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The Effect Of Zoning In A Closed House On Total Erythrocytes, Hemoglobin Levels, And The Percentage Of Hematocrit In The Blood Of Laying Hens In The Starter Period

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----------***ABSTRACT***----------
High temperatures might cause heat stress in laying hens. Even in a closed housing, the temperature will be higher at the outlet than it will be near the inlet. There was a decrease in wind speed due to negative pressure at the ¼, ½ and ¾ distance of placement of laying hens [1]. The placement zone of laying hens in a closed house can affect the temperature, humidity in the cage which is thought to also affect the health of laying hens in the starter period which will be seen from the blood profile of the laying hens. The materials of this research were DOC of laying hens which were kept in a closed house. The method used was a direct experiment. The measurement of temperature and humidity in the closed house was carried out for 38 days during the research period. The hematological tests were carried out when the laying hens were 1, 16 and 38 days old. The research data was tested using the Completely Randomized Design (CRD) method with 4 treatments and 6 replications, referring to previous research conducted by Sarjana, et al., (2018). T0 was laying hens reared in zone 1 (0 to 30 m from the inlet), T1 in zone 2 (31 to 60 m from the inlet), T2 in zone 3 (61 to 90 m from the inlet), and T3 in zone 4 (91 to 120 m from the inlet). The zoning in the closed house showed a significant difference to the microclimate conditions in the cage. The chicken placement zone in the closed house did not show a significant difference in total erythrocytes, hemoglobin levels, and hematocrit percentage.
KEYWORDS*: laying hens, closed house, erythrocytes, hemoglobin, hematocrit*

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I. INTRODUCTION

In Indonesia, it is expected that the COVID-19 outbreak will have no effect on chicken egg consumption, allowing the hen population's productivity to remain stable [2]. The rising popularity of laying hens as a livestock business object is influenced by the rising consumption of protein and eggs. This can be proven by the increasing population of laying hens. In 2016, the population of laying hens was recorded at 161,364,000 heads, increasing to 263,918,000 in 2019 [3]. Indonesia is a tropical country where the temperature and humidity are relatively high throughout the year. Relatively, high temperatures can trigger heat stress in laying hens. Temperatures that are too high and too low can cause economic losses due to high feed conversion and increased mortality.

The temperature and humidity of the cage are challenges that laying hens face in the field, especially during the starter period. Even in a closed housing, a difference in temperature in the cage has been discovered. The temperature will be higher at the outlet than it will be near the inlet. Laying hens placed in the front (inlet) have better production performance and egg quality according to standards when compared to laying hens placed at the back (outlet) [4]. There was a decrease in wind speed due to negative pressure at the ¼, ½ dan ¾ distance of placement of laying hens and from the length of each cage of 17.54; 23.78 and 22.41% [1] so that the placement zone of laying hens in a closed house can affect the temperature and the humidity in the cage which can later affect the blood profile of laying hens in the starter period.

II. MATERIALS AND METHODS

The research materials were DOC laying hens up to the age of 38 days which are kept in a closed house. DOC were taken from PT. Japfa Comfeed Indonesia, Poultry Breeding Division, Subang. 72 laying hens were used, divided into 4 treatments and 6 replications. 72 laying hens in the starter period would have their blood drawn for hematology testing. The hematological tests were carried out when the laying hens were 1, 16, and 38 days old.

The study was conducted using a completely randomized design (CRD) method with 4 treatments and 6 replications.

T0 : Zone 1 (0 to 30 m from inlet)
T1 : Zone 2 (31 to 60 m from inlet)
T2 : Zone 3 (61 to 90 m from inlet)
T3 : Zone 4 (91 to 120 m from inlet)

III. RESULTS AND DISCUSSION

The first stage in this study was a microchemical test in a closed house. The difference in microclimate in the four closed house zones is seen from the temperature, humidity, and heat index in the closed house. The difference in temperature in the four zones of placing laying hens in a closed house can be seen in table 1:

Table 1. The average temperature, humidity, and heat index in a closed house

Treatment	Temperature Average (°C)	Humidity Average (%)	Heat Index Average
0 (Zona 1)	$29,087^{a} \pm 0,028$	$80,41^{c} \pm 6,62$	$164,28^{c} \pm 1,83$
1 (Zona 2)	$29,385^{ab} \pm 0,034$	$74,05^{ab} \pm 5,38$	$158,39^{ab} \pm 2,62$
2 (Zona 3)	$29,769^{c} \pm 0,326$	$77,52^{bc} \pm 5,24$	$163,08^{c} \pm 1,75$
3 (Zona 4)	$29,578^{bc} \pm 0,285$	$70,80^{a} \pm 3,77$	$156,58^{a} \pm 1,63$

Note: Different superscripts on the same line shows significant differences ($P \leq 0.05$).

At T0 (Zone 1) which was right on the side closest to the inlet, the average temperature on the 1st and 2nd days was slightly lower than the recommended optimum temperature of 33,67°C and 34,07°C. On the same day, the temperature at T2 was also lower than the optimum temperature, which were 34,24°C and 34,10°C The temperatures at T1 and T3 which at that time were closest to the optimum were 35,07°C, 34,51°C, 35,01°C, and 34,44°C, respectively. Furthermore, after passing the first week of maintenance, the temperature in the four zones in the closed house was above the recommended optimum temperature.

