

# Hemoglobin Level and Total Differential Blood Leucocytes of Broiler Chicken Given Different Probiotics

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## ABSTRACT

### Article Info

Volume 9, Issue 2

Page Number : 224-230

### Publication Issue :

March-April-2022

### Article History

Accepted : 01 April 2022

Published: 10 April 2022

The use of adding probiotics to drinking water is an alternative to reduce the accumulation of additional chemical feed residues in meat, which functions to maintain the balance of the microflora ecosystem in the digestive tract and provide enzymes that can digest crude fiber, protein, fat and detoxify toxic substances or metabolites. This study aimed to determine the hemoglobin level and total differential leukocyte blood of broiler chickens given different probiotics using 100 broiler strains of MB 202 platinum with 20 cages with a size of 80X80 cm. The research design used a completely randomized design (CRD) with 4 treatments and 5 replications consisting of 5 chickens for each replication. The results showed that blood hemoglobin levels had a significant effect ( $P>0.05$ ) and the administration of different probiotics into drinking water had no significant effect ( $P>0.05$ ) on the differential value of leukocytes (monocytes, eosinophils, heterophils, and basophils) in broiler blood, but giving different probiotics had a significant effect ( $P<0.05$ ) on blood lymphocyte levels in broiler chickens.

**Keywords :** Hemoglobin, Leukocytes, Broiler Chicken

## I. INTRODUCTION

Broiler chickens are broilers that grow very fast because they can be harvested at the age of 1 month. The harvest period for broilers is shorter because they have good genetic characteristics, especially growth characteristics. Indicators of the success of livestock development efforts, especially broiler chickens are seeds, management, and feed. There are various obstacles to increasing chicken production, including bacterial and viral infections. Decreased chicken

productivity due to bacterial and viral infections can be overcome using antibiotics [1],[2]. However, excessive use of antibiotics in chickens poses a risk to consumer health, namely causing teratogenic and carcinogenic effects [3],[4]. The use of adding probiotics to drinking water is an alternative to reduce the accumulation of chemical feed additives in meat [5],[6]. Probiotics have the function to maintain the balance of the microflora ecosystem in the digestive tract and provide enzymes that can digest crude fiber, protein, and fat and detoxify toxic substances or metabolites [7],[8]. The concept of

utilizing the balance of microflora is the basis for the use of probiotics to suppress the development of pathogenic bacteria, both in the digestive tract of chickens and in the litter (environment in livestock cages) [9],[10]. In the digestive tract of chickens, microbes are found almost throughout the intestine. Blood is one of the parameters of the health status of animals because blood has an important function in the physiological regulation of the body.

Regulation in the body's physiology, blood functions, in general, are related to the transportation of components in the body such as nutrients, oxygen, carbon dioxide, metabolites, hormones, heat, and body immunity while additional functions of blood are related to fluid balance and body pH [11],[12]. The main function of red blood cells is to transport hemoglobin (Hb) [13],[14]. Hemoglobin functions as a carrier of O<sup>2</sup> from the lungs to the tissues [15],[16]. The number of erythrocytes and hemoglobin determines its ability to transport oxygen and nutrients to tissues [17],[18],[19]. Thus, oxygen and nutrients can determine the health of livestock owned by a farmer [20],[21].

Livestock health can be seen in one way, namely by looking at the blood picture or blood profile [22],[23]. A blood profile is one of the physiological and pathological parameters of the body that reflects the health condition of livestock [24],[25]. Blood functions as a transport component in the body such as nutrients, oxygen, carbon dioxide, heat, metabolism, hormones, and the body's immune system [26],[27]. Changes in blood profile can be influenced by environmental conditions, and physiological factors such as stress during fishing and transportation, age, and gender [28],[29]. Health is a very determining factor for the success of broiler chicken farming.

