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Physiological Conditions of Broiler Chickens During Transportation with Vitamin Treatment and Distance Difference

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ABSTRACT: The physiological condition of broiler chickens during the transportation process has changed, presumably due to changes in environmental conditions. Changes in the environment, such as transport distance, density in the basket, vehicle speed and vibration, and heat stress during the transportation process, are thought to cause stress in chickens, disrupting the body's homeostatic and metabolic processes. The condition of stressed chickens harms the physiology of livestock, especially the biochemical components. It can result in decreased body weight, increased heart rate, respiration, and increased temperature, to the chickens' hematological status, which can be detrimental to breeders' income. Giving commercial vitamins containing vitamins A, D, E, K, B, and C, minerals, and amino acids is an alternative solution that can minimize stress levels in broiler chickens. This study aims to analyze the physiological condition of broiler chickens given vitamins and without vitamins with different mileage during transportation. The research method used was an experimental method using a randomized block design. This study used a sample of 48 broiler chickens with a weight range of 1.4 to 1.9 kg, treated with vitamins and without vitamins at a distance of 0 km (control), 30, 60, and 90 km. The parameters measured were heart rate, respiratory frequency, temperature, and body weight. Hematological tests measured were erythrocytes, hematocrit, hemoglobin, platelets, and leukocytes. The data were analyzed statistically. This research concludes that giving vitamins can stabilize the physiological condition of broiler chickens while being transported at a certain distance of 0 km (control), 30, 60, and 90 km. The treatment of giving vitamins at a distance of 90 km was no different from the control treatment. Evidenced by measurements of body weight with a value of 1.47 kg, heart rate of 262 times per minute, a stable respiratory rate at a value of 31 times per minute, and rectal temperature of 41 °C and hematological conditions of chicken blood such as erythrocytes of 2.60 c 10^6 μL, hematology 13.5 g/dL, hematocrit 33%, platelets 145 × 10^3 μL, and leukocytes 9 × 10^3 μL, are all in the normal range of broiler physiological conditions. Furthermore, it proves that giving vitamins can maintain the condition of the chicken's body from environmental temperature changes, transportation distance, transportation speed, and the density of transport baskets during transportation.

Keywords: Physiological response; Transportation; Broiler chickens; Vitamins; Hematology

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INTRODUCTION

Broiler chickens have the advantage of fast meat production and are the most economical livestock because they can consume them relatively short maintenance of around 4 - 5 weeks. Distribution activities are carried out by chicken farmers through the transportation process using trucks and the like. During transportation, the chickens experience changes in physiological conditions due to changes in the environment. Environmental changes such as transportation distances are thought to cause stress in chickens, disrupting homeostatic processes and body metabolism (Tamzil, 2014). Stress impact the physiology of livestock, especially the biochemical components and can cause a decrease in body weight to the death of livestock. In addition, after transportation, the physiological state of livestock affects by changes in physiological components such as blood and hormones that affect the structure of the meat produced (Gregory, 2010). Setiawan et al. (2019) reported that transport distance, density in the transport basket, speed, and vibration during transportation could cause stress in chickens during the transportation process due to an imbalance between body temperature and ambient temperature.

The location of broiler chicken farms in the Cirebon area is far from the chicken slaughterhouse, so transportation is needed to bring the broiler chickens to the slaughterhouse. The transport process can cause stress in broilers due to environmental changes. The transportation process takes a long time, and the possibility of shocks due to poor road conditions results in stress for livestock. It can affect changes in the physiological conditions of livestock (Suryadi et al., 2011). Cattle stressed during transportation will lack many things, one of which is reducing body weight. Loss of body weight is caused by loss of fluids and nutrients. Efforts should be made to minimize body weight loss during transport as high body weight loss harms farmer income. In addition, during the transportation process, it is suspected that there will be an increase in heart rate, respiration, and body temperature to the hematology of livestock.

The supplements given to broiler chickens are neobro vitamins containing A, D, E, K, B, and C, minerals, and amino acids as an alternative solution that can minimize stress levels in broiler chickens. Previous studies have researched the impact of transportation, which causes stress on chickens. However, research on giving vitamins during the transportation process for broiler chickens has not been carried out. Based on the importance of solutions to overcome stress levels in chickens, this research is very important to be carried out as information and recommendations for broiler breeders. This study aims to analyze the physiological condition of broiler chickens given vitamins and without vitamins at different distances during transportation.

MATERIALS AND METHODS

This research was carried out from July to September 2020, at a broiler farm located at Kapetakan Village, Cirebon City. Laboratory testing was carried out at the Animal Hospital Laboratory, Faculty of Veterinary Medicine, IPB Bogor.

The research method used was an experimental method using a randomized block design (RBD) with the treatment of giving vitamins and without vitamins which were transported over a distance of 30 km, 60 km, 90 km, and 0 km (control). The tools and materials in this study were pick-up cars for chicken transportation, boxes for broiler chickens measuring 0.94 m × 0.58 m × 0.27 m (containing six birds weighing 1.2 kg – 1.9 kg), 5 kg manual needle sitting scales, digital thermometer, stethoscope, and stopwatch. The chickens were 48 ready-to-harvest broilers weighing 1.4–1.9 kg and commercial vitamins. Tools and materials for blood sampling are a 1 ml blood sample, 1 ml syringe, and vacuum tube with EDTA

anticoagulant. Laboratory tools used for blood sample analysis include a microscope, Sahli tube and pipette, hemocytometer numbers, erythrocyte diluent pipette, microcapillary, microcapillary centrifuge, microcapillary reader, and number counting chamber BC-2800 VET MINDRAY.

The stages of primary data collection were carried out in the following way: preparation, transportation, measurement of body weight, body temperature, respiratory frequency, heart rate, and blood sampling of chickens. The data were analyzed using analysis of variance (ANOVA), with the F test used at the 5% level to determine the effect of the treatment of giving vitamins and without vitamins at a certain distance. If there is a significant treatment effect, it was continued with the least significant difference test.

