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Submission date: 22-Jun-2023 12:08PM (UTC+0700)
Submission ID: 2120714823
File name: ._Effect_of_Supplementation_of_Indigofera_Shoot_Flour_on_Egg.pdf (299.67K)
Word count: 3652
Character count: 18688

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International Journal of Zoology and Animal Biology
ISSN: 2639-216X

Effect of Supplementation of Indigofera Shoot Flour on Egg Quality of ISA Brown Layers

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Research Article

Volume 6 Issue 2

Received Date: March 24, 2023

Published Date: April 10, 2023

DOI: 10.23880/izab-16000461

Abstract

This study purposed to investigate the effect of using shoot flour of Indigofera zollingeriana from coconut plantations which was added to the ration on the quality of chicken eggs. This research used a completely randomized design with four (4) treatments and five (5) replications. The experimental ration contain Indigofera shoot leaf flour (ISLF) which was tested consisted of: P0 = 0% ISLF, P1 = 2.5% ISLF, P2 = 5.0% ISLF, and P3 = 7.5% ISLF. The variables measured and observed included egg weight, egg shell weight, shell thickness, egg height, albumen height, albumen weight, egg yolk color and egg yolk weight. The research data were analyzed by using Analysis of Variance (ANOVA) based on Completely Randomized Design in using Minitab 16 software. If the treatment has a significant effect, further testing would be carried out with the Honesty Significant Difference Test. This study found that the internal and external quality of eggs was affected when shoot leaf flour from indigofera zollingeriana was added to chicken rations. It was reasoned that organization of indigofera shoot flour to a degree of 5.0% gave the best.

Keywords: Chicken Egg; Internal; External Morphology

Abbreviations: ISLF: Indigofera Shoot Leaf Flour; PPMM: Poultry Meat Meal; CRD: Completely Randomized Design; HSD: Honesty Significant Difference.

Introduction

The observing of egg quality attributes of outside and inside type is significant fundamentally for interest of economy of creation. Due to the high losses that crack egg shells cause for market egg producers, particularly when eggs are produced from aged hens during the second laying cycle, the focus of our experiment was specifically on the quality of the eggs. As a result, it's critical to assess the eggs' quality and the age factor, which can affect them. Egg weight, as well as the other (external and internal) characteristics of the egg, may be influenced most by the genotype and age factor.

Indigofera zollingeriana is one of the feed ingredients with a high nutrient content production, and has potential dry matter production 21.2 to 24.9 ton [1]. Particularly noteworthy is the high protein content. Indigofera leaves have a crude protein content of 29.16 percent, a crude fiber content of 14.02 percent, and a crude fat content of 3.62%. According to Abdul [2], the leaves of *Indigofera zollingeriana* can increase feed consumption, egg weight, production, egg mass, feed conversion, and the egg yolk score while decreasing the cholesterol content and MDA

levels in quail eggs. Quail eggs may have a higher vitamin A content due to the presence of s-carotene in indigofera shoot flour [3].The leaves of *Indigofera zollingeriana* are suitable as ingredients for poultry feed due to their nutritional value and nutrient content. The purpose of this study was to find out how adding shoot flour from coconut plantations from *Indigofera zollingeriana* to feed affects the internal and external quality of chicken eggs.

Material and Method

This experiment was carried out in Kakaskasen Village, East Tomohon District, Tomohon City, North Sulawesi. The research was conducted from June 2022 to September 2022.

This study used 100 laying hens ISA Brown aged 32 weeks. The feed ingredients used were indigofera leaf flour, rice bran, yellow milled corn, soybean meal, poultry meat meal (PMM) and top mix. The cage used is a litter cage made of rice husk, which is equipped with a place to eat and drink, consisting of 20 units, each unit containing 5 ISA brown layer. A thermometer was used to measure temperature and humidity.

Production of Indigofera shoot flour. Indigofera shoots used were taken from indigofera plants grown on coconut plantations and then processed into flour. Indigofera shoots before being made into flour, first dried in the sun. After drying, then milled until it becomes flour. Before use, Indigofera leaf flour was analyzed for its nutrient content to prepare rations according to treatment.

