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Blood Lipid Profile of *Coturnix coturnix japonica* Fed Whith Organic Feed and Supplement *Curcuma longa*

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Abstract

People's concern about quail egg consumption has triggered the efforts to produce quail eggs with low cholesterol content by using organic feed. Organic feed is one type of feed rations made of mixing organic material. In this study, standard organic feed (rice bran, yellow corn, soybean, and fishmeal) and organic feed containing mackerel, cassava leaves, and turmeric powder was administere to female japanese quail. Organic feed containing mackerel, cassava leaves, and turmeric powder can affect the Japanese quail (*Coturnix coturnix japonica L.*) lipid profile. This research used experimental methods. Twenty-seven female Japanese quails were divided into 3 treatment groups (PO: commercial feed, P1: standard organic feed, P2: feed containing organic turmeric powder, cassava leaves, and mackerel) for 145 days with 9 repeat. Data obtained were in the form of average daily feed intake and blood lipid profiles of each treatment group. Further data analysis was performed by analysis of variance (ANOVA) followed by Duncan test. The results showed that administration of organic feed containing mackerel, cassava leaves, and turmeric powder can reduce the levels of cholesterol, triglycerides, and LDL but increase the HDL levels in Japanese quail. Supplementation of turmeric powder improve the chemical quality of Japanese quail eggs, so it is good for the development of quail embryos as well as for consumption. It can be concluded that organic feed and turmeric powder supplementation stabilize blood lipid profile and improve the reproduction of Japanese quail egg low cholesterol, so good for the development of embryo quail and for consumption.

How to Cite

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INTRODUCTION

Quail egg production is relatively faster than the laying hens' or the laying ducks'. As a food, quail egg is a source of protein with higher protein content (844 mg/dL) than in chicken egg, with fat content that is only 423 mg/dL (Listyowati & Roospitasari, 1997). Quail egg contains higher cholesterol as compared to other poultry eggs. In eggs, cholesterol and its esters are primarily found in the yolk. Egg quality is a reflection of the chemical composition of the yolk. The quality of nutrition fed to the quail affects egg characteristics and quality, such as the size and proportions of the main content of the yolk and albumin. Cholesterol is important for health because it is used as the building blocks for the production of hormones and bile acids, but excessive cholesterol consumption will be detrimental to health as it can lead to atherosclerosis (Baron & Hylemon, 1997).

The nutrient of quail egg is complete,which include, carbohydrates, protein and eight kinds of amino acids that are useful for future growth. However, a high cholesterol content in eggs of quail needs to be accounted for quail egg consumption. Cholesterol in the body come from endogenous and exogenous pathway. An endogenous cholesterol comes from the body it self from some tissues, especially hearts, whereas the exogenous cholesterol comes from food (Murray *et al.,* 2014; Leuis *et al.,* 2014).

People's concern about quail egg consumption has triggered the efforts to produce quail eggs with low cholesterol content by using organic feed. Organic feed is one type of feed rations made of mixing organic material. In this study, standard organic feed (rice bran, yellow corn, soybean, and fishmeal) and organic feed containing mackerel, cassava leaves, and turmeric powder was administered to female japanese quail. Putra *et al.,* (2015) stated that the provision of turmeric powder was 108 mg/head/day can lower cholesterol levels in quail eggs and can affect blood lipid profile of Japanese quail.

Organic feed containing mackerel, cassava leaves, and turmeric powder are thought to affect the blood lipid profile of Japanese quail due to the nutrients that are contained in the feed. Omega-3 fatty acid found in puffer fish is a long-chain fatty acid that is needed for growth. The long chain polyunsaturated fatty acids can improve the metabolism of fat in the body because it is unsaturated (Kim *et al.,* 2007). Cassava leaves that contain crude fiber and β-carotene acts as an antioxidant that decreases the activity of β-oxidation, so that the cholesterol will decrease (Sanz *et al.,* 2008). Curcumin in turmeric powder acts as a hepatoprotective that can lower the blood lipid levels (Kohli *et al.*, 2008). Based on the explanation above, it is needed to examine the blood lipid profile of Japanese quail after the administration of organic feed containing mackerel, cassava leaves, and turmeric powder. Thus, this research is useful useful to increase knowledge about the benefits of organic feed so quail breeders can raise and produce quail eggs that are low in cholesterol for consumption.

