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Supplementation of Mulberry leaf extract on growth performance and carcass percentage of broilers

Suplementasi ekstrak daun Murbei terhadap kinerja pertumbuhan dan persentase karkas ayam broiler

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A B S T R A C T

The purpose of the study was to determine the effect of Mulberry leaf extract (MLE) supplementation in drinking water on growth performance and carcass percentage of broiler chickens. The research method is quantitative. The broilers were supplemented with MLE in drinking water for 28 days. The research consists of five treatments with four replications, T0 = drinking water (negative control), T1 = 0.05 g tetracycline antibiotics/liter of drinking water (positive control), T2 = 1 ml MLE/liter of drinking water, T3 = 3 ml MLE/liter of drinking water and T4 = 5 ml MLE/liter of drinking water. Research parameters include growth performance and carcass percentage. Data analysis was conducted using ANOVA, and it was followed by the Duncan test. The results of the study showed that supplementation of the extract in drinking water did not affect feed intake, water intake, non-carcass percentage, and abdominal fat, but affected the final weight, carcass percentage, and feed conversion ratio. The study concluded that the supplementation of MLE with a dose of 0.05 g/liter of drinking water increased final body weight, average daily gain, carcass percentage, and decreased feed conversion ratio of broilers.

Kata kunci:
Broiler
Persentase karkas
Ekstrak
Kinerja pertumbuhan
Daun murbei

A B S T R A K

Tujuan penelitian untuk mengetahui pengaruh suplementasi ekstrak daun Mulberry (EDM) dalam air minum terhadap performa pertumbuhan dan persentase karkas ayam broiler. Metode penelitian yang digunakan adalah penelitian kuantitatif dengan pemeliharaan ayam broiler selama 28 hari yang disuplementasi dengan EDM dalam air minum. Rancangan percobaan yang digunakan adalah 5 perlakuan dengan 4 ulangan. Perlakuan meliputi P0 = air minum (kontrol negatif), P1 = antibiotik tetrasiklin 0,05 g/ liter air minum (kontrol positif), P2 = 1 ml EDM/liter air minum, P3 = 3 ml EDM/liter air minum dan P4 = 5 ml EDM/liter air minum. Parameter penelitian meliputi performa pertumbuhan dan persentase karkas. Analisis data menggunakan ANOVA dan dilanjutkan dengan analisis uji rentang berganda Duncan. Hasil penelitian suplementasi ekstrak dalam air minum tidak mempengaruhi konsumsi ransum, konsumsi air minum, persentase non karkas dan lemak abdomen, tetapi mempengaruhi bobot akhir, persentase karkas dan rasio konversi pakan. Kesimpulan penelitian adalah suplementasi EDM dengan dosis 0,05 g/liter air minum mampu meningkatkan bobot badan akhir, pertambahan bobot badan harian, meningkatkan persentase karkas dan menurunkan rasio konversi pakan ayam pedaging dan tidak mempengaruhi konsumsi pakan.

INTRODUCTION

Broiler chickens are a type of poultry with fast productivity. One of the factors that supports broiler chicken productivity is feed. Nutrient content in feed to meet the living needs and productivity. In addition, the health condition of the small intestine to digest feed nutrients also supports broiler productivity. The walls of the small intestine, in the form of villi are a place for nutrient absorption as well as a place for pathogenic bacteria to live. Pathogenic bacteria often interfere with the nutrient absorption process, potentially reducing broiler chicken productivity (Silfia *et al*., 2024).

The use of synthetic antibiotics in drinking water is often used to reduce pathogenic bacteria in the small intestine of broiler chickens. However, the use of antibiotics can produce harmful residues in chicken meat (Fadhiila *et al*., 2022), Pasaribu (2019) stated that the provision of antibiotic feed additives can cause resistance to pathogenic bacteria or microflora found in the intestines, so an alternative is needed to replace antibiotics that do not produce residues in broiler chicken meat by using natural phytobiotics. Phytobiotics are feed additives that act as natural antibacterials made from organic materials (Sihite *et al*., 2023).

One of the natural ingredients that has the potential as a phytobiotic is mulberry leaves. Mulberry leaves are a type of shrub that is often used as a traditional medicinal plant. Mulberry leaves are extracted to obtain secondary metabolite compounds such as flavonoids, phenols, alkaloids, anthocyanins, antioxidants, and fatty acid components (Chandra, 2022). Pogaga *et al*. (2020) stated that mulberry leaves also have effects as antioxidants, antibacterials, antivirals, anti-inflammatories, and antimicrobials.

