

Profile of Chicken Nugget Fatty Acid Added Soybean Flour as Food Sources Dietary Fiber

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ABSTRACT

The current research were conducted with the aim to determine the effect of soybean flour as fortification ingredient to increase dietary fiber products to chicken nuggets. The meat used for nuggets chicken was taken from the chest. Soybeans were used as a fortification ingredient for the product of chicken nuggets. This experiment use a completely randomized design with five treatments consisting of a treatment: R₀ level 0% of soybean of the meat composition of 500 g (0 g of soybean and 500 g of meat), R₁ level of 5% of soybean of the meat composition (25 g soybean and 475 g of meat) R₂ level of 10% of soy bean of the meat composition (50 g of soybean and 450 g of meat), R₃ 15% of soybean of the meat composition (75 g of soybean and 425 g of meat), R₄ level 20% soybean of the meat composition (100 g of soybean and 400 g of meat). Each treatment was conducted four replications. The results were analyzed using analysis of variance and when there was a difference of average, the DMRT test was used to separate the difference. The results showed that fortification with soybeans in chicken meat had a significant effect on the protein, fat and fatty acid. In conclusion, Product of chicken nuggets using soybean flour can increase unsaturated fatty acids with a composition level of 75 g soybean flour and 425 g chicken meat.

INTRODUCTION

Meat is the result of animal husbandry fulfilling nutritional needs such as protein, fat, minerals and vitamins as well as substances that the body needs. The disadvantage of meat is that it is easily damaged and causes degenerative diseases when consumed uncontrollably (McEvoy et al., 2012; Jiang and Youling, 2016). People's fear of consuming and tend to avoid meat because of health considerations. But on the other hand, meat is rich in bioactive compounds that can benefit human health (Pogorzelska-Nowicka et al., 2018).

Recently, the diversity of biological products as an extender to improve the quality of processed meat products is growing today. Substitution with vegetable ingredients is quite popular with the advantages that can be utilized in processed meat products such as increasing the nutritional value and the preferred value of these processed products. The combination of vegetable products with processed meat products is an interesting thing to be marketed. One of the biological products that has the potential to be combined with processed meat products is soybean flour because it has the advantage of food fiber content (Mawati et al., 2017) which is expected to function as a neutralizing fat contained in processed meat products to increase the nutritional value of processed meat.

There are many processed meat products that are very popular with the people of Indonesia, namely nuggets. Nuggets processing is done by grinding, seasoning, mixed with binder, printed into certain shapes, covered with bread flour then fried half-cooked and frozen (Yuanita and Silitonga, 2014; Komansilan and Sakul, 2017).

Generally, the nuggets are in the form of blocks, but now the nuggets are increasingly varied and become a food that is liked by many people (Albuquerque et al., 2016). Research on nuggets has been done a lot, but studies on nuggets added with soy flour have not been done much. Mawati et al. (2017) has conducted a study on the substitution of meat with soy flour, but is limited only to the physical quality of the nuggets. Also, Ratulangi et al. (2017) once studied the combination of broiler meat with soy flour but the study only reached the organoleptic test. Still many variables that have not been tried and studied are mainly chemical quality variables related to the nutrition of a product.

Based on this description, research has been carried out to complement previous studies aimed at obtaining information about the nutritional value of chemical quality consisting of the quality of proteins, fats and fatty acids contained in nuggets products added with soybean flour.

THEORETICAL REVIEW

The combination of vegetable products with processed meat products is an interesting thing to be marketed. One of the biological products that has the potential to be combined with processed meat products is soybean flour because it has the advantage of food fiber content (Mawati et al., 2017) which is expected to function as a neutralizing fat contained in processed meat products to increase the nutritional value of processed meat.

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METHODOLOGY

The equipment used to make chicken nuggets is grinding blenders, analytical scales, refrigerators, coolers, digital scales, platzer bags. The ingredients used consist of broiler meat, soybean flour, tapioca flour, and other ingredients for making nuggets.

Procedure of making soybean flour

Soybean flour is made by way of 1) 1 kg of soybeans sorted to select good soybeans, removing foreign objects and broken or broken soybeans, 2) Then the soybeans are washed clean, 3) the soybeans are drained and dried by drying or using oven with a temperature of 50°C for 12 hours and finely ground and sieved with a 60 mesh sieve to obtain fine soybean flour (Mawati et al., 2017).