The manufacture of Indigofera shoot flour was carried out in stages: 1. Fresh shoots are harvested from plantations, taken approximately 30cm from the tip of the plant. 2. The shoots that have been taken were aerated without direct sunlight for ± 1 day so that the leaves do not change color. 3. After being aerated and then dried in the sun for ± 10 hours, then milled to powdery form.

Eggs were weighed and broken on a flat surface where the height of the albumen was measured with micrometer. The yolk was separated from the albumen and weighed. Also was measured the diameter and height of yolk. Using a Roche company fan, the yolk color was determined. Egg shell was weighed and dried at room temperature.

The study's design was completely random, with four treatments and five replications. The following was the experimental ration that was tested: P0 indicates that the ration contained no Indigofera shoot leaf flour, P1 indicates that it contained 2.5 percent of the ingredient, P2 indicates that it contained 5.0 percent of the ingredient, and P3 indicates that it contained 7.5 percent of the ingredient. Egg weight, egg shell weight, shell thickness, egg height, albumen height, albumen weight, egg yolk color, and egg yolk weight were the variables measured and observed. Using Minitab version 16 software, an analysis of variance (ANOVA) based on a completely randomized design (CRD) was performed on the research data. The Honesty Significant Difference (HSD) Test could be used for additional testing if the treatment has a significant effect.

Results and Discussion

Results

Table 1 shows how treatment with indigofera shoot flour affected the external quality of laying hen rations, as measured by egg weight, egg height, shell weight, and shell thickness. Table 2 shows how treatment with indigofera shoot flour affected the internal quality of laying hen rations, as measured by weight albumen, albumen height, yolk weight, yolk height, and yolk color.

External Quality of Eggs

Variable	Perlakuan				SEM	P Value
	P0	P1	P2	P3		
Egg weight	57.44^{b}	59.78^{a}	61.16^{a}	60.90^{a}	0.55	<0.001
Egg height	5.422^{b}	5.576^{a}	5.678^{a}	5.672^{a}	0.03	<0.001
Shell weight	4.464^{c}	4.896^{b}	5.220^{a}	4.932^{b}	0.06	<0.001
Shell thickness	0.044^{c}	0.054^{b}	0.068^{a}	0.052b^{c}	0	<0.001

a,b,c Means in the same coloum with different letters show differences (p<0.05).

Table 1: External egg quality as a result of *Indigofera zollingeriana* supplementation.

In Table 1, the average weight of chicken eggs that were fed feed that contained *Indigofera zollingeriana* shoot flour is shown. The average weight of chicken eggs ranged from 57.44 g in rations that did not include shoot flour from *Indigofera zollingeriana* to 61.16 g in rations that did include shoot flour from *Indigofera zollingeriana* that was 5% of the total weight. This study's findings are superior to those of Damaziak, et al. [4], who found that the weight of chicken eggs ranged from 48.63 g to 59.18 g. The analysis of diversity revealed that the inclusion of indigofera shoot flour in the feed resulted in a very significant (P0.01) difference in the weight of chicken eggs. According to the HSD test, the egg weight of the ration containing 5% indigofera shoot flour was significantly (P<0.01) higher than that of the ration without indigofera, but it was not significantly different (P>0.05) from that of the

rations containing 2.5% and 7.5%.

Table 1 shows the average height of chicken eggs that were fed feed containing *Indigofera zollingeriana* shoot flour. The average height of chicken eggs varies from 5.442 cm in rations that do not contain *Indigofera zollingeriana* shoot flour to 5,678 cm in rations that do contain 5 percent Indigofera shoot flour *zollingeriana*. This study's findings are nearly identical to those of Sapkota, et al. [5], who found that chicken eggs ranged in height from 5.163 cm to 5.559 cm.

The diversity analysis revealed that the inclusion of Indigofera shoot flour in the feed had a significant impact on the height of chicken eggs (P 0.01) Egg height was significantly (P0.01) higher in the ration with 5% indigofera shoot flour than in the ration without it, but not significantly different (P>0.05) in the rations with 2% and 7% indigofera shoot flour, according to the HSD test.

