

EFFECT OF VITAMIN E ON LIPID BLOOD PARAMETERS IN LAYING DUCK KEPT UNDER VILLAGE SYSTEMImam Suswoyo^{1*}, Mohandas Indrajit² and Endro Yuwono²¹Laboratory of Poultry Production Faculty of Animal Science Jenderal Soedirman University Indonesia.²Laboratory of Animal Health Faculty of Animal Science Jenderal Soedirman University Indonesia.

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ABSTRACT

A study was conducted to investigate the effect of vitamin E on lipid blood parameters of laying ducks kept under a village system. The study involved 600 local laying ducks (Tegal ducks) aged 12.3 ± 0.9 months. The ration contained 18.91% protein, 64.48% dry matter, 5.02% fat, 8.91% crude fiber, 10.03% ash, 2.29% calcium, and 0.78% phosphorus. A Completely Randomized Design was used with 4 groups: control, and vitamin E administration (D1= 400 IU, D2= 500 IU, and D3=600 IU per day). Each treatment group was replicated 6 times with 25 laying ducks per replication. Commercial vitamin E was administered for 3 months. At the end of the study, blood samples were collected for hematologic tests. The results showed that cholesterol and LDL levels were significantly lower ($P<0.05$) in D2 and D3; HDL was significantly higher ($P<0.05$) in D1, D2, and D3; while triglycerides were significantly lower ($P<0.05$) in D1 and D3. It is concluded that vitamin E supplementation has decreased blood cholesterol, LDL, and triglycerides levels and increased blood HDL levels of laying ducks under the village management system.

KEYWORDS: Vitamin E, blood lipids, laying duck, village system.**INTRODUCTION**

In 2022, there were 56,728,470 ducks in Indonesia. Most of the population consists of local ducks that are egg-producing ducks. By 2023, duck egg production had reached 358,220.20 tonnes.^[1] Duck eggs play an important role in Indonesia, both economically and culturally. They are a good source of animal protein, providing essential nutrients for society. In many Indonesian cultures, duck eggs are used in various traditional dishes, such as salted eggs, which are very popular. Duck eggs also serve as a source of income for many breeders and egg traders, contributing to the local economy.

Cholesterol is a substance necessary for the body, particularly in forming hormones like adrenal cortex hormones, estrogen, androgen, progesterone, and bile fluid. Additionally, the digestive process requires cholesterol.^[2] However, some Indonesians currently avoid consuming duck eggs due to their high levels of fat, including cholesterol and LDL, which can increase the risk of heart disease, stroke, and liver cancer.^[3] Atherosclerosis, a chronic inflammatory disease characterized by the accumulation of plasma lipoproteins carrying cholesterol and triglycerides in the arteries, is a major cause of morbidity and mortality worldwide.^[4]

Cholesterol is a metabolic product found in animal-based foods such as meat, brain, and eggs, particularly in egg yolks.

Efforts to reduce cholesterol levels in duck eggs are necessary to restore the role of duck eggs for the entire community. However, the biggest source of cholesterol is the feed given to the chickens in question, where the presence of cholesterol in the feed will be absorbed into the body, causing high blood cholesterol and impacting the formation of egg yolk cholesterol.^[5] Cholesterol concentration in the blood may directly affect cholesterol concentration in eggs and meat.^[6] Several studies have been carried out to reduce blood fat levels in ducks. Dietary supplementation of lime (*Citrus aurantifolia*) significantly increased HDL and lowered triglycerides, blood cholesterol, and LDL.^[7] Similarly, the addition of *gelugur* leaves in a non-conventional ration did not reduce performance but decreased cholesterol and LDL levels and increased triglycerides.^[8] Much research has been carried out on the use of vitamin E in poultry, especially in broiler chickens and laying hens.

