

## **Pengaruh Suplementasi Debris Dalugha (*Cyrtosperma merkusii*) Terhadap Kadar Hemoglobin, Kolesterol dan Glukosa Darah Ayam Broiler**

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### **ABSTRAK**

Pakan merupakan faktor penting yang mempengaruhi pertumbuhan dan perkembangan ayam. Debris dalugha adalah hasil samping pengolahan tepung dalugha yang sudah tidak digunakan lagi dan diperkirakan dapat menjadi sumber pakan untuk pertumbuhan dan perkembangan ayam daging. Pakan yang baik dapat mengoptimalkan proses metabolisme pada hewan sehingga akan mendukung proses pertumbuhan dan perkembangan hewan tersebut. Penelitian ini bertujuan untuk mengetahui kadar hemoglobin, kolesterol, dan glukosa darah pada ayam yang disuplementasikan debris dalugha dalam pakan. Penelitian ini menggunakan rancangan acak lengkap (RAL), di mana sebanyak 60 ekor ayam dikelompokkan ke dalam empat perlakuan dengan tiga ulangan. Perlakuan suplementasi debris dalugha diberikan pada beberapa dosis yaitu; 0%, 0.065%, 0.13% and 0.26%. Parameter yang diamati berupa kadar hemoglobin, kolesterol dan glukosa darah. Hasil penelitian menunjukkan bahwa pakan yang ditambahkan suplementasi debris dalugha secara signifikan ( $p < 0.05$ ) mempengaruhi kadar glukosa darah, tetapi tidak mempengaruhi ( $p > 0.05$ ) kadar hemoglobin dan kolesterol darah ayam daging. Hal ini menunjukkan bahwa debris dalugha memiliki potensi sebagai bahan penyusun pakan ayam broiler.

**Kata kunci:** Ayam daging; biokimia darah; *Cyrtosperma merkusii*

## **Effect of Dalugha (*Cyrtosperma merkusii*) Debris Supplementation on Hemoglobin, Cholesterol and Blood Glucose Levels in Broiler Chickens**

### **ABSTRACT**

Feed is an important factor that influences the chicken's development and growth. Meanwhile, dalugha debris is a by-product of dalugha processing which is expected to be a source of feed for the growth and development of broiler chickens. The good feed can optimize metabolic processes in the animal so that it can support the process of growth and development of the animal. This study aims to determine the levels of hemoglobin, cholesterol, and blood glucose in broiler chicken that is given dalugha debris supplementation. This study used a completely randomized design (CRD), where as many as 60 docs of unsex chicken used were divided into four treatments and three replications. Each replication consisted of five chickens. The treatment given was the concentration of dalugha debris at several doses: 0%, 0.065%, 0.13%, and 0.26%. The parameters observed were hemoglobin, cholesterol, and blood glucose levels. The results showed

that the provision of dalugha debris in the feed significantly ( $p < 0.05$ ) affected the blood glucose level, but did not affect the cholesterol and hemoglobin levels ( $p > 0.05$ ) of the broiler chicken.

**Keywords:** Blood biochemistry; broiler chicken; *Cyrtosperma merkusii*

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## INTRODUCTION

Broiler chicken is a superior breed of chicken that has high genetic characteristics, especially in growth. The development of broiler chicken farms continues to experience a significant increase because in addition to fast growth, the meat also has a delicious taste and is tender and the price is relatively affordable by the public. Given the high production costs required in broiler farming, it encourages breeders to look for ways to improve broiler performance. This also stimulates researchers to conduct various studies to meet these needs (Hidayatullah *et al.*, 2019; Samadi *et al.*, 2021; Tumbal & Simanjuntak, 2019).

The availability of corn as the main feed source of energy for poultry livestock today is increasingly difficult because of the transition of land use for settlements, industry, and other physical developments. In addition, the use of corn as animal feed is considered inappropriate because corn is also the second food source for humans after rice. Apart from being used as a feed ingredient, corn is currently widely used as a raw material for biofuels (Roni *et al.*, 2020; Suardi *et al.*, 2019). The utilization of waste is an alternative to overcome the problem of difficulty in feeding ingredients. One of the potential wastes to be used as an energy source feed is dalugha (*Cyrtosperma merkusii*) debris.

Animal and human health are two related fields of science. The cellular activity and performance of broilers are reported to depend on the available feed nutrients, which can be used and distributed, and absorbed to and through tissues and organs. According to Adegoke *et al.*, (2018) measurement of blood biochemistry can act as an indicator of the response of chickens to exposure to toxic substances as well as to organ functions.

