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# PREFERENCE TEST OF LOW CHOLESTEROL FUNCTIONAL CHICKEN MEAT

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***Abstract***

*This study was conducted with the aim of measuring the hedonic quality of low cholesterol functional chicken meat through a preference test. The study was conducted on 240day-old broilers with an average body weight of Lohman strain of 44.16 ± 3.72 grams using a 3x2 factorial completely randomized design with 4 replications. As factor A is a source of oil, namely A1 fish canning waste oil (FO), A2 coconut oil (CO), and A3 pure lauric acid (LA). Factor B is the level of oil on ration, namely B1 5%, and B2 8%. 6 treatment combinations apply. The feed was given until day 35. There was no interaction between the source of oil and the levels on all variable of hedonic test of chicken meat. The organoleptic test is an assessment measure using the sensory senses and meat quality parameters consisting of colour, aroma, taste, texture tests that are tested subjectively by the panelists. Panelists like the nature and quality of a material with organoleptic testing so that someone can give an assessment. Differences in oil sources and levels do not change consumer preferences for low-cholesterol functional chicken.*

***Key words****: hedonic quality of chicken meat, level of oil, oil sources.*

## INTRODUCTION

Along with increasing public awareness of healthy living, consumer demands for food are also increasingly shifting. Consumers began to pay attention to the food they consume to avoid the risk of disease. The main desire of consumers is to consume food that is safe and healthy, free from substances that can harm their health. This phenomenon gave birth to the concept of functional food. Designer food, functional food and fortified food are synonyms, referring to food that is fortified or enriched with nutrients already contained in the food or complementary nutrients.

Meat that has been damaged by bacteria is characterized by smell deviations and the appearance of mucus. Functional meat is meat which, apart from having high nutritional value, also contains compounds that can maintain the health of humans who consume it. Fast growth of broiler tends to result in fatty or fat accumulation in broilers due to high appetite (Jahanpour et al., 2015).

Functional food is defined as a compound that contains physiologically active compounds (bioactive compounds) and is used for the prevention or cure of a disease or to achieve optimal body health. The increase in the economic status of the community causes the consumption of animal products to increase as well. The essential components in the community's diet are meat and processed meat products. According to WHO in 2010, 25% of deaths in developing countries were caused by cardiovascular disease. Cardiovascular disease and type 2 diabetes are thought to be the result of increased consumption of animal products. Many studies have been conducted to refute this assumption. The results showed that total fat, saturated fatty acids and monounsaturated fatty acids were not associated with death from coronary heart disease, and consumption of saturated fatty acids was not associated with the risk of coronary heart disease, stroke and cardiovascular disease. Currently functional food is not only concerned with the high content of omega-3 fatty acids, but has shifted to the ideal ratio between omega-3 and omega-6. According to Simopoulus (2002), the ratio of omega-3 and omega-6 of 1:4 can reduce deaths from cardiovascular disease by 70%, while the

ratio of 1:3 is very good for asthmatics. The imbalance of these fatty acids has a negative effect, including causing cardiovascular disease. Strengthening the supply of food of animal origin is in a dilemma because on the one hand the consumption of meat per capita is still low but on the other hand there is a tendency for certain consumers to limit the consumption of livestock meat because of the negative effect of food on health (Chen, 2009). This issue is certainly a challenge for animal husbandry experts on how to develop a business that can produce livestock commodities with carcasses that have a high edible meat portion as a source of safe and healthy food for consumers. Livestock commodities that are considered strategic for meeting animal protein needs are chicken meat.