Several studies have proven that the addition of vitamin E can increase egg production and quality and improve the health of chickens.^[9] Vitamin E also improves laying

performance, helps regulate serum cholesterol levels, increases tocopherol deposition, and increases antioxidant capacity in laying hens.^[10] Meanwhile, in broiler chickens, the addition of vitamin E to feed has been proven to increase blood antioxidant status and non-enzymatic antioxidant content in liver and breast muscle.^[11]

There is a direct relationship of serum vitamin E to total serum lipid concentrations (sum of cholesterol, triglycerides, and phospholipids) as well as a less strong relationship with total serum cholesterol levels, as a result of the fact that vitamin E is a fat-soluble vitamin.^[12] Vitamin E has the ability to break down free radical reactions in tissues and is the dominant antioxidant in LDL particles so it can prevent the formation of oxidative LDL, which plays a very important role in the formation of fatty plaque in the blood vessels.^[13] However, there was little information on the influence of dietary vitamin E supplementation on the lipid blood contents of laying ducks, especially in research conducted directly on the farm. This research, therefore, aimed to study the effect of vitamin E on the fat blood parameters of lying ducks kept in a village system.

MATERIALS AND METHOD

Method

This research used an experimental method and was conducted in a duck farmer group as a sample of village duck farming in Tegal town Central Java Province. The village system refers to the daily maintenance of ducks that have been carried out by farmers for generations with minimal introduction of new technology. The rearing system was intensive, which was duck rearing with a closed fence so that the birds had no access to the outside area, and the amount of feed provided could be controlled and measured. Vaccination programs and the provision of vitamins, minerals, and other feed supplements are rarely carried out. The type of ducks kept are local laying ducks, namely Tegal ducks. These ducks are kept in duck houses located within the farmer's village area and usually not far from their homes. The ducks kept are mostly under laying period.

Materials

In total, there were 600 local laying ducks (Tegal ducks) involved in this research. The ducks were at the age of 12.3 ± 0.9 months. The feed provided consists of 45.45% rice bran, 30.30% dried rice, 22.73% fresh fish, and 1.50% egg-laying duck concentrate. The ration contains protein 18.91%, dry matter 64.48%, fat 5.02%, crude fiber 8.91%, ash 10.03%, calcium 2.29%, and phosphorus 0.78%. Minor variation was found among farmers, but it was not significant. Every morning and afternoon feed was provided to the ducks, while drinking water was provided *ad libitum* three times a day, i.e. in the morning, noon, and afternoon.

A Completely Randomized Design was applied with 4 groups, namely control, and vitamin E administration ($P_1 = 400$ IU, $P_2 = 500$ IU, and $P_3 = 600$ IU per day). In total, there were 4 treatment units that were replicated 6 times. Every treatment unit had 25 laying ducks. Vitamin E used was commercial and was given for 3 months. At the end of the study, blood sampling was carried out for hematologic tests. Each experimental plot took 3 ducks. Blood is taken from the wing vein (brachial vein), 3 ml with a syringe, then put in a sterile tube containing anticoagulant (EDTA), labeled according to the duck's number, the tube was put in an ice flask and taken to the laboratory.

Parameters observed were lipid blood parameters: cholesterol, High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), and triglycerides. The enzymatic colorimetric with CHOD-PAP (Cholesterol Oxidase - Para Aminophenazone) method was applied to measure blood cholesterol content, while for triglyceride level analysis the method used was the enzymatic colorimetric with GPO-PAP (glycerol phosphate oxidase-para aminophenazone).

Data obtained was analyzed using Variance analysis with a 5% level of confidence.

RESULTS AND DISCUSSION

The average blood lipid content of ducks given Vitamin E is presented in Table 1

Table 1: Blood lipid content of ducks given Vitamin E.

Parameters	Control	Vitamin E		
		Dose 1	Dose 2	Dose 3
Cholesterol (mg/dl)	208.00 ^{a)}	215.40 ^{a)}	183.33 ^{b)}	197.78 ^{b)}
HDL (mg/dl)	51.33 ^{a)}	67.57 ^{b)}	72.05 ^{b)}	65.56 ^{b)}
LDL (mg/dl)	151.33 ^{a)}	157.83 ^{a)}	111.28 ^{b)}	132.22 ^{b)}
Triglycerides (mg/dl)	221.43 ^{a)}	179.59 ^{b)}	214.29 ^{a)}	168.57 ^{b)}

Note: a different superscript on the same line indicates a significant difference ($P < 0.05$).

