Slaughter weight, carcass and giblets percentage of broiler chicken with addition of Indigofera zollingeriana leaves in feed

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Abstract. This study was aimed to study the addition effect of Indigofera zollingeriana leaves flour in feed on slaughter weight, carcass and giblets percentage of broiler chicken. This research used completely randomized design (CRD) with 4 treatments and 4 replications. The treatments were P0 = control, P1 = feed containing 2% indigofera leaves flour, P2 = feed containing 4% indigofera leaves flour, and P3 = feed containing 6% indigofera leaves flour. The measured variables in this research were slaughter weight, whole carcass weight, carcass percentage, heart percentage, gizzard percentage, liver percentage, and abdominal fat percentage. The data obtained were analyzed using varian analysis based on completely randomized design and continued using Duncan’s Multiple Range Test. The result showed that addition of 2–6% Indigofera zollingeriana leaves flour in broiler feed did not give any significant effect on slaughter weight, whole carcass weight, carcass and giblets percentage, but gave a significant effect (P<0.05) on the abdominal fat percentage of broiler chicken. The addition of 6% indigofera leaves in broiler feed could reduce the abdominal fat content.

1. Introduction
Animal husbandry has an important role in meeting the needs of animal protein. Broiler chickens are a meat producer to meet the protein needs which are in great demand by the public. According to Rasyaf [1] and Nuraini et al [2], broiler chickens are a type of broiler that has been bred specifically for marketing at a relatively young age, has fast growth, and has a wide chest with a lot of meat piles.

The carcass is the main result expected in the broiler chicken farm. The percentage of the carcass is an important factor in assessing the production of broiler chicken because carcass production is closely related to living weight. As livestock live weight increases, carcass production will increase. According to Hafid (2011) and Hafid et al (2017) that good carcass has a high percentage of the carcass to live weight with maximum meat yield [3,4]. The percentage is a calculation to determine the quality of broiler chicken. Commonly found commercial cuts include the chest, thighs, wings and back. The quality carcass will provide better meat quality [4,5].

Good quality poultry rations are rations that can meet the nutritional content needed by livestock for the needs of life, growth and reproduction. The ration that is usually given is a commercial ration mixed with local feed ingredients. One of the local raw materials that are an alternative feed ingredient which has high nutritional content which is good for animal feed is Indigofera zollingeriana leaves. Indigofera zollingeriana leaves are local raw materials that are used as additional feed for poultry.
Indigofera zollingeriana is a type of legume plant that is rich in nitrogen, potassium, calcium, and phosphorus. Indigofera zollingeriana has a high protein content of 27%, 15.25% crude fiber, 0.22% calcium and 0.18% phosphorus [6]. Akbarillah et al (2010) [7] stated that the use of fresh indogofera zollingeriana as much as 10% in feed still has a good effect on egg production, egg weight and improvement of egg yolk color in ducks. Akbarillah et al (2008) [6] also stated that indigofera zollingeriana leaf meal can be used as a quail feed supplement up to 10%.

2. Method
This research was conducted in November 2019 at the Laboratory of the Poultry Unit, Faculty of Animal Science, Halu Oleo University, Kendari. This research used a self-mixing feed that consisted of BP-11 concentrate, yellow corn, rice bran, and indigofera leaves and containing 3100 kcal/kg metabolizable energy and 18% crude fiber (table 1). A total of 64 day old chicks of broilers were divided into 4 treatments and 4 replications based on completely randomized design. The applied treatments were P0 (feed without indigofera leaves flour), P1 (feed containing 2% indigofera leaves flour), P2 (feed containing 4% indigofera leaves flour), and P3 (feed containing 6% indigofera leaves flour).

| Feedstuff                  | Percentage | BP-11 concentrate | Yellow corn | Rice bran | Indigofera leaves flour |
|----------------------------|------------|-------------------|-------------|-----------|-------------------------|
| Nutritional Content        |            |                   |             |           |                         |
| Metabolizable energy (kcal/Kg) | 3,130  | 3,126  | 3,128  | 3,124  |
| Crude protein (%)          | 18.5       | 18.0  | 18.0  | 18.0  |
| Crude fiber (%)            | 4.8        | 4.8   | 4.9   | 5.0   |
| Extract ether (%)          | 5          | 5.4   | 5.4   | 5.4   |
| Ca (%)                     | 1.1        | 0.8   | 0.8   | 0.8   |
| P (%)                      | 0.9        | 0.7   | 0.7   | 0.7   |

Broiler chickens were reared since day old chick until 5 weeks of age. Feed was given twice a day, in the morning at 07:00 and at 16:00, while drinking water was given every day on an adlibitum basis. After reaching the age of 5 weeks, 32 chickens were slaughtered for observation of slaughter weight, carcass weight, carcass percentage, giblets percentage and abdominal fat. Before being cut, the chickens have fasted for 6 hours. The slaughter was done in a halal manner according to Islamic law. Then the carcass weights were collected by cutting the head and legs to the knees and doing evisceration, then weighing the carcass. Furthermore, the giblets that consisted of gizzard, liver and heart were weighed. Gizzard was weighed by weighing the whole gizzard, then extracting the contents. After that, weighing the weight of abdominal fat that obtained from fat attached to the digestive organs such as the gizzard, intestine, cloaca and a little bit in the heart. The data obtained were analyzed using analysis of variance based on completely randomized design and continued using Duncan’s Multiple Range Test [8].

3. Result and discussion
The average of slaughter weight, carcass weight, carcass percentage, giblets percentage, and abdominal fat percentage were presented in table 2.

