

The influence of housing type on broiler chicken production in Biting village of Jember regency

Pengaruh jenis kandang terhadap produksi ayam broiler di Desa Biting Kabupaten Jember

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Abstract. Jember Regency is a notable region for broiler chicken production. The broiler cultivation system predominantly used in this area is the partnership system, mainly operated by smallholder farmers employing open house and semi-closed houses. This study aimed to evaluate the impact of different cage types on mortality rates, Body Weight Gain (BWG), feed conversion (FCR), and Performance Index (PI) in broiler chickens. The research was conducted at Surya Inti Ternak (Ltd.) in Biting village, Arjasa district, Jember regency. The study investigated two types of cages: open house and semi-closed house. The observed variables were mortality, BWG, body weight, FCR, and PI were analyzed using the Independent T-test. The results indicated a significant difference in the mortality rate during the first week ($p < 0.05$). However, no significant differences were observed in the mortality rate from weeks 2 to 5, BWG, body weight, FCR, and PI of broiler chickens ($p > 0.05$). The study concludes that while there is a significant difference in mortality rates between cage types during the first week, there are no significant differences in mortality rates, BWG, body weight, FCR, and PI between semi-closed house and open house system from the second week onward throughout the 35-day rearing period.

Keywords: broiler chickens, jember, open house, semi-closed house

Abstrak. Kabupaten Jember salah satu kabupaten potensial penghasil ayam broiler. Salah satu sistem budidaya broiler yang banyak dilakukan yaitu dengan sistem kemitraan yang masih didominasi oleh peternak rakyat yang menggunakan kandang tipe open house dan semi-closed house. Penelitian ini bertujuan untuk mengevaluasi perbedaan tipe kandang terhadap tingkat mortalitas, penambahan bobot badan (PBB), konversi pakan (FCR), dan indeks performa (IP) ayam broiler. Penelitian dilakukan di kemitraan PT. Surya Inti Ternak, Desa Biting, Kecamatan Arjasa, Kabupaten Jember. Metode penelitian ini menginvestigasi dua tipe kandang yaitu open house dan semi closed house. Variabel yang diamati yaitu mortalitas, PBB, Bobot Badan, FCR, dan IP dianalisis menggunakan Independent T-test. Hasil menunjukkan tingkat mortalitas pada pemeliharaan minggu ke-1 mengalami perbedaan yang signifikan ($P < 0,05$), sedangkan pada tingkat mortalitas minggu ke 2-5, PBB, Bobot Badan, FCR, dan IP ayam broiler tidak ada perbedaan yang signifikan ($P > 0,05$). Kesimpulan dari penelitian ini adalah terdapat perbedaan yang signifikan antara tipe kandang terhadap tingkat mortalitas minggu ke-1. Namun tidak ada perbedaan yang nyata antara tipe kandang semi-closed house dan open house terhadap tingkat mortalitas minggu ke-2 sampai minggu ke-5. PBB, bobot badan, FCR, IP ayam broiler selama masa pemeliharaan 35 hari juga tidak signifikan antara kandang open house dan semi-closed house.

Kata kunci: ayam broiler, Jember, kandang terbuka, kandang semi tertutup

INTRODUCTION

Livestock plays a crucial role in developing and escalating agricultural sector as well as improving social welfare. One of the livestock products with substantial potential of development is broiler chickens for they can provide protein for humans (Pakage et al., 2020). Given this potential, the population of boiler chickens in Indonesia has been constantly on the rise as a result of increased population growth, production, and consumption of broiler chickens. Statistics demonstrate that the population of broiler chicken in Indonesia reached 3.77 million tons in 2022, marking an increase by 18.20% compared to the previous year (Statistic Indonesia, 2022).

Three crucial factors significantly influence the success of a broiler chicken farming business, namely breeding, feeding, and management (Suharyon et al., 2020). In addition, cage management is also a critical element in the success of broiler chicken farming (Girsang & Setianto, 2023). The cage plays an important role in ensuring the comfort and safety of chickens from the exposure to direct sunlight during the day, rain, wind, and predators, leading to optimal growth (Suasta et al., 2019).