In this study, the cholesterol content varied from 183.33 to 215.40 mg/dl. These results corresponded to the findings of previous research which found that cholesterol content was between 148.67 – 179.00 mg/dl^[14] and also the findings of other research which informed that the number was between 178.6 – 251.6

mg/dl.^[8] The average cholesterol content in ducks was 252.4 mg/dl.^[15] Statistical analyses showed that Vitamin E at D2 and D3 has decreased cholesterol levels significantly ($P < 0.05$). Increasing levels of vitamin E decreased the levels of cholesterol and triglyceride significantly.^[16] As an antioxidant, can reduce blood

cholesterol levels in various ways, namely by reducing the activity of HMG-CoA reductase, increasing the low-density lipoprotein (LDL) receptor, and increasing the activity of lecithine cholesterol acyl transferase (LCAT) which works to speed up the reaction of the formation of cholesterol esters. from free cholesterol to high-density lipoprotein (HDL) molecules in the process of taking cholesterol from cells/tissues, and reducing levels of the hepatic enzyme HMG-Koa reductase.^[17] Vitamin E is a suppressor of LDL lipid oxidation, therefore the presence of vitamin E in lipoprotein may contribute to the decreased level of LDL.^[18]

The HDL-cholesterol content varied from 51.33 to 72.05 mg/dl. These results are similar to previous research which informed us that HDL content was between 65.80 to 81.20 mg/dl.^[19] The result of LDL level in this research is. 111.28 to 157.83 mg/dl was in accordance with the result of a study in which the LDL level was 162.6+23.4 mg/dl on average.^[8] Vitamin E supplementation in D1, D2, and D3 have significantly ($P<0.05$) increased HDL levels. Vitamin E as an

antioxidant can increase HDL levels by blocking oxidative stress in the blood so that the imbalance of free radicals can be overcome.^[20] In this study, the triglyceride content varied from 168.57 to 221.43 mg/dl. These results were higher compared to the results of research which found that the cholesterol content in the blood of ducks were triglycerides were 66.6-200.3 mg/dl.^[21] In general, it is said that the triglyceride content will follow the cholesterol content. In this study, the cholesterol content decreased with the addition of vitamin E so it is not surprising that the triglyceride content also decreased. Vitamin E as an antioxidant is thought to reduce the availability of fatty acids for triglyceride synthesis by inhibiting the activity of phosphatidic acid Phosphohydrolase (PAP) and Diacy enzyme Glycerol Transferase (DGAT). This inhibition of triglyceride synthesis causes a decrease in triglyceride production.

To provide a clearer picture, the results of this research are shown in the figure below.

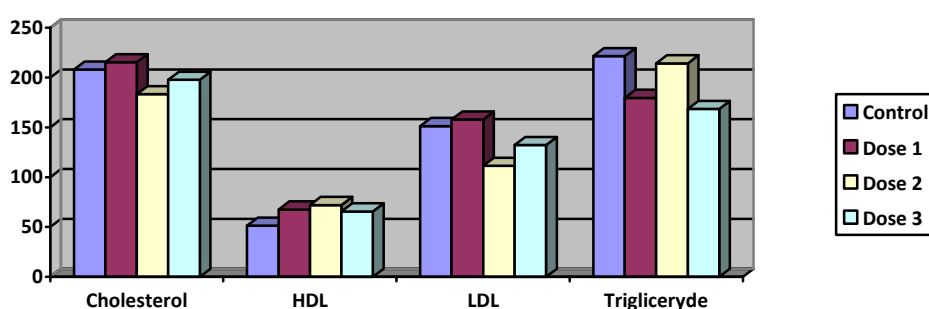


Figure 1: Lipid blood contents under vitamin E supplementation.

CONCLUSION

Based on this research, it is concluded that vitamin E supplementation has decreased blood cholesterol, LDL and triglycerides levels and increased blood HDL level of laying ducks under village management system.

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