From the table above, it can be concluded that the humidity at T3 is significantly different from the humidity at T0. Meanwhile, the humidity at T1 and T2 is not significantly different. When the temperature rises, the humidity will decrease and vice versa. With the difference in temperature and humidity, heat index data is needed that can explain the environmental conditions in the cage [5].

The standard heat index for DOC is 155 while the age of 35 days is 140. Laying hens will start to panting when the heat index is above 155, and humidity is the main part of the heat index calculation [6]. Based on table 3, the heat index in the closed house is at risky numbers, especially at T0 and T2 because according to Palupi (2015) the heat index that can still be tolerated by laying hens is 160, so the laying hens will be panting. The climate outside the cage can affect the heat index inside the cage.

The second stage in this study was a hematological test. Hematology testing is intended to determine whether the blood components in the poultry body are sufficient to support all the functions of the blood. The hematological test carried out in this study produced data in the form of total erythrocytes, hemoglobin levels, and the percentage of hematocrit.

Table 2. Average total erythrocytes ($10^6/mm^3$) from starter period laying hens kept in closed house

Treatment	Standard	First Average	Second Average	Third Average
0 (Zone 1)	1,25 – 4,50	3,06 ± 0,15	2,62 ± 0,04	2,64 ± 0,05
1 (Zone 2)	1,25 – 4,50	3,05 ± 0,08	2,67 ± 0,07	2,63 ± 0,04
2 (Zone 3)	1,25 – 4,50	2,97 ± 0,11	2,65 ± 0,02	2,65 ± 0,05
3 (Zone 4)	1,25 – 4,50	2,94 ± 0,11	2,64 ± 0,03	2,65 ± 0,04

Based on the table above, the total erythrocytes in the blood of the starter period laying hens kept in closed house did not show a significant difference ($P<0.05$). In the first collection, at the beginning of maintenance, the erythrocyte levels in laying hens reared near the inlet (T0) were higher than those reared in other zones (T1, T2 and T3), but could still be categorized as normal. The average total erythrocytes in the second and third blood collections tended to decrease.

High ammonia emissions can disrupt the physiology of livestock. The existence of physiological changes in the body, can lead to changes in the total picture of blood cells [7]. In the four zones in this closed house, no significant differences in total erythrocytes were found. The total erythrocytes in the four zones were also within a safe range, so that the 120 m-long closed house area had no effect on the total erythrocytes in the blood.

Table 3. Hemoglobin level (g/dl) in the blood of starter period kept in closed house

Treatment	Standard	First Average	Second Average	Third Average
0 (Zone 1)	7,3 – 10,9	7,81 ± 0,46	7,21 ± 0,38	7,07 ± 0,58
1 (Zone 2)	7,3 – 10,9	7,92 ± 0,57	7,24 ± 0,41	7,32 ± 0,42
2 (Zone 3)	7,3 – 10,9	8,12 ± 0,41	7,42 ± 0,45	7,31 ± 0,25
3 (Zone 4)	7,3 – 10,9	7,96 ± 0,63	7,20 ± 0,39	7,05 ± 0,45

Based on the table above, the hemoglobin level in the blood of the starter period laying hens kept in a closed house did not show a significant difference ($P<0.05$). Based on the data above, it can be seen that the hemoglobin level in the blood of laying hens kept in closed houses is at a risky level (with a standard of 7.3 – 10.9 g/dl for starter period laying hens). The lowest hemoglobin level was in T3 at the third blood draw at the end of the starter period, namely 7.05 g/dl while the highest was in T2 at the first blood collection, which is 8.12 g/dl.

Table 4. The percentage of hematocrit (%) in the blood of the starter period laying hens kept in closed house

Treatment	Standard	First Average	Second Average	Third Average
0 (Zone 1)	22 - 35	31,35 ± 0,77	29,98 ± 0,32	30,04 ± 0,30
1 (Zone 2)	22 – 35	31,39 ± 0,61	30,10 ± 0,50	29,88 ± 0,26
2 (Zone 3)	22 – 35	30,74 ± 1,01	29,95 ± 0,16	29,96 ± 0,38
3 (Zone 4)	22 – 35	30,97 ± 1,02	30,04 ± 0,31	30,08 ± 0,34

Based on the test results, it can be seen that the percentage of hematocrit in the blood of laying hens in the starter period kept in different zones in the closed house did not have a significant difference ($P<0.05$). Hematocrit value indicates the level of viscosity or blood viscosity. Hematocrit shows the level of viscosity or viscosity of blood. The percentage of chicken hematocrit under normal conditions was in the range of 22 – 35%. The more the number of erythrocytes in the blood, the percentage of hematocrit will also increase. A high hematocrit percentage indicates that the chicken is dehydrated [8].

IV. CONCLUSION

The zoning in the closed house showed a significant difference to the microclimate conditions in the cage. The chicken placement zone in the closed house did not show a significant difference in total erythrocytes, hemoglobin levels, and hematocrit percentage.

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