There are three predominant types of poultry cages used in Indonesia: open house, semi-closed house, and closed house (Maulana, 2018). The open house system is the most widely utilized due to its relatively low construction costs (Setianto et al., 2021). However, open houses are highly susceptible to damage from extreme weather conditions and significant fluctuations in environmental temperature. These vulnerabilities can lead to increased stress in chickens, as the microclimate within the cage is dependent on the external environment, and the structural integrity of the cage is compromised over time (Pakage et al., 2020). In contrast, larger-scale farms typically employ semi-closed and closed house systems. Although these systems require a more substantial initial investment, they offer superior management capabilities, including regulated temperature and humidity, controlled lighting, optimal ventilation, and reduced disease risk (Marom et al., 2017).

The use of open house system and closed house systems has a significant impact on such aspects as feed consumption, body weight, and FCR (Andreas, 2016). A previous study has acknowledged that the FCR for the open house cage system reached 1.605 (Nuryati, 2019). Meanwhile, the FCR value in the semi-closed house cage system is 1.45 (Maulana, 2018). This concludes that the in semi-closed houses leads to higher rate of production than open house system. However, it is not guaranteed that chickens housed in semi-closed houses will consistently exhibit better production outcomes. Several other factors, including disease, suboptimal cage construction, improper operation of semi-closed house systems, inadequate management, and the climate at the cage location, may influence production efficiency (Alam, 2018).

This research aims to determine the physical attributes of broiler chickens kept in open house and semi closed house system at the Surya Inti Ternak (Ltd.) in Jember Regency. The regency is situated in a lowland area, with a tropical monsoon climate characterized by two different seasons, i.e., rainy season and the dry season. The air temperature in the region ranges from 23 °C to 33 °C (World Enciclopedia).

METHODS

Samples and Data Collection

This research was conducted at the PT Surya Inti Ternak partnership farm located in Biting Village, Arjasa District, Jember Regency. This area has low rainfall, temperatures between 24-32 °C and 80-90% humidity (BMKG, 2024). This research was conducted from October 2023 to April 2024. This research employed Cobb 500 strain broiler chickens, which were kept in two different types of cages, open house and semi-closed house. The open house was located at an area of 300 m² with the capacity to accommodate 2,200 chickens in the first period and 2,400 chickens in the second and third period. The semi closed house was built at an area of 324 m², accommodating 3,200 chickens in the first period and 2500 chickens in the next two periods. Samples in the study involved 25 chickens in open house system and 30 chickens in semi closed house system for each period. The first and second periode were using secondary data collected

by their field extension officers and the third period using primary data. The first period was from August 1st to September 10th 2023, the second period was from September 10th to October 31st 2023, and the third period is from November 10th to December 15th 2023.

Open house cages use a fan that is activated when the chickens are 3 weeks old or when the ambient temperature is too extreme, to circulate the air out of the cage. When feeding, baby feeders, hanging feeders, and super feeders are used, while drinkers use gallons and nipples. In semi-closed house cages, the air in the cage is filtered and extracted using blowers, which are switched on continuously for 24 hours with different time spans from one blower to another, as well as celldecks that are switched on during the day or when the weather is too extreme, to ensure the air quality is maintained. The feeding and drinking system in this cage is similar to an open house cage, involving the use of baby feeders, hanging feeders, super feeders, gallons and nipples. Feeding was carried out twice a day, namely in the morning at 08:00 am and in the afternoon at 04:00 pm, while drinking water was given ad libitum. The addition of vitamins such as Biocomplek, TM-Vita, Intra Ultra Mix was given in the afternoon at 04:00 in a ratio of 1:2 and antibiotics such as Carmavit, Moxacol were given in the morning in a ratio of 1:2. Lights were switched on at night in open house type cages, while in semi-closed house cages, lights remained on for 24 hours.

The observed variables were body weight, body weight gain, feed intake, feed conversion ration, mortality and performance index. Every day, chickens were weighed to monitor their growth, a sample of 10 chickens was taken per partition in the cage and feedings were calculated daily to determine weekly body weight, body weight gain and feed conversion ration (FCR). At 35 days, the chicken were harvested and weighed to determine final body weight and performance index.

Data Analysis

The independent samples t-test mediated by SPSS was used to compare two different sample groups, subsequent to three replications during the rearing period. This research required no ethical approval because there was no treatment applied to the chickens.