Fish oil, like other oils, is composed mainly of triglycerides. Fish oil contains polyunsaturated fatty acids (PUFA) mainly consisting of DHA and EPA (Larsen, 2000). Fish oil showed as anti-aggregation and the addition of fish oil was effective in reducing plasma triglycerides and decreasing serum triglycerides caused by the oxidation of DHA and EPA. Dietary supplementation with fish oil can lower LDL. The beneficial effect of omega-3 essential fatty acids can help overcome coronary heart disease, hypertension, cancer, and a significant reduction of total cholesterol (Supadmo, 1997). Choct et al. (2000) explained that dietary supplementation with fish oil can lower LDL. In addition, the beneficial effect of omega-3 essential fatty acids is that it can help overcome coronary heart disease, hypertension, cancer and a significant reduction of total cholesterol. According to Miles & Jacob (1998), DHA and EPA are important for the health and normal growth of animals, where DHA is essential in brain membranes, spermatozoa, heart muscle, and cells in the retina of the eye. It is said further that fish oil is high in DHA, which is why it is called a good brain food. While EPA is a precursor of prostaglandin B and tromboxan A3 and leukotriene 5, substances that are very effective for anti-platelet aggregation (Brodeur, 2000). Schwartz & Weiss (1990) suggested that theoretically omega-3 PUFAs such as DHA and EPA are one of the main preventers of coronary artery disease through their effects on plasma lipids and platelet function. In addition, it is important in the prevention of coronary artery atherosclerosis and peripheral vascular disease through the same mechanism, namely cholesterol concentration, blood viscosity and platelet aggregation. It is also said that omega-3 PUFAs also have a role in the treatment of special diseases, namely hypertension and immune problems. Research using lemuru fish oil with a level of 3% in laying hens rations showed an increase in HDL-cholesterol in chicken eggs from 0.76 to 1.22 mg/100 ml and a decrease in LDL-cholesterol from 0.58 to 0.38 mg/100ml and a decrease in total cholesterol from 1.42 to 1.35 mg/100 ml (Londok, 2003). Rapid weight gain in broiler chickens is always followed by a large amount of fat and cholesterol deposits in broiler chicken meat (Supadmo, 1997). Cholesterol has various uses in embryonic development, including its role as a structural component of cell membranes and as a precursor to adrenal hormones, vitamin D, and bile acids (Leeson & Gonzales, 2000). According to Wiryanti (1990), fish has 5 to 20 percent fatty acids and almost all types contain unsaturated fatty acids that have double bonds, including omega-3.

Coconut oil is the processed product of coconuts. 92% of the fat in coconut oil is saturated fat. The medium chain fatty acids (ALRM) in coconut oil contain 47.7% lauric acid. The advantage of ALRM over long chain fatty acids (ALRP) is in its metabolic processes in the body. Crude fiber is one of the important food substances in poultry rations, because it functions to stimulate the peristaltic motion of the digestive tract so that the digestive process of food substances goes well. Poultry has limitations in digesting crude fiber because the fermenter organ is located at the end of the absorption organ. High crude fiber causes poultry to feel full, so it can reduce consumption because crude fiber is voluminous. The energy level in the feed will determine the amount of feed consumed. Broilers tend to increase their consumption when the metabolic energy content in the feed is low. Feed formulation by optimizing the use of fiber-rich feed ingredients can reduce the fat content of meat so that it becomes a safe/healthy meat product for consumers.

The resulting functional meat needs to be tested for its hedonic quality. The functional chicken meat as a result of this study is widely preferred

because it is more chew and muscular, has less fat like broiler chickens. In Indonesia, many consume free-range chicken as a processed menu because the meat is not easily destroyed. Meat from chicken contains amino acids (21.88% non-essential and 19.96% essential). Carcass is the main product of slaughtering livestock which has high economic value (Soeparno, 1992). The most expensive component of carcass is meat and the largest part of the meat is found in the breast, so that the size of the breast is used as a measure to compare the quality of meat in broilers (Muchtadi et al., 2010). Body parts affect the amount of fat, breast meat is relatively lower than thigh meat (Pane 2006). This study was conducted with the aim of measuring hedonic quality of functional chicken meat contain low meat.

