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PROFILE OF BLOOD LIPID AND CHOLESTEROL OF BROILER MEAT FED WITH CINNAMON (*Cinnamomumburmanii*) LEAF EXTRACT SUPPLEMENTATION FEED

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ABSTRACT : Thisstudy aimed to determine the blood lipid profile and cholesterol levels of broiler meat fed commercial feed with cinnamon leaf extract supplementation (*Cinnamomum burmanii*). The material used is Day old chick (DOC) Lohman strain broiler (MB 202) produced by PT. Japfa Comfeed Indonesia totaled 144 broilers and was kept up to 35 days of age. This study used a completely randomized design (CRD) consisting of six treatments and four replications and each replication consisted of 6 chickens. The treatment with the addition of cinnamon leaf extract was carried out in various concentfeed levels, namely feed without the addition of cinnamon leaf extract as a control (P0), Basal feed + antibiotic zinc bacitracin 0.01% (P1), Basal feed + cinnamon leaf extract (EDKM) 0 ,25% (P2), Basal feed + cinnamon leaf extract (EDKM) 0.5% (P3), Basal diet + cinnamon leaf extract (EDKM) 0.75% (P4) and Basal feed + cinnamon leaf extract (EDKM) 1% (P5). The parameters observed in this study were the lipid profile of broiler blood which consisted of total cholesterol levels, high density lipoprotein (HDL) levels, low density lipoprotein (LDL) levels, triglyceride levels, and meat cholesterol levels. The results showed that the addition of cinnamon leaf extract in the feed had no significant effect ($P>0.05$) on total cholesterol levels, triglyceride levels and low-density lipoprotein (LDL) levels, and significantly ($P<0.05$) on increasing levels of high-density lipoprotein (HDL) and lower cholesterol levels in meat. It can be concluded that the supplementation of cinnamon leaf extract in feed up to a level of 1% can increase the body's high-density lipoprotein (HDL) levels and reduce the cholesterol level of chicken meat.

KEYWORDS: Supplementation, Cinnamon Leaf Extract, Broiler, Cholesterol

I. INTRODUCTION

Broilers as a source of animal protein from livestock have economic characteristics, fast growth, good feed conversion and produce soft and quality meat. The rapid growth of broilers will be accompanied by high fat growth, thereby increasing the body's cholesterol levels which are less desirable by consumers. Some people have begun to be selective to leave fatty foods, especially some animal proteins and their processed products, because both cholesterol and triglycerides are factors that cause coronary heart disease.Cholesterol is a component of fat that plays a role in the formation of cell membranes, as a precursor to steroid hormones such as estrogen and progesterone and the synthesis of bile acids. Cholesterol in the body comes from food (exogenous) and is synthesized by the body in the liver (endogenous). Normally, the body produces cholesterol in the right amount, but it can increase in number due to the addition of foods derived from animal fats (Murray *et al*., 2012).The high fat content in foodstuffs tends to be a major considefeed for consumers in consuming foodstuffs from animal. People as consumers of livestock products need food of animal origin that has low fat and cholesterol contained. Foodstuffs with high cholesterol content can cause an increase in the concentfeed of very low-density lipoprotein (VLDL) in the body which will increase the risk of arteriosclerosis and cause various diseases such as stroke, hypertension, coronary heart disease and cause death (Wijaya *et al*., 2013). Therefore, it is necessary to make efforts to produce livestock products that are low in fat and cholesterol without reducing the efficiency of feed use and livestock body weight. One of the efforts that can be done to achieve this goal is the use of feed additives in chicken feed.

The use of antibiotics as feed additives in the feed has had a negative impact, that is the presence of residues and bacterial resistance. In addition, in Indonesia the use of antibiotics in livestock is not controlled in doses, so that the negative impact does not only occur in livestock, but also infects humans who consume livestock products. Currently, there is a need for safe and natural alternative materials as a substitute for antibiotics, namely the use of herbal ingredients (phytobiotics). One of the herbal ingredients that can be used by farmers to achieve this goal is using cinnamon leaf.

Cinnamon leaves contain several types of active substances such as tannins, eugenol, safrole, calcium oxalate, resin, saponins, tanning substances, and cinnamaldehyde (Sulistiyani *et al*. 2006). According to research Wang *et al*. (2009), the dominant polyphenolic compound in cinnamon (Cinnamomum burmannii) leaves is from the aldehyde group, namely trans-cinnamaldehyde at 60.17%. This compound has insulin-like activity (insulin mimetic) called methylhydroxychalcone polymer (MHCP) (Jarvill-Taylor *et al*. 2001). According to Goldberg (2001), insulin also plays an important role in the process of lipid metabolism in adipose tissue and liver. Polyphenol compounds will inhibit the formation of triglycerides which are the main deposits of fat in the body so that fat levels in the body are reduced. Allegedly with its role in reducing fat content, cinnamon leaves have the potential as a feed additive in broiler feed to produce chicken meat with low fat and cholesterol content.Based on this, it is necessary to conduct a study to evaluate the effect of adding cinnamon leaves in feed to blood cholesterol levels and broiler meat.

