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MAKING ARTIFICIAL MEAT FROM RED BEANS

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ABSTRACT
Artificial meat is a product made from vegetable protein made from non-meat ingredients, but conforms to or closely resembles the properties of real meat. Artificial meat has no cholesterol and low saturated fatty acid content so it can be consumed by people who cannot consume beef due to disease. The protein content in legumes, including kidney beans, has long been recognized for its contribution to the daily diet. Even red beans supply almost as much protein as meat. This study aims to determine the effect of the right amount of red bean flour and tapioca flour on the manufacture of artificial meat. This research was carried out at the Agricultural Product Technology laboratory, Faculty of Agriculture UISU Medan. The study used a factorial completely randomized design with two replications with two treatments, namely: treatment of the number of red beans (T) which consisted of four levels, namely 40% (T1), 50% (T2), 55% (T3), 60% (T4), and the amount of tapioca flour (O) which consists of four levels, namely 5% (O1), 10% (O2), 15% (O3), 20% (O4). The results showed that to make artificial meat based on 60-70% red bean flour and 5% tapioca flour, the panelists preferred artificial meat because it had the highest texture and protein content.

KEYWORDS: Red beans, tapioca, flour, artificial meat.

INTRODUCTION

Meat of animal origin is a source of animal protein. Meat contains many essential amino acids that cannot be synthesized by the human body directly but are obtained from the outside. The benefits of animal meat itself are very many of them, as the largest source of calories for humans. Various types of food (processed) come from meat such as comet, sausage, and also steak. This encourages people to be wiser in choosing their consumption patterns, thus encouraging the popularity of artificial meat which is considered to have several added values, namely containing calories and low saturated fatty acids compared to animal meat.

The protein content in legumes, including kidney beans, has long been recognized for its contribution to the daily diet. Even red beans supply almost as much protein as meat. The advantage of using legumes such as red beans, as raw material for making meat, is that artificial meat processing is done by boiling to get a fiber texture that resembles animal meat. The processing process by boiling can affect the nutritional content, increase digestion, reduce various anti-nutritional compounds contained in food.

Artificial meat is a product made from vegetable protein that is made from non-meat ingredients, but matches or closely resembles the properties of real meat. Artificial meat has no cholesterol and low saturated fatty acid content so it can be consumed by people who cannot consume beef due to disease factors, as well as for "veganers".[1]

Based on the description above, artificial red bean meat was made as an alternative source of protein, other than animal meat in order to improve people's nutrition. The high price of animal meat causes some people to rarely consume it, even though the need for protein is needed for the body. Therefore, the existence of artificial meat

with more affordable raw material prices will be an alternative for people to consume meat.

MATERIALS AND METHODS

This research was carried out at the Agricultural Product Technology laboratory, Faculty of Agriculture, UISU Medan.

The study used a factorial completely randomized design with two replications with two treatments, namely: treatment of the number of red beans (T) which consisted of four levels, namely 40% (T1), 50% (T2), 55% (T3), 60% (T4) , and the amount of tapioca flour (O) which consists of four levels, namely 5% (O1), 10% (O2), 15% (O3), 20% (O4).

The raw materials used are red bean flour, tapioca flour, wheat flour, and baking soda. The variables observed included water content, protein content, ash content, organoleptic test values for taste, color, and texture.

RESULTS AND DISCUSSION

Based on analysis of variance showed that the amount of red bean flour had a significant effect on water content, protein content, texture and taste of artificial meat, while the amount of tapioca flour had a significant effect on protein content and taste of artificial meat. The interaction between the two treatments had no significant effect on the observed variables (Table 1).

Table 1: The effect of the amount of red bean flour on the observed variables.

Amount of Flour (T)	Moisture Content (%)	Protein Content (%)	Ash Content (%)	Texture	Color	Taste
T_1 = 40%	32.675d	13.481d	0.826	2.801d	3.038	3.118d
T_2 = 50%	34.570c	15.480c	0.838	3.013c	3.100	3.375c
T_3 = 60%	35.188b	16.968b	0.844	3.338b	3.125	3.618a
T_4 = 70%	36.650a	18.066a	0.849	3.561a	3.150	3.439b

Note: Values in the same column followed by different letters show a significant difference at the 5% level based on the LSD test

Tabel 2: Pengaruh jumlah tepung tapioka terhadap variabel yang diamati.

