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Comparative production performance of broiler under opened house and closed house system

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ABSTRACT: The purpose of this study is to compare the performance of broiler production in a closed and open house system. The study was conducted on September 13-October 25, 2019, at Sumardi's broiler farm located in Kademangan Village, Pagelaran District, and Malang Regency. The material used is 120 broilers in a closed house and 120 broilers in an open house. CP-707 strain broiler chickens were given complete feed produced by PT. Charoen Pokphand Indonesia. Feed and drinking water are given ad libitum. Research variables are feed consumption, body weight, feed conversion, carcass percentage, and abdominal fat weight. Research data were tabulated and analyzed using unpaired t-test. Based on the results of statistical analysis, there is a difference between the performance of broiler production in a closed house and open house system ($P<0.05$). Closed house system gives a better effect on the performance of broiler production.

Keywords: production performance; opened house; closed house; broiler

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INTRODUCTION

The success of poultry farming, especially broilers, depends on three aspects, breeding, management, and feed. Broilers are the most efficient in converting feed into livestock derivative products as supported by good management. The housing system is one aspect of management, which has a very important role in ensuring optimal production processes. Generally, the housing system developed in Indonesia is an open cage and closed cage. The decision to choose a cage system based on the capital and environment in which the cage built. Closed house, generally owned by companies with substantial capital and maintenance scale. In a closed cage system, the microclimate in the house can be adjusted as needed while in an opened house, the microelements in a cage depend on the natural conditions around the cage environment (Hameed *et al.*, 2012). These differences will affect the microclimates in the cage—microclimates in closed houses designed and controlled to meet the comfort zone for the maintenance of broilers.

Microclimates in the house include temperature, humidity, air velocity and movement, air composition, and light (Kalio and Okafor, 2012). Broilers have certain microclimate needs according to their physiological development and production phase (Bonnet *et al.*, 1997). Broiler types of starter period require environmental temperature is 29°C-32°C, whereas in the finisher period requires 23°C-28°C (Ross, 2018). Differences in the construction of the open and closed house will give a microclimate difference to the internal environment. Interestingly poultry farmers raise chickens all around the world under widely varying circumstances of housing and management, and their main objectives may generally be the same, usually to maximize production via minimum costs and with minimum risks.

There is a lack of information as regards the performance of chickens, especially the broilers in this area by farmers adopting these management systems. Therefore the objectives of this study were to investigate the response of broiler chickens via animal performance, carcass, and organ characteristics under the opened and closed house systems of managing broilers.

MATERIALS AND METHOD

Location and Birds

This research carried out at Sumardi's farm located in Kademangan Village, Pagelaran District, Malang. The ambient temperature was 27 °C-29 °C. The research location was 500-1000 Mean Sea Level. This research carried out during the starter and finisher phase period, starting on September 13th until-October 18th, 2019. The owner was on a partnership with PT. Japfa Comfeed Indonesia.

The material used is 120 broilers in a closed house and 120 broilers in an open house. The birds were CP 707 strain produced by PT. Charoen Pokphand Indonesia. Feed was complete feed code 511 (starter period) and code 512 (finisher period) provided by PT. Charoen Pokphand Indonesia Tbk.

House

Specifications of the opened house were 8 x 80 m in size, without curtains, consisting of two floors (double deck), gable type roof, the height of the cage was 4 m (first floor and second floor). Litter material is a rice husk with a height of 10 cm in the brooding period. House material is bamboo. Stock density was 8 birds/m^2.

Specifications of the closed house were 8 x 80 m in size, with curtains, consisting of two floors (double deck), gable type roof, the height of the cage was 4 m (first floor 1 and second floor). Litter material is a rice husk with a height of 10 cm in the brooding period. House material is bamboo. Stock density was 16 birds/m^2.

Method

The research method is an experiment to test the differences in broiler performance under opened and closed house management. The tool for measuring tem-

perature and humidity is thermo-hydro USB Temperature and Humidity Data Logger Model No. DS102. Air velocity measured using a Kestrel 300 Weather Meter part # 0830.

Collection of data

Data on body weight and feed consumption were recorded every week, and mortality was recorded every week, and mortality was recorded at the occurrence. From the above data body weight gain, feed conversion was calculated. At the end of the experiment, one bird from each replicate, a totally of 20 birds for each house type, were randomly picked up and slaughtered. The pre-slaughter weight, eviscerated carcass weight, and abdominal fat weight were recorded. The data collected on various parameters were subjected to statistical t-unpaired test analysis (Wahua, 1999).

RESULT AND DISCUSSION

Result

Average of feed consumption (g/bird), body weight gain (g/bird), and feed conversion presented in Table 1.

Average of carcass weight (g/bird), carcass percentage (%), and abdominal fat weight (g/bird) presented in Table 2.

