Chemical and the Acceptability of Chicken *Nuggets* as Functional Food with Utilization Rice Bran to Substitute Wheat Flour

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Abstract

The purpose of this research was produce a product with the chemical properties and acceptability as well as having health benefits. The research was conducted from July to September 20 12. The variables in this research were insoluble dietary fiber, antioxidant activity, and sensory test. Dietary fiber was measured using the total multienzyme method, antioxidant activity was measured using DPPH method and the acceptability for the sensory test. Completely Randomized Design (CRD) with 4 treatments and 5 replications were used in this research. Treatment in this research was the total substitution of rice bran (w / w), consisting of : T0 = 0%, T1 = 25%, T 2 = 50%, T 3 = 75%, T4 = 100. The data obtained were further processed by analysis of variance to determine the effect of treatment. If there was any significant effect of treatment then it was followed by Duncan's Multiple Range Test to determine the differences among the treatments. Based on the results of the study showed that the use of rice bran increase insoluble dietary fiber.Similarly, the antioxidant activity, the higher utilization of rice bran, significantly (P <0.05) increased the antioxidant activity of rice bran chicken nuggets. Overall, the use of rice bran as a substitute for wheat flour can improve the chemical properties but lower the acceptability of chicken nuggets as functional food.

Keywords: *nuggets, rice bran, dietary fiber, antioxidants*

INTRODUCTION

Chicken *nuggets* are products of processed meat whom quite popular lately. Besides of the delicious taste, chicken *nugget* is easy to serve as a side dish. However, meat and processed meat products like chicken *nuggets*, have a low sources of dietary fiber and compounds that are beneficial to health such as vitamins. Their regular consumption is being associated with various health disorders such as colon cancer, obesity and cardiovascular diseases. Therefore, additional sources of dietary fiber in meat products need to be done to improve the nutritional value (NCI, 1984; Eastwood, 1992; Johnson and Southgate, 1994; Voskuil *et al.*, 1997; Tarrant, 1998; Larsson and Wolk, 2006). Dietary fiber is added to meat products, in addition have a physiological function / health for consumers, it also provides functional benefits of the final product that can be used as an auxiliary material in the production process. *Nugget* has the potential to be enriched with dietary fiber (Darojat, 2010).

Ingredient of dietary fiber can be produced from various types of plants, such as rice bran from rice. Rice bran is the outside of the rice that escapes into a fine powder in a rice milling process. The outer layer is composed of the aleurone layer of rice *(rice*

kernel), endosperm, and germ. Although bran is available in a large amount in Indonesia, but the utilisation for human consumption as a source of food and nutrition were limited. The utilisation of rice bran limited as fodder (Michwan, 2010).

Not many people know that rice bran has a high nutrient content. Rice bran is rich in vitamin B, vitamin E, essential fatty acids, dietary fiber, protein, and ferulic acid orizanol. Rice bran can be consumed as functional food, when it prepared properly. Rice bran, rich in *phytokimia* and *c-oryzanol, tocopherols* and *tocotrienols. C-oryzanol* mixture of esters derived from the reaction of trans-ferulic acid with phytosterol and triterpene alcohol (Lerma-Garcia *et al.,* 2009). *C-oryzanol* has natural antioxidant properties and has also been shown to have properties to reduce cholesterol (Sugano and Tsuji, , *1997;* Xu *et al.,* 2001).

Rice bran chicken *nuggets* is expected to become alternative of food functional in the presence of dietary fiber, unsaturated fatty acids, antioxidants and vitamins. Brice bran will be used as a substitute for wheat flour in the formulation of chicken *nuggets.* Beside of being cheaper, rice bran is easier to obtain compared with wheat flour and has a high nutritional content. Rice bran chicken *Nugget*, will be analyzed the chemical and Sensory Characteristics (acceptability).

In this reserch, rice bran would be a source of dietary fiber whom added to the chicken nuggets with the aim to produce food with the high content of dietary fiber, and has the ability of antioxidant activity whom good for our health.