## MATERIALS AND METHODS

The study was conducted on 240 day-old broilers with an average body weight of Lohman strain of 44.16 ± 3.72 grams using a 3x2 factorial completely randomized design with 4 replications. As factor A is a source of oil, namely A1 fish canning waste oil (FO), A2 coconut oil (CO), and A3 pure lauric acid (LA). Factor B is the level of oil on ration, namely B1 5%, and B2 8%. 6 treatment combinations apply. Experimental broiler chickens were fed during 35 days of age by *ad libitum* system with feed mixture. Nutritional value of feed mixtures on this experiment was showed in Table 1. At the end of the study the chickens were fasted for 8 hours (all night) and the next morning the chicken was slaughtered for variable measurement. Slaughter was carried out on 1 broiler for each experimental unit. Furthermore, for the hedonic test using chicken breast meat. 35$^{th}$ half-trained panelist tested the hedonic quality of chicken meat. The organoleptic difference test for colour, smell, and texture of chicken meat was based on a comparison scale transformed into a numerical scale (Table 2). Organoleptic testing on panelists was carried out by presenting six samples of chicken meat, each with labelled cut of meat. Data analysis used Minitab version 16. If there are significant differences between treatment combinations and their interactions or at least one treatment combination and their interactions are significantly different, it is followed by an honest real difference test (HSD).

Table 1. Composition of experimental diet (*as fed*)

| Ingredient | FO (%) | | CO (%) | | LA (%) | |
|---|---|---|---|---|---|---|
| | 5% | 8% | 5% | 8% | 5% | 8% |
| Yellow corn | 48 | 38 | 58 | 46 | 55 | 50 |
| Rice bran | 10 | 17 | 3 | 14 | 4 | 6 |
| Soybean meal | 18 | 18 | 18 | 22 | 18 | 18 |
| MBM | 17 | 17 | 14 | 8 | 16 | 16 |
| CaCO3 | 1 | | 1 | | 1 | |
| NaCl | 0.35 | | 0.35 | | 0.35 | |
| Premix | 0.6 | | 0.6 | | 0.6 | |
| DL-Methionine | 0.05 | | 0.05 | | 0.05 | |
| Fish canning oil | 5 | 8 | 0 | 0 | 0 | 0 |
| Coconut oil | 0 | 0 | 5 | 8 | 0 | 0 |
| Lauric acid | 0 | 0 | 0 | 0 | 5 | 8 |
| **Calculated Nutrient content** | | | | | | |
| ME (Kcal/kg) | 3124 | 3268 | 3052 | 3052 | 2997 | 3077 |
| Protein | 21.47 | 21.75 | 19.70 | 19.29 | 20.64 | 20.58 |

Table 2. Comparative scale and numerical scale of colour, juiciness, tenderness, flavour, and texture of breast meat of broiler

| Comparative scale | Numeric scale |
|---|---|
| really, really like | 5 |
| really like | 4 |
| like | 3 |
| do not like | 2 |
| very dislike | 1 |

Source: Soekarto (1985)

## RESULTS AND DISCUSSIONS

Result from hedonic test of breast meat of broiler after consume ration contain different source and level of oil were shown in Table 3. There was no interaction between the source of oil and the levels on all variable of hedonic test of chicken meat. The organoleptic test is an assessment measure using the sensory senses and meat quality parameters consisting of color, aroma, taste, texture tests that are tested subjectively by the panelists. Panelists like the nature and quality of a material with organoleptic testing so that someone can give an assessment. The organoleptic test assessment involved 35 semi-trained panelists to assess the broiler meat served. The average organoleptic test scores obtained can be seen in Table 3.

Colour organoleptic test is one of the factors that affect food when viewed visually, it affects consumer tastes. Bintoro (2008) states that the colour of processed meat can be obtained by processing methods and ingredients added. The colour of the meat shown in Table 3 based on the results of the hedonic test on the colour of the meat shows that there is no difference between the treatment with different sources of oil.