RESULTS AND DISCUSSION

As presented in Table 2, no significant difference ($p > 0.05$) is identified in the average body weight gain, body weight, FCR, mortality, and IP of broiler chickens kept for 35 days (5 weeks) in semi-closed house and open house system. Likewise, considering the UN, BW, FCR, mortality, and IP of both sample groups, the mortality rate is indifferent. However, in week 1, the mortality rate in the open house cage is higher than that in the semi-closed house ($p < 0.05$).

The research results showed no significant difference between sample groups with respect to body weight gain, body weight, FCR, mortality, and PI at the end of rearing. The increase in body weight was no different, influenced by maintenance in both types of cages, which involved the feeding, drinking, vaccines, and medicine. (Nugraha et al., 2017) further explained that the driving factors to body weight gain are differences in gender, feed consumption, environment, seeds and feed quality.

The results show that harvest body weight ranges from 1.78kg/chicken to 2.26kg/chicken, with an average of 1.90 kg/chicken in open house system and 2.11 kg/chicken in semi-closed houses (Table 1). This average is above the pre-determined standard of 1.85kg/chicken (Maharatih et al., 2017). This is coherent with the studies conducted by (Pakage et al., 2019), (Nuryati, 2019), noting that the weight of broiler chickens ranges from 1,900 to 2,002 grams at 5 weeks of age.

This insignificant difference in FCR results is hypothesized to occur because of similar production and maintenance processes under the company. (Pakage et al., 2020) explained that differences in performance, especially in achieving weight of broiler chickens and FCR, are caused by the cage system, while keeping the production process and assistance between the two groups of breeders similar. The FCR from semi-closed houses are nearly similar as those determined by Cobb. (Vantress, 2015) states that the feed conversion for female Cobb broiler chickens kept from 3 to 5 weeks of age is 1.41.