Previously, the content of dalugha debris has never been known whether it has an effect or ability to act as an anti-oxidative agent but we thought that it has a anti-oxidative substance since this is a plant. Anti-oxidative substances in plants have been shown to limit the formation of oxidation products, maintain nutritional quality and improve broiler performance (Adegoke *et al.*, 2018; Gharechopogh *et al.*, 2021). The dalugha plant is endemic to the North Sulawesi province (Leu *et al.*, 2021). Dalugha has the potential as an alternative source of food starch ingredients (Moko *et al.*, 2022). The starch extraction process from dalugha will then produce dalugha debris as unused waste. The greater the potential of dalugha as a source of starch, the more dalugha debris it will produce. This research has focused on the beneficial effect of phytochemical substances in broiler chickens. Therefore, based on the thoughts above, this study aims to find out the effect of the dalugha debris supplementation on levels of hemoglobin, cholesterol, and blood glucose in broiler chickens to improve the quality of the broiler chickens production.

## RESEARCH METHOD

### Materials

The materials used in this study were broiler chicken strain Lohmann unsexed age one day (Day Old Chicken) with initial weight is 38-45 g, commercial feed, carboxymethyl cellulose (CMC), and dalugha debris.

### Experimental Design

This study used a completely randomized design (CRD). This completely randomized design used 4 treatments with 3 replications so that there were 12 experimental units, and each experimental unit was filled with 5 broiler chicken DOCs so that the total of the broiler chicken DOC used was 60 chickens. The groups of treatment used were:

P0: Control/without supplemented dalugha debris

P1 : 0,065% of dalugha debris

P2 : 0,13% of dalugha debris

P3: 0,26% of dalugha debris

The composition of commercial feed used in this study is energy 4100 Kkal/kg, protein 21%, fat 3-7%, calcium 0.9-1.1%, and phosphor 0.6-0.9%.

### Experimental Procedure

The cages used were 12 units with a size of 100x75x30 made of bamboo and wood. The cage is equipped with a place to feed/food, a place to drink, and lights. The treatment of chickens was carried out for 40 days. During treatment, chickens were given commercial feed with dalugha debris, which was given twice daily. The concentration of the dalugha debris was given according to the treatment in the experimental design. The dalugha debris was bound to commercial feed by using carboxymethyl cellulose (CMC). During treatment, control is carried out on the chickens every day to see if any chickens die. Sampling for parameter measurement was carried out at the end of the study.

### Parameters Measurements

Blood was withdrawn from the brachial vein using a disposable syringe (3 mL; MDI Europa GmbH, Langenhagen, Germany) and kept in an EDTA tube. The concentration of glucose (mg/dL) and blood cholesterol (mg/dL) were analyzed using Autochek GCU multi-monitoring System (General Life Biotechnology Co., Ltd. Taiwan). The concentration of hemoglobin (g/dL) was analyzed using Easy Touch GCHb.

### Statistical Analyses

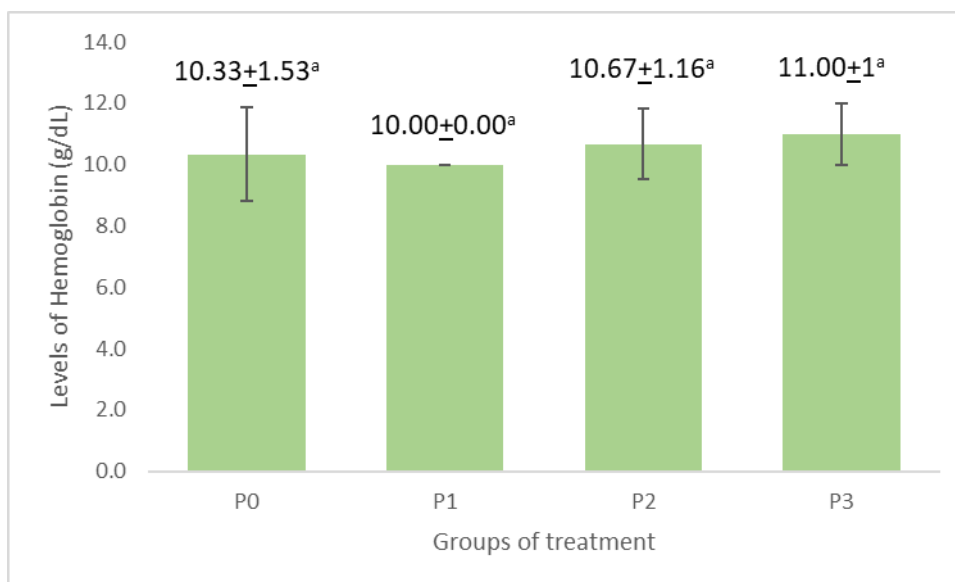
The data obtained were analyzed by using analysis of variance (ANOVA). The whole data analysis was conducted MINITAB software version 16. The differences between the means of the treatment were tested by using Tukey simultaneous test. All results were significantly different and were expressed with  $p < 0.05$ .

