

Original Research Article

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Influence of Cage Density on the Growth and Mortality Rate of Broiler Chickens (0 to 2 Weeks)

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ABSTRACT

Broiler chicken products make a great contribution to meeting the needs of protein of animal origin. Annual chicken meat requirement increased because the price is accessible to all levels of society. The objective of this study is to find out the influence of cage density on the performance of broiler chicks in the initial phase with the same type of food. The investigation was carried out at the campus facilities of Instituto Politécnico de Betano (IPB) located at the village of Betano, Administrative Post of Same, Municipality of Manufahi, located in the south of Timor Island, approximately 94 km from the city of Dili. Around 160 broiler chickens were used, divided into four groups, each consisting of 40 chickens, and placed in cages of different sizes. The sizes of the cages are as follows: D1 (1m²), D2 (1.2m²), D3 (1.4m²), D4 (1.6m²). The feed provided was commercial feed with code BR1 during the observation period. The method used was the observation method with the same intensive treatment and measurement of indicators that determine the productive performance of chickens. The variables observed were feed consumption, conversion rate, and average daily weight gain and mortality rate. The results showed that there was no significant difference in the variables observed between cages with different sizes. However, descriptively, the results show that the cage with 1m² of sizes is better, especially in relation to feed conversion and average daily weight gain of the chickens. This means that the ideal cage size for raising 40 broiler chickens is 1m², and when using a larger cage can reduce the productive performance of the chickens.

Keywords

Density, cage, broiler chickens, initial phase, performance

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Introduction

Broiler chickens are produced by modern technology in breeding, they have the highest rate of growth and are therefore economically advantageous. The benefits can

be in the form of good chicken growth, good carcass production and ideal meat with by-products that can also be utilized. Broiler chicken farming consists of three phases, namely the initial phase of 0-2 weeks, the growth phase of 2-6 weeks and the final phase of 6-8 weeks.

According to [Rasyaf \(2006\)](#) Since broiler chickens are human-designed and have undergone years of genetic selection, they can be sold in as little as 21 to 40 days after reaching 8 weeks of age. However, when they are sold, they must meet specific body weight requirements and have a wide chest with an abundance of meat.

Various stages of a chicken's growth require varying amounts of proteins and metabolic energy. The initial phase of chickens requires about 23% protein with a metabolic energy of 3,200 Kcal/kg, and the growing phase requires 20% protein with a metabolic energy of 3,200 Kcal/kg. The final phase requires about 18% protein with metabolic energy of 3,200 Kcal/kg ([NRC, 1984](#)), due to which the protein requirement in the initial phase is greater than in the growth and final phases.

Feeding with high protein content in the initial phase is expected to optimize the growth of broiler chicks, thus increasing body weight at the beginning of feeding. According to [Yohani \(2013\)](#), the most critical phase in raising broiler chickens is during the initial phase of the first 1 to 10 days, due to this phase really determines the subsequent performance of the chicken. In addition to the influence of the quality of the feed provided, the cage's stocking density is also one of the determining factors in the growth of broiler chicks. When chickens are in high density, it can cause slow performance due to high competition and stress.

The size of the cage is very important to guarantee chickens' welfare and it impacts the growth of broiler chicks. A cage that is too narrow will certainly stress the chickens due to limited space to move around and consume the diets offered as much as possible. Meanwhile, a cage that is too large is very ineffective. Therefore, the first thing to do is pay attention to determining the size of the chicken coop. The objective of this study is to find out the effect of cage density on the performance of broiler chicks in the initial phase with the same type of diet.

Materials and Methods

Research Site

The study was carried out at the campus facilities of Instituto Politécnico de Betano (IPB) located at in the village of Betano, Municipality of Manufahi, Timor-Leste. The municipality of Manufahi located in the south of Timor Island, approximately 94 km from the city of

Dili. The average temperature at the research site is 25⁰C and in the afternoon it is always cloudy.

Chickens and Cage

Around 160 broiler chickens were used, divided into four groups, each consisting of 40 chickens, and placed in cages of different sizes. The sizes of the cages are as follows: D1 (1m²), D2 (1.2m²), D3 (1.4m²), D4 (1.6m²). The feed provided was commercial feed with code BR1 during the observation period.

Research Method

To gather the research data, an experimental approach was taken. The chickens receive the same intensive treatment and measurement of indicators that determine the productive performance. The variables observed were feed consumption, conversion rate, and average daily weight gain and mortality rate. The data obtained was analyzed descriptively to determine the best performance among the four groups based on cage density according to the recommendation of [Sampurna and Nindhya \(2008\)](#).

Results and Discussion

The result of the descriptive statistical analysis on the variables observed in the study as described in Table 1 and Figure 1 and Figure 2 below.

The results in Table 1 shows that there was no greater effect of difference in feed consumption, feed conversion rate and average daily weight gain of chickens between cages with different sizes. However, the cage with code D1 is better, especially regarding feed conversion and the average daily weight gain of the chickens. This means that the ideal cage size for raising 40 broiler chickens is cage D1 (1m²) or 0,025m²/ chick (Figure 1), and when using a larger cage, it will hinder the productive performance of the chickens. Figure 2 shows that there was an increase in feed consumption per day in each cage and the greatest increase occurred on the 7th and 8th day of age of the chickens (Figure 3).

