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Characteristics of Carcass and Total Microbials of Broiler Chicken Meat as the Impact of Zonation In Closed House Cages

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ABSTRACT

This study aims to determine whether zonation closed house cages affects the carcass characteristics and shelf life of broiler chickens. Closed house enclosure of the Faculty of Animal Husbandry, Udayana University with an area of 120 X 12 M which is divided into 4 zonation and the area of each zonation is 30 X 12 M. The research design used was a Completely Randomized Design with 4 cage zoning treatments, namely zonation 1, zonation 2, zonation 3, and zonation 4, with 30 replications. The research material is 120 broiler. The variables observed were carcass characteristics and meat storage. The results showed that cage zonation had a significant effect ($P < 0.05$) on final weight, slaughter weight, carcass weight, carcass percentage, breast weight and whole thigh weight, but had no significant effect ($P > 0.05$) on wing cut, back and total microbial meat. In zone 3, the average final weight of 4-5% was significantly ($P < 0.05$) higher than the final weight in other zones. Storage at room temperature (25°C) for 3-9 hours, broilers in zone 3 obtained the highest microbial growth in meat ($P < 0.05$). The conclusion of this study is that the zoning of the cage in the closed house causes differences in the parameters of the broiler carcass characteristics. Broilers in cage 3 zoned had the best carcass characteristics, the highest total microbial meat and the lowest meat storage capacity.

Key words: Zonation, broilers, carcass characteristics, total microbe of meat

INTRODUCTION

The application of a cage with a closed house system is one way to increase broiler production. Closed house cages are closed cages equipped with feed, drinking, lighting, heating/brooder systems, exhaust fans, cooling pads, sensors, electrical panels, and curtains. In the Closed house type cage, there are 4 maintenance areas or zoning, where in zone 1 it is close to the air entrance (inlet) which has a lower temperature compared to the other 3 zones. Zone 4 is the maintenance area closest to the air outlet (ekshaust fan). This causes differences in temperature, humidity, and ammonia levels in the closed house, which in turn can affect broiler productivity (Renata *et al.*, 2018). Broilers that are farther away from the air entrance (inlet) are found to have a decreasing red blood profile (Brilianto *et al.*, 2019).

Closed house cages can reduce mortality, morbidity and accelerate growth so that it can affect the income level of farmers. The basic principle of closed house cages is to prevent environmental influences, such as temperature and excessive sunlight intensity entering the cage. The closed house cage system can also minimize the spread of disease from outside into the cage and can record data on changes in temperature inside the cage in real-time (Adnyana *et al.*, 2020 ; Putra *et al.*, 2019). It is very important to pay attention to the density of broilers in the cage, because a high number of broilers in the cage will have an impact on their activities and production.

The density of broilers in the cage has an effect on pH, water holding capacity and has no effect on tenderness and cooking implants of meat (Fausiah *et al.*, 2019). Factors before broiler slaughter (antemortem) including maintenance and feed management can affect the quality of results after slaughter, such as carcass and broiler meat quality (Soeparno, 2011). Carcass and meat quality that is not good and followed by poor handling, will have an impact on the growth of destructive microbes in broiler meat (Hajrawati *et al.*, 2016). Based on the description above, a study was carried out with the title "Carcass characteristics and total microbes of broiler chicken meat as the impact of zoning in closed house cages".

MATERIALS AND METHODS

Research material

The research material consisted of: 1) One day old CP Ross Platinum strain broiler (DOC) weighing 44.7 g. \pm 1.13; 2) Complete commercial ration in the form of crumble (BR0/S0) for chickens aged 1-7 days (pre starter); 3) BR-1/S11 commercial ration for 8-21 days old chicken (starter); 4) BR-2/S12 commercial ration for 22 day old chicken (finisher); and 5) Drinking water sourced from bore well water in the cage area. The nutritional content of the ration is shown in Table.1.

Table. 1. The Nutritional Content of the Ration Used.*

Nutrition		Nutrient content (%)		
		BRO	BR1	BR2
Water content	Max	14.00	14.00	14.00
Crude protein	Min	22.00	20.00	19.00
Crude Fat	Min	5.00	5.00	5.00
Crude fiber	Max	4.00	5.00	6.00
Ash	Max	8.00	8.00	8.00
Ca	-	0.80-1.10	0.80-1.10	0.80-1.10
P	-	0.50	0.50	0.45
Lisin	Min	1.30	1.30	1.05
Metionin	Min	0.50	0.50	0.40
Metionin+Sistin	Min	0.90	0.90	0.75
Triptopan	Min	0.20	0.20	0.18
Treonin	Min	0.80	0.80	0.85

Source : *) Produced by PT. Carroen Pokphand Indonesia Tbk.