METHODS

This study used 45*(C. coturnix japonica* L.) 145-day-old female quails in the form of DOQ (Day Old Quail). Quails were acclimated for 4 days in collective cages and then 27 quails with same body weight were selected to be transferred to individual cages (3 quails in each enclosure). This study used Complete Random Design. Data were analyzed using ANOVA and followed by DUNCAN test. Twenty seven quails were divided into 3 treatment groups with 9 repeat, namely:

PO: Commercial feed

P1: Standard Organic feed

P2:Standard organic feed containing turmeric, cassava leaves, and fish bloating powders.

Feed consumption per enclosure was done by preparing the measure of 2 kg of feed. Feed consumption was calculated as follows: the initial feed was deducted by residual feed and divided by the number of days (days to spend 2 kg of feed). The amount of feed generated per enclosure was divided by the number of Japanese quail in one cage to obtain individual feed consumption of Japanese quail.

Cholesterol analysis was carried out using KIT from DiaSys (Diagnostic System) with the method of Liebermann Burchard (Elwakked *et al.*, 2012).Ten µL of serum was placedin a first cuvet and 1000 µL cholesterol reagent was added while the second tube was filled with 10 µL of standard reagents cholesterol and the third tube is blank cuvette filled with 10 µL water and 1000 µL cholesterol reagent. All the cuvettes were then incubated for 10 minutes at 37°C. Cholesterol levels were measured using a photometer with a wavelength of 546 nm and a factor of 676.

Triglyceride analysis was carried out using KIT from DiaSys (Diagnostic System) by the method of Liebermann Burchard (Elwakked *et al.*, 2012). The first cuvet was filled with 10 µL serum and 1000 µL triglyceride reagent.The second

tube was filled with 10 µL of standard triglyceride reagent and the third tube was a blank cuvet filled with 10 µL water and 1000 µL triglyceride reagent. They were incubated for 10 minutes at 37°C. The triglyceride levels were determined using a photometer with a wavelength of 546 nm and a factor of 676.

Analysis of LDL was conducted by using KIT from DiaSys (Diagnostic System) and CHO-PAP method (Bekal et al., 2011). The first stage was filling the 2 tubes of which the first tube was filled with 100 µL serum and 1000 µl LDL reagent. The second tube was filled with 100µL reagent and 1000 µL standard LDL. They were then incubated for 15 minutes at a temperature of 20-25°C and followed by centrifugation for 10 minutes until clear liquid formed. The 100µL of clear liquid from the first stage was placed in the first tube and 1000 µl cholesterol reagent was added. The 100µL of clear liquid from the first stage was placed in the second tube and 1000 µl cholesterol reagent was added. Third tube was a blank cuvet filled with 1000 µL. They were incubated for 10 minutes at a temperature of 37°C. Measurement of LDL levels was carried out using a photometer with a wavelength of 546 nm and a factor of 676.

Analysis of LDL was conducted by using KIT from DiaSys (Diagnostic System) and CHO-PAP method (Bekal et al., 2011). The first stage was filling the 2 tubes, the first tube was filled with 100 µL serum and 1000 µL HDL reagent. The second tube was filled with 100µL reagent and 1000 µL standard HDL. They were then incubated for 15 minutes at a temperature of 20-25°C, and followed by centrifugation for 10 minutes until clear liquid formed. The 100µL of clear liquid from the first stage was placed in the first tube and 1000 µL cholesterol reagent was added. Third tube was a blank cuvet filled with 1000 µL. They were incubated for 10 minutes at a temperature of 37°C. Measurement of LDL levels was carried out using a photometer with a wavelength of 546 nm and a factor of 676.

RESULTS AND DISCUSSION

Effect of standard organic feed and organic feed containing mackerel, cassava leaves and turmeric powder on food consumption and weight of Japanese quail body (*C. coturnix japonica* L.) showed no significant difference (P> 0,05). The effects of feed consumption on body weight are presented in Table 1.

Effect of standard organic feed and organic feed containing mackerel, cassava leaves and turmeric powder on food consumption and weight of Japanese quail body (*C. coturnix japonica* L.) showed no significant difference (P> 0.05). This result means that the administration of organic feed had no effect on quail feed intake. The acceptance of poultry to food is affected by the shape, taste, texture, smell, and temperature of food that can be felt after the food enters the mouth. This is in accordance with the study by Saraswati *et al.*, (2013) stated that the administration of turmeric powdered at a dose of 54 mg / head / day does not affect feed consumption and body weight.

Low consumption of food resulted in low body weight. According to Almatsier (2009),the consumption of rations affects the number of nutrient elements that enter the body of livestock. The incoming nutrients must be in accordance with those needed for production and for life. In addition, according to Alsuhendra *et al.*, (2009).