## RESULTS AND DISCUSSION

### Levels of Hemoglobin (Hb)

Data on Hemoglobin levels can be seen in Figure 1. The addition of dalugha debris in broiler chicken feed did not give a different value to hemoglobin levels ( $p > 0.05$ ). The hemoglobin level of the broiler chickens in this study ranged from 10.00 – 11.00 g/dL.

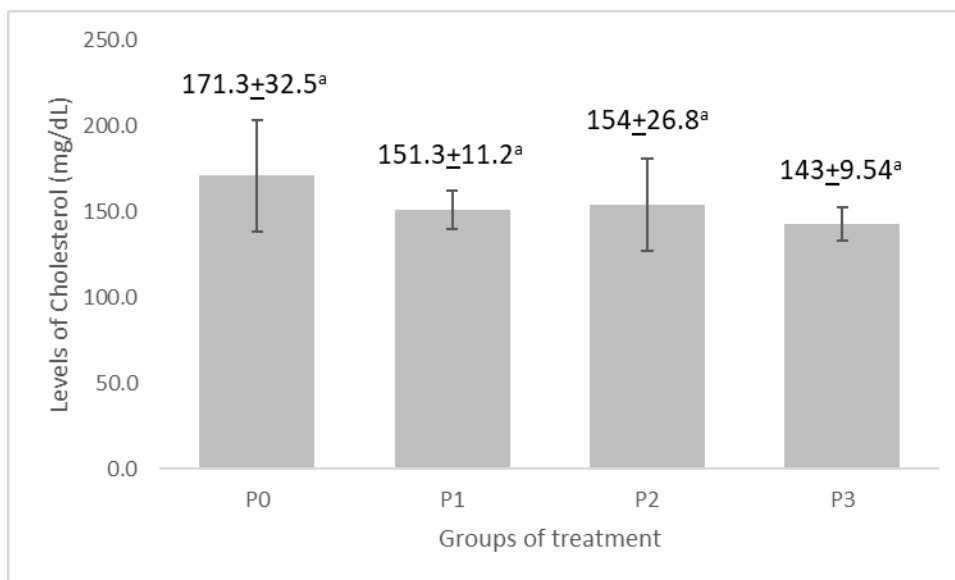
Normal hemoglobin levels in chickens range from 10.2 – 15.2 g/dL (Parwati *et al.*, 2017). This shows that the hemoglobin level in all groups of experimental chickens is still in the normal range. The main component of erythrocytes is hemoglobin, as it forms about one-third of red blood cell content, which generated increased hemoglobin (Hb) concentration by possibly signaling the production of hemoglobin (Adegoke *et al.*, 2018). The function of Hb is to carry oxygen to tissues or cells and excrete carbon dioxide from tissues. Increased Hb levels lead to a better ability to carry oxygen to the tissues and more efficient excretion of carbon dioxide. This causes the condition and function of cells and tissues to become more optimal (Figure 1).



**Figure 1.** Levels of Hemoglobin (g/dL). P0 (Control/without supplemented dalugha debris); P1 (0.065% of dalugha debris); P2 (0.13% of dalugha debris); P3 (0.26% of dalugha debris). Means  $\pm$  standard deviation with different superscripts indicated a significant difference ( $p < 0.05$ ).

