Effect of ratio of oyster mushroom with straw mushroom and the type of filling flour on the quality of natural seasoning

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Abstract. Seasoning is one of food additives that needed to improve the taste of food. Natural seasoning can be obtained from plants, one of them is mushroom, especially from the class Basidiomycota. The purpose of this research to find the effect of ratio of oyster mushroom with straw mushroom and the type of filling flour on the quality of natural seasoning. This research was using factorial completely randomized design with two factors, i.e: ratio of oyster mushroom with straw mushroom (J) : (20%:80% ; 40%:60% ; 60%:40% ; 80%:20%) and type of filling flour (P) : (wheat flour, rice flour, cornflour, cipera). The results showed that the ratio of oyster mushroom with straw mushroom had highly significant effect on water content, fat content, and brightness. Type of filling flour had highly significant effect on brightness, protein, fat, and crude fibre content. Interaction of two factors had highly significant effect on water, fat, and crude fibre content. The ratio of oyster mushroom with straw mushroom that is 60%:40% and cipera as filling flour (J3P4) produced the best quality of this research that obtained by deGarmo methods.

1. Introduction
Food additives such as seasoning are ingredients needed to improve the taste of food. In addition, foods that do not use seasoning ingredients are considered to have deficiencies in the level of consumer satisfaction. Therefore, the use of synthetic seasoning ingredients on the market such as monosodium glutamate (MSG) is very high [1]. However, excessive consumption of artificial seasonings for a long period of time can have adverse effects on health, such as cancer, damage to the nervous system and eyes, slow down the development of children's intelligence, and pregnancy and fetal disorders [2]. Hence, it is necessary to look for alternative materials derived from nature that can replace the function of MSG as a food seasoning.

Natural seasonings are food additives obtained from plants or animals directly or through physical, microbiological, or enzymatic processes that can be consumed directly or through a prior process [1]. One of the plants that can be used as a natural flavouring agent is mushrooms, especially mushrooms from the class Basidiomycota including oyster mushroom and straw mushroom.

Mushroom, in botanical terms are called fungi, is simple plants that do not have chlorophyll, are insulating tubes, and live in media that already contain the nutrients they need. The main sources of nutrition for mushrooms are elements such as nitrogen, phosphorus, sulfur, potassium, and carbon [3]. Mushrooms have a special taste that is in great demand because they provide a delicious taste. This savory and delicious taste is the same taste as that of meat due to the high glutamic acid content in
mushroom. Glutamate is a non-essential amino acid that functions as a neurotransmitter in the brain and nerve cells. The glutamate content will increase when the mushrooms are mature for harvest [4].

Research by Widyastuti, et al., [5] found that mushroom gives the best taste to seasonings and oyster mushroom gives the best colour and aroma to seasonings. The combination of oyster mushrooms and straw mushrooms in this study is expected to provide the best colour, aroma, taste, general acceptance, and chemical quality values for seasonings. The manufacture of flavouring seasonings in powder form is strongly influenced by fillers that function to bind water to make it easier to dry, bind and trap the flavour and nutritional content of the spices, and maintain the texture during storage. The commonly used fillers are flour, starch, dextrins, and tween 80 [6]. The use of wheat flour, rice flour, cornflour, and cipera (roasted cornflour from Batak Karo) in this study is because they are very easy to find at affordable prices.

2. Materials and methods

2.1. Materials and equipment

The main materials used in this study were Mario Boss oyster mushrooms and straw mushrooms obtained from Pondok Indah, Pasar Buah, Setia Budi street. Other ingredients used in this research are wheat flour, rice flour, cornflour, cipera, sugar, salt, ground pepper, shallots and garlic which are obtained from Jamin Ginting & Street, Medan. Reagents used for chemical analysis of flour and product analysis are aquadest, sulfuric acid, potassium sulfate, sodium hydroxide, copper sulfate, hexane, ethanol, silver nitrate, potassium chromate, methyl red, and methyl blue.

The equipment used in the processing of seasonings is a knife, a basin, oven drying, a scale, a filter, a 60 mesh sieve, a baking sheet, a blender, a stove, and a boiling pan. The equipment used for the analysis of the physicochemical and sensory properties of the seasonings is analytical balance, aluminum plate, porcelain cup, soxhlet, hot plate, Kjeldhal flask, furnace, flask, Erlenmeyer, oven, chromameter, desiccator, and other glassware.

2.2. Research method

This research was using factorial completely randomized design with two factors, i.e Factor I: ratio of oyster mushroom and straw mushroom (J) consisting of 4 levels, namely: J1 = 20%:80%; J2 = 40%: 60%; J3 = 60%:40%; J4 = 80%:20%. Factor II: Type of filling flour (P) with 4 levels, namely: P1 = wheat flour; P2 = rice flour; P3 = corn flour; P4 = cipera.

Each treatment was made in 2 replications so that the number of samples were 32 samples. The best treatment analysis was carried out using the deGarmo method [7]. The best treatment will be analyzed for levels of NaCl and levels of glutamic acid.

2.3. Research implementation

This research carried out in stages as follows: oyster mushrooms and straw mushrooms sorted then washed and drained. Furthermore, 500 g of mushrooms were weighed in each treatment with a ratio of J1 (20%: 80%), J2 (40%: 80%), J3 (60%: 40%), and J4 (80%: 20%). Then, the mushrooms were mashed in a blender with the addition of 1:1 water. The mushroom porridge was cooked in a boiling pan for 20 minutes and added with the prepared spices: 30 g of fine shallots, 40 g of ground garlic, 1 g of ground pepper, 15 g of salt, and 8 g of sugar.