Preparation

Before being transported into the car, broiler chickens fasted for 8 hours. This is done so that there is no leftover feed in the cache, which causes partial data (Terlouw et al., 2008). Broiler chicken samples were fasted starting at 17.00 WIB. During fasting, 24 chickens were given a drink with vitamins and 24 without vitamins. Chickens were divided into six boxes (3 boxes filled with 24 chickens without vitamins) and (3 boxes filled with 24 chickens with vitamins). Then body weight, body temperature, respiratory rate, and heart rate were measured at 30 km, 60 km, 90 km, and 0 km (control). The measurement results are recorded, then processed and analyzed.

Freight

The process of transporting broiler chickens begins at 01.00 WIB with a vehicle speed of around 48 km/hour. The transportation of chickens was carried out at a certain distance of 30 km, 60 km, 90 km, and 0 km as control, and measurements of body weight, body temperature, respiratory rate, heart rate, and blood sampling were carried out.

Measurement

Measurement of broiler chicken samples at a distance of 30 km, 60 km, 90 km, and 0 km as control. Parameters measured were body weight, body temperature, respiratory rate, heart rate, and blood sampling of chickens.

Heart rate measurement (minutes)

Heart rate measurement using a stethoscope placed on the left chest (Suprayogi et al., 2017). Measurements were carried out for 1 minute at a distance of 0 km (control), 30 km, 60 km, and 90 km. Then the measurement results are recorded.

Respiration Frequency Measurement (minutes)

Respiration frequency measurement by placing a plastic mask with holes perforated at the end (Suprayogi et al., 2017). Measurements are carried out for 1 minute at a distance of 0 km (control), 30 km, 60 km, and 90 km. Then the measurement results are recorded.

Temperature measurement (^oC)

Rectal temperature measurement using a thermometer inserted into the rectum (Suprayogi et al., 2017). Measurements were made for 1 minute at a distance of 0 km (control), 30 km, 60 km, and 90 km. Then the measurement results are recorded.

Measurement of body weight (kg)

They weighed broiler chickens by weighing chicken samples using scales at all treatment distances of 0 km (control), 30 km, 60 km, and 90 km. The measurement results are recorded.

Blood sampling

Blood samples were taken at 30 km, 60 km, 90 km, and 0 km (control). A blood sample of 1 ml was taken from the brachial vein using a one cc syringe. Blood samples were put into a tube with EDTA anticoagulant and homogenized. The tube filled with blood is put into the cooling box containing crushed ice cubes. A hematology measurement was conducted at the Laboratory of Veterinary Hospital FKH IPB Bogor.

The types of parameters measured were the average measurement of erythrocytes (MCV), the variation of erythrocytes (RDW), the average measurement of hematocrit, the average measurement of hemoglobin (MCH), the average measurement of leukocytes, and

measurement of the average platelets (MPV) using the BC-2800 VET MINDRAY tool.

The blood measurement method using the BC-2800 VET MINDRAY

1. Preparation before turning on the tool: preparing reagents, preparing all hoses, and checking the drain bottle. When it is full, it is emptied again.
2. Turn on the testing tool and wait 7-10 minutes for the initialization process.
3. Then, check the blood samples one by one.
4. Then, fill in the sample data.
5. The sample is shaken in a tube with anticoagulant homogeneously.
6. Insert the sample into the probe until it touches the bottom of the tube. Then press the sample probe button to process the sample, and the test results appear on the screen.
7. Then, the tool is turned off by pressing the Shutdown button.

Table 1. Table of Distance Treatment and Administration of Vitamins

Treatment	Distance (km)			
	0 (Control)	30	60	90
Without vitamins	6	6	6	6
Vitamins (0.5 grams per 1L of drinking water)	6	6	6	6

The data is presented in diagrams and analyzed using a random sub-sampling group design. With a mathematical model as follows.

$Yij = \mu + Ki + Pj + \varepsilon ij$

Yij : response to treatment i in repetition j

μ : the midpoint of the response

Ki : Effect of the i-th group

τi : the effect of the ith treatment that we will test (is the difference between the mean ith treatment and the general mean: μi –μ)

εij : random effect (randomly arising deviation) from the i-th treatment of the j-th repetition. This value is the difference between the observed results and the median value of the treatment (εij = Yij - μi).

Table 2. Two-way table between groups

Group (i)	Treatment (j)				Total (yi…)
	1	2	3	4	
1	y11	y12	y13	y14	y1..
2	y21	y22	y23	y24	y2..
Total (y.j)	y.1.	y.1.	y.1.	y.1.	Y…

Table 3. Table of variance list

List of variance	Degree of Freedom (df)	Sum of Squares	Mean Squares (MS)	F	F_{table}	
					0.05	0.01
Group	(k-1)	JK K	JK K/(k-1)=K	K/GS		
Treatment	(p-1)	JK P	JKP/(p-1)=P	P/GS		
Error (S)	(p-1) (u-1)	JK GS	JKG/(p-1) (u-1)=GS	GS/G		
Error	kp(u-1)	JK G	JKG/kp(u-1)=G			
Total	(kpu-1)	JK T				

If the $F_{count} > F_{table}$, then H0 is rejected, and H1 is accepted, it can be concluded that not all treatment mean values are the same, and to find out the effect of the treatment, a further test was carried out using the least significant difference test.

RESULT AND DISCUSSION

Heart rate

Increased heart rate is one of the livestock's efforts to maintain body temperature balance. The increase is a response from the livestock body. Based on the study results with the treatment of giving vitamins and without giving vitamins at a certain distance, shown in Figure 1, the heart rate without giving vitamins has increased at a certain distance compared to giving vitamins. The average heart rate without vitamins during transportation was 250.67 to 270.67 times per minute. At the same time, the average with vitamin administration during transportation tends to be stable and decreases at a distance of 90 km. The average heart rate measurement by administering vitamins was obtained at 261.77 to 262.00 times per minute.

