The Production Performance and Meat Quality of Kampung Unggul Balitbangtan (KUB) Chicken Fed with Food Containing Indigofera Meal

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Abstract. This study aimed to determine the production performance and meat quality of KUB chicken meat fed with food containing Indigofera meal. In total, 36 female KUB chickens were raised within the period of 4 to 19 weeks in The Agricultural Technology Research and Assessment Installation, Gowa, South Sulawesi. The experimental design was a complete randomized design divided into three treatments with 12 replications. In addition, the given treatments were categorised as R1 (100% commercial feed), R2 (75% commercial feed, 10% Indigofera meal, 5% bran, 9% corn, and 1% red ginger meal), and R3 (50% commercial feed, 15% Indigofera meal, 9% bran, 25% corn, and 1% red ginger meal). The parameters measured were slaughter weight, carcass weight, and nutritional content of meat. The results showed that the treatment of feed significantly affected (P <0.05) the slaughter weight and carcass weight of KUB chicken. R2 treatment showed the highest slaughter weight and carcass weight compared to other treatments, which are 1069.5 g/head and 701.2 g/head. Furthermore, the meat crude protein and crude fat analysis indicated that R2 treatment had the highest crude protein (30.18%), lowest fat (0.11%), and cholesterol content (47.8 mg/100 g). Conclusively, the addition of 10% Indigofera meal to the feed was able to improve the production performance and meat quality of KUB chicken.

Keywords: Performance, meat quality, KUB chicken, Indigofera meal

1. Introduction

Native chickens are widely reared in a local poultry system by communities in rural areas. They have the potential to produce meat and eggs and can also adapt to different environmental conditions. Also, the texture of the meat is different from that of broilers, hence, the major reason for its high demand by consumers [1]. The consumption of Native chicken meat and eggs yearly has increased rapidly thereby leading to a high increase in community income, although, local chicken production has not been able to satisfy the community's end needs. For this reason, it is necessary to improve the production process of village chickens which have high egg production values as well as good meat quality. Kampung Unggul Balitbangtan (KUB) is a chicken research Center by the Ciawi Bogor Livestock Research Institute. However, KUB chicken has been certified as the best by the Agricultural Technology Research and Development Agency of the Ministry of Agriculture since 2009. This is the major reason for selecting female lines for six generations with advantages over ordinary native chickens [2]. The benefits
of KUB chickens are that egg production can reach 180 eggs per year, the weight of KUB hens ranges from 1200 - 1400 g/head at the first age of laying eggs, that is, 160-180 days or 5.5 - 6 months. Meanwhile, adult roosters weigh 1300-2000 g/head. Hatchability (fertility) reaches a level of 80 - 90% with natural mating and hatchability up to 72%. This means that KUB chickens still have the same hatchability as their ancestral native chickens in terms of incubation and egg production [3].

In poultry production, about 70% of the total expenditure cost was attributed to feeding cost [4]. Therefore, using local feed ingredients can serve as an alternative to reduce production cost. Furthermore, the local feed ingredients used should contain all the essential nutritional content needed by livestock, which must be cheap and also easy to acquire [5]. One of the efforts to achieve this purpose is by utilizing easy, and non-conventional ration materials found in the farm's vicinity.

*Indigofera* sp is a leguminous shrub that contain high level of nutrients (protein, calcium, and phosphorus) and it can be found in Gowa axis [6]. However, Indigofera has been widely used as cattle feed, but has not been fully introduced as chicken feed [7]. According to Koten B.B et al., (2014) it was discovered that in a year plantation and three months of interval defoliation, *indigofera* contain an average crude protein of about 23.20% [8].

This study aimed to determine the product performance and quality of KUB chicken meat fed with Indigofera meal.

2. Material and Method

2.1. Research Implementation

This study was conducted in the trial farm of The Assessment Institute of Agricultural Technology South Sulawesi, Gowa, Indonesia. It was aided with the construction of six different unit stage cages made of bamboo slats with dimensions 120 cm x 100 cm x 50 cm. Each unit consists of 6 female KUB chicken making a total of 36 KUB chickens. However, the KUB chickens used were reared within the period of 4 to 19 weeks. Furthermore, a completely randomized design which is divided into three treatments and 12 replications, was used. Hence, the composition and substance content of the research feed was presented as shown in Table 1.

| No | Ingredient                  | R1   | R2   | R3   |
|----|-----------------------------|------|------|------|
| 1  | Commercial feed             | 100  | 75   | 50   |
| 2  | Local ingredient            |      |      |      |
|    | - Bran                      | 0    | 5    | 9    |
|    | - Indigofera meal           | 0    | 10   | 15   |
|    | - Maize flour               | 0    | 9    | 25   |
|    | - Red ginger meal           | 0    | 1    | 1    |
|    | Amount                      | 100  | 100  | 100  |

* Source: The animal feed chemistry laboratory of the Faculty of Animal Science, Hasanuddin University, Makassar, South Sulawesi Indonesia.

