

**PENGARUH PENAMBAHAN BAYAM MERAH (*Amaranthus Tricolor L.*)
TERHADAP DAYA TERIMA DAN NILAI GIZI SOSIS VEGETARIAN**

**(The Effect Of Addition of Red Spinach (*Amaranthus Tricolor L.*)
For Acceptance and Nutritional Values On Vegetarian Sausages)**

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ABSTRACT

The vegetarian sausage is an alternative food interlude made from oyster mushrooms, red bean flour and red spinach are well consumed for health body because of low fat and high in iron. This study is knowing the influence of red spinach (*Amaranthus tricolor L.*) acceptability and nutritional value of vegetarian sausages. The design of this experimental with a total 30 untrained panelists students of Nutritional Sciences Esa Unggul University. Statistical test using One Way Anova and Bonferroni. The result of the study a difference from the influence of red spinach on taste, color, flavor and texture ($p < 0.05$). At the level liked of choice in the treatment of F1 sausages, the sausage with the addition of red spinach as much 15% and the best quality in treatment of F2, the sausage with the addition of red spinach as much 30%. The proxymat analysis of vegetarian sausage of most liked a obtained was water content of 65.53%, ash content 1.08%, protein content 1.94%, fat content 0.59%, carbohydrate 17.2% and iron content 38.98% (mg) and total calories 82.19 kcal / 100 gram.

Keywords : Iron, Low Fat, Red Spinach, Sausages, Vegetarian

ABSTRAK

Sosis vegetarian merupakan selingan makanan alternatif yang terbuat dari jamur tiram, tepung kacang merah dan bayam merah yang baik dikonsumsi bagi kesehatan tubuh karena rendah lemak dan tinggi zat besi. Penelitian ini bertujuan mengetahui pengaruh penambahan bayam merah (*Amaranthus tricolor L.*) terhadap daya terima dan nilai gizi dari sosis vegetarian. Desain penelitian ini *Eksperimental* dengan total subjek sebanyak 30 panelis agak terlatih mahasiswa/I Studi Gizi Universitas Esa Unggul. Analisis menggunakan uji *oneway* Anova dan uji lanjut *Bonferroni*. Hasil penelitian terdapat perbedaan dari pengaruh penambahan bayam merah terhadap rasa, warna, aroma dan tekstur ($p < 0,05$). Pada tingkat kesukaan yang terpilih pada perlakuan sosis F1, yaitu sosis dengan penambahan bayam merah sebanyak 15% dan mutu terbaik perlakuan F2, yaitu sosis dengan penambahan bayam merah sebanyak 30%. Uji analisis proksimat sosis vegetarian yang paling banyak disukai diperoleh kadar air 65.53%, kadar abu 1,08%, kadar protein 1,94%, kadar lemak 0,59%, kadar karbohidrat 17,2% dan kadar zat besi 38,98% (mg) serta total kalori 82,19 kkal/100 gram.

Kata Kunci: Bayam Merah, Rendah Lemak, Sosis, Vegetarian, Zat Besi

PRELIMINARY

The nowadays vegetarian diet is getting popular among society. The reason behind the community to choose a vegetarian one healthy lifestyle, this is due to vegetarian foods that contain no cholesterol as contained in animal food products (Anggraini, 2015).

In Indonesia the development of vegetarian groups based on the data obtained shows that the number of vegetarians enrolled in the Indonesian Vegetarian Society (IVS) was established in 1998 around 5,000 people and increased to 60,000 members in 2007 and the number is predicted to increase to 500,000 in 2010 (Fikawati, 2012).

One of the nutritional problems that are vulnerable to vegetarians is iron deficiency or anemia. The data show that the incidence of anemia in vegetarians is quite high with age <25 years that is 64.4% of all WUS anemia. While the prevalence of anemia data in Indonesia is still high enough, that is fertile age of woman (WUS) 26,9% (Kemenkes 2013).

The rapid development of food products in this modern era, one of the most popular food product all the sausage products. According to SNI 01-3020-1995, sausage is a mixture of meat with starch flour or without the addition of herbs and other food additives that are allowed and put in a sausage case (Astuti, 2014).

The sausage raw materials that usually use chicken or beef, can be replaced with other ingredients that oyster mushroom (*Pleurotus ostreatus*) is a source of protein and low fat food with a more affordable price and suitable as a substitute for the texture of beef and chicken. The benefits of oyster mushrooms have a protein of 27% and fat of 1.6% (Seswati, 2013).