Table 1 displays the average eggshell weight of chicken eggs treated with feed containing *Indigofera zollingeriana* shoot flour. The average weight of chicken eggshells ranged from 4.464 grams in rations that did not include *Indigofera zollingeriana* shoot flour to 5.220 grams in rations that did include 5% Indigofera shoot flour. *zollingeriana*. This study's findings are lower than those of Sapkota, et al. [5], who found that the weight of chicken egg shells ranged from 4.16 g to 5.00 g. The diversity analysis revealed that the inclusion of indigofera shoot flour in the feed had a very significant effect (P0.01) on the weight of chicken eggshells. According to the HSD test, the ration containing 5% indigofera shoot flour had a significantly higher eggshell weight (P0.01) than the diet lacking indigofera or the rations containing 2.5% and 7.5%, respectively.

The average thickness of the eggshells of chickens fed *Indigofera zollingeriana* shoot flour is shown in Table 1. The average thickness of chicken eggshells ranges from 0.044 cm in rations without *Indigofera zollingeriana* shoot flour to 0.068 cm in rations with 5 percent flour. *Indigofera zollingeriana* shoots. This study's findings are superior to those of Sapkota, et al. [5] study, which found that the thickness of the chicken egg shell ranged from 0.029 cm to 0.043 cm. This study's findings are superior to those of Damaziak, et al. [4], who discovered that the thickness of the chicken egg shell ranged from 0.0354 cm to 0.0380 cm.

The diversity analysis revealed that the inclusion of indigofera shoot flour in the feed significantly reduced the thickness of the chicken egg shell (P 0.01).The HSD test revealed that the ration containing 5% indigofera shoot flour had a significantly (P0.01) thicker shell than the rations containing 2.5% and 7.5% indigofera shoot flour, respectively.

Internal Quality of Eggs

Variable	Treatment				SEM	P Value
	P0	P1	P2	P3		
Albumen weight	24.02^{b}	26.00^{ab}	28.29^{a}	24.13^{b}	0.65	<0.001
Albumen height	0.934^{b}	0.950^{ab}	0.998^{a}	0.994^{b}	0.01	<0.012
Egg yolk weight	13.46^{b}	14.58^{a}	14.84^{a}	13.82^{b}	0.12	<0.001
Egg yolk height	1.398^{c}	1.612^{b}	1.912^{a}	1.702^{b}	0.04	<0.001
Egg yolk color	7.40^{b}	7.60^{b}	8.60^{a}	7.60^{b}	0.25	<0.013

a,b,c Means in the same coloum with different letters show differences (p<0.05).

Table 2: Effect of supplementation of *Indigofera zollingeriana* on the internal quality of eggs.

Table 2 shows the average weight of chicken egg whites treated with feed that contained *Indigofera zollingeriana* shoot flour. The average weight of chicken egg whites ranged from 24.02 g in the ration that did not include shoot flour from *Indigofera zollingeriana* to 28.29 g in the rations that did include shoot flour from *Indigofera zollingeriana* that contained 5% of the plant. This study's findings are nearly identical to those of Sapkota, et al. [5], who found that the height of chicken eggs ranged from 27.03 g to 31.27 g. The analysis of diversity revealed that the inclusion of indigofera shoot flour in the feed resulted in a very significant difference (P0.01) in the weight of chicken egg whites. According to the results of the HSD test, the ration containing 5% indigofera shoot flour had a significantly higher egg white weight (P0.01) than the ration without indigofera, but there was no significant difference (P>0.05) between the rations containing 2.5% and 7.5% indigofera shoot flour.

Table 2 shows the average height of chicken egg whites treated with feed that contained *Indigofera zollingeriana* shoot flour. In rations that did not include *Indigofera zollingeriana* shoot flour, the average height of chicken egg whites ranged from 0.934 centimeters to 0.988 centimeters in rations that did *Zollingeriana indigo*. This study's findings are superior to those of Sapkota, et al. [5], who found that chicken egg whites ranged in height from 0.461 cm to 0.584 cm.

According to the diversity analysis, feeding chicken egg whites Indigofera shoot flour had a significant (P 0.05) different effect on their height. The HSD test revealed that the ration with 5% indigofera shoot flour had a significantly

higher egg white (P0.05) than the ration without indigofera, but that there was no significant difference (P>0.05) between the rations with 2, 5%, and 7.5% indigofera shoot flour.