Cages and equipment

The cage used is 1 unit of Closed house cage complete with automatic facilities and infrastructure. The cage area is 120 X 12 m divided into 4 zones/maintenance areas, with the length of each zone is 30 m (Figure 1). The provision of feed and drinking water as well as vitamins is carried out automatically/mechanically. The temperature in the cage is regulated by a system/thermoregulator that can regulate the fan/exhouse fan aounatically according to the temperature required by the DOC/broiler chickens in the cage.

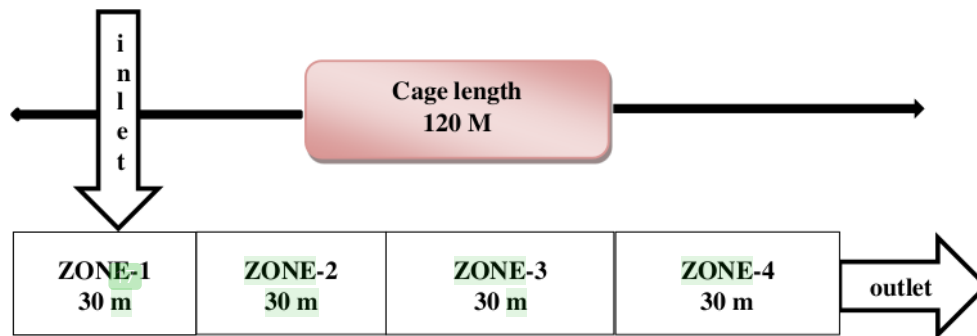


Figure 1. Floor plan of the Closed House at the Faculty of Animal Husbandry, Univ. Udayana.

8 Research design

His study used a Completely Randomized Design (CRD) with 4 treatment areas of maintenance / zoning (Figure 1). Each treatment consisted of 30 broilers as replicates, and all samples were marked according to zoning. Research variables : Final Weight, Cut Weight, Carcass Percentage, Carcass Cut Weight (Breast, Wings, Back and Whole Thighs), and microbial count during storage. The results of the study were analyzed by analysis of variance with the SPSS-1.7 system.

RESULTS AND DISCUSSION

Carcass characteristics

One way anova analysis (Table 2), showed that there were significant differences ($P < 0.05$) in final weight (FW), slaughter weight (SW), carcass weight (CW), % carcass, breast and thigh pieces intact (TI) as a result of the maintenance/zoning area in the closed house enclosure. Zoning is not significant ($P > 0.05$) the effect on the back and wing pieces. The broiler closest to the air inlet had the lowest FW, SW, CW and breast piece. This is caused by the humidity in the Z1 above 80%. High humidity causes the litter to get wetter, which in turn can speed up the fermentation process. This is in accordance with the opinion of Renata *et al.* (2018) which states that wet litter will accelerate the production of NH₃. Hidayat *et al.* (2020) and Brilianto *et al.*, (2019) stated that the increase in microclimatic ammonia in the cage can reduce the appearance before slaughter (ante mortem) of broilers, and also have an impact on all parameters after slaughter (post mortem). High levels of ammonia cause oxidative stress and irritation of the respiratory tract, then there will be

disruption of nutrient absorption by the intestinal mucosa of broilers. This condition will have an impact on increasing daily body weight.

The carcass characteristics of broiler chickens as the impact of rearing/zoning areas in closed house cages are presented in Table 2.

Table.2. Carcass Characteristics of Broiler Chickens as Impact of Retention Area/zoning in Closed House Cages

ZONATION (Z)	Parameters (gr)							
	FW	SW	CW	% C	Breast	IT	Wing	Back
Z-1	2000 ^b	1990 ^b	1500 ^b	75 ^b	583 ^b	447 ^b	150 ^a	320 ^a
Z-2	2090 ^a	2050 ^a	1550 ^a	76 ^a	595 ^b	478 ^a	152 ^a	325 ^a
Z-3	2100 ^a	2080 ^a	1600 ^a	77 ^a	628 ^a	488 ^a	150 ^a	334 ^a
Z-4	2040 ^b	2070 ^b	1523 ^b	74 ^b	588 ^b	452 ^b	155 ^a	328 ^a
SEM	0.44	0.41	0.44	0.01	0.45	0.43	0.45	0.35

Note.: FW.: final weight, SW.: slaughter weight, CW= carcass weight. carcass percentage, IT.: intact thigh.

