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The effect of soybean meal substitution with *Indigofera* leaves and turmeric on carcass weight of Indonesian native chickens

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Abstract. This study aims to determine the effect of substitution of soybean meal with *Indigofera* (*Indigofera zollingeriana*) leaf flour (ILF) and turmeric (*Curcuma longa*) flour on the carcass weight of the native chickens. A total of 80 8-weeks-old Indonesian native chicken were fed 4 types of a ration containing ILF and turmeric flour to substitute soybean meal based on the completely randomized design with 5 replication. The formulated ration consisted of basal feed (R0), 10% of ILF and 2.5% turmeric flour (R1), 15% ILF and 2.5% turmeric flour (R2), 20% ILF and 2.5% turmeric flour (R3), respectively. At the end of the experiment, 2 chicken sample from each group were selected and slaughtered for further carcass characteristics measurement. Partial carcass percentages of the chest, thigh, and back were not affected by the substitution of soybean meal with ILF and turmeric flour in the ration, however, wing percentage was significantly higher in the group of chicken fed 15% of ILF and 2.5% turmeric flour (R2) compared to other groups.

1. Introduction

The population native chicken from the year 2014-2018 experienced 275.116.120 until 310.959.951 tail in the tail, while for south Sulawesi province to finish in a tie to three after the province of east java and west java 31.970.051 tail in the year 2018 (The Directorate General of Animal Husbandry and Health Animals). The development of the population of native chicken is very much related to maintenance especially feed given management. Protein feed has an important role to improve the quality of chicken carcasses. The quality of poultry feed is seen from the protein content, the higher the protein and complete the feed is getting better [1]. The use of protein the weft of which is flawed can force chicken growth disturbed, resulting in the chicken carcasses generated out at cannot be optimal.

One of the protein source feed ingredients that are almost always used as a compiler for chicken rations is soybean meal, which until now still depends on imported products. The use of soybean meal in native chicken ration formulas can reach 30% [2]. During this time, Indonesia imports 1.5 million tons of soybeans annually. To reduce the use of imported soybean meal, efforts are needed to find alternative protein sources that can partially replace soybean meal protein.



One of the feed ingredients that have the potential as a source of protein feed ingredients is the shoot leaves of *Indigofera* (*Indigofera zollingeriana*). *Indigofera* has high productivity and a fairly good nutrient content, especially high protein content. According to Sirait et al [3], *Indigofera* is a tree legume that has fast growth and contains crude protein of 27.9% and 27.68% [4].

On the other hand, turmeric is well known to have curcumin, an active ingredient that has many biological activities, such as anticancer, anti-inflammatory, antimicrobial, and antioxidant properties [5]. The active substances of turmeric like curcumin and essential oils have a function to increase bile secretion into the intestine (colagoga) which is, in turn, can increase appetite life weight. The addition of 2.5% turmeric flour in feed was reported to increased body weight gain and did not harm feed consumption, feed conversion, and carcass percentage [6].

This study aims to determine the effect of substitution of soybean meal with *Indigofera zollingeriana* leaf flour and turmeric on the weight of the grower phase of the digestive tract of native chickens.

2. Materials and method

In this study, 80 Indonesian native chickens with the same body weight were randomly assigned to 20 units with 4 treatments and 5 replications. at the Poultry Production Laboratory, Faculty of Animal Science, Universitas Hasanuddin Makassar from June to August 2020. Chickens are reared at the age of 8 weeks to 16 weeks of age. The treatments in this study consisted of R0: Control feed (without the addition of *Indigofera* leaf shoots flour (ILF) and turmeric), R1: 10% ILF substituted soybean meal (protein = 2.82%) + 2.5% phytobiotic turmeric, R2: 15% ILF substitute soybean meal (protein = 4.23%) + 2.5% phytobiotics of turmeric, R3: 20% ILF substitutes soybean meal (protein = 5.64%) + 2.5% phytobiotics of turmeric. The research began with the manufacture of *Indigofera* leaf shoots flour by pruning and separating the shoots of *Indigofera*, the top part of the plant with a stem diameter of less than 5 mm or one that has 4-5 leaf stalks at the top [7]. This part is then dried in the sun until it reaches a moisture content of 10-20% or is put in the oven for 3 days at a temperature of 60°C. During maintenance, feed and drinking water were given ad libitum based on the treatment. The nutritional composition of the feed can be seen in table 1.