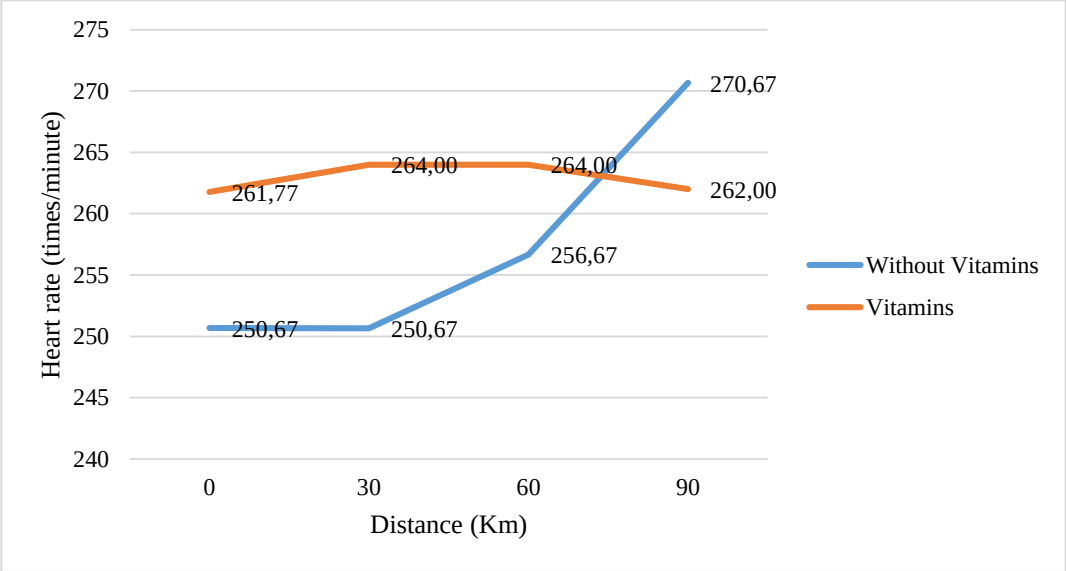

Figure 1. The average broiler heart rate at distances of 0 (control), 30, 60, and 90 km

Heart rate in the treatment without giving vitamins increased during transportation at a distance of 30 km, 60 km, and 90 km, and this is suspected that the livestock experienced stress due to changes in ambient temperature, the presence of vehicle noise, vehicle speed, and unstable road conditions. Heart rate given vitamins heart rate tends to be more stable, based on the results of research analysts that the increase in heart rate at a certain distance is not significant (p> 0.05). This research follows the statement (Bomy et al., 1986) stating that the heart of broiler chickens beats as much as 250.33 to 274.64 times per minute.

Treatment without giving vitamins at a distance of 90 km gave higher results than transportation at a distance of 60 km. It was due to heat stress which caused stress in the chickens. Broiler heart rate with vitamins at a distance of 90 km gives lower results than transportation with a distance of 60 km; this is presumably due to the effect of the vitamins contained in neobro can help reduce the effects of stress on broiler chickens

Respiration Frequency

Based on the research results presented in Figure 2, distance and treatment without vitamins and vitamins on respiration frequency showed no effect during transportation (P> 0.05). However, the measurement results showed an increase in transportation distance. The average respiration rate of broiler chickens without vitamins increased from 25.33 to 32.67 times per minute.

It is suspected that the increase in the respiratory frequency of chickens is triggered by the mechanism of regulating the temperature of the chicken's body to adapt to high temperatures. The respiration rate of broiler chickens with vitamins was more

stable than without vitamins, with an average respiration rate during transportation of 31.33 times per minute. Treatment without giving vitamins broiler chicken respiratory frequency experienced a change allegedly due to the length of transportation and temperature, which changed to be higher than the initial conditions (control treatment). However, these conditions were still within the normal range.

The results of the average respiratory frequency by administering vitamins show frequency values that are in the normal range and tend to be stable. According to (Abioja et al., 2012), the respiratory frequency of chickens generally ranges from 20-30 times per minute. Giving these vitamins can maintain the stability of the frequency of respiration during transportation. The increased respiration frequency indicates a higher pressure of climatic parameters due to the long transportation distance. Temperature and humidity are the stressors that have the greatest impact on increasing the respiratory rate. Increasing the respiratory rate is one way to dissipate body heat by gasping (panting) to maintain body temperature. Panting is a breath of fresh air, removing heat by evaporating moisture from the respiratory tract. According to Yuwanta (2004), at high ambient temperatures, rapid heat dissipation occurs due to the evaporation of water through the air ducts with a panting mechanism.

Longer transport distances lead to periods of heat stress and excessive body heat. According to (Dewanti et al., 2014), high environmental temperatures that the body cannot adapt to will cause panting by inhaling fresh air from the environment and expelling hot body air through the respiratory tract.

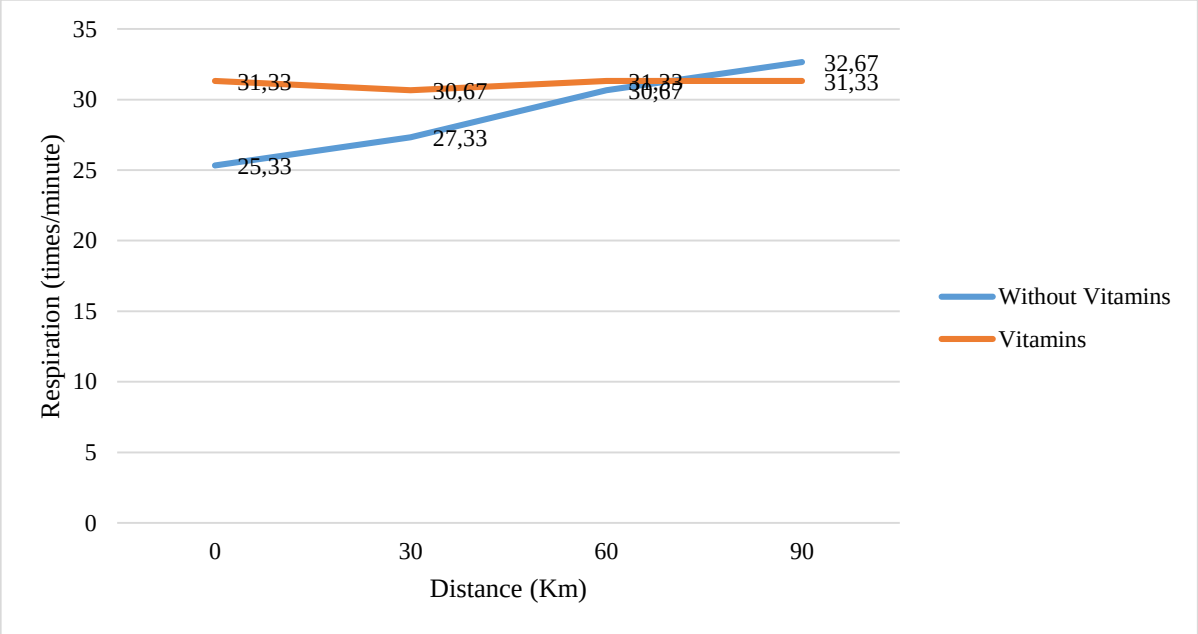

Figure 2. The average of broiler respiration at distances of 0 (control), 30, 60, and, 90km.