The same superscript in the same column shows a non-significant difference (P>0.05)

The carcass characteristic data obtained was better than that informed by (Pakage *et al.*, 2020) with the achievement of final weight (FW): 1.99 kg and performance index (PI): 336. According to (Setiawan & Adisti, 2018; Putra *et al.*, 2019) the final weight of the broiler is 1567 - 1614 gr. The final weight data in this study is lower than the results of Hidayat *et al.* (2020) research, namely : 2226,67 gr in the zone near the inlet. This may be due to the closed house of the Faculty of Animal Husbandry in the lowlands with hot weather. Prasetyo *et al.* (2021), stated that to get the performance and quality of broiler meat, the location of closed house farms must be carried out on higher ground. The zoning of the cage had no significant effect on the back and wing pieces of broilers (P<0.05). This is because on the wings and back there is no accumulation of reserve energy in the body (Soeparno, 2009).

Total microbial count

Healthy broiler meat before slaughter is basically sterile or contains only very few levels of microorganisms, but after slaughter, these tissues begin to be contaminated by microbes from the surrounding environment (Komariah *et al.*, 2004). The effect of cage zoning (Z) on total microbial / total plate count (TPC) in meat and stored at room temperature 25°C for 9 hours is shown in Table 3. Zoning had no significant (P<0.05) effect on TPC at 0

hours of storage. With the increase in storage time to 3, 6, and 9 hours the zoning effect became real ($P < 0.05$) on TPC during 6 hours of storage and TPC was still on the safe threshold for consumption. The Standar Nasional Indonesia (2009), stipulates that the biological quality requirement for the total plate count (TPC) of broiler chicken is a maximum of 1×10^6 cfu/g. This is similar to that reported by (Hajrawati et al., 2016) who get TPC on broiler chicken in the market: 2.9×10^5 to 8.19×10^6 . Antari *et al.* (2017) also reported that the total microbes in meat in the Denpasar city market were 2.22×10^4 cfu/gr.

Table.3. The Number of Broiler Meat Microbes (TPC/Log CFU/g) in Different Zoning, for 9 Hours of Storage at Room Temperature (25°C)

ZONATION (Z)	Store time (Hours)/ TPC/Log cfu/g			
	0	3	6	9
Z1	$8.3 \times 10^{2.a}$	$2.7 \times 10^{3.b}$	$5.3 \times 10^{5.b}$	$1.4 \times 10^{6.b}$
Z2	$1.2 \times 10^{3.a}$	$4.0 \times 10^{3.4.b}$	$2.6 \times 10^{4.b}$	$1.1 \times 10^{6.b}$
Z3	$1.8 \times 10^{3.5.a}$	$2.9 \times 10^{5.a}$	$4.5 \times 10^{6.a}$	$9.0 \times 10^{7.a}$
Z4	$1.4 \times 10^{3.a}$	$4.1 \times 10^{4.b}$	$7.2 \times 10^{5.4.b}$	$1.7 \times 10^{6.b}$
SEM	0.03	0.04	0.02	0.05

Note: The same superscript in the same column shows a non-significant difference ($P > 0.05$)

Broiler chicken meat at Z3 with 9 hours of real storage had the highest TPC ($P < 0.05$) and exceeded the recommended SNI-2009. This may be because broiler chickens at Z3 have the highest temperature (30°C - 31°C) and the lowest air humidity (60%). This condition causes broiler chickens to experience heat stress. Prolonged stress before slaughter will have an impact on meat quality (Soeparno, 2009). It was further explained that low water holding capacity (WHC) of meat and high cooking loss would increase microbial contamination (TPC), and meat would spoil quickly.

The total bacteria in the meat will be safe for consumption if it is cooked at a high temperature, because the bacteria cannot tolerate heat (Hajrawati *et al.*, 2016).

CONCLUSION

Zoning in a closed house at the Faculty of Animal Husbandry, Udayana University causes differences in the parameters of the carcass characteristics of broiler chickens. Broiler

chickens in cage zoning 3 (Z3) have the best carcass characteristics, but the highest total bacteria (TPC) and the lowest shelf life of meat.

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AUTHOR CONTRIBUTIONS

Tirta Ariana IN: Conceived the study, contributed to the discussion and correction the final manuscript.

Sumerta Miwada IN : Contributed to the method and discussion.

Bulkaini: Collected the data and the method and discussion.

Gde Suranjaya: Contributed analyses the data

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