Table 3. Average of hedonic quality of chicken meat breast[1]

| Variable | Source of oil | Level of oil | |
|---|---|---|---|
| | | 5% | 8% |
| Colour | FO | 4.37±0.54 | 4.44±0.63 |
| | CO | 4.27±0.53 | 4.56±0.55 |
| | LA | 4.29±0.72 | 4.39±0.79 |
| Juiciness | FO | 3.17±1.32 | 2.63±1.32 |
| | CO | 2.71±1.05 | 2.98±1.27 |
| | LA | 2.93±1.31 | 3.07±1.29 |
| Tenderness | FO | 3.44±1.18 | 3.59±0.81 |
| | CO | 3.22±0,99 | 3.63±0.92 |
| | LA | 3.44±1.07 | 3.71±0.84 |
| Flavour | FO | 3.54±0.84 | 3.59±0.89 |
| | CO | 3.41±0.95 | 3.80±0.87 |
| | LA | 3.41±0.85 | 3.73±0.87 |
| Texture | FO | 3.22±1.11 | 3.34±0,73 |
| | CO | 3.22±1.08 | 3.59±1.00 |
| | LA | 3.34±0.96 | 3.63±0.83 |

[1]values are the means of 3 replications, values are expressed as mean±Stdev, [A-B]different superscripts within row shows highly significantly different ($p<0.01$). [A-B]different superscripts within column shows highly significantly different $p<0.01$). [a-b] different superscripts within column shows significantly different ($p<0.05$), [A-B]different superscripts within row and column shows highly significantly different ($p<0.01$).

The assessment has been carried out by 35 (thirty-five) panelists giving a score that is not different from colour, namely an average score of 4.27-4.56. The highest average score for the panelists assessment was found in the CO treatment combination at the 8% level, namely 4.56±0.55, which was then followed by the FO treatment combination at 8%, LA treatment combination at 8% level, FO treatment combination at 5% level, and the FO treatment combination at the 5% level. LA treatment was at 5% level, and the lowest was CO treatment combination at 5% level with values respectively 4.44±0.63, 4.39±0.79, 4.37±0.54, 4.29±0.72 and 4.27±0.53 which ranged from white to yellowish white. This is because the addition of oil sources with different levels does not affect haemoglobin (Chartrin *et al*., 2006). The colour of the meat is determined by the processing method so that it produces colour from a non-enzymatic process (Permadi *et al*., 2012). Chicken meat is generally white in colour (Jaelani *et al*., 2014). Oil contains β-carotene which functions to produce bright colours in chicken meat, but differences in oil sources do not cause differences in chicken meat colour. Lawrie (2003) states that the pigment oxymyoglobin is an important pigment in fresh meat, this pigment is only found on the surface and describes the colour of meat that consumers want. Forrest *et al*. (1975) stated that normal chicken meat is grayish white to pale red or purple. In other words, the use of various sources of oil in the ration still gives normal colour to chicken meat. Good meat colour is thought to be supported by good handling so that chickens do not experience stress during slaughter. This is as stated by Soeparno (1994), that the factors that affect meat colour are feed, species, nation, age, sex, stress, (activity level and muscle type), pH and oxygen. All of these factors are the main determinants of the concentration of the meat myoglobin pigment (Soeparno, 1994). The provision of different sources and levels of oil in broiler rations did not have a negative effect on the colour of broiler meat.

Juiciness of meat. Juiciness is a sensory property related to the level of wetness of the meat. The results showed that the juiciness score of broiler meat fed with different sources and levels gave a non-significantly different effect. The juiciness score of broiler chicken that was fed with the addition of oil from different sources and levels ranged from a score of 2.63 to 3.17 which ranged from slightly juice to juice. The increasing level of added oil in the feed, the lower the fat content of broiler meat (Oktaviana, 2009) did not affect the sensory panelists on the juiceness of the meat, even though the presence of fat played a role in the juiciness characteristics of the meat (Williams and Damron, 1998). This is presumably because the effect of the liquid released during mastication (Soeparno, 2005) on broiler chicken meat with the addition of different oil sources in the feed is relatively the same so it does not affect the juiciness of the meat. Good quality meat contains relatively more juice than low quality meat (Soeparno, 2005).

