
Comparison of Wheat Flour and Tapioca Flour Towards Characteristics of White Oyster Mushroom Chips

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Abstract

White oyster mushroom chips are products that are in great demand today. In addition to delicious taste, it also contains nutrients that are beneficial for health. The quality of the chips is largely determined by the addition of the type and amount of flour added. The purpose of this study was to determine the effect of the ratio of wheat flour and tapioca flour on the characteristics of white oyster mushroom chips. This study used a completely randomized design with three replications. The treatments tested were the ratio of wheat flour and tapioca flour with levels: (90:10) %, (80:20) %, (70:30) %, (60:40) %, (50:50) %. Comparison of wheat flour and tapioca flour only had a significant effect on the subjective test of water content and carbohydrate content of white oyster mushroom chips. The objective test had a significant effect on the taste, texture, and overall acceptance of white oyster mushroom chips. Comparison of flour and tapioca flour 60: 40% produces white oyster mushroom chips with the best organoleptic score.

Keyword: *Wheat; tapioca flour; oyster mushroom*

1. Introduction

White oyster mushroom (*Pleurotus ostreatus* sp) is one type of vegetable that has the potential to be developed. The problems that are often faced by white oyster mushroom farmers occur during the rainy season, namely the availability of white oyster mushrooms is very much and exceeds market demand so that the harvest is not utilized optimally. In addition, white oyster mushrooms contain high water content, so they are easily damaged by physical, chemical, and microbiological damage [1]. Proper processing of agricultural products can increase added value and extend shelf life [2,3].

Processed white oyster mushroom products that have been developed include crispy oyster mushrooms with the addition of flour and some spices. This product has long been known to the public and has been widely sold in the market. However, there was a loss of the distinctive taste of white oyster mushrooms due to the addition of several other ingredients. The physicochemical properties of agricultural products will change if not handled properly [4]. Several studies on processed white oyster mushroom products include the manufacture of vegetable mushroom chips [5], study of the Physico-chemical properties of freeze-dried white oyster mushrooms [6], and optimization of temperature and time of vacuum frying oyster mushrooms. white by [7]. The chips produced in this study were only limited to the original taste of oyster mushrooms. Some of the shortcomings in existing chip products can be complemented by developing and modifying the design of the chip processing process, namely by modifying the ratio of wheat flour and tapioca flour in the manufacture of white oyster mushroom chips [8].

The diverse tastes of consumers necessitate the development of a chip flavor variant without losing the distinctive taste of the white oyster mushroom itself. The resulting chips are also safe for consumption because there is no addition of additives such as preservatives, crunching agents, and dyes. The addition of inappropriate additives will affect product quality [9]. Thus, these chips will have better quality, making them more attractive for consumers to consume. The purpose of the study was to determine the effect of the ratio of wheat flour and tapioca flour on the characteristics of white oyster mushroom chips and to determine the best ratio.

2. Materials and Methods

The materials used in this study were white oyster mushrooms, cooking oil, pepper powder, wheat flour and tapioca flour, clean water, eggs, salt. The raw materials used in making the chips include young and fresh white oyster mushrooms that have just been harvested and processed directly, which are obtained from a mushroom garden in Denpasar. Additional ingredients used include wheat flour and tapioca flour. The analytical materials were 0.325 N H₂SO₄, 0.1 N KOH, hexane, 1.25 N NaOH, CuSO₄, Na₂SO₄, concentrated H₂SO₄, 0,02 N NaOH, indicator pp. NaOH 30%, HCL 4N, H₂SO₄, Aquadest. The tools used in the process of making white oyster mushroom chips include stove, washbasin, sotil, scales, drainer, knife, polyethylene plastic, petri dish, mortar.