The use of oyster mushrooms in the manufacture of sausages can be done with the addition of other ingredients for better produced texture. One of them is red bean flour (*Phaseolus vulgaris L.*) which has a high enough protein content of 24% compared to other nuts. Due to short shelf life of red beans, the sieve is done to facilitate the application as an additional alternative food (Aswatan, 2009).

From the use of oyster mushrooms and red bean flour with a protein source alone is not enough, it should be noted other minerals that are important for vegetarian body balance. One source of minerals required by the body is iron found in red spinach (*Amaranthus tricolor L.*) has a content of (7 mg / 100 g) more than other vegetables (Rohmatika, 2017). In addition, good red spinach is consumed to prevent and treat iron deficiency anemia that is susceptible to the vegan group (*American Dietetic Association*, 2009).

The description of the researchers make sausage derived from vegetable foods containing protein and low fat oyster mushrooms and red bean flour with the addition of red spinach that has a better nutritional content than sausages circulating in the market, so it can be a healthy and nutritious food alternative , not only for vegetarians but can be consumed by the general public, ranging from children to adults.

RESEARCH METHODS

Design, Time, and Place of Study

This study is an *Experimental* study, using a Complete Randomized Design (RAL) which consists of the addition of red spinach to vegetarian sausage food. The red spinach addition factor consisted of four formulations namely F0 (0%), F1 (15%), F2 (30%)

and F3 (45%) of total red spinach used in the manufacture of vegetarian sausages.

The study was conducted in January 2018. The manufacture of sausage products was conducted in non-institutional. Data collection or organoleptic test by untrained 30 panelists collage man or woman Nutrition Study of Esa Unggul University held in Culinary Laboratory of Esa Unggul University and Sausage Nutritional Analysis conducted at FIKES Laboratory of Esa Unggul University-West Jakarta.

Materials and Tools

The main ingredients used in this research are white oyster mushrooms and red spinach obtained from one of Cipanas-Cianjur traditional market and red bean flour under the brand "Hasil Bumiku" produced by "Kusuka Ubiku" originated from Banguntapan, Bantul, Jogjakarta.

Other additives such as tapioca starch, carrageenan, vegetable oil, white pepper (pepper), salt, sugar, ice cubes, onion, and garlic and casing. Casing or selongsong sausage used is a *non-edible* type casing made of *polymide* plastic material purchased from the plastic shop Cipanas Market.

In addition to ingredients for the manufacture of sausage products, chemicals are also used for the purpose of nutritional analysis. The tools used for production are refrigerator (*food processor*),stuffer, and cooking utensil. Meanwhile, the tools used for analysis, glassware, oven, electric furnace, desiccator, analytical scales, clamp cup, hot plate, texture analyzer, incubator, and porcelain plate.

Making a Vegetarian Sausage

How to make sausage is a raw material such as oyster mushrooms and

red bean flour steamed first ± 20 minutes, after that squeezed remaining water still contained in the material. Then proceed with red spinach blended until smooth. After that the steamed oyster mushrooms blend until smooth, then mixed and stirred dough according to each formulation sausage, then the dough is included in polymide sausage sleeves (*non edible*). And last boiled at temperature 1000C for ± 30 minutes.

Vegetarian Sausage Formulation

After preliminary research, four oyster mushroom, red bean and red spinach formulations were selected for the main study. Vegetable sausage composition seen in table 1 below.

Tabel 1. Sausage Composition Ingredients

Bahan	F0 (g)	F1 (g)	F2 (g)	F3 (g)
Red spinach	-	15	30	45
Oyster mushroom	90	90	90	90
Red Bean Flour	10	10	10	10
Tapioca flour	7	7	7	7
Carrageenan	3,5	3,5	3,5	3,5
Red onion	2,5	2,5	2,5	2,5
Garlic	2	2	2	2
Lada Powder	0,5	0,5	0,5	0,5
Sugar	2	2	2	2
Salt	1,5	1,5	1,5	1,5
Coconut oil	3	3	3	3
Ice water	30cc	30cc	30cc	30cc

Source: Modification (Suwita, 2012) and (Zebua, 2014).