Changes in respiratory frequency are one of the body's responses to broiler chickens to expel body heat. In the opinion of Wijayanti (2011) states that the environmental temperature in the tropics during the day is quite high, reaching 34ºC and resulting in a buildup of heat in the body so that livestock experience heat stress. Broiler chickens are homeothermic animals with a constant temperature of 24ºC, which will try to maintain a relatively constant body temperature by increasing the frequency of respiration. In the results of this study giving vitamins and without being given vitamins were still within normal limits during transportation.

Temperature

Rectal temperature shows an accurate body temperature of chickens, so it is used to measure body temperature (Zurriyati & Dahono, 2013). Based on the results of research data on chickens without vitamins and vitamins, the measurement analysis on the treatment of chickens without vitamins and vitamins on the body temperature of chickens showed no significant difference (P>0.05) during the transportation process. The results of the average temperature value are still within the normal range during the transportation distance. Whereas chickens without vitamins showed an increase in the average temperature at a certain distance, namely at a temperature of 40.63^{o}C to 41.18^{o}C, this is suspected to be broiler chickens experiencing heat stress so that the impact on broiler comfort during transportation takes place. Efforts to maintain the chicken's body temperature from heat stress by taking fresh air from outside so that the body temperature can be maintained and within the normal range. The results of the average temperature with giving vitamins are also not much different from without giving vitamins which shows that the frequency value is still in the normal range, where the normal body temperature in poultry ranges from 40.5^{o}C to 41.5^{o}C (Etches et al., 2008).

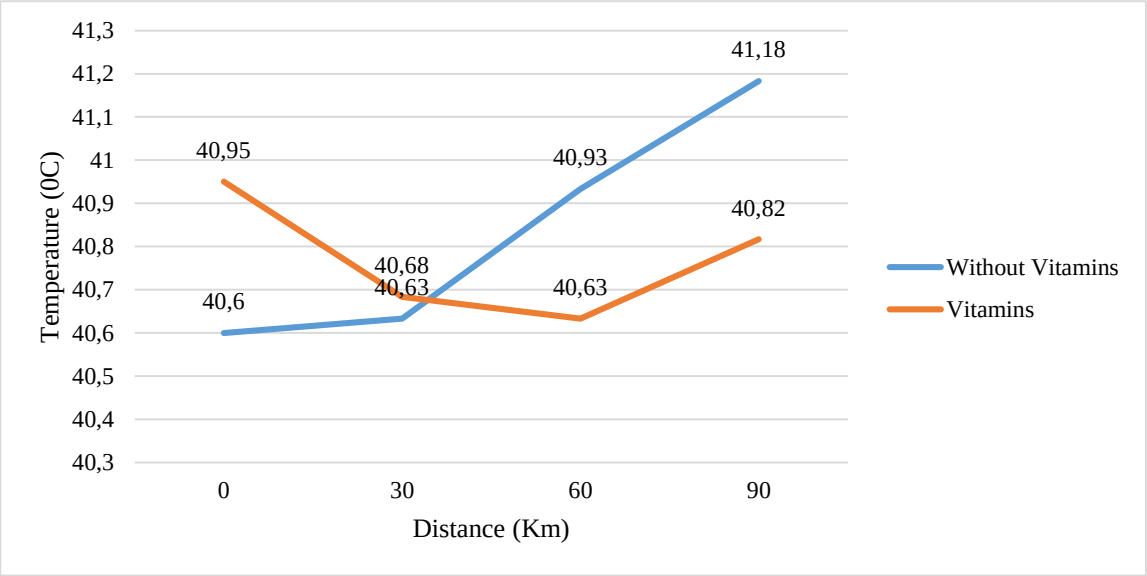

Figure 3. The average broiler body temperature at distances of 0 (control), 30, 60, and 90km

Body temperature given vitamins tends to be lower and stable; this happens because giving vitamins can reduce the increase in body temperature in chickens. When the need for oxygen increases and the respiratory rate increases, breathing causes water to be lost from the body. It is due to their physiological nature broiler chickens have the ability to homeostasis to maintain a stable body temperature even though the ambient temperature changes, so it is necessary to pay attention to air circulation during transportation. According to (Mitchell & Kettlewell, 1998), stress can affect stress levels in broiler chickens which result in an increase in body temperature, including microenvironmental conditions during transportation, vehicle acceleration, vibration, noise, and satisfaction during transportation activities. Rectal temperature measurement can be used as an indicator of physiological response in broiler chickens. The analysis of variance showed that the average rectal temperature during transportation at a certain distance did not affect the physiological condition of the broilers (P>0.05).

Body weight

An important aspect that needs to be considered during the transportation of broiler chickens is the loss of body weight because differences in body weight can

affect the loss of income for farmers. Based on the research results on chickens without vitamins and chickens given vitamins, there is a difference in body weight loss. The results of body weight measurements can be seen in Figure 4.