Research on mulberry leaves was conducted by (Geng *et al*., 2024), which showed that adding mulberry leaves to feed can improve growth, production performance, and immunological parameters in poultry and livestock, although the effects vary at different doses. Similar research by Yani (2018) showed that the use of mulberry leaf extract up to 20% increased feed intake and reduce abdominal fat levels in broilers. Several studies showed the effect of using mulberry leaves applied as flour in the feed mixture, the drying process with sunlight, followed by grinding is feared to damage the bioactive compounds in mulberry leaves (Lantah *et al*., 2017), so this study will use mulberry leaves that are extracted and applied through drinking water.

The selection of mulberry leaf application through drinking water rather than feed is to maintain the quality of the bioactive compounds in mulberry leaves. This is because the extraction of mulberry leaves with the maceration method is safer to maintain quality than the direct sunlight drying method. The maceration method is a series of steps that involve soaking plant simplicia to quarantine the natural compounds in it and protect it from direct exposure to sunlight (Nafiisah & Purnamasari, 2024). So, the novelty of this study will by applying mulberry leaves that are extracted and given in drinking water, which is expected to have an effect on the performance and percentage of carcasses in broilers.

MATERIALS AND METHODS

Time and Location

The research was conducted for 28 days from 12 July to 8 August 2024, located in the Sleman, Special Region of Yogyakarta.

Materials

The research equipment includes experimental cages, feed containers and drinking containers, 30 kg digital scales, 10 kg digital scales, 100 ml beaker glass, 500 ml beaker glass, 10 ml measuring cup, 50 ml measuring cup, filter cloth, oven, water bath, and magnetic stirrer. The research materials include 60-day-old chick broiler chickens, Strain New Lohman. Mulberry leaves from Sleman City Special Region of Yogyakarta, concentrate feed from Japfa Comfeed, tetracycline antibiotics, ethanol, methanol, distilled water, filter paper, and tween 80.

The method of using mulberry leaves in this study used a method that was almost similar to the research by Karisma (2019) which selected old mulberry leaves as a simple drug, which is believed to have more bioactive compounds than young leaves.

Methods

The research method is the collection of quantitative data from broiler chicken maintenance with phytobiotic supplementation treatment of Mulberry leaf extract (MLE) in drinking water.

Antibiotic Suspension

The determination of the treatment dose of this study refers to the research results of Sudrajat & Kardaya (2017) that by making a suspension in the form of antibiotics in the form of flour as much as 0.05 g with 1 liter of water, then homogenized using a magnetic stirrer for 30 minutes at a speed of 350 rpm.

Mulberry Leaf Extraction

The procedure for making extracts using the maceration method begins with drying Mulberry leaves using an oven for 24 hours at a temperature of 60°C. Next, the Mulberry leaves are ground and filtered into Mulberry leaf flour with a uniform particle size, followed by the maceration process by soaking Mulberry leaf flour and methanol with a volume ratio of 1:10 for 24 hours (Illing *et al*., 2023). The soaking formulation is stirred during maceration every 8 hours so that the extraction process takes place optimally. Then the soaking is filtered using a filter cloth and filter paper to separate the filtrate and dregs. The filtration results contain phytochemical compounds precipitated using a water bath at a temperature of 55°C until thick. The extract thickness is then formulated with tween 80 and ethanol in a ratio of 1:1:5. The formulation is homogenized with a magnetic stirrer until dissolved. The final stage is to make an extract solution using distilled water up to 100 ml so that a solution with a content of 1% Mulberry leaf extract is obtained.

Poultry Trial

The study started from 60-day-old chicks in one experimental cage with the same feed and drink from 0-7 days of age. Treatment started from 8 to 28 days of age by randomly selecting chickens to be placed in a box. Each box contains 3 chickens. The type and amount of feed are adjusted to the needs of broiler chickens, but drinking water is given according to the treatment.

Experiment Design

The experimental design of the study was a Completely Randomized Design (CRD) with 5 treatments and 4 replications: each treatment group consisted of 3 broiler chickens, total of 60 chickens. The treatments consisted of:

T0: Drinking water without supplementation (negative control)
T1: 0.05 g tetracycline antibiotic per liter of drinking water (positive control)
T2: 1 ml Mulberry leaf extract per liter of drinking water
T3: 3 ml Mulberry leaf extract per liter of drinking water
T4: 5 ml Mulberry leaf extract per liter of drinking water

The use of tetracycline antibiotics as a positive control in the treatment is a general description of the majority of maintenance management using tetracycline. In addition, tetracycline is effective in suppressing the population of gram-positive and negative bacteria in the chicken digestive tract (Ananda *et al*., 2021).

