IOP Conf. Series: Journal of Physics: Conf. Series **1469** (2020) 012010 doi:10.1088/1742-6596/1469/1/012010

Effect of oyster mushroom (*Pleurotus ostreatus*) to the mice longissimus dorsi muscle: A chemical review

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Abstract. Objective of the research was to determine potency of oyster as mice nutrition growth. Oyster from market, oyster which harvested from ganyong waste biomass, and 6 weeks old male DDY strain mice were used for this research. The mushroom powder dissolved in distilled water then inserted orally force-fed 0.5 mL. There were 5 groups of treatments were dosage 200 mg/kgBW of oyster from market, without mushroom, dosage 100 mg/kgBW of mushroom from biomass waste of ganyong, dosage 200 mg/kgBW, and dosage 300 mg/kgBW. Parameters measured were histology and perimeter Longissimus dorsi muscle. The results showed histology analysis with higher dosage of mushroom solution could effect a better growth of Longissimus dorsi muscle.

1. Introduction

White oyster mushroom has been produced commercially on an industrial scale as food and supplements. This caused white oyster mushrooms contain nutrients that are beneficial to the body so that it is able to support health. This potential has led white oyster as a source for nutraceutical for society [1]. It also produces secondary metabolites that are useful for body treatment. The lignolitic potency could be used for the purposes of agricultural waste bio conservation, biodegradation organic pollutants, biodegradation and xenobiotic [2].

The nutrients contained in white oyster make this fungus has a lot of potential such as food additives, drugs and supplements. Beta Glucan Health Center stated that white oyster mushroom contains compounds of pleuran, protein (19-30%), carbohydrates (50-60%), amino acids, vitamins B1, B2, B3, B5, B7, C, calcium, iron, magnesium, phosphorus, potassium, sulfur, zinc, fiber, thiamin, and riboflavin [3,4].

White oyster can also be used as a drug because of the abundant nutrients content in it. This fungus is potentially as anti-tumor, decrease cholesterol and as antioxidant [3]. This fungus has the ability to increase metabolism and regulate autonomic nervous function [4]. In addition to treatment the fungus also acts to relieve the hepatitis diseases, gastrointestinal, duodenum and stomachache. White oyster good for preventing from cardiovascular and heart attack. White oyster contains mevinolin and other compounds which potentially acted as an inhibitor of HMG CoA in biosynthesis of cholesterol. The fungus also had efficacy in controlling high blood pressure, diabetes, anemia, increases the body's immune against polio virus, influenza, and some nutritional deficiencies [5]. Based on information about the rich nutrients that are contained and the number of benefits white oyster, we do the research to obtain pertinent information about potency of white oyster to mice growth. So that the use of white oyster for

human needs could be elevated. However, it is expected that it could also be used as a medicine in healing degenerative diseases.

The purpose of this research is to determine the potency of white oyster to the growth of mice (Mus musculus). This research is expected to deliver and add information for the utilization of white oyster food ingredient and nutrition for health.

2. Method

This research was conducted with dosages: dosage 200 mg/kgBW of oyster mushroom from market, 100 mg/kgBW of oyster from biomass waste of Canna edulis, 200 mg/kgBW of oyster from biomass waste of Canna edulis, 300 mg/kgBW of oyster from biomass waste of Canna eduli, and no oyster addition in oral delivery. This research begins with the oyster fluor optimization. Oyster oral delivery using gavage once per day in 12 days. A 6 weeks male DDY (Deutschland, Denken, Yoken) strains were taken from Ruminantia Veterinary Unit, Bogor. The parameters that will be observed were histology, density, and perimeter of the Longissimus dorsi muscle.

2.1. Making of fluor

The making of oyster flour based on reference with modification [4]. The white oyster first rinsed under running water, weighed as 100 g, cut, dried at 40 ^{0}C during 24 to 48 hours. The oyster mashed with grinder into flour, further filtered to obtain a smooth texture, then stored in a ziploc bag and labeled.

2.2. Treatments delivery

Oyster fluor were dissolved with sterile aquades. Gavage administration were using needle gastric (gavage tube) which is connected with 0,5 ml spuit. The lethal dose 50 (LD50) tested by using 6 doses: 100, 200, 300, 350, 500, 650 mg/kgBW. These doses were not cause death so it's safe to give to the mice. However, this research used a dose of 100 mg/kgBW, 200 mg/BW, and 300 mg/BW.