Amount of Flour (O)	Moisture Content (%)	Protein Content (%)	Ash Content (%)	Texture	Color	Taste
O_1 = 5%	34.600	17.030a	0.848	3.159	3.000	3.540a
O_2 = 10%	34.750	16.394b	0.846	3.170	3.113	3.438b
O_3 = 15%	34.813	15.616c	0.833	3.185	3.138	3.375c
O_4 = 20%	34.925	14.893d	0.830	3.190	3.163	3.189d

Note: Values in the same column followed by different letters show a significant difference at the 5% level based on the LSD test

Table 1 shows that the use of red bean flour has a significant effect on the water content of the artificial meat produced. The less red bean flour used, the lower the water content. Likewise with the tapioca flour treatment, although the effect was not significant, it was seen that the less tapioca flour was given, the water content of artificial meat would be lower. This is in line with the research results of Nurhartadi et al.[2] which also shows that the water content of artificial meat increases with the increasing amount of red beans given.

The addition of tapioca flour, although the effect was not significant, it was seen that the more tapioca flour was added, the higher the water content. The highest water content was found in artificial meat with the addition of 20% tapioca flour. This is due to the higher water holding capacity of tapioca flour compared to the smaller amount. The Ministry of Agriculture[3] stated that tapioca flour with a water content of 12.9% per 100 g of material can increase the water holding capacity caused by the nature of the starch itself which easily attracts water. This happens because during cooking starch molecules will bind to each other with proteins through hydrogen bonds. With the weakening of this hydrogen bond, water molecules can infiltrate between protein and starch molecules, so that when cooled there is a strengthening of hydrogen bonds between starch and hydrogen molecules involving water molecules as hydrogen bridges.[4]

Red bean flour and tapioca flour had a significant effect on the protein content of artificial meat (Table 1). In the treatment of red bean flour, it was seen that the higher the percentage of red bean flour given, the higher the protein content of artificial meat. On the other hand, in the tapioca flour treatment, the higher the percentage of tapioca flour given, the lower the protein content of artificial meat. In line with the research results of Nurhartadi et al.[2] which also showed that the higher the addition of flour other than red bean flour, the lower the protein content of artificial meat.

Ash content in food is used as an indicator of the amount of mineral elements in an ingredient[5] The ash content of artificial meat is not affected by the percentage of red bean flour (Table 1) and tapioca flour (Table 2). In the treatment of red bean flour, it can be seen that the higher the percentage of red bean flour given, the higher the ash

content of artificial meat, while in the treatment of tapioca flour, it can be seen that the higher the percentage of tapioca flour given, the ash content of artificial meat will be lower. In line with the results of Lekahena's research[6] which showed the addition of a higher concentration of tapioca flour in the manufacture of fish nuggets would reduce the ash content of fish nuggets. This is thought to be the result of the mineral content of tapioca flour being less than that of fish meat, so that the addition of tapioca flour concentration resulted in a decrease in the ash content. The same result was also obtained by Wellyalina et al.,[7] which showed that the ash content of red tuna nuggets decreased with increasing concentration of tapioca flour with a value range of 0.73-1.14%.

Red bean flour had a significant effect on the organoleptic texture of artificial meat (Table 1), but tapioca flour had no significant effect on the texture of artificial meat (Table 2). The best artificial meat texture was obtained at 70% red bean flour treatment and the lowest was 40% red bean flour treatment. In line with the research results of Nurhartadi et al.[2] which shows that the artificial meat texture is better at the ratio of 60-80% red bean flour. This is because the more red bean flour is added, the lower the level of texture hardness. The function of red bean flour in general is to increase water holding capacity, increase flavor, reduce shrinkage during cooking, improve physical and chemical characteristics as well as product sensory and reduce formulation costs.[8] In addition, the fat content in red bean flour also affects the gelatinization process. Fat can inhibit the gelatinization process by means of some of the fat will be absorbed by the surface of the granules, so that a hydrophobic fat layer is formed around the starch granules. This will cause the viscosity and stickiness of starch granules.[9]

Red bean flour and tapioca flour and the interaction between the two treatments had no significant effect on the organoleptic color of artificial meat (Table 1 and Table 2). Although the effect is not significant, it can be seen that the higher the percentage of red bean flour given, the higher the organoleptic color of the artificial meat.

Red bean flour and tapioca flour had a significant effect on the organoleptic taste of artificial meat (Table 1 and Table 2). Table 1 shows that the higher the percentage of red bean flour, the more favorable the artificial meat taste. While in Table 2 it can be seen that the higher the percentage of tapioca flour given, the less favorable the artificial meat taste, where the most preferred artificial meat taste is artificial meat with a 5% tapioca flour percentage.

CONCLUSION

1. The amount of red bean flour had a very significant difference ($p < 0.01$) on water content, protein content, texture and organoleptic taste of artificial meat with the best percentage of red bean flour 60-70%.
2. The amount of tapioca flour had a very significant effect ($p < 0.01$) on the protein content and organoleptic taste of artificial meat with the best tapioca flour concentration of 5%.
3. he treatment interaction gave no significant effect ($p > 0.05$) on water content, protein content, ash content, texture, organoleptic color and taste.

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