Table 1. Composition of the nutritional substances of the ration.

| Feed ingredients | EM Kkal/Kg | CP (%) | EE (%) | CF (%) | Lysin e (%) | Methio nine (%) | P (%) | Ca (%) |
|-------------------|---------------|-----------|-----------|-----------|-------------------|-----------------------|----------|-----------|
| Corn | 3291.27 | 9.88 | 1.79 | 5.70 | 0.06 | 0.18 | 0.60 | 0.02 |
| Rice bran | 2730.00 | 13.40 | 5.10 | 11.50 | 0.42 | 0.30 | 2.50 | 0.2 |
| ILF | 2617.41 | 27.18 | 6.26 | 10.00 | 2.05 | 0.67 | 0.58 | 0.13 |
| Soybean meal | 2191.31 | 41.24 | 3.30 | 3.55 | 2.95 | 0.80 | 1.21 | 0.27 |
| Premix | | | | | 0.3 | 0.3 | | |
| Fish meal | 3233.88 | 36.32 | 0.52 | 0.16 | 2.11 | 0.66 | 2.88 | 7.19 |
| DCP | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21.00 | 16.00 |
| CaCO ₃ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 39.00 |
| L-Lysine | 0.00 | 62.00 | 0.00 | 0.00 | 99.00 | 0.00 | 0.00 | 0.00 |
| DL-Methionine | 0.00 | 58.78 | 0.00 | 0.00 | 0.00 | 99.00 | 0.00 | 0.00 |

The addition of turmeric was 2.50% as a feed additive.

The parameter measured in this study was the percentage of commercial carcass parts. The percentage of the carcass can be obtained by slaughtering and selecting a sample of 2 chickens at the age of sixteen for each treatment. Removing the digestive organs and cleaning then separating the wings, chest, back, and thighs then weighed using analytical scales. According to [8] carcass

parts can be calculated using commercial carcass pieces of each wing, chest, back, and thigh divided by carcass weight multiplied by 100%.

2.1. Data Analysis

The research design was carried out using a completely randomized design (CRD) with 4 treatments and 5 replications. Each replication contained 4 chickens. Then if it has a significant effect on the measured parameters, it is followed by a response test [9].

3. Results and discussions

The results of the research on the substitution of soybean meal with *Indigofera zollingeriana* and turmeric on the weight of the grower phase of domestic carcasses can be seen in table 2. The results of research conducted on the substitution of soybean meal with *Indigofera zollingeriana* and turmeric, it has not shown a significant effect ($P > 0.05$) on the percentage of the weight of the chest, thighs, and back native chicken in the grower phase.

The low average percentage of chest weight was found in treatment R1(26.55%) and the highest average percentage of chest weight was found in treatment R0(29.45%). The percentage of breast weight is obtained from the division of the carcass weight of the chicken breast multiplied by 100%. Carcass weight is influenced by the final live weight of chickens. The higher the final live weight, the resulting chicken carcass weight is also high. The average final weight of chickens in the study was 911.87- 1042.50 grams. This is in line with the opinion of Al-Rashid [10] that carcass weight is influenced by live weight. A large live weight will also be followed by a large carcass weight.

Table 2. The effect of substitution of soybean meal with *Indigofera zollingeriana* and turmeric on the weight of the grower phase.

| Parameters (%) | Treatment | | | |
|----------------|------------|------------|------------|------------|
| | R0 | R1 | R2 | R3 |
| Chest weights | 29.45±3.54 | 26.55±1.70 | 26.78±1.43 | 28.07±1.29 |
| Wing weights | 14.45±0.63 | 12.02±2.24 | 15.09±0.87 | 14.82±0.78 |
| Thing weights | 31.44±2.80 | 29.67±1.74 | 29.80±1.70 | 29.97±0.75 |
| Back weights | 26.27±2.09 | 25.80±2.30 | 26.40±0.87 | 26.27±1.20 |

Note: R0: Control feed (without the addition of indigofera leaf shoots and turmeric). R1: 10% ILS substituted soybean meal (protein = 2.82%) + 2.5% phytobiotic turmeric. R2: 15% ILS substitute soybean meal (protein = 4.23%) + 2.5% phytobiotics of turmeric. R3: 20% ILS substitutes soybean meal (protein = 5.64%) + 2.5% phytobiotics of turmeric.