Processing and Analysis of Data

The results of the organoleptic test (hedonic and hedonic quality) use the Anova Oneway Test because the data is more than two interconnected samples. If the ANOVA test produces $p \leq 0.05$, then proceed with *Bonferonni* test.

RESULTS AND DISCUSSION

Organoleptic Test

After experiments in the manufacture of vegetarian sausages, then the organoleptic test to determine

the level of panicle preferences of vegetarian sausage products. Categories are tested on organoleptic tests that include color, flavor, aroma and texture. This organoleptic test consists of hedonic test (favorite level) and hedonic quality test.

The result of hedonic test and hedonic quality is indicated by Mean \pm SD value from overall acceptance of each treatment of vegetarian sausage. The results of the hedonic test can be seen in tables 2 and 3 below.

Tabel 2. Mean and Standard Deviation Value of Vegetarian Sausage Test Result Hedonic

Parameter	Mean \pm SD (mm)				Sig.
	F0	F1	F2	F3	
Color	37,90 \pm 17,2 ^{cd}	50,57 \pm 18,1 ^{cd}	48,50 \pm 21,1 ^{ab}	35,30 \pm 20,3 ^{ab}	0,004*
Aroma	36,77 \pm 15,7 ^b	45,60 \pm 17,1 ^a	61,17 \pm 12,1 ^{abd}	57,43 \pm 18,6 ^{abc}	0,0001*
Flavors	37,33 \pm 20,3 ^b	53,40 \pm 20,3 ^a	49,60 \pm 20,8 ^{abd}	38,97 \pm 21,9 ^b	0,007*
Texture	40,53 \pm 20,3 ^{bcd}	54,93 \pm 14,4 ^{ac}	50,10 \pm 16,8 ^{abd}	39,73 \pm 17,4 ^{ac}	0,001*
Overall	46,67 \pm 15,0 ^{bcd}	51,33 \pm 17,4 ^{acd}	49,60 \pm 16,0 ^{abd}	43,03 \pm 19,2 ^{abc}	0,258

Information : Data is presented in mean \pm SD

Data followed by different superscript letters have significant differences

Data followed by the same superscript letter has no significant difference

Based on the above table, *oneway* Anova hedonic test results from each formulation showed that is color, aroma, taste and texture parameters were significant ($p < 0.05$) from red spinach added to hedonic or favorite assessment. As for the overall parameter there is no significant effect ($p > 0.05$) from the addition of red spinach to hedonic or favorite.

Color

Table 2 shows that the highest color of vegetarian sausage on F1 (like) with composition (90% oyster mushrooms: 10% red bean flour: 15% red spinach). This color in food products plays an important role on the acceptance of products by consumers.

This is because color is the nature of the senses most easily detected by consumers compared to other sensory properties such as texture and flavor. A good nutritious food good, tasty and excellent texture will not be accepted by the consumer if it has a color that deviates from the color that should be (Sulistyaningrum, 2014).

Aroma

Table 2 shows that the highest average vegetarian sausage on F2 (neutral) with composition (90% oyster mushrooms: 10% red bean flour: 30% red spinach). This aroma of food products is caused by the formation of volatile compounds. The smell of food products must be different. In addition, different cooking methods will cause different scents (Herawati, 2008).

Flavors

Table 2 shows that the highest taste of vegetarian sausage on F1 (like) with composition (90% oyster mushrooms: 10% red bean flour: 15% red spinach). This is thought to be related to the protein content in sausage products to produce a savory taste. This is because the distinctive taste of oyster mushrooms can already be felt that can lead to after taste (traces of taste) in sausage (Ambari, 2014).

Texture

Table 2 shows that the highest average texture on vegetarian sausage on F1 (like) with composition (90% oyster mushrooms: 10% red bean flour: 15% red spinach). This, of the carrageenans added as a filling material with tapioca starch, also acts as a balance regulator and natural binder so as to obtain a compact and non-hollow sausage dough (Sudjatmika, 2013).

Overall

Tabel 2 shows that the highest average texture on vegetarian sausage on F1 (like) with composition (90% oyster mushrooms: 10% red bean flour: 15% red spinach). From the overall result that the formula F1 is much preferred panelists.