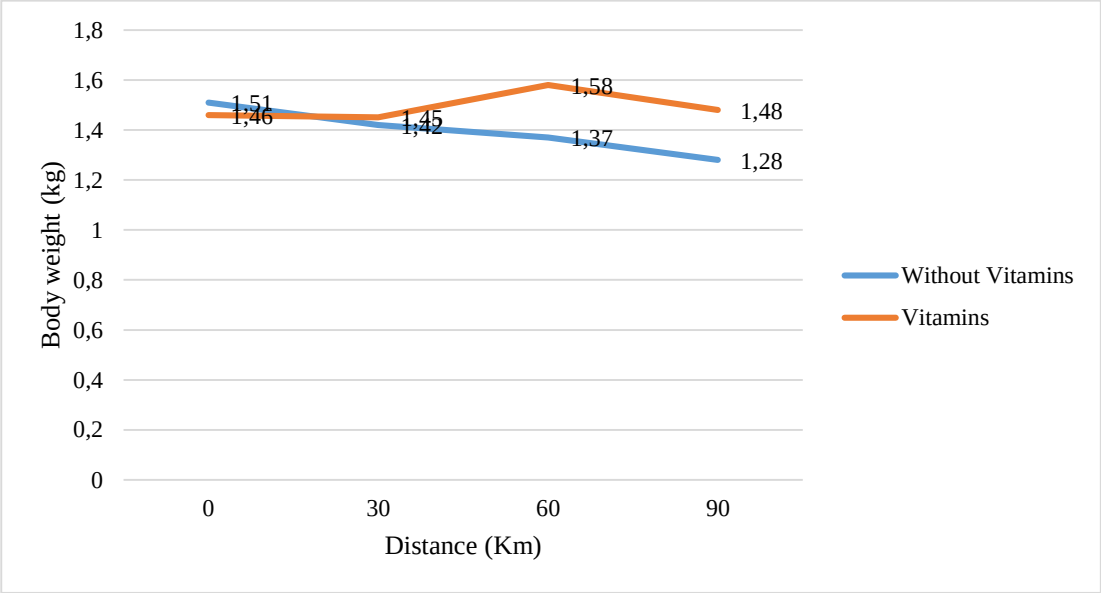

Figure 4. The average broiler body weight at distances of 0 (control), 30, 60, and 90km

Based on Figure 4, the effect of treatment with vitamins and no vitamins on chicken weight showed differences during transportation at a certain distance. Based on the results of research on chickens without being given vitamins, the body weight loss at a distance of 0 km with a weight of 1.51 kg decreased to 1.28 kg at a distance of 90 km. Heat, the length of the transportation process, vehicle speed, and unstable road conditions can also cause loss of body fluids and nutrients.

The decrease in body weight will negatively impact farmers' income, so efforts are needed to minimize body weight loss during transportation by administering vitamins. At the same time, the results of measurements on chickens given vitamins looked stable and did not show a high decrease in body weight. The analysis of variance showed that the administration of vitamins and without vitamins showed a very significant difference ($P<0.01$) in body weight during the transportation process at certain distances. At a certain distance treatment, the body weight did not show a difference ($P> 0.05$) because, at a distance of 30 km, 60 km, and 90 km, it was suspected that the livestock could still adapt to these environmental conditions. The treatment of giving vitamins tended to be stable from the control treatment from 0 km 1.46 kg to 1.48 kg at a distance of 90 km. Giving vitamins were used to prevent changes in physiological conditions in broiler chickens so that the chickens could maintain their body condition and reduce body weight loss during transportation. This is in line with the results of Nurkholis et al. (2018) stated that vitamin C could affect body weight loss. It is suspected that vitamin C can increase heat resistance to minimize heat stress in chickens.

Erythrocyte

Based on a statistical analysis of distances of 30km, 60km, and 90km with the treatment of chicken without being given vitamins and with vitamins, the results showed no difference ($P>0.05$) during transportation. Although the measurements of erythrocytes without being given vitamins decreased while the chickens were transported, the chickens' erythrocyte values were still in normal conditions, namely 2.4–2.8 × 10^6 µl. This is according to the opinion of Samour 2015, the normal range of

erythrocytes is around 2.5–3.9 × 10^6 µl. The mean value of the measurement results without being given vitamins was 2,41–2,75 × 10^6 µl. The average results of measuring erythrocytes with vitamin administration were 2.56–2,71 x 10^6 µl, which can be seen in Figure 5.

The two treatments showed no difference to a certain distance. It is suspected that vitamins can synthesize erythrocytes so that the chickens can maintain their bodies. According to Hoffbrand and Petit (1996), factors that influence the synthesis of erythrocytes include nutrients in the form of amino acids, vitamins, iron, and the hormone erythropoietin. The treatment of giving and without being given vitamins was not different because it was suspected that the condition chickens still stored energy reserves during transportation. Therefore red blood cells could be synthesized. Erythrocytes function as a medium for transporting oxygen (O2) from the lungs to body tissues and carbon dioxide (CO2) from body tissues to the lungs via hemoglobin (Ministry of Health of the Republic of Indonesia 2011).

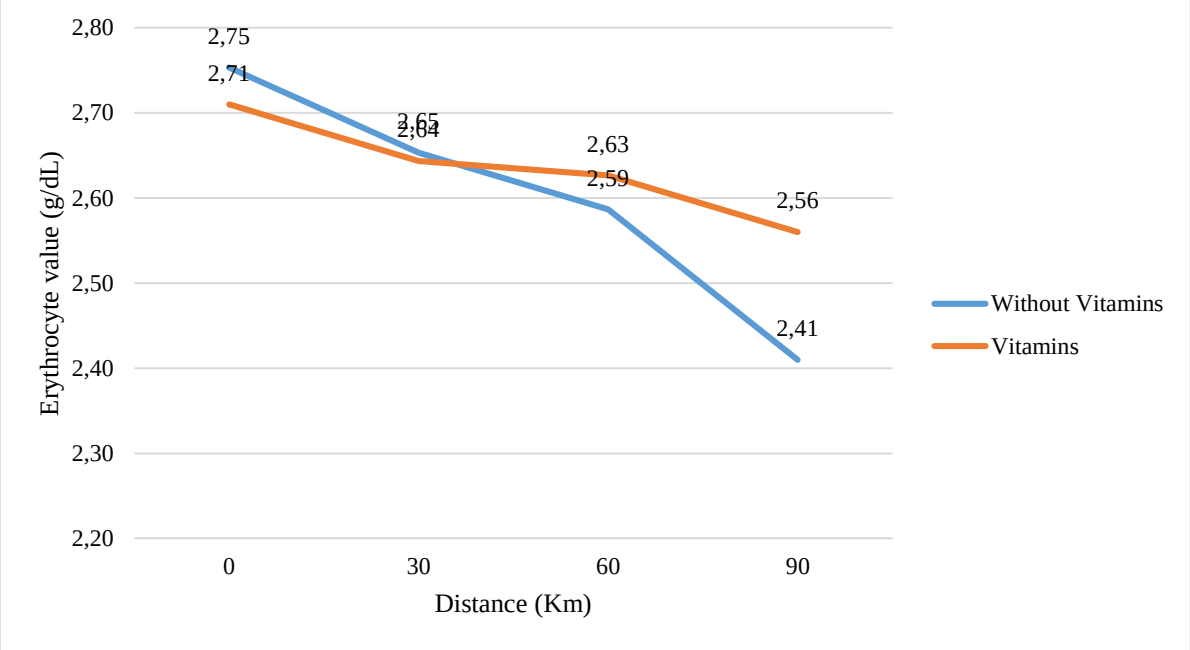

Figure 5. The average of broiler erythrocyte at distance 0 (control), 30, 60, and 90km.