A healthy chicken will efficiently convert the feed consumed into the meat because the energy obtained from the feed can be fully used for growth. The

appearance of blood is one of the parameters of the health status of animals because blood is a component that has an important function in the physiological regulation of the body [30],[31]. Blood function in general is related to the transportation of components in the body such as nutrients, oxygen, carbon dioxide, metabolites, hormones, heat, and body immunity [32],[33]. While the additional function of the blood is related to the balance of fluids and body pH.

There are several methods used to assess the health status of broiler chickens, one of which is through a hematological assessment or examination. The hematological examination is an examination carried out to determine the condition of the blood and its components which aims to detect abnormalities where it is suspected that there are abnormalities in the number and function of blood cells. Research on blood profiles such as the effectiveness of giving turmeric powder, garlic, and zinc minerals to blood cholesterol levels in broilers [34] at least provides an overview of the use of probiotics to determine hemoglobin levels and total differential leukocytes in broiler blood. Because in general, research on hemoglobin levels and total differential blood leukocytes in broiler chickens has not been studied in detail or comprehensively, especially regarding the health level of chickens kept by a farmer.

## II. METHODS AND MATERIAL

The research was carried out in January-February 2022 at the Poultry Livestock Unit Laboratory, Faculty of Animal Science, University of Halu Oleo Kendari.

Research material in the form of broiler strain MB 202 Platinum produced by PT. Japfa Comfeed Indonesia Tbk totaling 100 heads, commercial feed type BP-11 from PT. Charoen Pokphand Indonesia Tbk, probiotics (liquid organic supplement probiotics, Lacto probiotics, and local probiotics (tape yeast), as well as the tools to

be used in the research, are 20-unit rectangular cages with a size of 80 cm x 80 cm, a place to feed, a place to drink, scales, knife, 60-watt incandescent lamp as a source of heat and lighting as well as tools used to determine hemoglobin level and total differential leukocyte blood of broiler chickens, namely measuring cup, 10 ml syringe, microscope, EDTA tube, dropper pipette.

Blood sampling through the axillary vein (on the wing) as much as 3 ml/head was carried out 4 weeks after the application of the treatment. Analysis of blood samples (leukocytes and hemoglobin) was carried out at the Laboratory of the Poultry Livestock Unit, Faculty of Animal Husbandry, University of Halu Oleo Kendari.

The treatment was given through drinking water in the form of liquid organic supplement probiotics, Lacto probiotics, and tape yeast probiotics. The provision of liquid organic probiotic supplements was given according to the instructions labeled for the use of

**Table 1.** Nutritional Composition of BP11 Feed Used in Research

Nutrient levels	Range	Rate
Water content	Maximum	13%
Crude protein	Range	21%-23%
Fat	Minimum	5%
Coarse fiber	Maximum	5%
Ash	Maximum	7%
Calcium	Minimum	0,9%
Phosphor	Minimum	0,6%

The variables observed in the study were (1) hemoglobin level, and (2) leukocyte differential. The hemoglobin level and leukocyte differential were calculated according to the hemocytometer method. Chicken blood is diluted with Rees and Ecker solutions in a pipette. The total amount of hemoglobin and differential leukocytes were calculated in the Neubauer counting chamber using a microscope. The total value of erythrocytes and leukocytes is expressed in units of  $10^6/mm^2$  and  $10^3/mm^2$

probiotics, namely 5 ml for one liter of water into drinking water. Giving Lacto probiotics is 10cc into one liter of drinking water. Furthermore, the probiotic yeast tape (1 grain = 2.8 grams) for one liter of drinking water.

The research design used was a completely randomized design (CRD) with 4 treatments and 5 replications, each replication consisted of 5 chickens, so the total number of chickens used in this research was 100. The research treatment is as follows:

- P0 = Commercial feed (BP-11)
- P1 = Commercial Feed+ liquid organic supplement probiotics
- P2 = Commercial Feed + probiotic lacto
- P3 = Commercial feed + local probiotics (tape yeast)

The feed was given ad libitum. The nutritional content of the feed ingredients used in the study is presented in Table 1.