METODOLOGY

Materials

Materials used in the manufacture of Nugget is chicken meat without bones and skin, rice bran, bread crumbs, wheat flour, skim milk, vegetable oil, salt, garlic,onion, pepper, sugar and water.

Stabilization Of Rice Bran

Rice bran processing is as follows: fresh rice bran sifted 2-3 times. The size of sieve is approximately 49 mesh, then heated (sterilization) it by autoclave for 15-20 minutes, 121 ˚ C. After the sterilization, the rice bran had to sifted before use.

Making chicken nuggets

Method of making chicken nuggets include: chicken meat is cleaned from the skin (chicken) and bone, then cut into pieces approximately 2 cm^3, and milled it. Chicken meat plus flour, rice bran, water, and seasonings, then stirred, so that it becomes dough. The dough is formed with a mold, and covered with aluminum foil, then steamed until cooked. Dough that has been steamed and then cooled. The dough is then cut approximately 2 cm^3. Sliced nuggets at this stage, then smeared with egg white and rolled in bread crumbs, then fried for 2-3 minutes, until the colour is light yellow (Bintoro, 2008).

Chemical characteristics of chicken nuggets

Levels of insoluble dietary fiber were analyzed using multienzyme method (Asp et al., 1983). Antioxidant activity of the chicken nuggets was measured by DPPH method (1,1-difenil-2-pikrilhidrazil) (Carrapeiro et al., 2007).

Test of sensory characteristics of Chicken Nugget (Acceptability)

Sensory test is using scoring method with 15 untrained panelists. Panelists provide assessments according the instructions (Kartika et al., 1998).

Analysis of data

Data obtained from the test results of chemical and physical characteristics were then analyzed using various analysis (ANOVA), with a significance level of 5%. If there was any significant effect of treatment then it was followed by *Duncan's Multiple Range Test* to determine the differences among the treatments. (Dwiloka and Srigandono, 2006) to determine differences between treatments. Sensory test data were analyzed by non-parametric analysis through *hedonic Kruskal-Wallis* test (Saleh, 1996).

RESULTS AND DISCUSSION

Chemical characteristics of chicken nuggets

Chemical characteristics of rice bran chicken *nuggets* whom have a functional properties were dietary fiber and antioxidant activity. Dietary fiber and antioxidants play an important role in maintaining a healthy body.

Insoluble dietary fiber

Based on the data shown in Table 4, it can be seen that the replacement of wheat flour with rice bran increase the levels of insoluble dietary fiber on chicken *nugget* products. The results of this research, in accordance with the results of Damayanthi *et al.,* (2001), soluble fiber of whole rice bran is 1.89% (dry matter) and insoluble dietary fiber 15.55% (dry matter), while the "kunci biru wheat respectively 2.44% (dry matter) and 2.97% (dry matter). Thus, the higher the addition of rice bran, the higher level of insoluble dietary fiber. In the test of raw material (rice bran), insoluble dietary fiber level is 41.29% (bk). These results are higher than the standard, due to the rest of bran and husk in the rice bran. According to Damayanthi *et al.,* (2010) the commercial rice milling in Indonesia will produce a mixture of bran (outer brown rice - the rough) and rice bran (the inside of the brown rice – the refined).

The antioxidant activity

Based on the data shown in Table 4, it can be seen that the replacement of wheat flour with rice bran affects to the antioxidant activity of the chicken *nugget* products. The higher the addition of bran, antioxidant activity increased in the *nugget*, in addition, T0 has the lowest antioxidant activity, as there is no addition of rice bran. Crude rice bran (CRB), a by-product of rice milling, is rich in phytochemicals of high

nutritional value, such as c-oryzanol, tocopherols and tocotrienols. c-Oryzanol consists of a mixture of ester compounds derived from the reaction of trans-ferulic acids with phytosterols and triterpene alcohols (Lerma-Garcia et al., 2009). c-Oryzanol has natural antioxidant properties and has also been shown to have remarkable cholesterol reducing properties (Sugano and Tsuji, 1997; Xu *et al.*, 2001).