Procedure of making chicken nugget

Making chicken nuggets by substituting soybean flour is done with five different levels of soy bean flour, namely 0, 5, 10, and 15%. Chicken nugget formulation with soy flour substitution and complete research treatment are listed in Table 1. Broiler chicken meat that has been separated from bone and skin, cut into small pieces and then ground until smooth. Ingredients consisting of garlic, pepper, ice, salt, and tapioca flour are mixed. Then the chicken meat that has been ground and soybean flour in accordance with the treatment mixed with spices that have been mashed and then blended for 5 minutes. Homogeneous dough is formed to the desired size then steamed for up to 10 minutes. The chicken nuggets produced are used for chemical quality tests consisting of moisture, protein, fat, and fatty acid profiles (Mawati et al., 2017).

Variable of Research

Variable measured in this research were moisture (AOAC, 2017), crude protein (AOAC, 2007), crude fat (AOAC, 2007), Fatty acids profile (Abdulla et al., 2019)

Data analysis

The results were analyzed using analysis of variance of completely random design with confidence level of 0.05 and then when there was a difference of average, the DMRT test was used to separate the difference.

RESULT AND DISCUSSION

Table 1. Chicken nugget formulation and substitution of soybean flour at different levels

Ingredients	Level of soybean flour substitution				
	R ₀	R ₁	R ₂	R ₃	R ₄
	0%	5%	10%	15%	20%
Broiler (g)	500	475	450	425	400
Soybean (g)	0	25	50	75	100
Ice (g)	65	65	65	65	65
Tapioca flour (g)	150	150	150	150	150
Milk (g)	27	27	27	27	27
Seasoning (g)	15	15	15	15	15
Chili (g)	3	3	3	3	3
Garlic (g)	22	22	22	22	22
Total (g)	782	782	782	782	782
Palm oil (tablespoon)	3	3	3	3	3
Egg yolk (item)	2	2	2	2	2

Effect of adding soy bean flour to the nutritional content of nuggets products

The results of the study showed that the addition of soybean flour in chicken nuggets had an influence on the moisture, protein and fat content. There was a change in the nugget product after the addition of soybean flour. Nuggets added with soybean flour have less water content compared to without adding soybeans. There was a decrease in moisture when soybean flour added ($P < 0.05$). Treatment of R₀ without adding soybean flour had higher moisture content than treatments added with soybean flour. The lowest of moisture was achieved in the treatment added with 20% of soybean flour (R₄). Likewise with protein and fat, Significantly, there was a decrease in protein. The decrease occurred in the R₄ treatment, after adding 15% soybean flour. Meanwhile, R₃ and R₄ have the same effect. fat content with the addition of soybean flour, there was a decrease in fat in treatment R₃, namely the addition of 15% soybean flour. There is a change in the composition of fat and protein of the nugget product after being treated with soy flour. Products that do not contain soybeans are higher fat than products that contain soybeans 10-20%. The composition of fat nuggets added by soybeans is 5-10% higher compared to those that do not get soybean supply.

Changes in the moisture of the nugget added with soybean flour in accordance with what was stated by Whistler and Daniel (1985) that the concentration of flour and type of flour can affect the moisture of chicken nuggets. According to Marsudi (2009), the higher the use of flour in processed products, the lower the water content of the product. In this study, the decrease in moisture of nugget was thought to be due to the reduced composition of the meat in nuggets processing. It is known that the moisture of the meat is higher than the moisture of soybean flour. There was a decrease in the composition of protein when soybean flour added with 15%. In this study, protein nugget levels were highly correlated with water content. The relationship between protein and water content has been reported by Gumilar et al. (2011) that the meat protein plays a role in water binding meat. High protein content of meat cause increasing abilities hold the meat water, so free water content decreases. Mawati et al. (2017) reported that meat protein plays an important role in the binding of meat water, causing an increase in water holding capacity (WHC) when soybean flour is added to the nugget product. Kartika (2005) stated that, high levels of meat protein cause increased ability to hold meat water thereby reducing free water content, and vice versa.

Fat content decreased in the addition of soybean flour by 15%. The reduction in fat content is thought to be due to the addition of soybean flour to increase the fiber content of nuggets. Mawati et al. (2017) have reported that nuggets with soybean flour can increase dietary fiber on nuggets.

Table 2. Proximate analysis of nugget added with soybean flour.