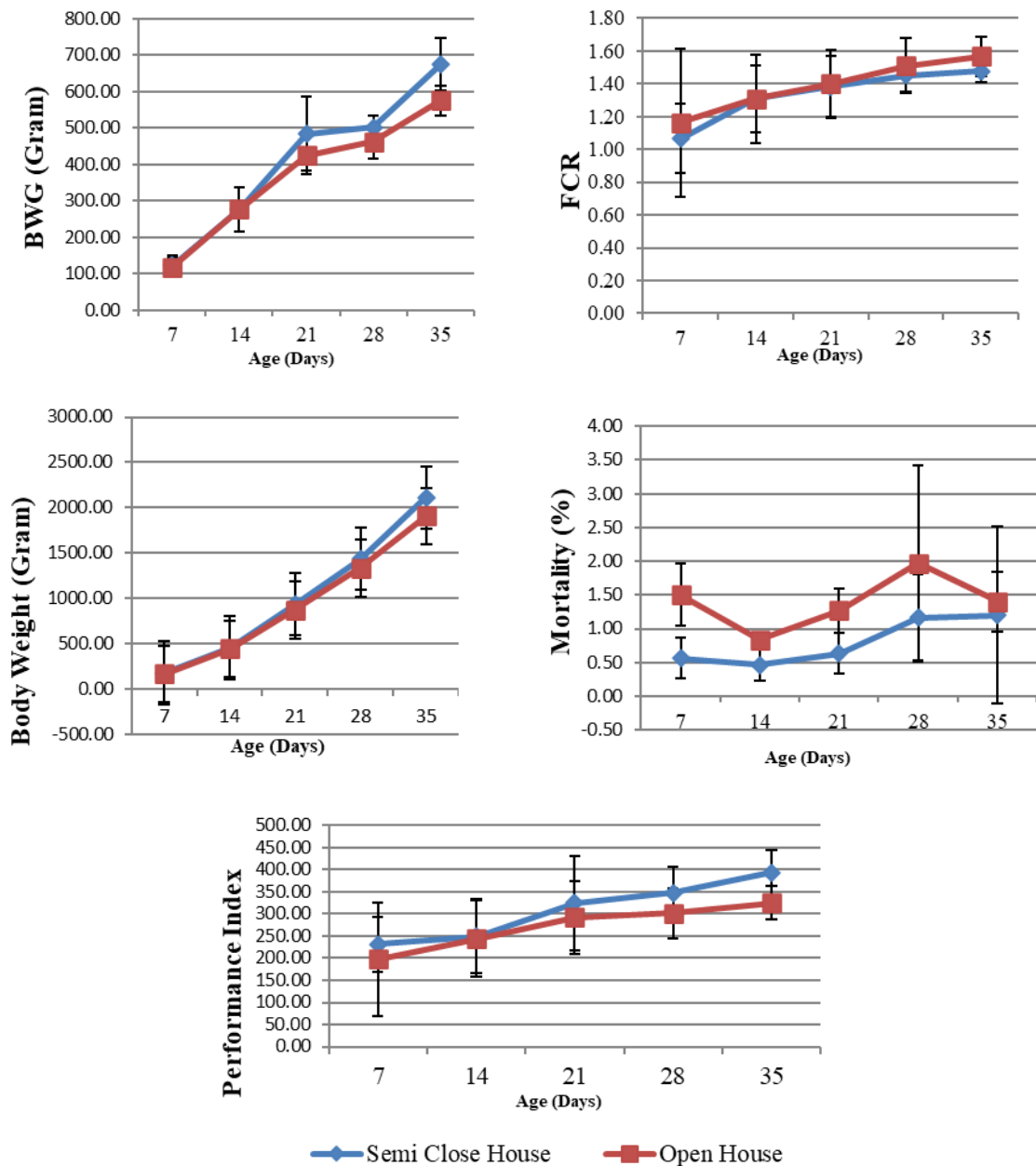


Figure 1. Production of broiler chickens during the 35 days of rearing in different cage types different superscript letters show significance at the 5% confidence interval.

A significant difference was noted in the 1st week in that the open house cage was found to have higher mortality rate by 2%. This difference is attributed to the superior brooding management in the semi-closed house cage, which allows for better regulation of temperature, humidity, and air circulation. In coherence, (Nuryati, 2019) affirms that high mortality rate can result from the lack of effective brooding management, health problems, low DOC body weight, inadequate feed and drinking water, and uneven distribution. Exceeding 5%, the mortality rate in the open house cage is deemed serious. This is in line with (Marom et al., 2017) who contend that the standard mortality rate for broiler chickens is 5%.

Table 1. Comparison of average body weight gain, body weight, FCR, mortality and performance index between sample groups of broiler chickens

Variable	Cage Types	
	Semi Closed House	Open House
BWG (g)	2058.67±146.68	1854.67±113.19
BW (g)	2110.67±146.65	1906.67±115.14
FCR	1.48±0.07	1.57±0.12
Mortality (%)	4.03±2.50	6.97±1.95
PI	393.33±51.48	325±37.59

Description: BWG (body weight gain), BW (body weight), FCR (feed conversion ratio), and PI (performance index)

During the 2nd to 5th weeks of maintenance, no significant differences were found. The temperature in the semi-closed house cage ranges from 24.3-26°C, that in the open house cage ranges from 23 to 28°C. (Maulana, 2018) mentions that the ideal temperature for broiler chickens after the pre-starter to finisher period is between 23-26°C. This may happen because the temperature in the semi-closed house and semi-open house system is both at the ideal temperature. The mortality rate is also influenced by the population density in the cage, leading to increased temperature. In this study, the density in the open house cage was considered ideal because the cage area was 300m² and it contained approximately 2,200-2,400 chickens. (Medion, 2015) affirms that the ideal density for keeping broiler chickens in open house system is 6-8 chickens/m², while semi-closed houses can accommodate 10-12 chickens/m².

At the end of the rearing period, it is important to calculate the PI to evaluate the extent to which desired productivity has been achieved. While no noteworthy increase is identified in PI, the results resonate with (Pakage et al., 2020), noting that open house cage tends to result in lower PI, with a good PI of 325. In contrast, semi closed house can reach a very good PI of 393. (Pakage et al., 2020) argue that PI between 326-350 is categorized as good, while the range between 351-400 is considered very good.

CONCLUSION

The study concludes that there is a significant difference in the mortality rates between different types of cages during the first week of rearing. Notwithstanding, there is no significant difference in mortality rates between semi-closed and open house cage types from the second week to the fifth week. In addition, the performance metrics, which include body weight gain, body weight, feed conversion ratio, and performance index of broiler chickens over the 35-day rearing period, demonstrate no noteworthy differences between open house and semi-closed house.

ACKNOWLEDGMENT

The author expresses gratitude to the Faculty of Agriculture, University of Jember, and PT. Surya Inti Ternak Company for their support in this research.

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