Early production performance of crossing chickens raised on indoor or with outdoor access

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Abstract. An experiment was conducted to determine the effect of the rearing system and feed on early growth performance of crossing chicken (male local chicken x female Isa Brown final stock laying chicken). One hundred 1-d-old chicks were randomly assigned to 2 factor treatments, the first factor was rearing cages (indoor and outdoor access) and the second factor was feed ration (20% and 17% crude protein). In the indoor treatment, the chickens were housed in floor pens (5 birds/m2). In the outdoor access treatment, the chickens were housed in a similar indoor house; in addition, they also had an outdoor grass paddock (5 birds/m2). All birds were provided ad libitum water and were raised from 14 to 35 days of age. The results showed that early production performance (average daily gain, feed intake and feed conversion ratio) were different among treatment (P>0.05) at 28 and 35 days.

1. Introduction

The rearing of local chickens has not shown optimum productivity, due to local chickens have relatively slower growth and lower egg production compared to purebred chickens. The slow growth of local chickens was caused by the low quality of their genetics [1] [2]. Efforts should be made to increase the productivity of these local chickens.

The performance of local chickens can be improved by improving feed, maintaining and improving genetic quality through the crossing process[3][4]. One of the local chickens that are commonly crossed is the Bangkok chicken, actually most of this chicken was crossing between pure male Bangkok with Kampung chicken [5]. Bangkok chickens are generally kept as fighting cock, because they have a larger and stockier morphology than native chickens in general. Besides being used as fighting chickens because they have high body weight gain, these chickens can be used to produce local broilers through crosses with broilers or layers. Free-range chickens are able to reach a weight of 0.85 kg within 2 months of rearing compared to native chickens which only reach a weight of 0.50 kg [6].

Improving the performance of local chickens which includes body weight gain, feed consumption, mortality and feed conversion is not enough just to be crossed, but other factors also need to be considered, for example, feed and environmental factors, especially the cage used to raise the crossbred chickens. Improving the growth performance of Bangkok chickens can be done through improving the quantity and quality of the diet [7]. The previous studies showed that the protein requirement for crossbreed Bangkok chicken was 20% and the Metabolic Energy content in the feed was 2,800 Kcal/Kg during its growth period [8]. Local chickens in the growth period require 17% protein and metabolic...
The protein and energy requirements for native chickens lower than broilers. There is a difference between the protein requirements of cross-bred chickens and local chickens with relatively expensive feed prices and limited availability, it is necessary to determine the optimal protein content for the growth of chicken crosses.

On the other hands housing factor also determines the growth of livestock. According to [10], chicken coops based on the type of wall or ventilation are divided into closed cages (indoor) and open cages (outdoor). The use of the cage system also affects feed consumption, the use of a wider cage makes chickens require a lot of energy to mobilize, so that feed consumption also increases [11]. The purpose of this study was to evaluate the effect of cages and feed on the performance of Bangkok chickens and broilers.

2. Material and methods

2.1. Animal and treatments

A total of 100 crossbred one day old chicks (DOC) derived from natural mating between male Bangkok chickens and female chickens (Isa Brown) with a sex ratio of 1:10. The DOC were housed in a brooder battery cage made of wire with a density of 20 birds per cage until the age of 2 weeks. After 2 weeks of age divided into 2 treatment factors, the first factor is the raising cage with indoor or outdoor access (A1 = outdoor and A2 = indoor access) with a cage size of 1m² for 10 chickens and the second factor is diet, containing crude protein (CP) content 20 % (B1) and 17% (B2) with metabolic energy of 2900 kcal/kg. One unit of cage was used as the treatment unit.

All chicks were given Newcastle and IBD vaccines, antibiotics, minerals and vitamins as needed. The ingredients were used in diets are corn, palm kernel, fish meal, rice bran, oil and premix. The diets were prepared in crumble.

2.2. Performance data collection

SPSS 26 software was used to analyze the studied traits of the average body weight gain, feed intake and feed conversion ratio at 21 days to 35 days old of treatment, assuming the Completely Random Factorial Design. The test of LSD was conducted to diagnosing the significant differences between the means of the levels of each factor.

3. Result and discussion

3.1. Feed intake

The result of the present study showed that there was a significant effect of cage to feed intake in the 28 to 35 days. The average feed intake for each treatment is showed in Table 1. with an average range of 113.84 g/head to 211.30 g/head at the age of 21 days to 35 days, it average is lower than the results of research by [5]. Feed intake in indoor cages was higher than outdoor cages at the age of 28 and 35 days, chickens reared outdoors consumed less feed due to initial stress and adjustment to the environment. In accordance with the results of research by [11] that different types of cages have a very significant effect on feed intake, and feed intake is influenced by environmental temperature, chicken health, cages, feed containers, nutrient content in feed and stress that occurs [12]. The temperature in the outdoor cage is higher so that stress can occur which will affect the decrease in feed consumption resulting in a decrease in body weight [13].

