

Hematological Profile in Free-Range Chickens at The Age Of 4, 8, 12 Weeks

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Abstract

The purpose of this study was to determine the hematological profile in hens at the ages of 4, 8, and 12 weeks. The research lasted for 4 months, and its implementation was in the Laboratory of the Department of Animal Husbandry, Faculty of Agriculture, Pattimura University. The livestock commodities used in this study were native chickens in the age groups of 4, 8, and 12 weeks. Each age group will have 4 pieces of blood drawn. The variables observed are hematological values, namely the number of erythrocytes, hemoglobin levels, and hematocrit values. The results showed that the age of native chickens had a significant effect on hematocrit values and hemoglobin levels, while the average number of erythrocytes did not differ markedly. The average number of erythrocytes, hematocrit values, and hemoglobin levels of native chickens at the ages of 4, 8, and 12 are still within the normal range.

Keywords: age, erythrocytes, hematocrit, hemoglobin, free-range chickens

Introduction

The Kampung chicken, a widespread indigenous breed in Indonesia, presents numerous advantages, including easy maintenance, minimal capital requirements, and adaptability to various environments. Descended from partridges and known as free-range chickens (*Gallus Domesticus*), these chickens play crucial roles in rural communities, serving not only as a primary protein source but also as significant contributors to local economies and savings.

Changes in livestock populations over time are evident. Over time, there has been a change in the livestock population. According to data from the Central Bureau of Statistics Ambon City in 2022 Figures shows that the free-range chicken population is 29,243 heads, and BPS Ambon City data in 2023 figures shows an increase in the number of free-range chicken populations, amounting to 41,102 heads. The population of native chickens in a particular area can experience a decrease and increase in the number of populations. This can be caused by the sale of livestock outside the area, slaughter, and death due to accidents, being eaten by predators, and illness. According to (Atmaja, Siswanto, Erwanto, & Hartono, 2023), native chickens have low productivity, are more susceptible to disease, and have fewer erythrocytes than male native chickens.

However, hematological examination in animals aims to assess or provide a general picture of health and the body's ability to fight infection, evaluate the physiological status of animals, and establish a diagnosis (Thrall, Weiser, Allison, & Campbell, 2022). According to (Syamsuryadi et al., 2020), the body's physiological parameters reflect the state of livestock; blood is a component that has a significant role in the physiological processes of poultry, including native chickens. Blood functions to transport several materials from cells and the

environment, transport metabolic substrates such as oxygen, glucose, amino acids, fatty acids, and some lipids, as well as resist disease and transport food juice into the tissues (Sugiharto, Widiastuti, & Wahyuni, 2021). Some factors that affect the picture of blood, according to (Delfita, 2020), include age, sex, work activity, race, nutritional status, lactation, altitude, and environmental temperature.

Research Methods

This study used experimental research methods with the object of research in the form of livestock commodities, namely native chickens in the age groups of 4, 8, and 12 weeks. The source of research data consists of hematological data, which includes erythrocyte count, hemoglobin level, and hematocrit value. The population in this study was native chickens in a predetermined age group, while the samples taken were as many as 4 heads from each age group. The technique of sampling chicken blood is carried out randomly.

At the blood sampling stage, a diluent solution of Ressa and Ecker modification is used to count the number of erythrocytes, with a composition of sodium citrate, formalin, and brilliant cresyl blue coloring agent. The tools used include a Neubauer Hemocytometer, erythrocyte pipettes and aspirators, microscopes, calculating instruments, and needles. In addition, to measure hemoglobin levels, the Sahli method is used with a Sahli hemoglobinometer and a Sahli tube for direct reading.

Data analysis was carried out using a Complete Randomized Design (RAL) with treatment in the form of native chicken age, and each treatment had four repeats. A linear model of RAL was used to evaluate the effect of treatment on hematological profiles. To determine the difference between treatments, a fingerprint analysis and Duncan's distance test were performed. Thus, this research method provides a comprehensive approach to assessing the hematological aspects of native chickens with a structured experimental and statistical approach.

Results and Discussion

In this study, the hematologic profile analyzed was the number of erythrocytes, hematocrit values, and hemoglobin levels. The results of the analysis of erythrocyte count, hematocrit value, and hemoglobin content of hens at the ages of 4, 8, and 12 weeks are shown in Table 1 below.

Table 1. Average erythrocyte count, hematocrit value, and hemoglobin level in female native chickens at the age of 4, 8, and 12 weeks

Umur (minggu)	Jumlah Eritrosit (x10 ⁶ /mm ³)	Nilai Hematokrit (%)	Kadar Hemoglobin (g/100 ml)
4	2,3119 ± 0,08 ^a	32,61 ± 3,45 ^{ab}	7,78 ± 0,69 ^a
8	2,0444 ± 0,62 ^a	30,15 ± 4,81 ^b	8,20 ± 1,09 ^a
12	2,0694 ± 0,52 ^a	35,10 ± 3,18 ^a	8,93 ± 1,14 ^b

Number of Erythrocytes

Erythrocytes, commonly known as red blood cells, contain hemoglobin, which has a role as a means of transporting O₂ from the lungs to cells and then carrying CO₂ from cells to the lungs (Alfian, 2017). The results showed that the average number of erythrocytes in hens aged 4, 8, and 12 weeks was 2.3119 x10⁶/mm³, 2.0444 x10⁶/mm³, and 2.0694 x10⁶/mm³. The

average number of erythrocytes in all treatments is still within the normal range. Normal levels of erythrocyte count in chickens range from $2.0 \times 10^6/\text{mm}^3$ to $3.2 \times 10^6/\text{mm}^3$ (Usman & Muin, 2022). Furthermore, (Oktariani, Handaya, & Purwanto, 2020) reported that the average number of native chicken erythrocytes ranged from $2.3 - 3.5 \times 10^6/\text{mm}^3$.