There are several important factors that need to be considered to improve broiler growth such as cage stocking density. The research results show that a cage with code D1 with a size of 1m² (0,025m²/chick) is better for housing 40 chickens aged 0 to 2 weeks. The chicks allocated to the cage D1 showed a little higher

performance in feed consumption, feed conversion, daily weight gain and percentage of feed consumption efficiency. Due to the limited space in cage D1, the high feed consumption is neither excessive nor insufficient for the broiler chicks. As a result, the feed is efficiently used in a comfortable cage environment and there was an increase in feed consumption each day, but the biggest increase occurred when the chicks reached the age of 7 to 8 days and returned to normal when the chicks reached 10 days of age or more as shown in Figure 2. On the other hand, in general, the average increase in daily diet consumption approximately the same in the four cages (Figure 3). The size of the cage needs to be adjusted to the number of chickens to be housed. A cage that is too small will make it difficult for the chickens to move and interact, while a cage that is too large can cause stress

(Gustira *et al.*, 2015). According to Wahyu (2004), factors that can influence the level of feed consumption are not only influenced by the body weight of the chicken, but also by activity, temperature, cage environment, environmental conditions, chick health, and the comfortable cage conditions. The more the chick grows, it needs more amount of feed consumed, and the amount consumed each week will increase compared to the previous week (Fadilah, 2004).

According to Nuriyasa and Astiningsih (2002), the higher the density in the cage, the higher the temperature and water vapor released into the cage environment. Feed consumption is the amount of feed consumed in a given period which will be used by the animals to provide vital needs and other nutrients to promote growth.

Table.1 The average value of the variables observed in the Study

Cage & Size	N observed	ADI (g)	FCR	ADWG (g)	DCE (%)	Mortality rate (%)
D1 (1 m ²)	40	49,36	1,19	41,36	83,79	0
D2 (1,2m ²)	40	50,00	1,21	41,29	82,57	0
D3 (1,4m ²)	40	50,00	1,23	40,79	81,57	0
D4(1,6m ²)	40	49,36	1,24	39,93	80,90	0

Obs.: D1-D4: Cage; ARC: average dietary intake; FCR: Feed rasion rate' ADWG: Average daily weight gain; DCE.: diet consumption efficiency.

Figure.1 The average stocking density (m²/ chick) in each cage.

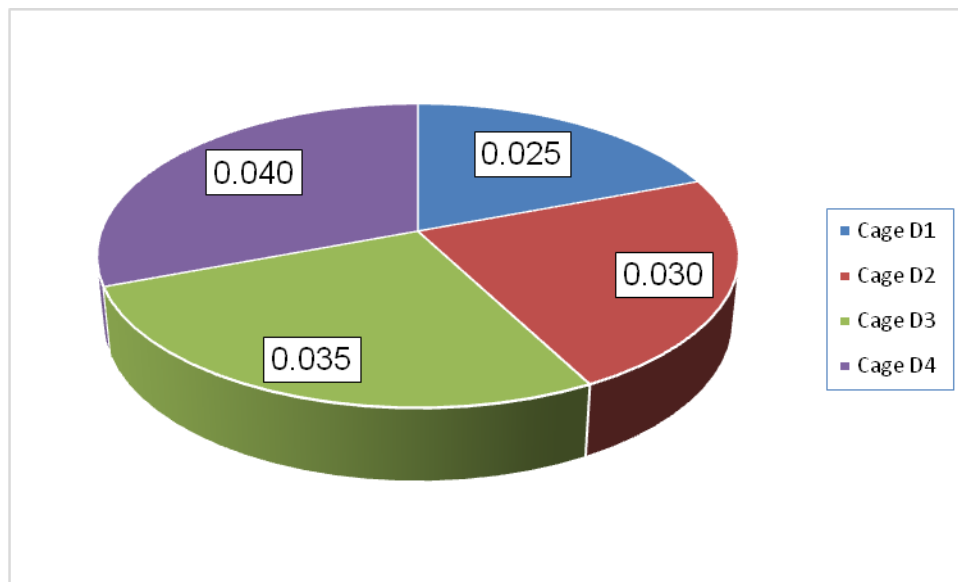


Figure.2 Increased of feed consumption per day per chick in each cage.