II. MATERIALS AND METHODS

Animal Experiment Prepafeed : The experimental animal used in this study was Day old chick (DOC) Lohman strain broiler (MB 202) produced by PT. Japfa Comfeed Indonesia totaled 144 broilers and was kept up to 35 days of age. The basal feed used during the study was commercial feed BR-1 from PT. Japfa Comfeed Indonesia. The litter used during the study was rice husk with a thickness of 5 cm from the bottom of the cage floor. The use of litter was carried out from the beginning of maintenance until the chickens were 35 days old. The rearing system was carried out randomly and divided into 24 colony cages consisting of 6 treatments and repeated 4 times, with each replication consisting of 6 chickens. The six treatments were: P0 treatment in the form of feeding without the addition of cinnamon leaf extract as a control, P1 = basal feed + antibiotic zinc bacitracin 0.01%, P2 = basal feed + cinnamon leaf extract (EDKM) 0.25%, P3 = Basal diet + Cinnamon leaf extract (EDKM) 0.5%, P4 = Basal diet + Cinnamon leaf extract (EDKM) 0.75% and P5 = Basal diet + Cinnamon leaf extract (EDKM) 1%. Each experimental animal colony cage was coded according to the treatment group to facilitate observation and data collection during maintenance.

Cinnamon Leaf Extraction : Cinnamomumburmanii leaf samples were obtained from UPT. Materia Medica Batu City. Cinnamon leaves are dried in the open air (air dry) without being exposed to direct sunlight to avoid damage to the active ingredients contained in cinnamon leaves. Drying is carried out until the leaves can be crushed and sifted to obtain dry cinnamon leaf powder (simplicia).The extraction method used in this study refers to the method used by Safratilofa *et al*. (2015) with some modifications. Cinnamon leaf powder was soaked in 96% ethanol solvent with a ratio of 1:10 (w/v) and macerated for 24 hours while being stirred using a magnetic stirrer. The result of macefeed is left to stand until two layers of material suspension are formed. The top layer is the liquid produced by macefeed and filtered using filter paper. The second layer is a precipitate of cinnamon leaf powder which is then added back with 1000 mL of 96% ethanol and macerated for 24 hours while being stirred. After settling and settling, the macefeed liquid was again filtered with the first filter and the second filter. This is repeated until the macefeed liquid becomes clear. The macefeed liquid is then evaporated using an evaporator at a temperature of 40°C. The extraction results are then stored in the refrigerator until used.

Measurement of Total Cholesterol, Triglycerides, HDL and LDL Levels : Total cholesterol, triglyceride, HDL and LDL levels were measured using a sample of blood serum collected through the brachial vein according to the method applied by Gusti *et al*. (2017). Two ml of chicken blood samples were taken, put into a vacutainer tube and positioned horizontally for 1 hour until the serum came out, then the serum was transferred to a microtube and stored in an ice flask for analysis in the laboratory. The procedure for determining complete cholesterol levels in chicken blood uses a photometer using the cholesterol oxidase-peroxidase amino-antipyrine phenol (CHOD-PAP) method with a wavelength of 546 and a temperature of 37°C.

Data Analysis : This study used a completely randomized design (CRD) with six treatments and four replications. All parameters were tested statistically. The data obtained were analyzed quantitatively using Microsoft Office Excel and statistical package for the social science (SPSS) version 16.0 for windows. Oneway analysis of variance (ANOVA) statistical test of variance was followed by Duncan's further test to determine whether there was a significant difference with a significance level of 5%.

III. RESULTS AND DISCUSSIONS

Effect of Cinnamon Leaf Extract Supplementation on Total Cholesterol and Triglyceride Levels : The results of measurements of total cholesterol and triglyceride levels are presented in Table 1. The results of statistical analysis showed that the addition of cinnamon leaf extract had no significant effect ($P>0.05$) on total cholesterol and triglyceride levels in chickens. This is presumably because the basal feed and daily feed consumption of chickens were not much different in each treatment, so that they did not have a significant effect

on the total cholesterol and triglyceride levels of chickens.Total cholesterol levels in this study were in the range of 85-99 mg/dl. Total cholesterol levels in each treatment were still within the normal range of broiler cholesterol levels. According to Basmacioglu and Ergul (2005) the average blood cholesterol level of broilers is 52-148 mg/dl. The performance of the compounds contained in cinnamon leaves in reducing cholesterol levels was seen in the average blood cholesterol levels of chickens which tended to be lower in the treatment group with the addition of cinnamon leaf extract when compared to the control group (P0) and the use of antibiotics (P1) in the feed (Table 3). 1).