After 20 minutes of cooking, 25 g of filling flour was added according to the predetermined treatment, namely P1 = wheat flour, P2 = rice flour, P3 = cornflour, and P4 = cipera. Then, the mixtures were cooked and stirred until thickened. The resulted dough was poured into a baking sheet and dried in an oven at 60°C for 8 hours until the dough was completely dry. To get the seasoning, the dry dough was smoothed using a blender then sieved with a 60 mesh sieve to get a uniform size until the dough runs out. Finally, the natural flavouring powder was packaged in a polyethylene (zipperlock) and stored at room temperature for one day before analysis.
3. Results and discussion

3.1. Water content
Figure 1 shows that the highest water content obtained in treatment J₁ (20% oyster mushroom : 80% straw mushroom) and the lowest in treatment J₄ (80% oyster mushroom : 20% straw mushroom) were 7.4166% and 5.9843%, respectively. In a fresh state, straw mushroom contains high water content that affect the processed mushrooms [8]. Therefore, the use more of straw mushroom, the water content of the flavouring produced will be higher.

![Figure 1. The relation of ratio of oyster mushrooms with straw mushroom with water content of natural seasoning](image)

3.2. Ash content
Figure 2 shows that the highest ash content that obtained in treatment J₁ (20% Oyster Mushroom : 80% Straw Mushroom) and the lowest is in treatment J₄ (80% oyster mushroom : 20% straw mushroom) were 16.1728% and 14.9268%, respectively. Straw mushroom have a higher mineral content than other foodstuffs such as beef and lamb [9], so with the use more of straw mushroom, the resulting product ash content will be higher.

Figure 3 shows that all samples had similar ash content, except for seasoning made of wheat flour (15.0518%). This is because wheat flour has a lowest ash content than other flours. Cipera is a flour that produced from roasted corn which is cornflour has a high mineral content, namely phosphorus around 245 mg, calcium 20.11-28 mg, and calcium around 275-305 mg [10].

3.3. Protein content
Figure 4 shows that the highest protein content that obtained in the treatment P₁ (wheat flour) and the lowest is in the treatment P₄ (cipera) were 24.0849% and 21.0672%, respectively. Wheat flour has a higher protein content than another flours. The lowest protein content in cipera caused by roasting process of corn kernels, so that cause damage and decrease in food nutrition including protein content [11].

![Figure 1. The relation of ratio of oyster mushrooms with straw mushroom with water content of natural seasoning](image)
3.4. Fat content

Figure 5 shows that the highest fat content that obtained in treatment J1 (20% oyster mushroom : 80% straw mushroom) and the lowest is in the treatment J4 (80% oyster mushroom : 20% straw mushroom) were 2.7103% and 2.2757%, respectively. The more oyster mushrooms are used, the lower the product fat content will be. Straw mushrooms have a fat content about 2.0% - 2.6% while oyster mushrooms have about 1.1% - 2.4% [12].

Figure 6 shows that the highest fat content that obtained in the treatment P4 (cipera) and the lowest is in the treatment P2 (rice flour) were 3.6086% and 1.5614%, respectively. Cipera has a high fat content due to roasting in the manufacture of cipera flour so that water content decreases and other components including fat content increases [13]. The relation of interaction of ratio of oyster mushrooms with straw mushroom and type of filling flour to the fat content of natural seasoning can be seen in Figure 7.
Figure 5. The relation of ratio of oyster mushroom with straw mushroom with fat content of natural seasoning.

Figure 6. The relation of type of filling flour with fat content of natural seasoning.

Figure 7. The relation of interaction of ratio of oyster mushroom with straw mushroom and type of filling flour to the fat content of natural seasoning.

3.5. Crude fibre content
Figure 8 shows that the highest crude fibre content that obtained in treatment P_4 (80% oyster mushroom : 20% straw mushroom) and the lowest is in treatment P_2 (rice flour) were 9.4407% and 6.6750%, respectively. The low fibre content of rice flour is due to processing processes, namely soaking, milling, and sifting which cause damage and loss of fibre in rice flour.

3.6. Brightness
Figure 9 shows that the highest brightness that obtained in treatment J_4 (80% oyster mushroom : 20% straw mushroom) and the lowest is in treatment J_1 (20% oyster mushroom : 80% straw mushroom), were 49.4639 and 42.0260, respectively. Oyster mushroom have a bright white colour and straw mushroom have brown to gray colour [14] so that the more oyster mushrooms are used, the brighter the seasoning will be.
Figure 8. The relation of type of filling flour with crude fibre content of natural seasoning

Figure 9. The relation of ratio of oyster mushroom and straw mushroom with brightness of natural seasoning

3.7. Organoleptic of colour

Figure 10 shows that the highest colour organoleptic value that obtained in treatment J₄ (80% oyster mushroom : 20% straw mushroom) and the lowest is in treatment J₁ (20% oyster mushroom : 80% straw mushroom) were 3.7625 and 3.5417, respectively. The more the use of oyster mushroom, the more the colour of product will be preferred by panelist. This is because oyster mushroom has a bright white colour and straw mushroom have brown to gray colour [14]. Figure 11 shows that the highest organoleptic value that obtained in treatment P₁ (wheat flour) and the lowest is in treatment P₄ (cipera) were 3.7542 and 3.5333, respectively. The low organoleptic value in cipera flour is thought to be due to the brownish-yellow colour which panelists do not like. This colour caused by browning reaction that called maillard reaction in processing of cipera which produces a brown pigmen [15].

Figure 10. The relation of ratio of oyster mushroom with straw mushroom with hedonic value of colour of natural seasoning

Figure 11. The relation of type of filling flour with hedonic of colour of natural seasoning
4. Conclusions
The best treatment in this study was treatment J3P4 with the ratio of 60% oyster mushrooms : 40% straw mushrooms and cipera as filling flour that obtained by deGarmo methods on organoleptic value, protein content, and crude fibre content.

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