The effect of standard organic feed and organic feed containing mackerel, cassava leaves and turmeric powder on the cholesterol, triglycerides, HDL and LDL blood of Japanese quail (*C. coturnix japonica* L.) age of 145 days are presented in Table 2.

The effect of organic feed on blood cholesterol Japanese quail showed significantly different results (P <0.05). There was a real difference between P0 to P1; P0 to P2, but there is no real difference between P1 to P2.

Effect of organic feed on blood cholesterol Japanese quail showed significantly different results (Table 1). It is because the provision of organic feed and the addition of turmeric powder improve the lipid metabolism. Turmeric powder plays an improrant role in optimizing lipid metabolic activity so as to support the use of cholesterol in the formation of vitellogenin (Pandey *et al.,* 2011).Quail is actively reproducing until age 6-7 months (Ghazvianet al*.,* 2011). This means that the age of Japanese quails (145 days) in

Table 1. Average weight of treated quail after145 days of treatment.

Variable	Treatment		
	P0	P1	P2
Feed consumption (g)	22.55[a]± 3.40	20.70[a]±5.04	21.90[a]±4.18
Body weight (g)	153.11[a]±38,08	128.55[a]±32.84	121.77[a]±37.29

Description: Different rank indicates a significant difference in each column (P<0,05).

Table 2. Blood Lipid Profile of Japan Quail Fed with Organic Feed and Turmeric Powder Supplements

Variable	Treatment		
	P0	P1	P2
Cholesterol (10^{-4} x mg/m^3)	322.40^{a}±31.81	227.00^{b}±35.42	222.20^{b}±35.52
Triglycerides (10^{-4} x mg/m^3)	1188.20^{a}±94.19	1169.60^{a}±61.11	944.50^{b}±74.97
LDL (10^{-4} x mg/m^3)	91.76^{a}±32.18	51.60^{ab}±39.43	37.48^{b}±13.82
HDL (10^{-4} x mg/m^3)	53.00^{a}±30.85	39.50^{a}±10.28	60.80^{a}±12.91

Description: Different rank indicates a significant difference in each column (P<0.05).

this study is appropriate because they require lots of cholesterol for the formation of steroid hormones and as a material in forming the yolk (vitellogenin). It is resulted in a decrease in blood cholesterol levels of the Japanese quail due to the distribution of cholesterol into the ovarian follicle. Putra *et al.,* (2015) reported that the administration of turmeric powder to 108 mg/head/day can lower the cholesterol levels in the blood of the Japanese quail. Provision of turmeric powder as much as 4 g in laying hens also decreased cholesterol levels by 162.5 mg/dl (Kermanshasi & Riasi, 2006). Results of research by Mehala & Moorthy, (2008) reported that the administration of 0.6 g turmeric can lower the serum cholesterol levels in chicken boiler up to 3.42 mg/dl.

The test of blood triglyceride levels of Japanese quail showed significantly different results (P <0.05). There were differences between P0 to P2 and P1 to P2, but there was no significant difference between P0 to P1.

Decreased levels of triglycerides is because of the β-carotene, fiber and chlorophyll content in feed containing organic mackerel, cassava leaves, and turmeric powder. Fiber can bind free fatty acids in the digestive tract, and then remove it through the feces (Peter *et al.,* 2009). Chlorophyll and β-carotene in cassava leaves act as antioxidants to inhibit lipid oxidation process (Lanfer *et al.,* 2009). Inhibition of lipid oxidation process results in delays in the process of acetyl Co-A formation that plays a role in the biosynthesis of triglycerides so the triglycerides in the blood decreases (Botham & Mayer, 2006).

The test of Japanese quail blood LDL levels showed significantly different results (P<0.05). There were differences between P0 to P2, but there is no real difference between P0 to P1 and P1 to P2.

A decrease in blood LDL is because the curcumin enhances the activity of LDL receptors. LDL receptor that is in charge of transporting excess LDL and HDL bind to enter in the pathway to return to the heart, so the excess LDL in the network can be controlled. Mahela & Moorthy (2008) and Akbarin *et al.,* (2012) stated that turmeric has an effect in lowering levels of LDL in chicken boiler.

The blood HDL levels of Japanese quail given with standard organic feed and organic feed containing mackerel, cassava leaves and turmeric powder were not significantly different (P> 0.05), there is no real difference between P0, P1, and P2.

Effect of organic feed on blood HDL of Japanese quail showed not significantly different results (Table 2). This is because the feed contains bioactive substances such as alkaloids, tannins, and flavonoids that do not have a significant impact on levels ofquail blood HDL. This study showed that the administration of puffer fish that contain Trans fatty acids can lead to a decrease levels of HDL (Huang *et al.,* 2009).