The average weight of chicken egg yolks treated with feed containing *Indigofera zollingeriana* shoot flour is shown in Table 2. In ratio that did not contain *Indigofera zollingeriana* shoot flour, the average weight of the chicken egg yolks ranged from 13.46 g to 14.52 g. They contain 5% *Indigofera zollingeriana* shoot flour. The average weight of a chicken egg yolk is 13.9 gra according to Diwyanto, et al. [6] and Damaziak, et al. [4], the average weight of a chicken egg yolk ranges from 10.62 grams to 14.33 grams, according to a study. The analysis of diversity revealed that the inclusion of Indigofera shoot flour in the feed had a very significant effect (P0.01) on the weight of the chicken egg yolk. Egg yolk weight was significantly (P<0.01) higher in the ration with 5% indigofera shoot flour than in the ration without indigofera and 7.5% indigofera shoot flour, according to the HSD test, but the difference was not significant (P>0 0.05) in the ration with 2.5% indigofera shoot flour.

The typical shade of chicken egg yolks treated with feed containing *Indigofera zollingeriana* shoot flour is introduced in Table 2.The average color of chicken egg yolks ranges from 7.40 on the color scale obtained with no *Indigofera zollingeriana* shoot flour to 8.60 on the color scale obtained with 5% *Indigofera zollingeriana* shoot flour. According to Furqan [7], the average score of the yolk color of chicken eggs produced in this study is identical to that of chickens aged 22-28 weeks under normal temperature conditions (6.00-10.00).

The diversity analysis revealed that the inclusion of Indigofera shoot flour in the feed significantly altered the color of the chicken egg yolk (P<0.05).The HSD test revealed that yolk color of the ration with 5% indigofera shoot flour was significantly higher (P<0.05) than the yolk color of the ration without indigofera, 2.5% indigofera shoot flour, or 7.5% indigofera shoot flour.

Discussion

The nutritional content of the treated feed, which contained calcium (Ca) and phosphorus (P), was probably the cause of the external differences in chicken eggs that were measured through eggshell performance. According to Abdullah, et al. [2], the nutritional value of indigofera leaves includes as much as 0.34-0.46% phosphorus and as much as 1.78-2.04% calcium. The thickness and structure of the egg shell are what determine its quality, according to Wahju J [8]. Because sufficient carbonate ions and Ca ions are required for the formation of eggshell $CaCO_3$, the content of Ca and P in feed influences the quality of eggshells.

The nutrient and anti-nutritional content of the treatment rations probably contributed to the internal differences in chicken eggs that were measured by the performance of chicken egg whites. Indigofera shoot flour was used as the treatment feed because it has a lot of protein and anti-nutrients (tannins and saponins) [9].

According to Abdullah, et al. [2] Indigofera leaves contain between 2.24 and 4.20 percent saponin and 0.03-0.14 percent tannin. Tannins, which combine peptide bonds from proteins to form complex compounds, do not dissolve in the digestive tract and are excreted through the feces, affecting the availability of dietary protein. Additionally, tannins in high concentrations can disrupt the digestive system and interfere with the function of the digestive organs, particularly the liver, pancreas, and intestines effortless [10].

The distinction in egg yolk execution was brought about by the heaviness of the yolk being impacted by the fundamental unsaturated fat substance of the feed, in light of the fact that the most fat stores were in the yolk. According to Bell, et al. [11], the fat content of the feed has an effect on the fat content of the yolk. Linoleic fatty acids and the amino acid metheonine, according to Leeson, et al. [12] influence egg production and egg weight.

Indigofera leaf flour's -carotene may be the cause of the yolk's color. The egg yolk score was significantly influenced by the content of -carotene and xanthophyll, which reached 507.60 mg/kg in the ration [13]. According to Sangeetha, et al. [14] some of the carotenoids will be utilized by the poultry body to raise the yolk score. Yolk tone is impacted by feed containing - carotene and *xanthophylls*, these two shades are exceptionally helpful in shaping yolk tone [13]. The amount of xanthophyll in feed, like corn, has an effect on the color of the yolk, making the color more concentrated [15]. According to Suprijatna [16], the dye in egg yolks is xanthophyll, a carotene pigment from chicken feed that is absorbed by the bloodstream and egg yolk.

Conclusions

The study's findin suggest that chicken eggs' internal and external quality is affected by e inclusion of Indigofera shoot flour in the diet. The highest egg weight, egg height, egg shell weight, egg shell thickness, egg white weight, egg white height, egg yolk weight, and egg yolk color were observed when indigofera shoot flour was included in the ration up to a level of 5%.

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