Cinnamon leaf extract supplemented in feed contains polyphenols and flavonoids which are antioxidants. These compounds can reduce cholesterol levels in the body, because they can increase the excretion of bile salts in the intestinal tract (Pagala and Agustina, 2009). Bile salts are fluids secreted by bile as an emulsifier of fat in the intestines and its precursor is cholesterol in the liver. Increased excretion of bile salts in the intestine with feces will increase the use of cholesterol in the blood serum for bile salt synthesis in the liver. In addition, antioxidant compounds from cinnamon leaves can inhibit the work of the HMG-CoA reductase enzyme which is a catalyst in cholesterol synthesis in the intestine (Oliveira *et al*., 2007).The average blood triglyceride levels in chickens in this study ranged from 46-61 mg/dl. These results are still classified as normal triglyceride levels in broilers. According to Basmacioglu and Ergul (2005), the average blood triglyceride level of broilers is <150 mg/dl. Triglyceride levels are strongly influenced by the carbohydrate content in the feed and the circulation of free fatty acids in the body. The liver plays a role in the synthesis of triglycerides. The liver can convert carbohydrates into free fatty acids and transform them back into triglycerides (Citrawidi *et al*. (2012). Factors that affect the synthesis of triglycerides and secretion of very low density lipoprotein (VLDL) by the liver are high-carbohydrate foods, circulating free fatty acids that high insulin levels, and low glucagon levels (Murray *et al*., 2012). Therefore, triglyceride levels will increase when chickens are given a high-carbohydrate diet. The basal feed given in this study was the same in each treatment and was not a feed with high carbohydrate content, so that the effect of cinnamon leaf extract supplementation has not been seen significantly in influencing the blood triglyceride levels of chickens.

Table 1.Average levels of total cholesterol, *high density lipoprotein* (HDL), low *density lipoprotein* (LDL), triglycerides, and broiler meat cholesterol

Treatment	Total Cholesterol (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	Triglycerides (mg/dl)	Meat Cholesterol(mg/ 100 gSample)
P0 (Control feed)	95.25±14.50	36.00±1.41^{a}	24.25±3.40^{b}	61.00±27.54	77.98±0.87^{c}
P1 (Feed+Bacitrasin 0.01 %)	99.50±14.01	36.75±3.30^{ab}	18.00±1.83^{a}	48.00±15.64	78.13±0.50^{c}
P2 (Feed+EDKM 0.25 %)	94.25±4.35	39.25±0.96^{b}	16.25±2.63^{a}	54.50±11.90	76.43±0.92^{b}
P3 (Feed+EDKM 0.5%)	85.50±9.54	44.75±3.10^{c}	16.00±0.82^{a}	47.00±5.03	76.98±1.10^{bc}
P4 (Feed+EDKM 0.75 %)	93.75±8.54	55.50±1.29^{d}	15.75±4.20^{a}	46.50±1.29	74.50±1.14^{a}
P5 (Feed+EDKM 1%)	92.75±9.21	56.25±0.96^{d}	19.75±1.26^{a}	56.00±2.58	73.71±0.74^{a}

Description : Notations a, b, and c showed significant differences between treatment groups (P<0.05).

Effect of Cinnamon Leaf Extract Supplementation on HDL and LDL Broiler Levels : Cinnamon leaf extract supplementation in feed was able to significantly increase the HDL levels of chickens when compared to the control group (P0) and the use of antibiotics (P1) (Table 1). The results of the average HDL levels of chicken blood in this study were 36.00-56.25 mg/dl. The results of statistical analysis showed that the administfeed of cinnamon leaf extract had a very significant effect (P>0.05) on body HDL levels. The mean HDL levels were within the normal range. The normal range of HDL is >22 mg/dl (Basmacioglu and Ergul, 2005). Increased HDL levels indicate a response from the treatment given. High HDL levels can prevent the risk of atherosclerosis by means of cholesterol from peripheral tissues will be transported to the liver thereby reducing excessive cholesterol levels in the body (Hartini and Okid., 2009).

In normal body conditions, HDL lipoprotein functions to carry excess cholesterol from all body tissues to be carried to the liver. Cholesterol transported to the liver is mainly in the form of cholesterol which will be used as raw material for making bile and hormones. High-Density Lipoprotein (HDL) in the blood will then bind to free cholesterol and cholesterol esters and transport them back to the liver. The bound cholesterol will undergo an overhaul into cholesterol reserves for the synthesis of Very-Low Density Lipoprotein (VLDL). High levels of

HDL in the blood will accelerate the process of transporting cholesterol to the liver, thereby reducing the possibility of accumulation of cholesterol in the blood vessels (Benjamin *et al*., 2005). HDL molecules are relatively small when compared to other lipoproteins, so they can pass through vascular endothelial cells and enter the tunica intima to transport cholesterol that has accumulated in macrophages. In addition, HDL also has antioxidant properties that can prevent LDL oxidation (Hartini and Okid., 2009).