It is also because cholesterols levels are widely used for the synthesis of steroid hormones and bile salts because HDL is required in the synthesis of the steroid compounds in the liver. Cholesterol will be transported back by HDL to be brought back to the liver which will be further described and then discharged into the gallbladder as bile acids (Yusniar & Nilasari 2009). Murray *et al.* (2014) stated that the decrease in HDL can be caused by the inflow of lipoprotein cholesterol that potentially lower the cholesterol (HDL) to the cell membranes and the use of HDL for the synthesis of steroid compounds such as hormones or bile salts in the liver.

Based on the results of the analysis of high triglyceride levels in this study, this causes a large number of follicular hierarchies to form. This is presented in Figure 1.

The number of follicle hierarchies that are formed due to an active reproduction of quail until the age of 6-7 months (Ghazvian *et al.,* 2011). This means that during the age of 145 days, Japanese quail in this study is still actively reproducing so that they requires a lot of triglycerides for the formation of steroid hormones and as an ingredient of yolk formation (vitolegenin).Vitellogenin is a glycophospholipoprotein in which one of

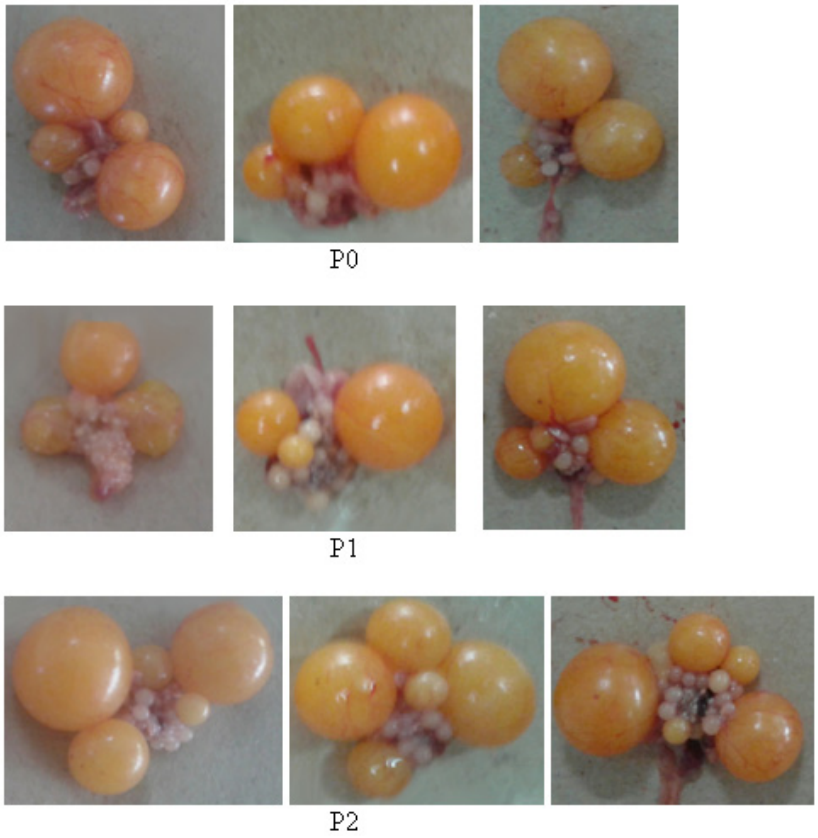

Figure 1. Follicular hierarchies of Japan Quail. Description: P0: control, P1: Standard Organic feed and P2: Standard organic feed containing turmeric, cassava leaves, and fish bloating powders.

its basic ingredients is triglycerides. Vitellogenin is synthesized in the liver due to the induction of the estrogen hormone. Vitellogenin is then transported through the bloodstream in the form of VLDL to the ovaries. according to the statement saraswati & tana, (2016) that trigliserida used as a synthesis of synthesis vitelogenin, so trigliserida in blood decrees because of distributed to ovarium follow.

Based on The results of this study, it can be concluded that organic feed and turmeric powder supplementation stabilize blood lipid profile and improve the reproduction of Japanese quail egg (*Coturnix japonica*) low cholesterol, so good for the development of embryo quail and for consumption.

CONCLUSIONS

Based on the research result, it can be concluded that standard organic feed and organic feed containing mackerel, cassava leaves and turmeric powder do not increase daily consumption of Japanese quail (*C. coturnix japonica* L.), however it can lower the cholesterol, triglyceride and LDL blood of quail japan but not increase the HDL level of Japanese quail blood (*C. coturnix japonica* L.).

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