The data obtained were analyzed for variance (ANOVA) according to the research design with the help of the SPSS software program. If the treatment has a significant effect ( $P < 0.05$ ), it will be continued with the Duncan Multiple Range Test (DMRT).

### III.RESULTS AND DISCUSSION

#### 3.1 Hemoglobin

The results of the analysis of variance showed that the provision of different probiotics in the drinking water of broiler chickens on hemoglobin levels of broilers had no significant effect ( $P > 0.05$ ). The average value of blood hemoglobin in this study was 10.85 g/dL-12.38 g/dL. The average hemoglobin levels in the use of different probiotics against broiler chickens obtained in this study are presented in Table 2.

**Table 2.** Blood hemoglobin levels (g/dL) of broiler chickens given different probiotics

Treatment	Hemoglobin (g/dL)
P0	10.85±1.19
P1	11.43±1.81
P2	11.87±1.61
P3	12.38±1.79

The value of blood hemoglobin given local probiotics (tape yeast) was higher than that given probiotics with liquid organic supplements or probiotic lacto. The high amount of hemoglobin in the administration of tape yeast probiotics indicates that the treatment affects increasing the amount of hemoglobin. This blood hemoglobin value is still in the normal range, this is to what was reported [35] that normal hemoglobin levels in broilers ranged from 7.3-10.90 g/%. The value of hemoglobin content in this study was higher than the study [36] with the administration of probiotic *Lactobacillus Plantarum* which was in the range of 11.21g%-11.60g%. According to [37] stated that hemoglobin levels in broilers can also be influenced by several factors including genetic factors, animal age, sex, species, environment, season, nutrition, presence or absence of erythrocyte damage, sampling time, health status, type of anticoagulant used. and the method used.

Hemoglobin is in erythrocytes and functions to carry oxygen to tissues or cells and excrete carbon dioxide from tissues. The increase in Hb levels causes the ability to carry oxygen to the tissues to be better and the excretion of carbon dioxide more efficient. This causes the state and function of cells and tissues to be more optimal [38]. The low hemoglobin content in chicken blood does not only show anemia but also shows a lack of protein caused by a low erythrocyte count, the hemoglobin content is positively correlated with the number of erythrocytes and the low protein content in the ration shows a decrease in the hemoglobin content.

### 3.2 Differential Leukocytes

The mean differential leukocytes (monocytes, eosinophils, heterophils, lymphocytes, and basophils) on the use of different probiotics against broiler chickens obtained in this study are presented in Table 3.

**Table 3.** Differential levels of blood leukocytes in broiler chickens are given different probiotics

Variable	Perlakuan			
	P0	P1	P2	P3
<b>Differensial Leukosit</b>				
Monocytes	6.50±0,58	6.75±0,96	5.00±1.29	5.25±0.96
Eusonophi	3.75±1.71	4.25±1.50	5.00±1.63	3.50±1.00
Heterophil	48.00±5.72	44.25±8.85	47.50±6.45	45.00±8.16
Lymphocytes	49.75±2.22	46.00±5.72	48.50±4.43	56.25±5.38 <sup>a</sup>
Basophils	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00

<sup>ab</sup>Different superscripts on the same line showed significantly different ( $p < 0.05$ ).

The results of the analysis of variance showed that the administration of different probiotics into drinking water had no significant effect ( $P > 0.05$ ) on the differential value of leukocytes (monocytes, eosinophils, heterophils, and basophils) in broiler blood, but the administration of different probiotics had a significant effect ( $P < 0.05$ ) on broiler blood lymphocyte levels. The average monocyte value in this study was still in the normal range, this is by the study [39] which stated that the blood monocyte value was 5.00-10.00. This is to the statement [40] which states that the percentage of monocytes ranges from 5.8–to 13% of the total leukocytes in chicken blood in healthy conditions. Monocytes are white blood cells that belong to the group of granulocytes that are formed in the bone marrow, when they enter the circulation, they mature into macrophages and enter the tissues. [41] stated that monocytes can phagocytize 100 cells of

pathogenic bacteria and become a regulatory system when inflammation and immune responses occur. Monocytes are mobilized together with heterophils, so they are referred to as the second line of defense against inflammation. Monocytes are the second defense in the body after heterophils, when inflammation occurs, monocytes are microscopic to tissues and turn into macrophages [42]. Monocytes also have the same function as heterophils in terms of phagocytosis of disease agents [43]. When migrating into tissues and turning into active macrophages, they act as phagocytic cells [44].