Tenderness is the main parameter in determining the quality of meat that is tested sensory. The results showed that the addition of different sources and levels of oil in the feed gave a score of tenderness of broiler chicken meat that was not significantly different. The tenderness score of broiler chicken that was fed with the addition of oil sources and different levels ranged from a score of 3.22 to 3.71, which was tender. This can be influenced by the fact that less connective tissue is softer than muscle which contains a larger amount of connective tissue (Soeparno,

1991) and the higher the fat, the more marbling the meat will be (Dilaga and Soeparno, 2007). In addition, three main components of meat that contribute to tenderness or toughness, namely connective tissue, muscle fibers, and adipose tissue (Soeparno, 1991). Sindu (2006) revealed that when the meat is pressed with a finger, healthy meat will have a chewy to dense consistency. Tender meat is the most sought after by consumers (Komariah *et al*., 2004).

The evaluation of flavor is very dependent on the tastes of the panelists, because of the diversity between individuals in responding to the intensity and quality of a stimulus, causing the assessment of the smell and taste given to differ between the panelists because there is disagreement about the detailed aspects of taste and aroma. The results of the analysis of variance in the provision of alternative feeds had an effect on the organoleptic test of the taste of chicken meat fed with different sources and levels of oil, which gave no significant effect on the taste of chicken so that they had the same level of taste. From the results of the score assessment given by the panelists, it can be seen that the average value ranges from 3.41-3.80. The highest value was given to the treatment combination of 8% CO with a value of 3.80, which was then followed by the treatment of 8% LA, 8% FO, 5% FO, 5% LA and 5% CO, which ranged from good to very good. This result is evidenced by the results of Prayitno *et al*. (2010) showed that the taste score of broiler chicken fed with the addition of virgin coconut oil ranged from slightly savory to savory. The delicious and savory taste of broiler chicken meat is caused by the addition of different sources and levels of oil in the feed that does not affect the volatile substances contained in the meat as small molecules released by food (during heating, chewing, etc.) receptors in the mouth or nasal cavity (Soeparno, 2005; Prayitno *et al*., 2010).

Texture. Texture is a sensory property of meat related to the level of smoothness of the meat. The average value of cooked free-range chicken meat texture that was fed commercial feed with coconut pulp flour substitution was 2.33, meaning that the panelists preference for cooked free-range chicken meat was still in the like area. The increase in substitution of oil levels in commercial feed did not affect the panelists texture. This is influenced by the tenderness of the meat which is still preferred by the panelists and is supported by the young age of the chickens. Soeparno (2005) added that the level of texture roughness increases with age, muscles with small muscle fibers do not show a significant increase in texture hardness with increasing age (Warris, 2000). Three main factors are known to influence the texture of meat, including the length of the sarcomere, the amount of connective tissue and cross-linking and the degree of proteolytic changes that occur during withering. Muscle texture can be divided into two categories, coarse texture with large fiber bundles and fine texture with small fiber bundles (Soeparno, 2005).

## CONCLUSIONS

Low-cholesterol functional chicken meat resulting from the provision of different sources and levels of fat in the ration provides the same level of preference by consumers.

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## REFERENCES

Brodeur, M. (2000). Broiler chickens enriched with N3-fatty acids. Health notes. Inc. *http://healthnotes.com.* p:6

Chartrin, P.K., Meteau, H., Juin, M.D., Bernadet, G., Guy, C., Larzul, H., Remignon, J., Mourot, M.J., Duclos, F., & Baeza, E. (2006). Effects of intramuscular fat levels on sensory characteristics of duck breast meat. *Poultry Sci*., 85, 914-922.

Chen, M. (2009). Attitude toward organic foods among Taiwanese as related to health consciousness, environmental attitudes, and the mediating effects of healthy lifestyle. *British Food Journal,* 111(2), 165-178.

Choct, M., Naylor, A., Oddy, H., & Nolan, J. (2000). Increasing efficiency of lean tissue deposition in broiler chickens. *RIRDC report 98:1-22*

Dilaga, I.W.S., & Soeparno, I. (2007). Pengaruh pemberian berbagai level clenbuterol terhadap kualitas daging babi jantan grower. *Buletin Peternakan,* 31(4), 200-208.