3.1. Slaughter weight
The slaughter weight obtained in this research was presented in table 2. Indigofera zollingeriana leaves flour treatment had no significant effect (P>0.05) on slaughter weight. The lowest slaughter weight was found at P1 of 2% indigofera leaves, namely 1,881 g/head, while the highest slaughter weight for broiler
chickens was found in treatment P0, namely 1,998 g/head. Slaughter weight in this study was classified as low. The low slaughter weight was caused by low/small ration consumption so that the nutritional needs of the broiler’s body are not sufficient. This shows that indigofera leaf meal did not effect on the increase in body weight (slaughter weight) of broiler chickens. According to Akbarillah et al (2008), although Indigofera zollingeriana contains quite a high protein of 27.0%, it has crude fiber of around 15.25% [6].

Table 2. The average of slaughter weight, carcass weight, carcass percentage, giblets percentage, and abdominal fat percentage.

| Parameters               | Treatments          |          |          |          |
|--------------------------|---------------------|----------|----------|----------|
|                          | P0                  | P1       | P2       | P3       |
| Slaughter weight (g)     | 1,998±84.48         | 1,881±137.95 | 1,921±49.29 | 1,899±157.38 |
| Carcass weight (g)       | 1,371±40.14         | 1,285±87.17 | 1,285±43.48 | 1,274±177.16 |
| Carcass percentage (%)   | 68.65±1.70          | 68.31±0.63 | 66.89±2.12 | 66.84±4.14 |
| Liver (%)                | 1.54±0.12           | 1.59±0.14 | 1.68±0.10 | 1.72±0.20 |
| Heart (%)                | 0.36±0.07           | 0.38±0.06 | 0.40±0.04 | 0.41±0.07 |
| Gizzard (%)              | 2.11±0.17           | 2.19±0.14 | 2.16±0.19 | 2.42±0.28 |
| Abdominal fat (%)        | 1.55±0.57           | 1.64±0.28 | 1.87±0.13 | 1.03±0.24 |

3.2. Carcass weight
The Indigofera zollingeriana leaves meal treatment had no significant effect (P>0.05) on carcass weight. The lowest average value of broiler carcass weight with Indigofera zollingeriana leaves flour was found in the P3 (feed containing 6% indigofera leaves meal), namely 1,274 g/head, while the highest carcass weight of broiler chickens was found in treatment P0, which was 1,371 g/head. This showed that there was no increase in carcass weight of broiler chickens, although Indigofera zollingeriana contains quite a high protein of 27.0% but has the crude fiber of around 15.25% [6].

3.3. Carcass percentage
The percentage of the carcass is obtained from carcass weight divided by live weight multiplied by 100% Brake et al [9]. Indigofera zollingeriana leaves meal treatment had no significant effect (P>0.05) on the percentage of the carcass. The lowest Indigofera zollingeriana leaves meal was found in the P3 treatment (feed containing 6% Indigofera leaves flour), namely 66.84%, while the highest percentage of broiler carcass was in the P0 treatment (control) which was 68.65%. This showed that the nutritional content of the ration with the provision of Indigofera zollingeriana leaves flour at the level of 2–6% in the ration did not effect on the percentage of broiler chicken carcass in each treatment.

3.4. Liver percentage
Giving Indigofera leaves flour to broiler chickens had no significant effect (P>0.05) on the percentage of the liver. The percentage value of broiler liver ranges from 1.54 to 1.72%. Addition Indigofera leaves flour on broiler feed did not affect the liver condition. All treatments showed that the percentage of liver was in a relatively normal range. Crawley et al (1980) stated that the percentage of broiler liver was 1.86% [10]. Rizkia (2013) explained that the percentage of broiler liver ranged from 1.88–2.03% [11].

3.5. Heart percentage
The addition Indigofera zollingeriana leaves flour in each treatment had no significant effect (P>0.05) on the percentage of broiler heart. The heart percentage of broiler chickens obtained in this research ranged from 0.36–0.41%, slightly higher than the percentage rate reported by Rizkia (2013) namely 0.31–0.34% and much lower that reported Brake et al (1993) namely 0.6% [11,9].
3.6. Gizzard percentage
The application of Indigofera zollingeriana leaves flour in each treatment had no significant effect (P>0.05) on the percentage of gizzard. The percentage value of broiler gizzard obtained in this research ranged from 2.11 to 2.42%, slightly higher than the percentage of gizzard obtained by Rizkia (2013) which ranged from 1.79 to 1.92% [11]. While the percentage of broiler chickens for all treatments in this research was lower than that reported by Crawley et al (1980) that the percentage of the gizzard was 3.12% [10].

3.7. Abdominal fat percentage
The provision of Indigofera zollingeriana leaves flour in broiler rations had a significant effect (P<0.05) on the percentage of abdominal fat. The average percentage of broiler chicken abdominal fat ranged from 1.03%–1.87%. The results of this study were much lower than the research of Al-Rasyid et al (2019) which ranged from 1.975%–2.662% [12]. Al-Rasyid (2019) also stated that giving indigofera leaves flour to broiler chickens could produce lower fatty conditions, thereby helping to improve the quality of the carcass produced [12].

4. Conclusion
The addition of 2–6% Indogofera leaves flour in broiler chicken feed did not significantly affect slaughter weight, carcass weight, carcass and giblets percentages but had a significant effect (P<0.05) on the percentage of broiler abdominal fat. The addition of 6% indigofera leaves in broiler feed could reduce the abdominal fat content.

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