This study used a completely randomized design with three replications. The treatments tested were the ratio of wheat flour and tapioca flour with levels: (90:10) %, (80:20) %, (70:30) %, (60:40) %, (50:50) %. The research stages are as follows: select mushrooms that are still fresh. The selected mushrooms are then washed and drained, mix the flour and tapioca flour according to the treatment, add water to form a dough. Mushrooms are dipped in the flour mixture. After that, it is fried at a temperature of 163°C for 1 minute and drained using a spinner machine. Then the white oyster mushroom chips are packed in plastic and stored according to the treatment. To determine the effect of each treatment, objective observations were made (moisture content, protein content, ash content, carbohydrate content, lipid content) and subjective observations (taste, texture, color, and overall acceptance).

3. Results and Discussion

Water content

The results showed that the water content in white oyster mushroom chips ranged from 19,62 to 21,67%. The highest water content was obtained in the comparison treatment of wheat flour and tapioca flour (70:30) % i.e., 21,67%, while the lowest was in the comparison of wheat flour and tapioca flour (50:50) % i.e., 19.62% (Table 1), There was a tendency to decrease the water content with an increasing amount of tapioca flour. This is because the water content of wheat flour is greater than the water content of tapioca flour. According to [10], starch can bind water, because the number of hydroxy groups in the starch molecule is very large. The more flour, the more water is absorbed so that the water content is higher [8].

Table 1. Effect of Comparison of Wheat Flour and Tapioca Flour on Moisture, Ash, Protein, Lipid, and Carbohydrate Content of White Oyster Mushroom Chips (%).

Treatment Flour: Tapioca (%)	Water Content	Ash Level	Protein	Lipid	Carbohydrate
(90:10) %	21.67	1.28	5.26	2.50	71.71
(80:20) %	21.64	1.24	7.56	2.28	66.96
(70:30) %	20.80	1.56	5.86	3.15	68.45
(60:40) %	20.25	1.42	6.49	2.17	69.66
(50:50) %	19.62	0.87	6.88	2.39	68.73

Ash content

The results of observations as in Table 1 show that the ash content of white oyster mushroom chips ranges from (1.56-0.87) %. The highest ash content of white oyster mushroom chips was obtained from the ratio of flour and tapioca flour (70:30) %, namely: 1.56%, while the lowest ash content was obtained from the ratio of wheat flour and tapioca flour (50:50) %, which was 0.87% (Table 1). The greater the addition of tapioca flour, the higher the ash content. However, in the comparison treatment (60:40) % and (50:50) % the ash content decreased, possibly this was caused by the increasing water content so that the ash content decreased. This is supported by [11] the statement that by increasing the water content of food, the content of compounds, such as protein, lipid, and ash, will decrease.

Protein

The protein content of white oyster mushroom chips ranges between (5.26-7.56) %. The highest protein content was obtained from the treatment of wheat flour and tapioca flour (80:20) % which was 7.56%, while the lowest protein content was obtained from the treatment of wheat flour and tapioca flour (90:10) % which was 5.26% (Table 1). This is probably due to the protein content in tapioca flour, the more tapioca flour the higher the protein content. This is supported by the statement [8,11] that the crispness of chips is determined by the protein content and water content in the chips, with the more tapioca flour, added, the higher the protein content, causing the chips to be crispier.

Lipid

Based on the results of research on white oyster mushroom chips, the results of the lipid content ranged from 2.17 to 3.15%. The highest lipid content was obtained in the comparison treatment of flour and tapioca flour of (70:30) %, around 3.15%, while the lowest lipid content was obtained in the treatment of comparison of flour and tapioca (60:40) %, average 2.17% (Table 1). This is probably because the greater the tapioca flour formulation, the lower the oil absorption rate, and the lower the oil absorption rate, the lower the lipid content of the mushroom chips. The lipid content in tapioca is (2.17-3.15) % smaller than the lipid content of wheat flour (10.0-18.0) % [12].

Carbohydrate.