The results of Duncan's test showed that the treatment of 4, 8, and 12 weeks did not differ markedly from the average number of erythrocytes. Although statistically, the average number of erythrocytes of hens aged 4, 8, and 12 weeks did not show a noticeable difference, the most significant average number of erythrocytes was owned by hens at the age of 4 weeks, followed by native chickens aged 12 and 8 weeks. This is thought to be due to physiological differences in the animal's body, so the total picture of red blood cells differs at different ages. This is in line with the opinion of (Clarke, Hossain, & Cao, 2020) that if there are physiological changes in the animal's body, then the total picture of red blood cells will also change. Furthermore, it was reported (Alfian, 2017) that age causes changes in the number of erythrotic diseases.

Hematocrit Value

The value of hematocrit (*packed cell volume*) is a percentage based on the volume of blood consisting of red blood cells (Alfian, 2017). Hematocrit values in normal animals are related to erythrocyte count and hemoglobin levels (Enos & Moore, 2022). The results showed that the hematocrit values of hens at the ages of 4, 8, and 12 weeks were 32.61%, 30.15%, and 35.10%. Hematocrit values in all treatments are still within the normal range. Normal chicken hematocrit values are 22-35%, with an average of 30%. Furthermore, (Zalizar et al., 2023) reported that the average number of native chicken erythrocytes ranged from $2.3 - 3.5\%$.

The results of Duncan's test showed that the treatment of 4, 8, and 12 weeks of age was significantly different from hematocrit values. This is thought to be due to damage, the number and size of erythrocytes. This is in line with the opinion of (Merdana, Sulabda, Tiasnitha, Gunawan, & Sudira, 2020) that the decrease in hematocrit value is caused by erythrocyte damage, decreased erythrocyte production or influenced by the size and number of erythrocytes. This factor causes the hematocrit value to vary in each individual poultry, considering the size and number of erythrocytes are different for each individual. Furthermore, (Untari, Susanti, Kodiyah, & Himawati, 2023) conveyed that the hematocrit value will increase due to the increase in the number of erythrocyte cells. Erythrocytes constitute the largest mass of cells in the blood. The higher the total value of erythrocytes, the higher the hematocrit value (Kishimoto et al., 2020).

Hemoglobin Levels

Hemoglobin is a blood-filled erythrocyte pigment composed of simple proteins, proteins, and conjugations. The hemoglobin protein is globulin in the form of cells, and the red color is *heme* in the form of iron atoms (Alfian, 2017). The results showed that hemoglobin levels of hens at the age of 4, 8, and 12 weeks were 7.78 g / 100 ml, 8.20 g / 100 ml, and 8.93 g / 100 ml. Hemoglobin levels in all treatments were still in the normal range. According to (Rawung, 2023), normal hemoglobin levels of poultry range from 6.5-9 g / dl. (Gandi, Bulus, Yahaya, Ibrahim, & Makama, 2020), Also reported that normal chicken hemoglobin levels are 7.0-13.0 g/dl.

The results of Duncan's test showed that the treatment of 4, 8, and 12 weeks of age was significantly different from hemoglobin levels. This is thought to be due to differences in

animal physiology, environment, and feed content. This is in line with what was reported by (Imbabi, Ahmed-Farid, Selim, & Sabeq, 2021) and (Irawan, Astuti, Wibawan, Hermana, & dan Makanan, 2020), that differences in haemoglobin levels are caused by physiological differences, namely age and activity, environment, temperature and humidity, and feed composition or content. According to (Aprihatin & Imral, 2021), blood hemoglobin levels are determined by body activity; the higher the body's activity, the higher the hemoglobin level. (Guensch et al., 2021) State that hemoglobin levels, oxygen levels, and erythrocyte counts affect hemoglobin levels; if the erythrocyte count is low, then hemoglobin levels will be low, and if oxygen is high in the blood, the body is aroused, and the production of erythrocytes and hemoglobin increases. Furthermore, (Jarosz, Marek, Grądzki, & Kwiecień, 2021) stated that the components of hemoglobin formation are proteins, especially amino acids, Fe minerals, and glycine.

Conclusion

The outcomes of this research hold significant implications for the practical management and breeding of indigenous chicken populations. The study reveals that the age of native chickens significantly influences their hematocrit values and hemoglobin levels, which are vital indicators of their overall health and physiological condition. Farmers and breeders can leverage this information to optimize the health and productivity of their flocks through tailored management approaches based on the chickens' age. For example, younger chickens might necessitate more frequent monitoring of their hematological profiles to ensure proper development, whereas older ones could benefit from targeted nutritional interventions to maintain optimal hematological parameters. Furthermore, these findings can guide breeding programs aimed at enhancing the overall health and productivity of native chicken breeds by selecting favorable traits related to hematological profiles. In summary, this study offers valuable insights that can be implemented in practical settings to improve the welfare and productivity of native chickens, thereby supporting the sustainability of local poultry industries.

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