Forrest, J.C., Aberle, E.B., Hedrick, H.B., Judge, M.D., & Merkel, R.A. (1975). Principles of Meat Science. W.H. Freeman and Co., San Fransisco

Jaelani, A., Dharmawati, S., & Wanda, W. (2014). Berbagai lama penyimpanan daging ayam broiler segar dalam kemasan plastik pada lemari es (suhu 4ºC) dan pengaruhnya terhadap sifat fisik dan organoleptik. *Ziraa'ah Majalah Ilmiah Pertanian,* 39(3), 119-128.

Komariah, I., Arief, I., & Wiguna, Y. (2004). Kualitas fisik dan mikrobia daging sapi yang ditambah jahe (*Zinger offìcinale roecoe*) pada konsentrasi dan lama penyimpanan yang berbeda. *Media Peternakan,* 28(2), 38-87.

Larsen, H.R. (2000). Fish Oil: The essential nutrients. International Health News Database. *http://www.oilofpisces.com/fishoilnutrient.html.* p:8

Lawrie, R.A. (2003). *Ilmu Daging*. Edisi Ke-5. Diterjemahkan oleh Parakkasi, A., dan Y. Amwila. Universitas Indonesia Press, Jakarta.

Leeson, S., & R. Gonzales. (2000). Value-added eggs and eggs products. *Poultry Sci.,* June edition., 5.

Londok, J.J.M.R. (2003). Efek suplementasi biochrome dan eksogenous enzim dalam pakan ayam petelur yang menggunakan by-produk agroindustri terhadap kolesterol, HDL dan LDL telur. *J. Zootek.,* 17, 289-295.

Miles, R., & Jacob, J. (1998). Omega-3,6 fatty acid: Their health implications. *Poultry Newsletter,* April edition, 4.

Oktaviana, D. (2009). *Pengaruh pemberian ampas virgin coconut oil dalam ransum terhadap performan, produksi karkas, perlemakan, antibodi, dan mikroskopik otot serta organ pencernaan ayam broiler*. Tesis. Fakultas Peternakan UGM, Yogyakarta.

Permadi, S.N., Mulyani, S., & Hintono, A. (2012). Kadar serat, sifat organoleptik, dan rendemen nugget ayam yang disubstitusi dengan jamur tiram putih (*Plerotus ostreatus*). *Jurnal Aplikasi Teknologi Pangan,* 1(4), 115-120.

Prayitno, A.H., & Suryanto, E. (2010). Kualitas fisik dan sensoris daging ayam broiler yang diberi pakan dengan penambahan ampas *virgin coconut oil* (VCO). *Buletin Peternakan,* 34(1), 55-63.

Simopoulus, A.P. (2002). The importance of the ration of omega-6/omega-3 esesntial fatty acids. *Biomed Pharmacother.,* 56, 365–379.

Sindu, A. (2006). *Kualitas fisik daging itik pada berbagai umur pemotongan.* Pusat Pengkajian dan Penerapan Teknologi Budidaya Pertanian, TAB, BPPT.

Soeparno, I. (2005). *Ilmu dan Teknologi Daging*. Gadjah Mada University Press Yogyakarta.

Supadmo (1997). *Pengaruh sumber khitin dan prekursor karnitin serta minyak ikan lemuru terhadap kadar lemak dan kolesterol serta asam lemak omega-3 ayam broiler*. Disertasi. Program Pascasarjana, IPB. Bogor.

Schwartz, C.S., & Weiss, H.S. (1990). Method and composition for increasing the concentration of omega-3 polyunsaturated fatty acid in poultry and poultry eggs resulting thereform. *Root Research,* Inc. April edition, 11.

Williams, S.K., & Damron, B.L. (1998). Sensory and objective characteristics of broiler meat from commercial broilers fed rendered spent hen meal. *Poultry Sci.,* 77, 1441-1445.