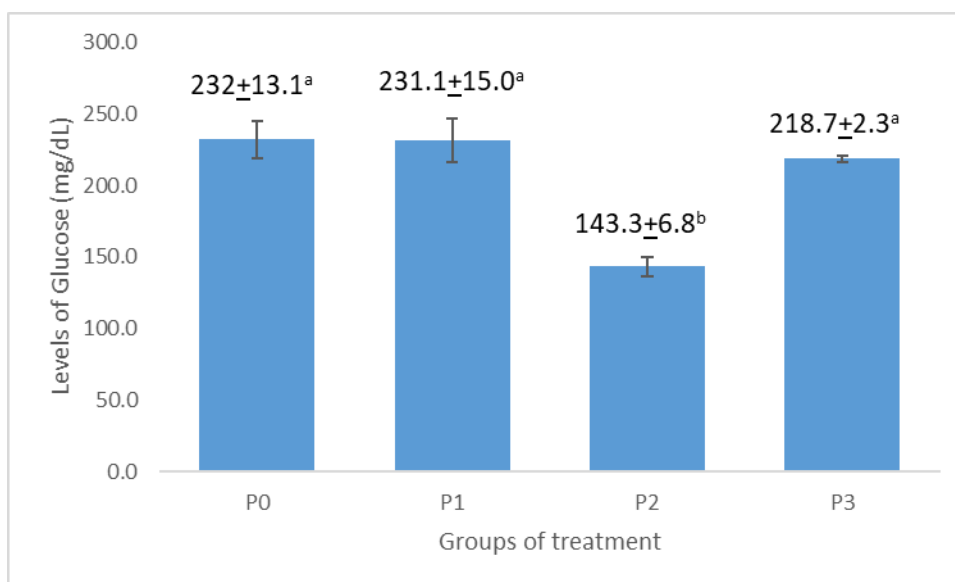
### Levels of Cholesterol

The addition of dalugha debris in broiler chicken feed did not give a different value on cholesterol levels ( $p > 0.05$ ). The data on cholesterol levels in the blood can be seen in Figure 2. Cholesterol levels in broiler chickens in this study ranged from 143 – 171.3 mg/dL. However, there is thought to be a tendency for cholesterol levels to decrease with the addition of dalugha debris in broiler feed. According to Ghazvinian *et al.*, (2018), for every 5% inhibition of the activity of the enzyme HMG-COA reductase (the key enzyme in cholesterol synthesis), cholesterol production is reduced by 2%, resulting in lower cholesterol, LDL, and VLDL concentration in the blood. This result showed that the addition of dalugha debris in broiler chicken has the potency to reduce the concentration of cholesterol. Cholesterol, an essential molecule for steroid hormone precursor and bile acids, can be acquired directly from the feed or produced via *de novo* biosynthesis (Ganeco *et al.*, 2020).



**Figure 2.** Levels of Cholesterol (mg/dL). P0 (Control/without supplemented dalugha debris); P1 (0.065% of dalugha debris); P2 (0.13% of dalugha debris); P3 (0.26% of dalugha debris). Means  $\pm$  standard deviation with different superscripts indicated a significant difference ( $p < 0.05$ ).

### Levels of Blood Glucose



**Figure 3.** Levels of Glucose (mg/dL). P0 (Control/without supplemented dalugha debris); P1 (0.065% of dalugha debris); P2 (0.13% of dalugha debris); P3 (0.26% of dalugha debris). Means  $\pm$  standard deviation with different superscripts indicated a significant difference ( $p < 0.05$ ).

The addition of dalugha debris in broiler chicken feed gave different values on blood glucose levels ( $p < 0.05$ ). The addition of debris at a dose of 0.13% significantly reduced blood glucose levels by 38.23%. However, the addition of debris at doses of 0.065% and 0.26% did not show a difference in blood glucose levels compared to the control group. According to Mushawwir & Latipudin (2011), an increase in blood glucose levels can be an indication that the chicken is under stress. Meanwhile, a severe decrease in blood glucose can result in a decrease of body weight. The response of simultaneous reduction of

triglycerides and increase in NEFA also indicate a response to glucose depression by shifting to alternative energy sources in the form of lipids. A similar increase in lactate and uric acid also suggest the search for alternative energy stores in the form of muscle glycogen and amino acid catabolism (Ashwell & McMurtry, 2003).

Dalugha has a high value of total fiber about 2.77% (Moko *et al.*, 2022). According to Bernstein *et al.* (2013), these dietary fibers form a viscous solution in the small intestine, which reduces the contact and mixing of macronutrients with digestive enzymes, and this delays the absorption of glucose, which consequently reduces the postprandial plasma glucose and insulin levels. Therefore, it is suspected that the dalugha debris even though the starch has been extracted, but there is still has fiber content in it. Several types of fiber, especially oligosaccharides, when added to poultry feed in isolated form, exhibit prebiotic effects by enhancing beneficial gut microbiota, modulating gut immunity, improving intestinal mucosal health, and increasing short-chain fatty acid (SCFA) production in the gut (Singh & Kim, 2021). According to Zhang *et al.* (2023), a diet with 7–9% crude fiber may promote growth performance by improving the nutrient digestibility, immunity, and intestinal morphology of broilers.

The results of this whole study showed that dalugha debris has the potential to be used as a feed ingredient for broiler chickens. This is because the provision of dalugha debris does not have a negative impact on the metabolic process of broiler chickens when seen from the levels of hemoglobin and blood cholesterol which are still at normal levels, and even tends to have a good effect. After all, it has the potential to be able to reduce blood levels of cholesterol. In addition, it appears that giving dalugha debris at certain concentrations can reduce broiler blood glucose levels. According to Reynolds *et al.* (2020), higher-fiber diets are important which resulting in improvements in glycaemic control, blood lipids, and inflammation. Therefore, further research is needed to be performed to find the best formulation for using dalugha debris as a basic ingredient in broiler feed.

## CONCLUSION

The addition of dalugha debris of 0.13% in broiler chicken feed can affect the decrease in blood glucose levels. Meanwhile, the addition of dalugha debris at all treatment did not affect the hemoglobin and blood cholesterol levels of broiler chickens. Further research on the cholesterol content of meat in broiler chickens needs to be conducted. It is because the results of this study showed there is a tendency to decrease cholesterol concentrations in the broiler chicken blood supplemented by the dalugha debris.

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