Table 3. Mean and Standard Deviation Value of Hedonic Quality Test Result of Vegetarian Sausage

Parameter	Mean ± SD (mm)				Sig.
	F0	F1	F2	F3	
Texture	27,83±10,3 ^{cd}	38,21±18,2 ^a	35,43±17,6 ^d	30,05±14,1 ^{ab}	0,09
Color	25,03±15,1 ^b	30,77±19,8 ^{ad}	56,63±16,2 ^d	74,17±18,2 ^{ab}	0,0001*
Aroma	34,25±18,0 ^b	42,70±19,8 ^{acd}	59,26±17,3 ^b	52,78±19,1 ^{ab}	0,0001*
Flavors	46,07±20,1 ^{bcd}	46,00±15,8 ^{cd}	57,23±14,1 ^{abd}	43,57±18,0 ^{abc}	0,012*

Information : Data is presented in mean ± SD

Data followed by different superscript letters have significant differences

Data followed by the same superscript letter has no significant difference

Based on the above table, One Way Anova hedonic quality test results from each formulation showed that the color, aroma and taste parameters were significant ($p < 0.05$) from red spinach added to the hedonic or favorite quality assessment. As for the texture parameter there is no significant effect ($p > 0.05$) from the addition of red spinach to hedonic or favorite.

Color

Table 3 shows that the highest color of vegetarian sausage on F3 (dark red) with composition (90% oyster mushrooms: 10% red bean flour: 45% red spinach). This color in food products plays an important role on the acceptance of products by consumers.

This is because color is the nature of the senses most easily detected by consumers compared to other sensory properties such as texture and flavor. A good nutritious food good, tasty and excellent texture will not be accepted by the consumer if it has a color that deviates from the color that should be (Sulistyaningrum, 2014).

Aroma

Table 3 shows that the highest average vegetarian sausage on F2 (neutral unpleasant) with composition (90% oyster mushrooms: 10% red bean flour: 30% red spinach). This aroma of food products is caused by the formation of volatile compounds. The smell of food products must be different. In addition, different cooking methods will cause different scents (Herawati, 2008).

Flavors

Table 3 shows that the highest taste of vegetarian sausage on F2 (neutral savory) with composition (90% oyster mushrooms: 30% red bean flour: 15% red spinach). This is thought to be related to the protein content in sausage products to produce a savory taste. This is because the distinctive taste of oyster mushrooms can already be felt that can lead to after taste (traces of taste) in sausage (Ambari, 2014).

Texture

Table 3 shows that the highest average texture on vegetarian sausage on F1 (slightly supple and soft) with composition (90% oyster mushrooms: 10% red bean flour: 15% red spinach). This, of the carrageenans added as a filling material with tapioca starch, also acts as a balance regulator and natural binder so as to obtain a compact and non-hollow sausage dough (Sudjatmika, 2013).

Test of Nutritional Value

The test result of nutritional value of vegetarian sausage product was done at Fikes Integrated Laboratory of Esa Unggul University. Tests carried out namely, proximate test and iron. The result of the test is done in table 4 below.

Tabel 4. Mean and Standard Deviation Value of Vegetarian Sausage Values Test Result

Nutritional Value	Mean \pm SD				Sig.	SNI
	F0	F1	F2	F3		
Water Content (%)	65,38 \pm 0,02	65,52 \pm 0,03	66,63 \pm 1,74	65,90 \pm 0,02	0,546	Maks 67.0
Ash Content (%)	0,99 \pm 0,028	1,07 \pm 0,03	1,09 \pm 0,02	1,14 \pm 0,06	0,075	Maks 3
Fat Content (%)	0,53 \pm 0,02 ^b	0,59 \pm 0,01	0,63 \pm 0,14 ^a	0,68 \pm 0,02 ^a	0,007*	Maks 25
Protein Content (%)	1,87 \pm 0,01	1,94 \pm 0,01	2,02 \pm 0,16	2,16 \pm 0,01	0,099	Maks 13
Carbohydrate Content (%)	17,19 \pm 0,00	17,28 \pm 0,01	17,59 \pm 0,48	17,47 \pm 0,01	0,443	Maks 8
Iron Content (mg)	-	38,98 \pm 0,01 ^a	39,39 \pm 0,16 ^c	39,84 \pm 0,04 ^d	0,000*	Maks 22

Information : Data is presented in mean \pm SD

Data followed by different superscript letters have significant differences

Data followed by the same superscript letter has no significant difference

Water content

The results of the analysis of vegetarian sausage water content ranged between 65.38% - 66.63%. The highest water content is at F2 of 66.63% and the lowest is in F0 of 65.38% (Table 4). Based on the results of *oneway* anova analysis of vegetarian sausage gave no significant effect ($p > 0.05$).