Variable	Treatments				
	R ₀	R ₁	R ₂	R ₃	R ₄
Moisture	60.70 ^d	58.56 ^c	56.33 ^b	55.52 ^b	53.16 ^a
Protein	18.31 ^a	18.24 ^a	18.12 ^{ab}	17.83 ^b	17.59 ^b
Fat	7.40 ^a	7.26 ^a	7.02 ^{ab}	6.54 ^b	6.38 ^b

R₀, control, 0% of soybean of the meat composition of 500 g; R₁, 5% of soybean (25 g soybean and 475 g of meat); R₂, 10% of soybean (50 g soybean and 450 g of meat); R₃, 15% of soybean (75 g soybean and 425 g of meat); R₄, 20% of soybean (100 g soybean and 400 g of meat). Means with different superscripts within the same row differ significantly (P <0.05).

Effect of addition of soybean flour on the fatty acid profile of nugget products

Changes in chicken nuggets fatty acids occur in saturated and unsaturated fatty acids. Meanwhile, in the total fatty acids and the ratio of saturated fatty acids and unsaturated fatty acids. Stearic acid has decreased with the addition of soybean flour but the condition of unsaturated fatty acids increased with the level of soybean addition. For total fatty acids, the change was not significant. Palmitic and stearic acids are the most saturated fatty acids found in this nuggets' product. The unsaturated fatty acids found the most is the oleic. These results are in accordance with the study reported by Arshad *et al.* (2013) and Nkukwana et al. (2014) regarding the content of fatty acids found in nuggets added to fillers containing unsaturated fatty acids. Stearic and

palmitic fatty acids decreased with the addition of soybean flour, while for unsaturated fatty acids, especially oleic, the amount increased. Thus, according to research data there is an increase in the total amount of unsaturated fatty acids and a decrease in the amount of saturated fatty acids. The study reported by Saleh et al. (2009) stated that the modification of the addition of feed ingredients containing unsaturated fatty acids both PUFA and MUFA can reduce saturated fatty acids and increase C20: 5 (EPA / Eicosapentaenoic Acid), C22 : 6 (DHA / Docosahexaenoic Acid), (LNA / Linolenic Acid) and omega 3, so as to increase PUFA significantly. The reduced content of stearic and palmitic acids in the addition of soybean flour 15-20% is due to the composition of the used of broiler meat getting lower. Meanwhile, the increase in oleic and linoleic is caused by increase in soybean flour in the nugget. The high unsaturated fatty acid content in soybeans causes an increase in unsaturated fatty acids in nugget products.

Table 3. Fatty acid profile of nugget products added with soy bean flour

Fatty acids	Treatments				
	R ₀	R ₁	R ₂	R ₃	R ₄
	-----g/100 g crude fat -----				
Palmitic (C16:0)	16.26 ^a	15.82 ^a	15.70 ^{ab}	14.58 ^b	14.61 ^b
Stearic (C18:0)	15.17 ^a	14.73 ^a	14.69 ^{ab}	14.43 ^{bc}	14.16 ^c
Oleic (C18:1)	34.23 ^a	35.86 ^{ab}	36.23 ^b	36.14 ^b	36.21 ^b
Linoleic (C18:2)	13.36	13.64	13.72	14.10	14.19
Linolenic (C18:3)	1.12	1.23	1.32	1.28	1.30
Total of fatty acids	80.14	80.78	81.66	81.53	81.47
SFA	31.45 ^b	30.05 ^a	30.39 ^{ab}	30.01 ^a	29.77 ^a
UFA	48.71 ^a	50.73 ^b	51.27 ^b	51.52 ^{bc}	51.70 ^c
SFA/UFA	0.64 ^c	0.59 ^b	0.59 ^b	0.58 ^{ab}	0.57 ^a

R₀, control, 0% of soybean of the meat composition of 500 g; R₁, 5% of soybean (25 g soybean and 475 g of meat); R₂, 10% of soybean (50 g soybean and 450 g of meat); R₃, 15% of soybean (75 g soybean and 425 g of meat); R₄, 20% of soybean (100 g soybean and 400 g of meat). Means with different superscripts within the same row differ significantly (P < 0.05).

CONCLUSION AND SUGGESTION

Product of chicken nuggets using soybean flour can increase unsaturated fatty acids with a composition level of 75 g soybean flour and 425 g chicken meat. The reduced content of stearic and palmitic acids in the addition of soybean flour 15-20% is due to the composition of the used of broiler meat getting lower. Meanwhile, the increase in oleic and linoleic is caused by increase in soybean flour in the nugget. The high unsaturated fatty acid content in soybeans causes an increase in unsaturated fatty acids in nugget products.

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