Hemoglobin

Hemoglobin in the blood is a binder of oxygen and is generally directly proportional to the number of red blood cells (erythrocytes). The range of normal hemoglobin levels in chickens, according to (Samour, 2015), ranges from 10.2 – 15.1 g/dL. The results of the analysis of variance in hemoglobin values did not show any differences during the transport process with or without vitamins.

The average hemoglobin level in treating chickens without being given vitamins decreased at a certain distance. That is, it decreased from 13.13 g/dL – 11.74 g/dL. This is presumably because the length of the transportation distance and the lack of nutritional intake can trigger the stress condition of the chickens.

At the same time, the results of the average hemoglobin level in chickens that were given vitamins tended to show an increase during the transportation process ranging from 13.43 – 13.57 g/dL. The results of measuring the hemoglobin value can be seen in Figure 6. Giving vitamins can improve the physiological condition of broiler chickens so that they can provide resistance to hemoglobin levels during the transportation process.

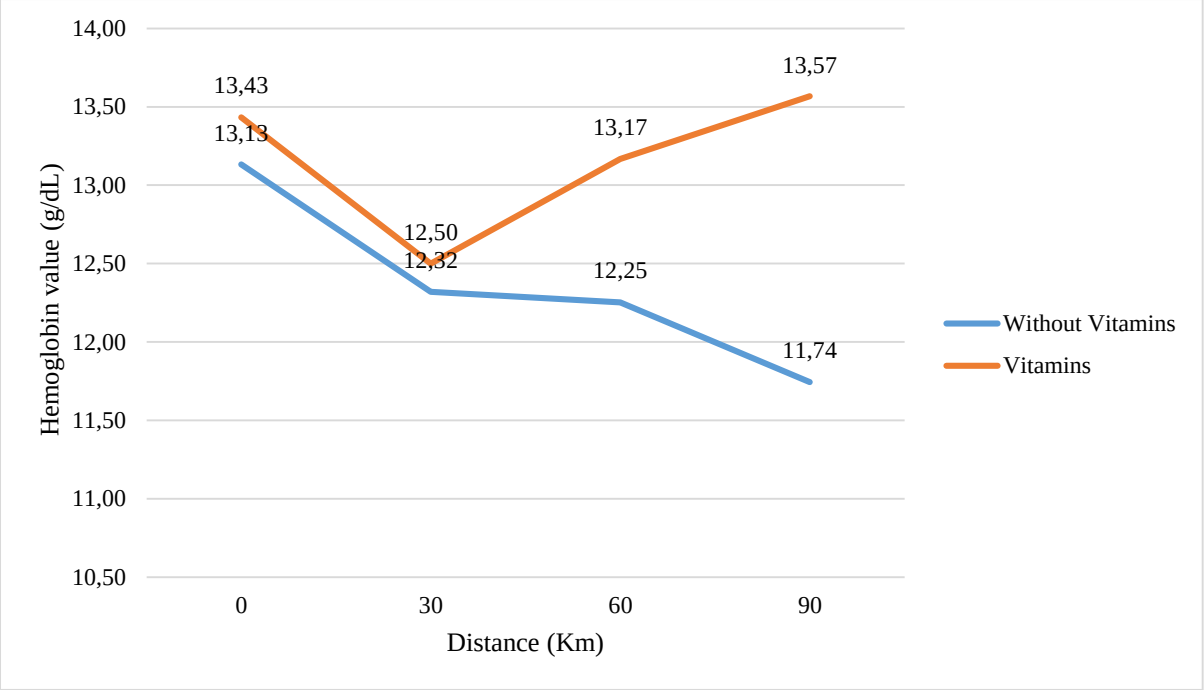

Figure 6. The average of broiler hemoglobin at distances of 0 (control), 30, 60, and 90 km.

Hematocrit

In the normal range of hematocrit values in the blood, the largest cell mass in chickens is 24% – 43% (Virden & Kidd, 2009); Samour, 2015). The variance analysis results showed no difference (P>0.05) between chickens treated with vitamins and not given vitamins during the transport process. The average result of measuring the hematocrit value in chickens given vitamins was within the normal range of 32.30% – 33.57%, as seen in Figure 7. The hematocrit value is the continuity of the transport of oxygen and nutrients in the blood (Etim et al., 2014)

During transportation, the hematocrit value in chickens without being given vitamins decreased at a distance of 0, 30, 60, and 90 km of treatment, namely in the range (of 36,47% –31,27%), but this value was still within the normal range. Hematocrit values that show a decrease can be suspected due to reduced oxygen-carrying capacity in the blood. The condition of poor air circulation in the transport basket is also thought to have caused a decrease in the hematocrit value in this study. It is also suspected that broiler chickens experience a period of fatigue due to changes in environmental temperature and heat stress, so the chickens become stressed during transportation. According to Parwati et al. (2017) opinion, the hematocrit value will decrease due to exposure to heat, so the chickens are under stress during transportation. Changes in environmental conditions respond physiologically to broiler chickens resulting in a decrease in the hematocrit value.

According to Ulupi and Ihwantoro (2014), the hematocrit value positively correlates with the erythrocytes' size. However, this hematocrit value negatively correlates with the concentration of fluids in the chicken's body. Chickens in conditions of lack of blood fluids will cause an increase in hematocrit values. Conversely, if the chicken is in a state of excess fluid, it can cause a decrease in the hematocrit value. This decrease indicates that broiler chickens are experiencing fatigue due to heat stress. Heat stress due to increased environmental temperature will trigger oxidative stress by forming free radicals or reactive oxygen compounds.