2.2. Crude Protein (%)*

| No | Nutrient                  | R1    | R2    | R3    |
|----|---------------------------|-------|-------|-------|
| 1  | Crude Protein (%)         | 16.54 | 16.94 | 16.71 |
| 2  | Metabolic energy (kcal/kg)*| 3431  | 3288  | 3393  |
| 3  | Crude fat (%)             | 5.11  | 5.27  | 6.26  |
| 4  | Crude fiber (%)           | 0.12  | 5.18  | 5.60  |

Stages of making Indigofera meal were as follows:

(1) Fresh Indigofera leaves harvested were aerated without direct sun exposure for one day to preserve its color.

(2) It was dried in the sun for ± 10 hours, after which it was grinded to form a meal.
The feed is in the form of fine dry meal and the proportion given is according to the age of the livestock as represented in Table 2. Also, drinking water was given as libitum.

| Age (week) | Feed requirements (g/head/day) |
|------------|-------------------------------|
| 0 - 1      | 10                            |
| 1 - 2      | 15                            |
| 2 - 3      | 20                            |
| 3 - 4      | 25                            |
| 4 - 5      | 30                            |
| 5 - 6      | 40                            |
| 6 - 7      | 50                            |
| 7 - 8      | 70                            |
| 8 - 9      | 90                            |
| 9 - 19     | 100                           |

2.2. Measured Parameters

2.2.1. Slaughter Weight and Carcass Weight
Slaughter weight measurements are the final weights measured before slaughtering. However, the chicken was fasted for 8 hours, and was slaughtered manually with a knife using the Kosher method. This reduces the volume of gut contents and bacteria, thereby eliminating the risk of contamination of the carcass during dressing [9]. Carcass weight refers to the weight of the chicken after being butchered, removing all the internal organs, feathers, and oftentimes the head, as well as inedible (or less desirable) portions of the legs [10].

2.2.2. Nutritional Content of Meat
The nutritional content of meat is in the form of crude protein, crude fat, and cholesterol content obtained by comparative method [11]. This crude protein and crude fat were analyzed in the animal feed chemistry laboratory of the Faculty of Animal Science, Hasanuddin University, Makassar, Indonesia. Also, the cholesterol of meat content was analysed in the analysis and calibration laboratories of the Indonesian Ministry of Industry's Agro-Industry Center based on the AOAC 994.10 test method 45.4.10.2005.

2.3. Data Analysis
The experimental design was analyzed using a completely randomized design (CRD) [12]. In addition, the data obtained were analyzed by diversity analysis (ANOVA), using the General Linear Model procedure according to S.P.S.S. instructions (version 23). The result will obey Duncan's multiple range test, when it shows a significant difference [13].

3. Result and Discussion

3.1. Slaughter Weight and Carcass Weight
Table 3 shows that the Indigofera meal mixture in the feed has a significant effect (P < 0.05) on KUB chickens considering the slaughter weight and carcass weight. Furthermore, R2 treatment resulted as the highest average slaughter weight of 1069.5g/head and R1 treatment was 1045.25g/head, while, the lowest slaughter weight was R3 treatment of value 981.25g/head. R2 and R3 feed were commercial feed with the addition of Indigofera meal and other local feed ingredients (Table 1). Moreover, the introduction of Indigofera meal makes the protein content of R2 and R3 feed to be slightly higher than the control feed (R1). Simanipurrak and Sirait (2009) [7], suggested that the crude protein and crude fiber content of Indigofera sp. are, 24.17% and 17.83% respectively. In addition, the high protein content
of feed was due to 10% Indigofera added to the meal which made the KUB chicken slaughter weight increased.

**Table 3.** The average slaughter weight and carcass weight of KUB chickens aged 19 weeks  

| Variable                | R1     | R2     | R3     |
|-------------------------|--------|--------|--------|
| Slaughter weight (g/head)| 1045.25b | 1069.5c | 981.25a |
| Carcass weight (g/head)  | 682 b   | 701.25c | 632.5a |

R1 (100% commercial feed); R2 (75% commercial feed, 10% Indigofera meal, 5% bran, 9% corn, 1% red ginger meal); R3 (50% commercial feed, 15%, Indigofera meal, 9% bran, 25% corn, 1% red ginger meal). Superscripts following the same values on the same line showed significant differences (P <0.05).