Table 4 shows that the boiled sausage has a high water content and is not significantly different. This is due to the temperature at the time of cooking from water usage directly from boiling. In addition, cooking can accelerate the decrease in muscle pH and increase the decrease in water holding capacity due to increased protein and fiber denaturation contained in materials that affect water holding capacity (Wirjatmadi, et al., 2002).

Ash Content

The results of analysis of ash content of vegetarian sausage ranged from 0.99% - 1.14%. The highest ash content was in F3 of 1.14% and the lowest was in

F0 of 0.99% (Table 4). Based on the results of *oneway* anova analysis of vegetarian sausage gave no significant effect ($p > 0.05$).

Table 4 shows that the boiled sausage has a low ash content and is not significantly different. This is due to various factors, among them is the process of ash less than perfect. So that the process of improper ash also impact with the remaining impurities on the sample. This impurity substance is able to bind minerals, so that when measured minerals measured very low samples (Poernomo, 2011).

Fat Content

The results of analysis of vegetarian sausage fat content ranged from 0.53% - 0.68%. The highest fat content was in F3 of 0.68% and the lowest was at F0 of 0.53 (Table 4). Based on the results of *oneway* anova analysis of vegetarian sausage gave a real effect ($p < 0.05$).

Table 4 shows that the boiled sausage has a low fat content and is significantly different. This is because the addition of red bean flour from the vegetable group has lower fat content. This is due to the use of oyster mushrooms and red spinach that contains higher fiber (Widjanarko, 2012).

Protein Content

The results of the analysis of vegetarian sausage protein levels ranged from 1.87% - 2.16%. The highest protein content was found in F3 of 2.16% and the lowest was in F0 of 1.87% (Table 4). Based on the results of oneway anova analysis of vegetarian sausage gave no significant effect ($p > 0.05$).

Table 4 shows that boiled sausage has low protein content and is not significantly different. This occurs from the decrease in protein content due to diffusion of nitrogen substances dissolved into soaking water and cooking water so that the loose bonding of protein structures in water (Tatipata, 2008).

Carbohydrate Content

The results of the analysis of carbohydrate levels of vegetarian sausages ranged from 17.19% - 17.59%. The highest carbohydrate content was found in F2 of 17.59% and the lowest was in F0 of 17.19% (Table 4). Based on the results of *oneway* anova analysis of vegetarian sausage gave no significant effect ($p > 0.05$).

Table 4 shows that boiled sausages have low carbohydrate levels and are not significantly different. This is related to the higher water content of the material, the level of the amount of water in the material increases so that carbohydrate levels will fall (Ernawati, 2012).

Iron Content

The results of the analysis of iron sausage level of vegetarians ranged from 38.98% - 39.84%. The highest iron content was found in F3 of 39.84% and the lowest was in F1 of 38.98% (Table 3). Based on

the results of *oneway* anova analysis of vegetarian sausage gave a real effect ($p < 0.05$).

Table 3 shows that the boiled sausage had high iron content and was significantly different. This is due to the absorption of the source of other vitamin products incorporated in the iron content of vegetarian sausage products such as the presence of a source of vitamin C in vegetables or fruits that can increase the absorption of non hem iron up to four times (Suwita, 2012).

CONCLUSION

The results of the selected vegetarian sausage organoleptic test based on the highest favorite level on the hedonic test were F1 treatment (90%: 10%: 15%) and the hedonic quality level was F2 treatment (90%: 10%: 30%). The preferred F2 treatment sausage based on the best treatment of the hedonic quality test has a neutral tenderness, a slightly dark red color, a neutral vaneer aroma and a slightly supple and slightly soft texture.

Based on the analysis of nutritional value for the best treatment of F2 that has water content 66.63%, ash content 1.09%, fat content 0.63%, protein content 2.02%, carbohydrate 17.59% and iron content 39.39%.

SUGGESTION

The Products vegetarian sausages with the addition of red spinach need further assessment of product interventions aimed at knowing the positive impact of the product on health. In addition, a shelf and microbiological analysis is also required to support the safety of vegetarian sausage products.

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