Table 1. Average of feed consumption (g/bird), body weight gain (g/bird), and feed conversion

Parameter	Opened House	Closed House	*Sig. (2-tailed)*
Feed consumption (g/bird)	3,506.80±113.78	3,235.15±218.30	0.000
Body weight gain (g/bird)	1,939.00±139.92	2,359.00±210.29	0.000
FCR	1.83±0.11	1.38±0.08	0.000

Note: Average± Std. deviation, a significant level of 95% (P<0.05)

Table 2. Average of carcass weight (g/bird), carcass percentage (%), and abdominal fat weight (g/bird)

Parameter	Opened House	Closed House	*Sig. (2-tailed)*
Carcass weight (g/bird)	1,328.50±113.64	1,568.60±200.12	0.000
Carcass persentage (%)	67.01±3.20	65.31±5.65	0.250
Abdominal fat weight (g/bird)	42.95±8.59	49.70±11.73	0.045

Note: Mean±Std. deviation, a significant level of 95% (P<0.05)

Discussion

Production performance

Farmers or modern broiler farming businesses must be able to realize the appropriate environmental conditions to be able to maximize the genetic potential of birds, pay attention to the most important factors in housing management, and understand the basic guidelines for operating the housing system (Ross, 2018). The types of house, commonly used by farmers in Indonesia are closed house and opened the house. In recent years many authors have also paid attention to the rearing of broilers as a particularly important factor influencing quality traits of meat (Castelini, 2005; Ponte, 2008; Meluzzi et al., 2009, Bogosavljević-Bošković et al., 2012; Nawalny, 2012). In an intensive broiler chicken rearing, a quickly growing material is used as well as complete feeds.

However, when rearing broiler chickens under a semi-intensive or an extensive system, part of the complete feeds is replaced with cereal grains. The use of complete feeds throughout the whole rearing period in broiler chickens under a semi-intensive and extensive system may increase the costs of chicken nutrition twice throughout the whole production cycle (Krawczyk & Wężyk, 2002). The findings indicated that the production performance of the Climate Controlled System (CCS) houses under small, medium, and large had

a better Feed Conversion Ratio compared to conventional house type with a significant difference. CCS farms had better productivity, which is explained by better growing conditions for the birds. It is recommended that CCS houses be established to maintain the conducive conditions for bird growth (Levy, 2017). The parameter FCR was used as the indicator of productivity in the study.

The feed conversion ratio is a measure of how well a flock converts feed intake (feed usage) into live weight. Even a small change in FCR will have a substantial impact on profit. The key to preventing the FCR problem is ensuring that throughout the brooding and grow-out period, good management practices are in place so that birds' performance is optimized (Kleyn, 2013).

Table 1. shows that FCR value higher on the opened houses than closed. In comparing the FCR for the opened house and closed houses, the closed house had a better FCR (1.38). In general, CCS houses had better average FCR than conventional and can be concluded that from this study, CCS farms have better productivity than conventional farms. It supports the findings of (Green 2008) that CCS improved the performance of birds as indicated by better feed efficiency. It is reported that the birds in the outdoor system are exposed to several factors including infectious and parasitic diseases, social interactions and adverse climatic conditions that may increase both stress and fear reactions and reduce welfare (Campo *et al.*, 2018). The housing with outdoor access resulted in poorer performance and higher date rate (Zao *et al.*, 2014).

Quality performance

Broiler chickens should be characterized by good dressing percentage, desired structure, taking into consideration as high as a possible proportion of meat per carcass, optimum distribution of fat tissue as well as proper skin color. With reference to this, proportions of main carcass parts (breasts, thighs and drumsticks), as well as presence of particular tissues in them, are considered to be significant parameters defining broiler meat quality (Lewis *et al.*, 1997; Suto *et al.*, 1998; Holcman *et al.*, 2003; Ristic, 2003).

The carcass weight of the birds after the slaughter was higher (1,569.25 g) for birds managed under the closed house system as compared (1328.50 g) to the birds managed under the opened house system. The differences in the carcass weight among the birds in the two different management systems reflected on the dressing percentages in the two groups and this was not significantly ($P>0.05$) different. The birds in the opened house managed group had a higher (67.01%) dressing percentage than those of the closed house managed group (65.31%).

The statistical analysis showed differences in abdominal fat weight under two management systems ($P<0.05$). Abdominal fat weight was higher under the closed system (49.70 g/bird) than the open system (42.95 g/bird). Chicken fed with complete feeds kept under an intensive system was distinguished by higher fattiness expressed as an abdominal fat weight, as well as by lower average intake of feed mixtures per individual broiler. Dou et al. (2009) noted 3.0% abdominal fat deposition in free-range broilers and up to 6.5% in those housed indoors. However, Castelini et al. (2002) proved the difference of 0.9% vs. 1.9% after 56 days and 1% compared with 2.9% at 81 days of ecological rearing of broilers Ross, confirming significantly lower fattiness compared with the conventional rearing.

However, the variations in results of dressing percent and primal cuts possessed by the broiler chickens managed under the two different housing systems reflected the trend in body weights of the experimental birds. The result in this study was in support of the findings of Atteh, (2004), who explained that the weight of the organs in broilers is known to indicate the response of birds to their growth. The higher body weight in the broiler chickens managed un-

der the intensive system had a direct reflection in the respective primal cuts (Atteh, 2004).

CONCLUSION

Based on the results of statistical analysis, there is a difference between the performance of broiler production in a closed house and an open house system. The closed house system has a better effect on the performance of broiler production.

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