Moreover, when protein which is one of the important components necessary for livestock growth is absent, their production rate will be disrupted. The growth rate and feed efficiency of chicken improve with the increase in dietary protein. However, the addition of 15% Indigofera meal to R3 causes the KUB chickens slaughter weight to reduce. This effect is probably caused by high protein content, which also increases the crude fiber content. Crude fiber is one of the essential food substances in poultry ration because its function is to stimulate peristalsis movement of the digestive tract so that the digestion process of food substances runs well. Moreover, consumption of large amount of crude fiber can cause birds to feel full which in turn reduces the rate of feeding of birds [15].

Apart from crude fiber, the fat content in R3 feed was also high (6.26%) compared to other feed treatments. The fat content in the feed is a source of energy but when in excess, accelerates the process of rancidity of the feed. However, if the levels are low, it will decrease the absorption rate of vitamins (A, D, E, K), thereby reducing the palatability of the feed, and make the feed easily dusty [16].

The commercial feed (R1), has the lowest protein content and also the highest metabolic energy content. The proportion of protein and energy must be fulfilled in a balanced manner because when one is deficient, the physiology of the livestock will be affected. On the other hand, protein deficiency causes slow growth, and the chicken's body will be unable to utilize energy efficiently. Energy intake is considered as a fundamental factor in chicken production because it affects growth rate and carcass characteristics [18]. Since energy is required for the activities of life and the production of meat, hence its shortage can cause stunted growth. R2 treatment feed produced a carcass weight of 701.25 g/head, which is significantly higher than R1 (682g/head) and R3 (632.5g/head) respectively. These results indicated that carcass weight is closely related to the slaughter weight of the chicken. According to Solikin et al., (2012) [19], the excellent carcass must contain a lot of meat, low by-yield, and not so high fat, all of which are influenced by feed and maintenance.

3.2. **Nutritional Content of Meat**  
The Chemical quality of KUB chicken meat with the addition of Indigofera meal, containing protein, fat and cholesterol content can be seen in Table 4. Also, it shows, the feed with highest protein content which is R2 (30.18%). R1 has 26.62% and the lowest value is R3 at 23.56%. These results indicated that the addition of 10% Indigofera meal to the feed made the meat protein to increase than KUB chicken meat which was given only commercial feed. However, the addition of 15% Indigofera meal (R3) made the protein content of KUB chicken meat to decrease. This effect is probably influenced by the slightly low protein content of the feed and the high crude fiber content in R3 feed. The chemical properties of the meat produced is influenced by the type of feed consumed. Dewi (2013) [20]. The high crude fiber content makes it difficult for birds to digest feed easily and pass out faeces before the absorption process occurs [21].
Table 4. The nutritional content of KUB chicken meat with the addition of Indigofera meal

| Variable              | R1     | R2     | R3     |
|-----------------------|--------|--------|--------|
| Crude protein (%)     | 26.62  | 30.18  | 23.56  |
| Crude fat (%)         | 0.11   | 0.11   | 0.27   |
| Cholesterol (mg/100 g)| 47.1   | 47.8   | 60.4   |

Source : * The animal feed chemistry laboratory of the Faculty of Animal Science, Hasanuddin University, Makassar, South Sulawesi Indonesia. ** Analysis and calibration laboratory for the Indonesian Center for Agro-Industry, Ministry of Industry, Bogor Indonesia

Furthermore, the fat content of KUB chicken meat in R2 is the same as R1 (0.11%) while R3 has 0.27%. Also, Fat content has an inverse relationship to meat protein content therefore, If the fat content is low, the resulting protein content will be high and vice versa Khasrad et al., (2016) [22].

In addition, the cholesterol content of meat in R1 and R2 were not much different, that is 47.1 mg/100g and 47.8 mg/100g respectively, while in R3 the cholesterol content of KUB chicken meat was quite high, that is 60.4 mg/100g. These results indicated that the higher the Indigofera level in the feed, the higher the cholesterol content of KUB chicken meat. This is as a result of Indigofera having tannins, xanthophyll and a high content of crude fiber. Indigofera sp. has NDF 43.56%; ADF 35.24%; Ca 1.16%; P 0.26%; tannins 0.08% and saponins 0.41% Abdullah (2010) [23]. Although, Cholesterol content aids in the production of bile acids which help in the absorption of fat and to produce hormones [24].

4. Conclusion

The addition of 10% Indigofera meal to the feed was able to improve the production performance and meat quality of KUB chicken.

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