2.3. Data analysis

Analysis of data using One-way ANOVA to determine treatment significance. Least Significant Difference tests are conducted to see the significance of the response.

3. Results and discussion

3.1. Nutritional factor

In general, the basic needs of the murine nutrients are proteins, carbohydrates, fats, and fiber already fulfilled from the given different doses. However, the nutrients contained in white oyster might be altered because of fluor processing. The environmental conditions could influence the mice feed consumption which resulted in the fulfilment of its nutrients. The shape, taste, smell, texture, and color of the feed given to the mice would also affected their palatability. Feed consumption could affect the growth. The quality change of feed could decrease mice appetite and lose body weight.

Nutrition composition of white oyster was varied depended on the cultivation methods, harvesting system, and crops management. Table 1 informed us about the nutrition composition of white oyster and mice feed.

Table 1. Nutrition composition of white oyster mushroom and mice feed.

Nutrition	White oyster (100 g) [3,4]	Mice Feed
Carbohydrate	50-60% (57-81 g)	---
Lipid	1-2.3 g	6.17%
Protein	19-30% (7.8-17.72 g)	13.8%
Fiber	5.6-8.7 g	4.38%

Carbohydrate, lipid, protein, and fiber were found in white oyster mushroom. They gave different number in 100 g mushroom. Carbohydrate took part as dominant nutrient which conduct the energy supply for cells and organisms. Protein were found about 30% that would have acted in cells development mostly. Whereas lipid and fiber which were detected in a few percentages also played important role for cell metabolism supports. In mice feed, the nutrients composition were not as much as white oyster nutrients [6].

3.2. The perimeter of longissimus dorsi

Longissimus dorsi was known as one of passive muscle in animal that it did not do all activities so that this muscle would be a good parameter for growth analysis in animal. The size of muscle fibers could be determined by measuring cross-sectional area, perimeter or diameter [7]. So that the nutrient metabolism fully used for muscle growth.

Based on Figure 1, the treatments tend to increase perimeter growth. The greater given dose showed better growth of muscle [8]. Muscle growth could be caused by two things, namely, activity and nutrition. Biceps muscle growth could enlarge because its trained periodically. In muscle growth because of nutrition, the protein and minerals accumulation would change the size of muscles [9].

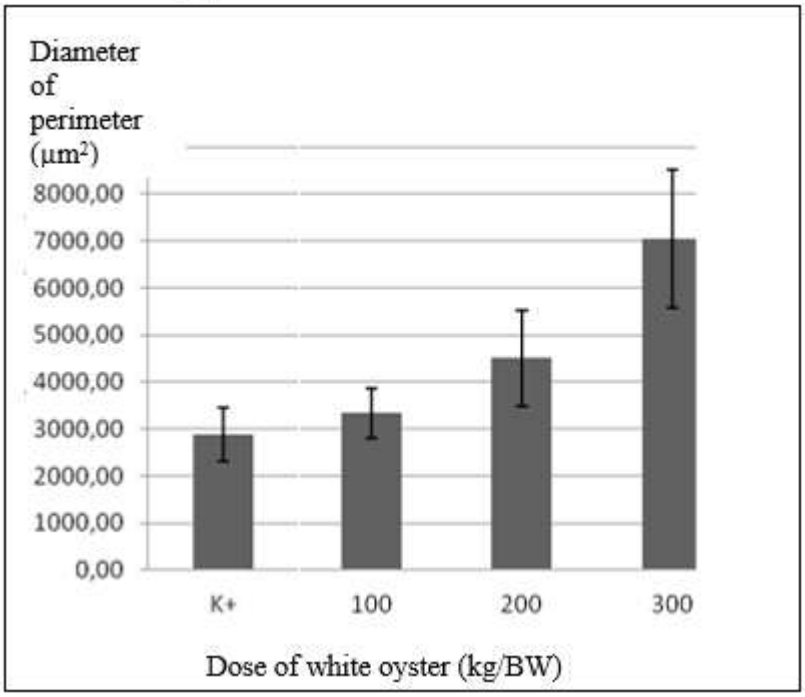

Figure 1. Perimeter growth in various dose of white oyster.