Based on the observation, the comparison of wheat flour and tapioca flour showed a significant difference to the total carbohydrates of white oyster mushroom chips. Carbohydrate levels of white oyster mushroom chips can be seen in Table 1. Carbohydrate levels ranged from (71.71-68.45) %. The highest carbohydrate content of white oyster mushroom chips was obtained from the ratio of wheat flour to tapioca flour (90:10) % is 71.71% while the lowest carbohydrate content was obtained from the ratio of wheat flour to tapioca flour (70:30) % which was 68.45%. Carbohydrates have an important role in determining the characteristics of food ingredients, such as taste, color, texture, and others. Carbohydrates are the main source of calories, although the number of calories produced by 1 gram of carbohydrates is only 4 Cal (kcal) when compared to protein and fat. Whereas in the body, carbohydrates are useful for breaking down excessive body proteins and helping fat and protein metabolism [10]. During the mushroom ripening process, starch content which is part of carbohydrates is hydrolyzed into simple sugars such as glucose, sucrose, and fructose. This causes the starch content in mature white oyster mushrooms to decrease [13].

Subjective Analysis

Color

The color variable of white oyster mushroom chips showed that the ratio of wheat flour and tapioca flour had a significant effect. The author's highest level of preference was obtained from the comparison treatment of wheat flour and tapioca flour (60:40) % with an assessment score of 6.39 (Table 2). This is because the gluten from wheat can absorb water and can distribute the color, while in tapioca flour many gels are formed from starch that undergoes gelatinization [14]. Starch granules also have the property of being able to reflect light so that white oyster mushroom chips look brighter and are preferred by researchers [15].

Taste

The comparison of wheat flour and tapioca flour has a significant effect on the panelists' preference level on the taste of white oyster mushroom chips. The panelist's highest preference level was obtained from the comparison of flour and tapioca flour (60:40) % with an assessment score of 6.93, while the lowest score was obtained from the comparison of flour and tapioca flour (90:10) % with a score of 5.80 (Table 2). With the addition of tapioca flour, the author's preference

level is higher. Possibly because wheat flour and tapioca flour provide a more savory and delicious taste than other flours [14]. Taste assessment of mushroom chips is a complex matter and is determined by the sharpness of the different panelists' senses of taste. The influence of the value of product taste preferences is also very dependent on the tastes and preferences of each researcher [10].

Texture

The texture score of white oyster mushroom chips showed that the treatment with the highest ratio of 60:40% wheat flour and tapioca flour was 6.93 while the lowest score was obtained from the treatment of the comparison of 80:20% wheat flour and tapioca flour, which was 3.47 (Table 2). This is because tapioca flour contains amylopectin where this portion of the starch can provide a good texture to the resulting product. While the nature of starch is easy to expand in heat and form gelatinization, so that it affects the texture of white oyster mushroom chips [16].

Table 2. The average value of the panelists' acceptance of subjective observations (color, taste, texture, and overall acceptance) of white oyster mushroom chips

Treatment Flour: Tapioca (%)	Color	Taste	Texture	Overall Acceptance
(90:10) %	6.53	5.80	5.37	6.33
(80:20) %	6.40	6.07	5.47	6.60
(70:30) %	6.40	6.13	6.07	6.47
(60:40) %	6.47	6.93	6.93	6.73
(50:50) %	6.47	6.80	6.27	6.93

Overall Receipt

Based on the observations, it can be seen that the comparison treatment of wheat flour and tapioca flour is not significant on the overall acceptance of white oyster mushroom chips. After further analysis with Duncan's test, the highest level of preference was obtained from the (50:50) % comparison of wheat flour and tapioca flour with a score of 6.93, and the lowest was obtained in the treatment of (90:10) % with a score of 6.33 (Table 2). The comparison of wheat flour and tapioca flour does not affect the overall acceptance rate of white oyster mushroom chips produced, possibly this is due to the overall acceptance of color, aroma, taste, and texture so that mushroom chips are still favored by panelists [16].

4. Conclusion

Comparison of wheat flour and tapioca flour only had a significant effect on the subjective test of water content and carbohydrate content of white oyster mushroom chips. The objective test had a significant effect on the taste, texture, and overall acceptance of white oyster mushroom chips. Comparison of flour and tapioca flour (60: 40) % produces the best white oyster mushroom chips.

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