The increase in the production of free radicals (Reactive Oxygen Species: ROS), which gets higher with increasing ambient temperature, causes a decrease in the quality of red blood cells (erythrocytes). Damaged

erythrocyte conditions can cause a decrease in hematocrit values. In the results of this study, chickens without being given vitamins experienced a decrease in hematocrit values but still within the normal range, different from physiological conditions in chickens given vitamins which experienced an increase in hematocrit values. It was because it was suspected that the effect of giving vitamins was maintaining their body temperature from changes in environmental temperature and heat stress.

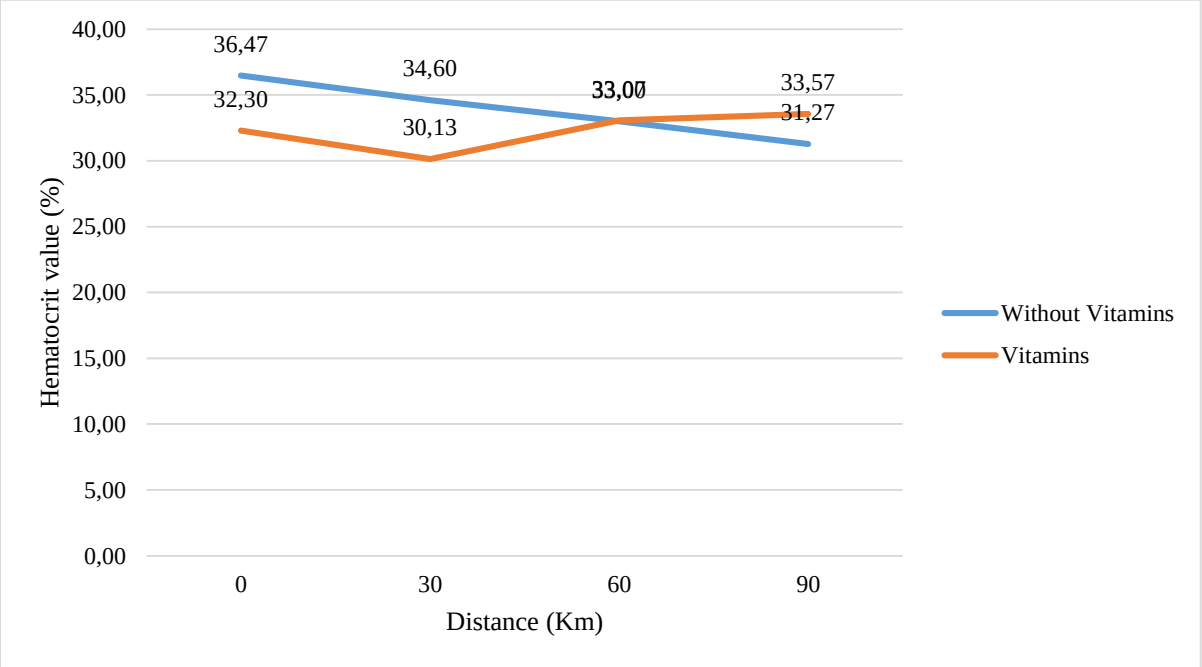

Figure 7. The average of broiler hematocrit at distances of 0 (control), 30, 60, and 90 km

Platelets

Platelets are part of the red blood cells, which have a function to help the blood clotting process. Normal homeostatic conditions to a vascular injury can affect platelet counts. Without platelets, small blood vessels can bleed spontaneously. The measurements of platelet values in chickens without being given vitamins under normal conditions showed a decrease from 83,33 $\times 10^3$ µl to 73,33 $\times 10^3$ µl, and the average measurement results of chickens treated with vitamins ranged from 130,00 – 156,67 $\times 10^3$ µl . Under normal conditions of primary homeostasis and when platelets form the first platelet plug, adequate numbers of platelets must be circulating in the blood. The results of platelet measurements in the study sample of chickens that were given vitamins were still within the normal range in animals, namely 117 – 460 × 10^3 µl, but in chickens that were not given vitamins, it was below the normal range. This vitamin greatly affects the physiological response of chickens. Therefore, a balance of nutrients is needed because it can increase the body's immune system to attack pathogens and maintain body temperature to adapt to environmental temperature changes.

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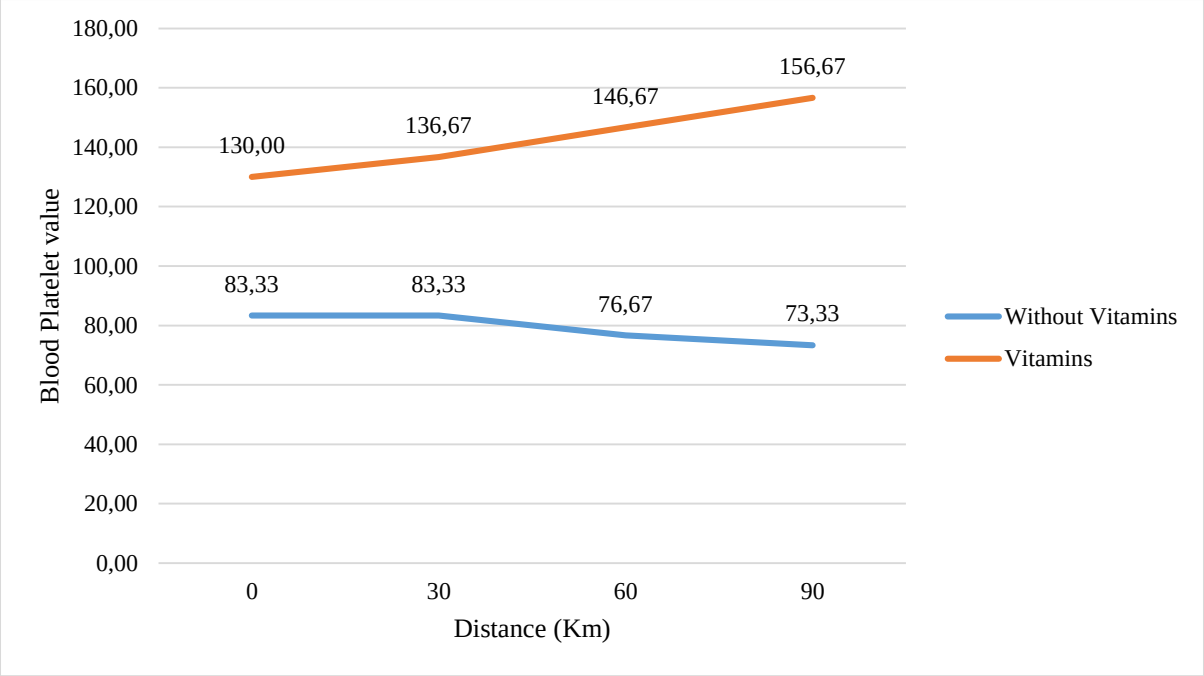