Parameter

This study consists of 2 parameters, namely:

Growth performance variables to determine the growth ability of chickens, including feed intake is calculated from total feed (g) minus remaining feed (g), water intake is calculated from total water given (ml) minus remaining water (ml), final body weight is calculated from weighing the chickens carried out each period (g), average daily gain is calculated from the final weighing of the chickens' weight (g) minus the initial weighing of the chickens' weight (g), feed conversion ratio is calculated from feed intake (g) divided by average daily gain (g) (Oktavia *et al*., 2021).

The carcass percentage variable to determine the results of the chicken carcass percentage. Including carcass percentage is calculated from the carcass weight (g) divided by the live weight of the chicken (g) multiplied by 100%, the non-carcass percentage is obtained from the non-carcass weight (g) divided by the live weight of the chicken (g) multiplied by 100%, the abdominal fat percentage is calculated from the abdominal fat weight (g) divided by the live weight of the chicken (g) multiplied by 100% (Funome *et al*., 2022).

Data Analysis

The collected data were analyzed using analysis of variance from the SPSS version 26 application to see the significance of $P<0.05$, and if there were differences between treatments, it was continued with the Duncan Multiple Range Test analysis.

RESULT AND DISCUSION

The results of the study are shown in the following Table 1., such as feed intake (FI), water intake (WI), feed intake (FI), final body weight (FBW), average daily gain (ADG), feed conversion ratio (FCR) of broiler chickens.

The administration of mulberry leaf extract in drinking water did not affect the feed intake and water intake of broiler chicken feed (P>0.05). This showed that supplementation of mulberry leaf extracts up to 5 ml per liter is still at the tolerance level of the broiler chicken intestine. It is believed that the bioactive compound does not interfere with the achievement of broiler chicken feed intake. The same results were obtained by Khothijah *et al*., (2021) using cashew leaf extract at a level of 20% per liter of drinking water did not affect the feed intake of broiler chicken rations because the bioactive compounds were still tolerated by the intestines.

Other factors are due to the palatability of broiler chickens to feed and feed research using the same type and amount. This condition is supported by the statement of Hidayat *et al*., (2020) that chicken growth will greatly depend on the treatment it receives, including feed treatment.

The same results were found for water intake, this result is that mulberry leaf extract supplementation was as acceptable to broilers as the negative control and tetracycline antibiotics. This finding is supported by Saleh *et al* (2023) statement that supplementing herbal extracts at certain doses in drinking water can provide a taste and aroma that is tolerable to broiler chickens. Supplementation of mulberry leaf extract in drinking water affects the final weight of broiler chickens (P<0.05). This result is alleged because the supplementation of mulberry leaf extracts up to 5 ml per liter of drinking water increases the saponin content that enters the digestive tract. Giving saponins can increase the permeability of intestinal cell walls and increase the absorption of feed nutrients, so that the resulting weight is higher (Irwani & Candra, 2016). Chandra (2022) stated that in the test results, betel leaf extract contains bioactive saponins. the ability of the intestine to absorb good nutrients can be used in the formation of body tissues such as muscles. This condition is in line with the statement of Pertiwi & Yudiarti, (2017) that good absorption of nutrients can increase the weight of broiler chickens.

Mulberry leaf extract supplementation affects the final body weight and average daily gain of broiler chickens (P<0.05). This condition is caused by the levels of mulberry leaf extract which are able to provide optimal metabolite compounds to suppress the population of pathogenic bacteria. These results are supported by Aliah *et al*, (2019) that mulberry leaf extract can inhibit the growth process of several types of bacteria, such as *Staphylococcus aureus* and *Salmonella typhimurium.*

Mulberry leaf extract supplementation at a dose of 5 ml per liter of drinking water provides the same final body weight of broiler chickens as 0.05 mg tetracycline antibiotic supplementation in drinking water, so that this dose is believed

Table 1. Growth performance of broiler chickens with Mulberry leaf extract supplementation in drinking water

Treatments	Variable				
	FI (g)	WI (ml)	FW (g)	ADG (g)	FCR
T0	2.248	4.682	1.423^{b}	345.19^{b}	1.58^{a}
T1	2.250	4.641	1.429^{a}	365.66^{a}	1.57^{b}
T2	2.246	4.720	1.421^{b}	359.45^{a}	1.58^{a}
T3	2.247	4.642	1.421^{b}	347.12^{b}	1.58^{a}
T4	2.253	4.672	1.431^{a}	368.73^{a}	1.57^{b}
P – value	0.160^{ns}	0.348^{ns}	0.050	0.022	0.010
SEM	0.542	0.374	0.762	0.305	0.883