Some of the cholesterol in the body is excreted in the form of bile, both free bile and bile acids. Bile acids synthesized by the liver are excreted in the intestine and then reabsorbed by the liver. A small portion of bile acids that are not reabsorbed will be excreted from the body with feces (Dorfman *et al*., 2004). The results showed that the use of cinnamon leaf extract in this study tended to increase blood HDL levels.The use of cinnamon leaf extract in feed was able to reduce the LDL levels of chickens when compared to the control group (P0) (Table 1). The decrease in LDL levels is directly proportional to the increase in HDL levels. The results of the average blood LDL levels of chickens in this study were 15.75-24.25 mg/dl. The results of statistical analysis showed that the administfeed of cinnamon leaf extract had a significant effect (P>0.05) on the reduction of body LDL levels compared to the control group (P0), but was not significantly different between the treatment groups. In this study, LDL levels were still in the normal range. Normal LDL levels according to Basmacioglu and Ergul (2005) are <130 mg/dl.

Under normal body conditions, cholesterol is transported in lipoproteins and the largest proportion of cholesterol is contained in LDL. When the amount of cholesterol in the cell increases, the number of LDL receptors will decrease, while when the cell needs a lot of cholesterol, the number of LDL receptors will increase. This system will regulate the amount of cholesterol in the cells to remain constant (Erinda, 2009). Cinnamon leaf extract given can be utilized by the body by increasing the synthesis of the enzyme lipoprotein lipase (LpL). This enzyme will catalyze glycerol and fatty acids, so that LDL undergoes an overhaul. Giving cinnamon leaf extract can increase HDL levels and affect the decrease in LDL levels.

Effect of Cinnamon Leaf Extract on Broiler Meat Cholesterol Levels : The results of the measurement of meat cholesterol levels in each treatment obtained the average of each treatment as shown in Table 1. In the table it can be seen that there was a decrease in meat cholesterol from the control treatment P0 (77.98 mg/100gr) to the treatment group by giving cinnamon leaf extract starting from P2 (76.43 mg/100gr), and continued to decrease until treatment P5 (73.71 mg/100gr). The results of the calculation of analysis of variance and Duncan's further test for breast meat cholesterol (Table 1) showed that the addition of cinnamon leaf extract in the feed had a significant effect (P<0.05) on reducing cholesterol levels of chicken meat. The higher the level of administfeed of cinnamon leaf extract, the lower the cholesterol level of chicken meat. The decrease in meat cholesterol levels gradually starting from P2, P3, P4 to P5 is thought to be due to the presence of methyl-hydroxychalconepolymer (MHCP) compounds in cinnamon leaf extract which have insulin-like functions (Solomon and Blannin, 2007; Akilen *et al*., 2012).). According to Polakof *et al*. (2010) insulin plays a very important role in the process of lipid metabolism in the liver and muscles (meat). The main effect of insulin on adipose tissue is to increase the synthesis of lipoprotein lipase (LpL) in adipocytes. LpL is an enzyme that converts triacylglycerol/lipoprotein triglycerides into glycerol and FFA. These polyphenolic compounds will inhibit the formation of triacylglycerol or triglycerides which are the main deposits of fat in the body (Azima *et al*. 2004).

Ismoyowati and Sumarmono (2011) stated that triglyceride and blood cholesterol levels can affect cholesterol levels in meat. When there is an increase in fat levels in the blood, fat will be deposited in fat tissue and muscle tissue as an energy reserve. Conversely, if there is a lack of fat in the blood, the body will provide impulses for the process of glyconeogenesis in fat/muscle tissue.The presence of saponins contained in cinnamon leaf extract is thought to help reduce cholesterol levels in the body. According to Nggena *et al*. (2019), saponins can reduce blood and tissue cholesterol levels in poultry, and can reduce cholesterol levels by limiting reabsorption and increasing excretion. The mechanism of action of saponins in lowering cholesterol is by inhibiting the absorption of cholesterol or by increasing the excretion of cholesterol through feces. The results of this study indicate that increasing the level of cinnamon leaf extract up to 1% in the feed can reduce cholesterol levels of meat from 77.98 mg/100gr (P0) to 73.71 mg/100gr (P5).

IV. CONCLUSION

Cinnamon leaf extract supplementation in feed has a good effect on body cholesterol levels, with the use of up to 1% level it can increase the body's highdensity lipoprotein (HDL) levels and reduce cholesterol levels in chicken meat.

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