Eosinophils are part of leukocytes that play an active role in helping to regulate the severity of allergies or killing several parasites that infect the body. The average value of eosinophils in this study was 3.50 (tape yeast probiotic) -5.00 (Lacto probiotic). The value of eosinophils in this study was still in the normal range according to the statement [39] that the value of eosinophils (is 1.50-6.00). The average value of blood heterophils in this study was 44.25 (Liquid Organic Probiotics) to 48.00 (Without probiotics). The broiler blood heterophile value in this study was the highest without probiotic treatment (48.00) and the lowest with liquid organic supplement probiotic treatment (44.25). The average heterophile value in this study was higher than the results of the study [40] that the heterophile value (26.56-27.04). Heterophilic are key components of the innate immune system, which act like neutrophils in mammals [43]. Heterophilic function as phagocytic cells or phagocytosis (eat pathogens) of bacteria, parasites, and viruses [42].

The average basophil value obtained in this study was in the normal range (0.00) in all types of treatment, this is to the opinion of [41] who stated that the standard basophil value was 0.00-0.60. Basophils play an important role in the immune response initiated by contact with allergy-causing substances by producing chemical mediators such as histamine which subsequently attract other immune cells [42].

Based on the results of the variance, the lymphocyte values of the tape yeast probiotic treatment were significantly higher (56.25) than the Lacto probiotic treatment (48.50) and the liquid organic supplement probiotic treatment (46.00) and without treatment (49.75). The lymphocyte values in this study were within the standard range, as stated [43] that the standard lymphocyte value was (45.00-70.00). The average lymphocyte value in this study was lower than the results of the study [42] which reported that the lymphocyte value of laying hens given betel leaf juice ranged from 60.67-to 62.45. Lymphocytes are immune cells that play a role in specific immune responses. The specific immune response is mediated by B lymphocytes (B cells) and T lymphocytes (T cells). B cells play a role in Humoral Mediated Immunity (HMI), which produces antibody products (immunoglobulins). T cells play a role in Cellular Mediated Immunity (CMI) [43].

The differential leukocyte values produced in this study were still within normal limits [46],[47]. It is suspected that the administration of different probiotics in drinking water can be accepted by the body and is not treated as a foreign object so that the differential leukocyte value produced is still at normal levels. Based on the overall leukocyte differential value, it can be assumed that broiler chickens are in good health so they do not make any efforts to fight pathogenic bacteria or viruses that enter their bodies. According to [48] livestock infected with bacteria will experience a decline in health which is characterized by an increase in white blood cells.

#### IV.CONCLUSION

The results showed that giving different probiotics to the drinking water of broiler chickens had no significant effect ( $P>0.05$ ) and giving different probiotics to drinking water had no significant effect ( $P>0.05$ ) on the differential value of leukocytes (monocytes), eosinophils, heterophils, and basophils)

of broiler blood, but the administration of different probiotics had a significant effect ( $P < 0.05$ ) on blood lymphocyte levels in broiler chickens.

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**Cite this article as :**

Rusli Badaruddin, Harapin Hafid, La Ode Nafiu, Syamsuddin, Amiluddin Indi, Fuji Astuti Auza, "Hemoglobin Level and Total Differential Blood Leucocytes of Broiler Chicken Given Different Probiotics", *International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET)*, Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 2, pp. 224-230, March-April 2022.

Available at

doi: <https://doi.org/10.32628/IJSRSET229230>

Journal URL : <https://ijsrset.com/IJSRSET229230>