The protein content of feed does not affect feed consumption because the energy content of the treatment feed is the same according to the opinion that the high consumption of chicken feed is influenced by the energy content of the feed, crude fiber, density of feed type or density and crude fat.
Table 1. Mean of feed intake at the growth period of crossbred chickens (g/head/week)

| Days | Cage (A)      | Feeding (B) | Average | P value |     |
|------|---------------|-------------|---------|---------|-----|
|      |               | B1          | B2      |         |     |
| 21 d | A1 (outdoor)  | 115.45±18.9 | 112.24±19.3 | 113.84±18.1 | 0.45 | 0.81 | 0.98 |
|      | A2 (indoor)   | 124.28±33.2 | 121.76±30.3 | 123.00±30.0 | 0.45 | 0.81 | 0.98 |
|      | Average       | 119.86±25.9 | 117.00±24.5 |         |     |     |     |
| 28 d | A1 (outdoor)  | 157.22±10.9 | 146.78±13.3 | 152.0±10.9 | 0.01** | 0.73 | 0.46 |
|      | A2 (indoor)   | 168.28±7.6  | 164.78±6.6  | 167.0±7.1  | 0.01** | 0.73 | 0.46 |
|      | Average       | 163.25±8.8  | 155.78±13.7 |         |     |     |     |
| 35 d | A1 (outdoor)  | 192.22±22.9 | 170.94±27.1 | 181.57±26.2 | 0.005** | 0.45 | 0.14 |
|      | A2 (indoor)   | 207.69±11.6 | 204.92±15.9 | 211.30±13.6 | 0.005** | 0.45 | 0.14 |
|      | Average       | 199.93±18.9 | 192.93±31.2 |         |     |     |     |

Notes: ** The different superscript letter within a column showed the significantly different (P<0.05) BNJ 5%

3.2. Body weight gain

Body weight gain is an important factor to consider in observing chicken performance. The result of this study showed that there was a significant effect of diet to body weight gain from 21 to 35 days, but the outdoor or indoor access had no effect on body weight gain, according research [13]. However, in other studies, the weight gain with the free-range treatment were lower than with the indoor treatment [14].

Table 2. Mean of body weight gain at the growth period of crossbred chickens (g/head/week)

| Days | Cage (A)      | Feeding (B) | Average | P value |     |
|------|---------------|-------------|---------|---------|-----|
|      |               | B1          | B2      |         |     |
| 21 d | A1 (outdoor)  | 68.11±7.05  | 44.16±6.53 | 56.13±14.2 | 0.94 | 0.001** | 0.799 |
|      | A2 (indoor)   | 67.25±2.91  | 44.65±8.6  | 55.95±12.7 | 0.94 | 0.001** | 0.799 |
|      | Average       | 67.68±5.11  | 44.51±5.85 |         |     |     |     |
| 28 d | A1 (outdoor)  | 97.53±24.6  | 52.89±16.64 | 75.21±30.75 | 0.311 | 0.001** | 0.880 |
|      | A2 (indoor)   | 108.20±22.1 | 60.83±14.34 | 84.51±30.56 | 0.311 | 0.001** | 0.880 |
|      | Average       | 102.86±22.79 | 56.86±15.23 |         |     |     |     |
| 35 d | A1 (outdoor)  | 122.90±16.15 | 57.25±19.43 | 90.07±38.48 | 0.436 | 0.001** | 0.578 |
|      | A2 (indoor)   | 124.56±16.47 | 67.11±11.45 | 95.83±33.09 | 0.436 | 0.001** | 0.578 |
|      | Average       | 123.73±15.40 | 62.18±15.91 |         |     |     |     |

Notes: ** The different superscript letter within a column showed the significantly different (P<0.05) BNJ 5%

The growth of crossing increasing until 35 days due to in the growth phase showed on Figure 1. The weight gain of crossing chicken increase or grow rapidly at the age of 1 - 2 months and decreasing at the age of 2 - 3 months. This is in line with the opinion of [15] which states the growth of chicken body weight will be fast and reach a specific weight at a young age.

3.3 Feed efficiency

Feed Conversion Ratio (FCR) in crossing chickens was significantly affected by diet, while the cage indoor or author factor does not have a significant effect, however, in other studies feed conversion ratio with the free-range treatment were lower than in the indoor treatment [14]. Dietary 20% crude protein gave a better conversion rate (p<0.05) in the range of 1.63 when compared to the feed containing 17% crude protein. It can be seen that the longer it takes for chickens to reach a certain body weight, give lower efficiency to use of feed.
Table 3. Mean of feed conversion ratio (FCR) at the growth period of crossbred chickens

| Days | Cage (A)       | Feeding (B)     | Average | P value |
|------|----------------|-----------------|---------|---------|
|      |                | B1              | B2      | A       | B      | AxB   |
| 21 d | A1 (outdoor)   | 1.70±0.30       | 2.59±0.65 | 2.15±0.67 | 0.529  | 0.006* | 0.921 |
|      | A2 (indoor)    | 1.86±0.65       | 2.81±0.94 | 2.34±0.88 |        |        |      |
|      | Average        | 1.78±0.43       | 2.70±0.77 |         |        |        |      |
| 28 d | A1 (outdoor)   | 1.68±0.37       | 3.03±1.08 | 2.35±1.04 |        |        |      |
|      | A2 (indoor)    | 1.63±0.39       | 2.86±0.84 | 2.25±0.89 | 0.739  | 0.01** | 0.872 |
|      | Average        | 1.66±0.36       | 2.94±0.91 |         |        |        |      |
| 35 d | A1 (outdoor)   | 1.59±0.31       | 3.25±1.05 | 2.42±1.14 |        |        |      |
|      | A2 (indoor)    | 1.69±0.28       | 3.31±0.79 | 2.50±1.02 | 0.792  | 0.001**| 0.945 |
|      | Average        | 1.64±0.28       | 2.46±1.05 |         |        |        |      |

Notes: ** The different superscript letter within a column showed the significantly different (P<0.05) BNJ 5%

4. Conclusion
It could be concluded that the performance of early growth performance of crossing chicken between Bangkok chicken and layer chicken have good performance in the indoor or outdoor cages with nutritional content of 20% crude protein and energy metabolize 2900 kcal/kg.

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