Figure 8. The average of platelet for broiler at distances of 0 (control), 30, 60, and 90 km

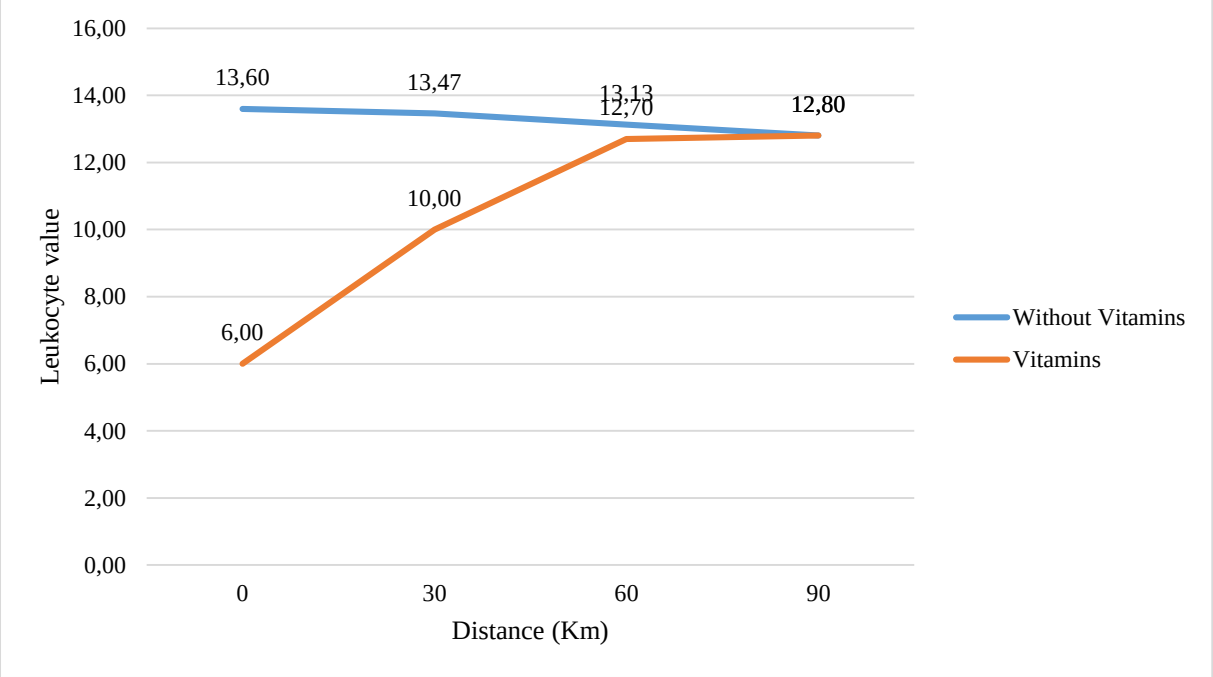

Figure 9. The average of leukocytes for broilers at distances of 0 (control), 30, 60, and 90 km

Leukocytes

The results of measuring the average number of leukocytes in the blood of broiler chickens in the treatment of giving vitamins showed normal conditions ranging from 10 - 12.8 × 10^3 µl. In contrast, in chickens that were not given vitamins, the number of leukocytes decreased during transportation with an average value of 13,60 × 10^3 µl to 12, 8 × 10^3 µl . Although there were differences in the results of leukocyte measurements, the treatment had no effect during the transportation process because it was still within normal limits for the number of leukocytes in broiler chickens, namely 6–12,8 × 10^3 µl. The results of the average measurement of leukocyte values at certain distances and different treatments can be seen in Figure 9. Broiler chickens without vitamins tended to have higher leukocyte

values than those given, but both treatments were still within normal limits. The increase in the number of leukocytes in broilers given vitamins is thought to be due to the working effect of vitamins that can increase immunity, thereby reducing stress conditions in chickens. It can also stabilize the broilers' physiological condition to stabilize and affect hormonal balance in the chicken's body. In contrast to broilers which were not given vitamins, the number of leukocytes decreased in value. The condition of the broiler chickens allegedly does not make any effort to fight pathogenic bacteria or viruses that attack its body. Under certain conditions, livestock infected with bacteria will cause chicken health to decline with an increase in white blood cells (Saputro et al., 2014).

Hematological measurements such as the number of leukocytes (white blood cells) are needed as one of the parameters supporting the physical measurements of broiler chickens so that the presence of pathogens cannot conclude that the physiological condition of the chickens is decreasing. Leukocytes are one of the blood plasma suspensions that act as the body's defense system against pathogen attacks through the mechanism of antibodies that are formed, which is one of the indicators to determine the status of healthy cattle. Livestock health can be known from the number of white blood cells containing substances that fight bacteria (Yuniwarti, 2015).

CONCLUSIONS

This research concludes that giving vitamins can stabilize the physiological condition of broiler chickens while being transported at a certain distance of 0 km (control), 30, 60, and 90 km. The treatment of giving vitamins at a distance of 90 km was no different from the control treatment. Evidenced by measurements of body weight with a value of 1.47 kg, heart rate of 262 times per minute, a stable respiratory rate at a value of 31 times per minute, and rectal temperature of 41°C and hematological conditions of chicken blood such as erythrocytes of 2.60×10^6 μL, haemoglobine 13.5 g/dL, hematocrit 33%, platelets 145×10^3 μL, and leukocytes 9×10^3 μL, are all in the normal range of broiler physiological conditions. Furthermore, it proves that giving vitamins can maintain the condition of the chicken's body from environmental temperature changes, transportation distance, transportation speed, and the density of transport baskets during transportation.

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