Note: Different superscripts in the same column indicate significant differences (P<0.05). ns = Non Significant. T0: Drinking water without supplementation (negative control); T1: 0.05 g tetracycline antibiotic per liter of drinking water (positive control); T2: 1 ml Mulberry leaf extract per liter of drinking water; T3: 3 ml Mulberry leaf extract per liter of drinking water; T4: 5 ml Mulberry leaf extract per liter of drinking water. Feed intake (FI), water intake (WI), feed intake (FI), final body weight (FBW), average daily gain (ADG), feed conversion ratio (FCR) of broiler chickens.

to be able to provide secondary metabolite compounds that suppress the population of pathogenic bacteria. This condition is supported by the statement of (Lu *et al*., 2023) that Mulberry leaves have natural antibacterial compounds such as alkaloids. flavonoids and polyphenols. Anita *et al*, (2014) added that compounds such as alkaloids. Flavonoids and polyphenols can act as antibacterials.

Average daily gain created by the different final body weight gain, so that a significant increase in body weight. These results are supported by the statement by (Islam *et al*., 2015) that Mulberry leaf extract can maintain the condition of lipids in the body of poultry so that it can maintain the increase in body weight of broiler chickens.

Supplementation of Mulberry leaf extract in drinking water has an effect on the feed conversion ratio of broiler chickens (P<0.01). Factors that affect the feed conversion ratio are feed intake and the final body weight of broiler chickens. Different body weights result produce comparative factors in producing different feed conversion ratios. This condition is supported by the statement by Wijayanti *et al*. (2021) that Feed Conversion Ratio (FCR) is a measure of broiler productivity in general by looking at the value of feed efficiency against body weight. so that if one of the comparative factors is different, the resulting feed conversion ratio is also different.

The results of carcass percentage (CP), non-carcass percentage (NP), and Abdominal Fat Percentage (AFP)of the study are shown in the Table 2.

Table 2. Performance and percentage of broiler carcasses supplemented with Mulberry leaf extract in drinking water

Treatments	Variable		
	CP (%)	NP (%)	AFP (%)
T0	60.25^{b}	28.00	0.46
T1	60.94^{a}	28.13	0.44
T2	60.06^{b}	28.00	0.44
T3	60.19^{b}	28.06	0.45
T4	60.75^{a}	28.13	0.42
P – value	0.050	0.823^{ns}	0.65^{ns}
SEM	0.236	0.823	0.174

Note: Different superscripts in the same column indicate significant differences (P<0.05); ns = Non Significant. T0: Drinking water without supplementation (negative control); T1: 0.05 g tetracycline antibiotic per liter of drinking water (positive control); T2: 1 ml Mulberry leaf extract per liter of drinking water; T3: 3 ml Mulberry leaf extract per liter of drinking water; T4: 5 ml Mulberry leaf extract per liter of drinking water. Carcass percentage (CP), non-carcass percentage (NP), and Abdominal Fat Percentage (AFP)

Supplementation of Mulberry leaf extract in drinking water affects the percentage of broiler chicken carcasses (P>0.05). The factors that form broiler chicken carcasses are live weight and chicken slaughter weight. the results achieved because the final body weight of the study differed between treatments. This condition is supported by the statement from (Tamzil *et al*., 2015) that carcass weight is formed from the final live weight and the increase in chicken live weight.

Supplementation of Mulberry leaf extract in drinking water does not affects on the percentage of non-carcass and abdominal fat of broiler chickens (P>0.05). Non-carcass is a part of the broiler chicken's body organs, which includes the head, neck, innards, and feet of broiler chickens. The non-carcass category has bone and internal organ compartments due to internal factors, including the body weight of the chicken strain. This condition is supported by the statement of (Hafid & Juliadin, 2021)as well as basic data in making estimates, the production of non carcass organs as well as information for research selanjutnuya. Samples of this research data is withheld Bali cattle (slaughter that the percentage and weight of non-carcass are caused by the composition of body organs, including internal organs and bones.

Abdominal fat is an energy reserve located at the base of the tail and covers the internal organs. Abdominal fat is formed from carbohydrates, proteins, and fats in feed. The feed in this study used the same type and amount between treatments, resulting in no different percentage of abdominal fat. This condition is supported by the statement of Anwar *et al*, (2019) that the factor that affects broiler chicken fat is the amount of ration consumption.

CONCLUSION

The conclusion of the study is that supplementation of 1% Mulberry leaf extract with a dose of 5 ml per liter of drinking water can increase the final body weight and average daily gain of broiler chickens, reduce the feed

conversion ratio and increase the percentage of broiler carcasses.

CONFLIC OF INTEREST

The writing of this scientific paper does not indicate any threat from any party, so that overall, this writing is free from any personal or organizational party.

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