The Blood Profile of Indonesian Native Chickens that Reared in Semi-Intensive System

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Abstract. The objective of the study was to evaluate the blood profile of Indonesian native chickens reared in a semi-intensive raised system. A total number of 68 chickens from four strains (Red *Lurik*, *Wareng*, *Ranupane*, and *Putih*) were used as samples. Chickens were challenged for 14 d in a semi-intensive raised system. Blood sampling was obtained from the pectoralis vein of the wing. The ANOVA and Duncant's test were applied for data analysis. The observed variables consist of hemoglobin, erythrocytes, hematocrit, total blood plasma protein, leukocytes, and leukocyte differentiation. The results showed that chicken strains had a very significant difference ($P < 0.01$) in blood protein and hematocrit variables, a significant effect ($P < 0.05$) on hemoglobin levels, and no difference ($P > 0.05$) on the number of erythrocytes, leukocytes, and leukocyte. The highest hemoglobin level was found in the *Ranupane* strain (13.48 g dL^{-1}). The highest blood protein and hematocrit values were found in the *Putih* strain at 7.60 g 100 mL^{-1} and 42.45 %, respectively. In conclusion that chicken strains of *Lurik*, *Wareng*, *Ranupane*, and *Putih* have different blood profiles (hemoglobin, blood protein, hematocrit, erythrocytes, leukocytes, and leukocyte differentiation). Consequently, the native chicken strain was normal even in a reared semi-intensive system.

Keywords: Chicken strains, *Gallus domesticus* (Linnaeus, 1758), *putih* straints, *ranupane* straints, red *lurik* straints, *wareng* straints.

1 Introduction

Native chicken [*Gallus domesticus* (Linnaeus, 1758)] is one of the original Indonesian Germplasm. This chicken is dual function because it can be used for both meat and eggs [1–3]. One of the characteristics of this chicken is that it is easy to adapt to the environment in Indonesia, making it easier to maintain. Free-range chicken strains include *Lurik*, *Wareng*, *Ranupane*, and *Putih* strains. These chicken strains come from different regions.

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Until now, free-range chickens are generally raised in a traditional way (extensive), so their production is not optimal [4].

The chicken-rearing system has been reported to have an effect on performance. Kuzniacka *et al*. [5] reported that chickens reared intensively contained higher levels of fat than chickens reared in a semi-intensive system. The rearing system and type of native chickens also affect the blood profile produced [6]. The blood profile can be used as an indicator of poultry health. Not only helps in terms of disease diagnosis but also as a knowledge base for studying the immune system and pathology of chicken [7]. Protein levels in blood serum can be used to determine feed quality [8] and biochemical characteristics of blood serum can be used to identify the immune status of livestock [9].

There have been many studies on the blood profile of broiler and layer chickens. However, identification of the blood profile of native chickens, especially the *Lurik*, *Wareng*, *Ranupane*, and *Putih* strains reared in a semi-intensive system, has not been reported. This study aims to evaluate the blood profile of native chickens of *Lurik*, *Wareng*, *Ranupane*, and *Putih* strains reared in a semi-intensive system.

2 Material and methods

2.1 Material

The research was conducted in the experimental farm of the Animal Science Department, Faculty of Animal Husbandry Agriculture located at the coordinates 7°55'05.5"S 112°35'41.4"E. The research material was 68 female native chickens consisting of 17 native chickens of the *Lurik* strain, 17 of the *Wareng* strain, 17 of the *Ranupane* strain and 17 of the *Putih* strain, commercial feed, vacuum tubes, centrifuges, syringes, laptops, EDTA tubes, microscopes, glass preparation, micropipette, tube, spectrophotometer, capillary tube, caliper, candle, and counting chamber. The study was carried out along with the Explanation of Ethical Approval No.5.a./048.a/KEPK-UMM/III/2022 issued by the Faculty of Medicine, University of Muhammadiyah Malang.

2.2 Methods

2.2.1 Research design

The design used in this study was a Completely Randomized Design (CRD), with four treatments and 17 replications and each replication consisted of one chicken. The treatment in this study was the difference in native chicken strains consisting of *Lurik, Wareng, Ranupane* and *Putih* strains (Figure 1).

Fig 1. a) *Lurik*, b) *Wareng*, c) *Ranupane*, and d) *Putih*.

2.2.2 Rearing management

Rearing was carried out for 14 d with a semi-intensive cages system. Feed was given as much as 120 g d^{-1} which was divided into two times, namely morning 40 % and afternoon 60 % of feed. Morning feeding was carried out at (07.00 to 08.00) West Indonesian Time (WIB/ *Waktu Indonesia Barat*) and in the afternoon, it was given at (15.00 to 16.00) WIB. Drinking water was provided ad-libitum. Vitamins were given every 3 d. During the rearing process no vaccinations were carried out. Cleaning of farm was carried out every day at (07.00 to 08.00) WIB. During the day a fan was provided to regulate air circulation.

2.2.3 Sampling for blood profile

The variables observed in this study were blood profiles consisting of levels of hemoglobin, blood protein, hematocrit, erythrocytes, leukocytes, and leukocyte differentiation. On the 14 d of the rearing period, blood was collected from each native chicken. Blood was drawn from the pectoralis vein under the wing. Blood samples were collected with a syringe of 3 mL and then placed in a heparin vacuum tube. Hemoglobin levels were measured using the Sahli method. The hemoglobin value was determined by looking at the g % scale of the liquid level in the Sahli tube. Hemoglobin values are expressed in units (g dL^{-1}). Hematocrit values are calculated using a microhematocrit reader. The number of erythrocytes and leukocytes, counted with Hemocytometer Neubauer. Leukocyte differentiation was determined using Giemsa staining.