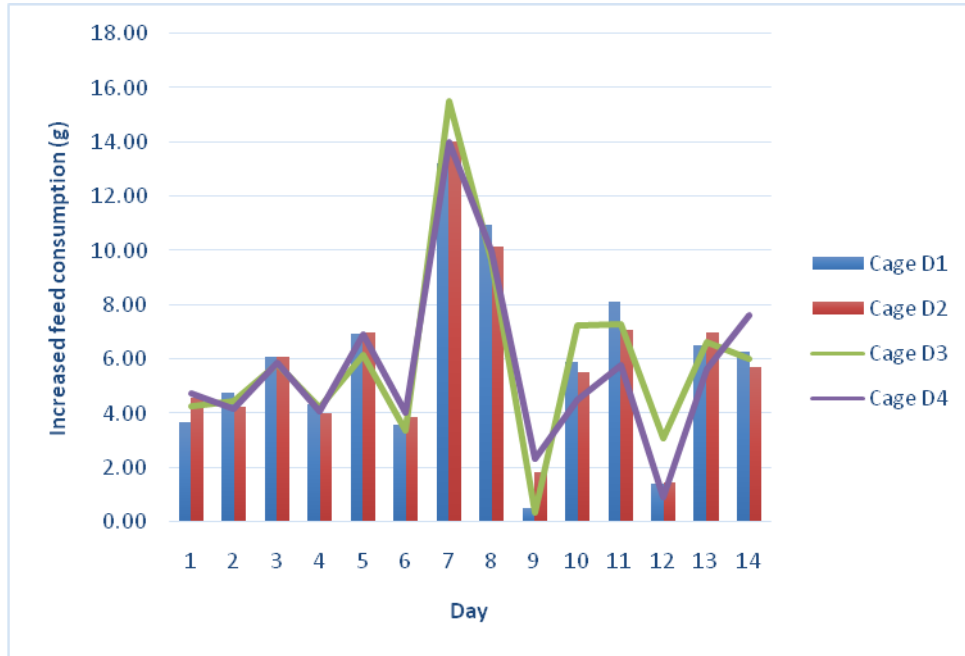
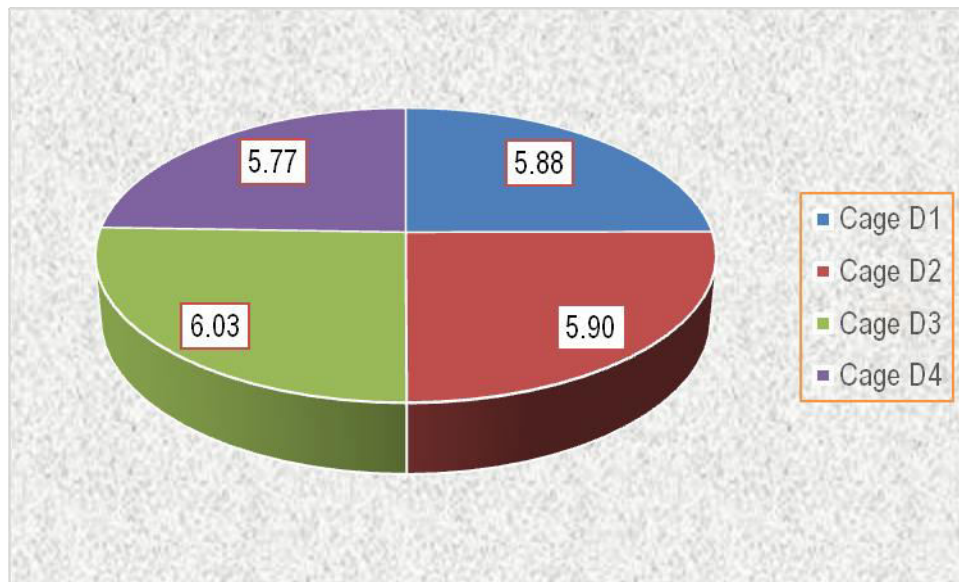


Figure.3 General average increase feed consumption per day (g) in each cage



A high level of density in the cage will hinder less uniform growth of chicks due to internal competition in the consumption of feed and drinking water, so many chickens will be discarded. According to [Gustira et al., \(2015\)](#), cage that is too dense will increase competition for food and drinking water as well as oxygen. The large number of chickens in the cage is one of the factors that cause stress with dietary changes and various behavioral

changes in chickens ([Iskandar et al., 2009](#)). [Bell and Weaver \(2002\)](#) stated that increasing cage density causing reduced feed intake, decreased growth and feed efficiency, increasing mortality, and cannibalism. According to [Cooper and Washburn \(1998\)](#) that high environmental temperatures cause an increase in body temperature in broiler chickens which is characterized by a decrease in body weight gain and consumption rations.

The results showed that there was no significant difference in the variables observed between cages with different sizes. However, descriptively, the results show that the cage with 1m² of sizes is better, especially in relation to feed conversion and average daily weight gain of the chickens. This means that the ideal cage size for raising 40 broiler chickens is 1m² (0.025 m²/chick), and using a larger cage can harm the productive performance of the chickens.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Author Contribution

Pedro de Deus: Investigation, formal analysis, writing—original draft. Celestino Gonçalves Talo Mali: Validation, methodology, writing—reviewing. Acacio Cardoso Amaral:—Formal analysis, writing—review and editing. Liborio Ximenes, José Mendes: Investigation, writing—reviewing. Carlito de Araújo Mali Code: Resources, investigation writing—reviewing. Graciano Soares Gomes: Validation, formal analysis, writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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