Figure 1 also informed that protein as a nutrient that is essential for growth of muscles. Protein acted as the largest part of the composition of living things after water. First of all, protein should be broken down into amino acids and reassembled into a typical protein needed by the body [10]. In this research, the mice were fed with low protein and white oyster feed. The value of low protein content about 14% which was insufficient to support life of mice [11]. The protein contained in the feed and the mushrooms give no effect on growth parameters. In other side, the feed delivered better growth of muscle.

3.3. Muscle density

Muscle density could be calculated by measuring the number of muscle fibers in each experiment group. Muscle density was identified as the average number of muscle fibers per unit area in the field of view. Muscle density was used to find out the density of muscle fibers amount in a particular field of view.

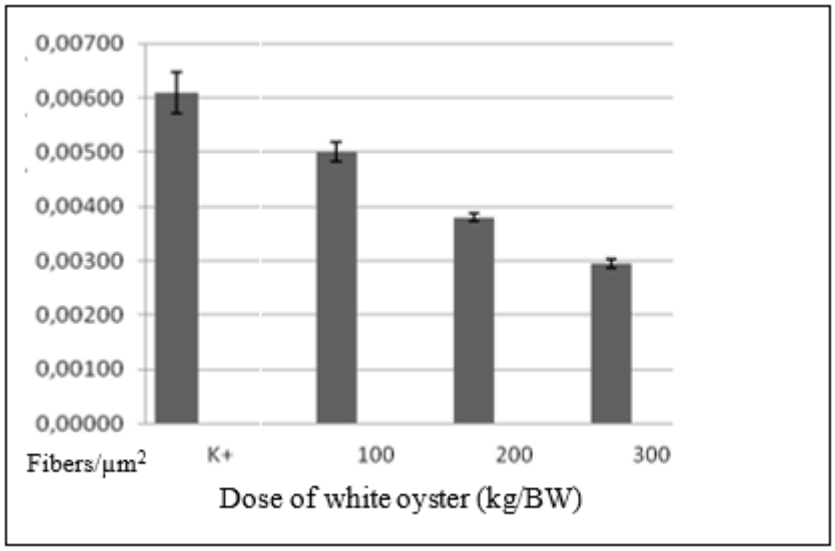

Figure 2. Muscle density (fibers/µm^2) in various dose of white oyster.

Figure 2 explained that the increase of oyster dose which planted from *Canna edulis* biomass would effect to muscle density. Muscle density was one of muscle parameter that correlated with muscle growth.

3.4. Perimeter and muscle density

Based on table 2 showed that the perimeter, fibers, and density had a nonlinear relation. The perimeter value was rise when fibers amount and density declined. The rise of fibers resulted the hyperplasia condition whereas the increase of perimeter conducted to hypertrophy.

Table 2. Comparison of perimeter and muscle density.

Dose of white oyster (kg/BW)	Perimeter (µm2)	Amount of Fibers	Density (µm2)
200*	2873.04	122	0.00610
100^	3332.68	100	0.00500
200^	4504.90	76	0.00380
300^	7053.18	59	0.00295

Note: * : Control (Oyster from market as)
^ : Treatment (Oyster from *Canna edulis* biomass)

The difference muscles size was caused by number of different muscle fibers. The potential muscle growth is affected by two things: muscle fibers growth that called hyperplasia and the low number of muscle fibers caused by dilated fiber which called hypertrophy [7].

4. Conclusion

Administering white oyster gave different results on Longissimus dorsi histology parameter. Muscle perimeter increased with oyster dose level. The amount of fibers and its density were effected when oyster dose increasing. Muscle density increased in higher dose level. Different dose level was not significantly effected to muscle growth. Nutrients composition of white oyster was higher than mouse commercial feed.

Acknowledgment
We thank to Research and Public Service Institute (LP2M) Universitas Al Azhar Indonesia for funding support so we could publish our research in this international seminar. The research was financially supported by Kemenristek Dikti for Penelitian Dosen Pemula (PDP) scheme research grant.

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