2.3 Statistical analysis

The resulting data were then analyzed by analysis of variance using a Completely Randomized Design (CRD) and further testing using Duncan with a significance level of 1 % and 5 %. Analysis was performed using SPSS software version 21.0 [10].

3 Result and discussion

The results of evaluating the blood profile of native chicken that rearing using semi-intensive system are shown in Table 1.

Table 1. Average blood profile of native chickens reared in a semi-intensive system.

Chicken strains	Hemoglobin (g dL^{-1})	Blood plasma protein (g 100 mL^{-1})	Hematocrit (%)	Erythrocyte (10^6 mm^{-3})	Leukocyte (x 10^3)	Leukocyte differentiation
Lurik	10.56b	3.18c	35.26b	2.92ab	16.06ab	44.83
Wareng	10.39b	3.34c	33.29b	2.94ab	15.47b	44.83
Ranupane	13.48a	4.77b	34.35b	2.75b	15.86ab	44.83
Putih	11.56ab	7.60a	42.45a	3.17a	17.16a	45.01
Se	0.742	0.362	0.870	0.108	0.455	0.991
P value	0.017	0.000	0.000	0.067	0.065	0.48

Native chicken strains reared semi-intensively in this study had a significant ($P < 0.05$) effect on hemoglobin levels, a very significant ($P < 0.01$) effect on plasma protein and hematocrit levels. Furthermore, the different strains of native chicken reared semi-intensively in this study had a difference value of P 0.067 ($P = 0.067$) for the number of erythrocytes and P 0.065 ($P = 0.065$) for the number of leukocytes. The different native chicken strains in this study were not significantly different ($P > 0.05$) in leukocyte

differentiation (Table 1). The highest hemoglobin level was found in the native chicken *Ranupane* strain which was not significantly different ($P > 0.05$) from the *Putih* strain of native chicken. Furthermore, the hemoglobin levels of *Putih* strain native chickens were not significantly different ($P > 0.05$) to *Lurik* and *Wareng* strains of native chickens. The highest blood plasma protein values were found in *Putih* strain, followed by the *Ranupane* and *Wareng* strains which were not significantly different ($P > 0.05$) from the *Lurik* strain. The highest hematocrit value was found in *Putih* strain. The highest number of erythrocytes was found in the *Putih* native chicken which was not significantly different ($P > 0.05$) from the *Wareng* and *Lurik* chickens. The highest number of leukocytes was found in the Putih strain of native chicken which was not significantly different *(*$P > 0.05$) from the *Ranupane* and *Lurik* strains of native chicken (Table 1).

The average blood profile of native chickens that reared semi-intensively in this study was generally normal (Table 1). Wakenell explained that chicken hemoglobin levels ranged from (7 to 13) g dL^{-1}, erythrocytes ranged from (2.5 to 3.5) × 10^6 mm^{-3}, hematocrit ranged from 22 % to 35 %, and leukocytes ranged from (12 to 30) × 10^3 mm^{-3} [11]. Furthermore, Abun et al. [12] reported that hemaglobin levels of native chicken were 9.46 g dL^{-1}, erythrocytes 2.36 × 10^6 mm^{-3}, leukocytes 36.09 × 10^3 mm^{-3} and hematocrit 32.60 %. Sugiharto et al. [13] also explained that native crossbreed chickens had a hemoglobin level of 10 g dL^{-1}, erythrocyte 2.05 × 10^6 mm^{-3}, leukocytes 28 × 10^3 mm^{-3}, and hematocrit 28.7 %. The same thing was also reported by Ulupi and Ihwantoro [14] that native chickens in Indonesia had hemoglobin levels of 8.96 g dL^{-1}, erythrocytes 2.65 × 10^6 mm^{-3}, and hematocrit 29.86 %.

The native chickens with Red *Lurik, Wareng, Ranupane* and *Putih* strains in this study had different blood profiles. This is because the strains of each native chicken are different, that resulting in a different blood profile. This is as reported by Borzouie *et al*. [15], Ulupi and Ihwantoro [14] that the blood profile of chickens is affected by the strain. Apart from affecting the blood profile, chicken strains also affect production performance [15, 16]. Although the blood profile of chickens is also affected by the rearing system, in this study all strains of chickens were reared semi-intensively, so it did not affect the differences in blood profile factors in this study [6].

Blood profile is a health parameter in livestock, including poultry. Poultry health status is measured against existing standards. A blood profile that is too high or low from the standard indicates a problem with the health of the poultry. The blood profile includes hemoglobin levels, blood plasma protein, hematocrit, erythrocytes and leukocytes. Low hemaglobin in poultry is called anemia. Anemia is an indicator that the poultry is attacked by Chicken Anemia Virus (CAV) and this is one of the deadliest diseases in poultry [17, 18]. Low hemoglobin can also be caused by heat stress in poultry [19] and in this study, rearing semi-intensive free-range chickens did not result in a decrease in hemoglobin compared to existing standards. This means that native chickens reared semi-intensively do not experience stress, even though native chickens live extensively in their habitat. Leukocytes are the immune system in the body of poultry, an increase in leukocytes beyond normal limits is an indication that poultry is experiencing a pathogen infection or disturbance of the immune system [20]. The rearing of native chickens using a semi-intensive system in this study showed normal leukocyte levels. This indicates that the chicken is not experiencing interference with the immune system. This was as reported by Kuzniacka *et al.* [5] that rearing chickens in a semi-intensive system can improve the health of chickens compared to an extensive rearing system.

4 Conclusion

Based on this study, it can be concluded that the blood profile of native chickens is affected by the strain. But the difference in blood profile is still in the normal category. So, if these local chickens are reared semi-intensively, they still have the potential to produce normally.

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