The highest average percentage of thigh weight was found in treatment R0 (control ratio) of 31.44% followed by R3(29.9%). The substitution of *Indigofera zollingeriana* and turmeric to replace the role of soybean meal by 20% has not been able to increase the percentage of carcasses. This is thought to be due to the nutritional content of *Indigofera zollingeriana* which is not absorbed by chickens, because the thigh bone is used more for activities causing low final weight. This is in line with the opinion of Muiz [11] which states that the size of the thigh meat deposit is greatly influenced by the size of the bones. The percentage of meat and thigh bone is influenced by the weight of cut which affects the percentage of the carcass. The femur is mostly used for activities. so that the growth and proportion follow the body's growth.

The highest average percentage of back weight was in treatment R2 (26.40%) followed by treatment R0 (26.27%) and R3(26.27%). The R2 treatment the average percentage of back weight was higher than the R0 (26.40%), this was due to the mineral content of *Indigofera zollingeriana* flour. especially the nutrient content of calcium and phosphorus each of 0.52% and 0.34% to help in the growth of chicken backbone tissue. This is following the opinion of Yusniatin [12] that the

back of broilers contains a lot of bone tissue. so that the mineral content in the ratio has more effect on back weight compared to protein.

Based on the results of the research on the substitution of soybean meal with *Indigofera zollingeriana* and turmeric on the weight of the grower phase of the domesticated wings which in table 2. The percentage of carcass weight on the wings shows a significant effect ($P < 0.05$) and presented in table 3.

Table 3. Carcass weight percentage response test

| Source of diversity | Df | Sum of squares | Mean Square | F | Sig. |
|---------------------|----|----------------|-------------|-------|-------|
| Linier | 1 | 3.499 | 3.499 | 2.055 | 0.177 |
| Quadratic | 1 | 4.655 | 4.655 | 2.734 | 0.124 |
| Cubic | 1 | 15.656 | 15.656 | 9.195 | 0.010 |

Based on the response test for the percentage of wing weight in figure 1. the relationship between the cubic equation $y = -0.0062x^3 + 0.212x^2 - 1.7438x + 14.45$. $R^2 = 1$ is obtained. From this equation. the optimal substitution of soybean meal with *Indigofera zollingeriana* is obtained by 15% (substitution of soybean meal PK = 4.23%) was able to increase the carcass weight of the wing sections by a maximum of 15.09%. The value of $R^2 = 1$ indicates that 100% of the weight gain of the wings is influenced by *Indigofera zollingeriana* leave.

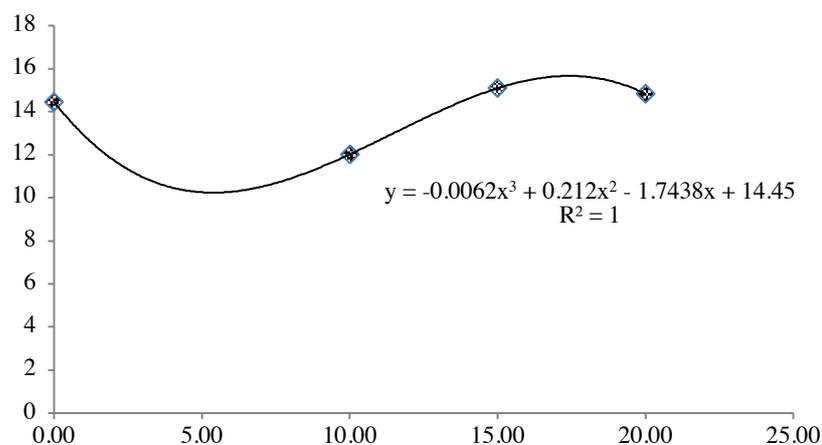


Figure 1. Percentage of wing weight on the substitution of soybean meal with *Indigofera zollingeriana* of native chicken phase grower.

The substitution treatment was 15% higher than the control ratio treatment. this was because *Indigofera zollingeriana* flour contained 2.04% amino acids such as valine and 3.2% leucine to aid in muscle growth. Protein in the ration is very important for carcass weight because protein contains amino acids that are essential for growth such as valine to help in muscle growth and leucine which increases growth hormone synthesis [13].

4. Conclusion

Substitution of soybean meal with 15% *Indigofera zollingeriana* and 2.5% turmeric can be concluded increase the carcass weight of the grower phase of native chickens.

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