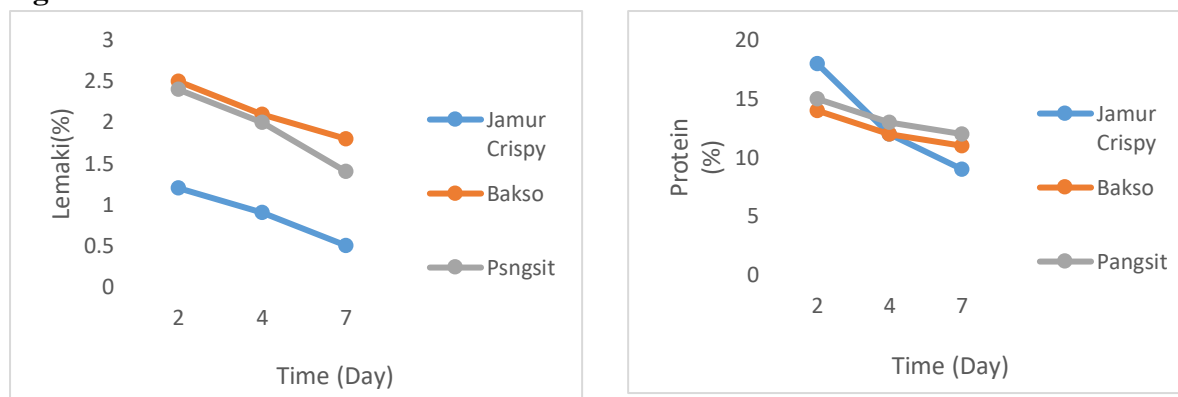


Figure 2. Effect of Frying Time on



From the picture above, it is proven that increasing the frying temperature can cause the content in the white oyster mushroom to die and damage its structure. Based on the test results, the conclusion is that the time for frying must be controlled. This is because it can increase the temperature to damage the structure of the content in the preparation (in this case, protein and fat). The optimal time for frying, so that fat and protein are not damaged is 10 minutes.

Figure 3. Effect of Preservation Time on The Amount of Fat and Protein



From the picture above, it is proven that the effect of preservation on processed white oyster mushrooms can be said to be effective in 2-4 days. This is because the curve of protein and fat is still in a stable state. Meanwhile, on the next day, there was a decrease in the protein and fat content of processed white oyster mushrooms preserved.

2. Benefits of Protein and Fat

Protein

Various studies on white oyster mushrooms have focused on the health and therapeutic benefits of mushrooms, especially in the area of civic bioactive nutraceuticals that have been carried out in recent years (Valverde et al., 2015). The trials conducted included enhanced immune function (Khatua & Acharya, 2013), anti-tumor, anti-inflammatory (B. P. P. Oliveira et al., 2014), antioxidant, antifungal, antibacterial, and antiviral activities (Rathore, 2017). Mushrooms have also been shown to have the ability to attenuate health hazards caused by obesity, such as hypotension, hypolipidemia, hypertension, and impaired function caused by aging or increasing age (Ma et al., 2018).

Protein content in the oyster mushroom is affected by the composition compos or mushroom growing media. The protein in fungi is a component macromolecule formed in the form of amino acid biopolymer. It consists of a series of nitrogen compounds that provide a variety of physical, chemical, and biological (Bonomi and Iametti., 2018 in Ch et al., 2021). Proteins in mushrooms have high thermal stability and pH (C. Oliveira et al., 2021). The utilization of white oyster mushrooms for the development of protein-rich food products could provide an attractive alternative for switching to animal protein sources while promoting their valorization (Nobre et al., 2021).

In general, white oyster mushrooms have 19% - 39% protein in dry conditions. The protein in mushrooms is a protein in which there are lectins and several enzymes found as lactase and is also an immunomodulator of fungal proteins (Xu et al., 2011 in Ch et al., 2021). In addition, this white oyster mushroom contains -glucan, gallic acid, homogentisic acid, myricetin, tocopherol, naringin, glycoprotein, protein-peptide, -D glucan (pleuran), and lectins (Goswami et al., 2021).

The peptide proteins in mushrooms have anti-tumor, antiviral, anti-inflammatory, and immunomodulating activities that suppress the invasion and metastasis of tumors. It has been demonstrated primarily as an anti-tumor and immunomodulator. This is because the protein utilizes HepG2 hepatoma cells, human leukemia T cells, and MCF 7 breast cancer cells (Lin et al., 2010). A single band protein (HEP3) exhibited immunomodulatory activity in lipopolysaccharide-activated RAW 264.7 macrophages by reducing the overproduction of cytokines isolated from *Hericium Erinaceus*, and further studies revealed that HEP3 could enhance immune function through regulation of gut microbiota composition and metabolism in mice. Research on this aspect requires in-depth and further studies in the future, which will reveal novel mechanisms of fungal proteins and peptides on modulating human health (Diling et al., 2017).

Bioactive peptide protein is a part that can play an essential role in the prevention of hypertension. In addition, mushroom protein hydrolysates (MPHs) or mushroom proteins that have been hydrolyzed have an antiproliferative solid effect on the cervix in humans. The following are other benefits produced by the protein present in white oyster mushrooms, including anti-tumor activity (Wang et al., 2006), antiproliferative activity, inhibits HIV-1 activity, and inhibits inflammatory activity (Zhao, 2014). The above studies prove that MPHs in white oyster mushrooms are considered potential agents to treat cardiovascular disease, early-stage cancer, diabetes, inflammation and can be used as food formulation agents in the industry (Goswami et al., 2021).

Fat

Fungal lipids are a group of molecules that play a vital role in the growth process. White oyster mushroom is a plant with a lipid compound structure at a percentage between 1.18 and 8.39% in dry conditions. Generally, white oyster mushrooms in their growth, these lipid-based compounds are used as fatty acids, sterols, and phospholipids (Motta et al., 2021). Fungal fatty acids are simple lipids. Research proves that this compound affects health. Compounds in fungi such as linoleic acid and -linoleic acid cannot be synthesized in the human body (Sande et al., 2019 in Ch et al., 2021). Linoleic, oleic, and palmitate are compounds that are part of mushrooms. The compound in mushrooms that is the most common and widely produced sterols is ergosterol which functions in the growth process of fungi. This molecule is a precursor of vitamin D; it positively links the cardiovascular system and lipid metabolism (Ch et al., 2021).

Linoleic acid is also known to be an essential part of fatty acids in humans. Linoleic acid has various physiological roles and functions, significantly reducing inflammation by inhibiting nitric oxide NO production and suppressing the expression of pro-inflammatory cytokines in c cells (Ma et al., 2018).

Conclusion

White oyster mushroom is a plant with quite a lot of nutrients, one of which is protein and fat. J amur white oyster has many benefits in the health field. White oyster mushrooms have also been shown to have the ability to weaken health hazards caused by obesity, such as

hypotension, hypolipidemia, hypertension, and impaired function caused by aging or increasing age. The protein in white oyster mushrooms is one of the macromolecular components consisting of a series of nitrogen compounds that provide various physical, chemical, and biological properties. The fat in white oyster mushrooms is formed in fatty acids (linoleic acid). Protein and fat in oyster mushroom white have many benefits in the areas of health, namely as an anti-tumor and immunomodulating, as a form of potential agents of cardiovascular disease, early-stage cancer, diabetes, inflammation motion and can be used as an agent formulator of food in the industry.

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