The higest antioxidant activity of the chicken nugget at T3 treatment, whereas the T4 treatment decreased. It is alleged, the antioxidants is a result of mailard reaction in the frying process. Maillard reaction is a reaction between the carbonyl group especially reducing sugars with amino groups mainly of amino acids, peptides and proteins (Whistler and Daniel, 1985). One of the antioxidants produced from processing can be produced from the Maillard reaction (Bailey and Won Um, 1992).

Sensory characteristics of chicken nuggets

Organoleptic tests carried out to determine the level of acceptance and assessment sample by panelists, ie chicken nuggets with utilization rice bran to substitute wheat flour. Based on the statistic analysis using the non-parametric Kruskal-Wallis test, the p-value of acceptability test 0.007 <0.05 value of criticism, so the null hypothesis is rejected, that shown there is a difference in five groups of scores with the acceptability chicken nuggets in each treatment. A test score results showed chicken nuggets, the highest ranking values is T0 (1.42- Extremely acceptable) and the lowest T4 (2.10- acceptable). According Damayanthi (2001), the substitution rate of 40% bran flour on the pastry snacks such as cucur, bolu kukus, nagasari and risoles gives the best acceptance rate of substitution among others. Higher utilisation pf rice bran lower the level of preference on the snacks. Garcia et al., (2002) mentions, the addition of fiber cereals (wheat and oats) 1.5 and 3% and fruit (peaches, apples and oranges) in dry fermented sausages significantly affect the sensory properties of the product. Best results obtained on the sausage with pork fat content of 10% and 1.5% fiber fruit.

CONCLUTION

Based on these results, can be concluded that the higher the use of rice bran as a substitute for wheat flour increased insoluble dietary fiber on chicken nuggets. Similarly, the antioxidant activity, the higher the use of rice bran, increase the antioxidant activity in rice bran chicken nuggets. Overall, the use of rice bran as a substitute for wheat flour can increase the chemical characteristics (dietary fiber and antioxidant activity) of chicken nuggets. Based on the physicochemical and organoleptic tes/sensory characterictic, the best treatment with the use of 75% rice bran as a wheat flour substitute.

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Tabel 1. Composition of nugget ingridients (gr)

Materials	Treatments				
	To	T1	T2	T3	T4
Chicken Meat	400,00	400,00	400,00	400,00	400,00
Filler					
- Wheat flour	40,00	30,00	20,00	10,00	0,00
- Rice Bran	0,00	10,00	20,00	30,00	40,00
Binder					
- Skim milk	40,00	40,00	40,00	40,00	40,00
Seasoning					
- Garlic	8,00	8,00	8,00	8,00	8,00
- Onion	4,00	4,00	4,00	4,00	4,00
- Pepper powder	4,00	4,00	4,00	4,00	4,00
- Msg	2,00	2,00	2,00	2,00	2,00
- Salt	6,00	6,00	6,00	6,00	6,00
- Sugar	3,00	3,00	3,00	3,00	3,00

T0 = Rice bran 0% (control) from filler total

T1 = Rice bran 25% from filler total

T2 = Rice bran 50% (from filler total

T3 = Rice bran 75% from filler total

T4 = Rice bran 100% from filler total

Tabel 2. Scores of acceptability

Score	Acceptability
1	*Extremely acceptable*
2	*acceptable*
3	*Rather acceptable*
4	*Not acceptable*
5	*Extremely not acceptable*

Tabel 3. Average of Insoluble dietary fiber and antioksidant activity of chicken nugget

Variable	The filler substitutions level of rice bran (%)				
	0	25	50	75	100
Insoluble dietary fiber (%)	11.58	10.35	11.98	12.64	12.96
Antioksidant activity(%)	0.72	2.29	3.01	5.35	2.48