Jurnal Nukleus Peternakan
pISSN : 2355-9942, eISSN:2656-792X
Terakreditasi Nasional, Dirjen Pendidikan Tinggi, Riset, dan Teknologi
Kementerian Pendidikan, Kebudayaan, Riset dan Teknologi RI
S.K. No. 105/E/KPT/2022

Desember 2024, Vol. 11 No. 2: 100 – 105
Received: 4 Oktober 2024, Accepted: 22 Desember 2024
Published online: 28 Desember 2024
Doi: https://doi.org/10.35508/nukleus.v11i2.18671
https://ejurnal.undana.ac.id/index.php/nukleus/article/view/18671

EFFECTIVENESS OF USING HERBAL PLANT-BASED FEED ADDITIVES ON BROILER PERFORMANCE

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ABSTRACT

Due to the regulation prohibiting the use of Antibiotic Growth Promoters (AGP), it is essential to explore alternative solutions for feed additives in the broiler industry. One promising approach is to utilize herbal plants as feed additives to enhance the performance and quality of broilers. This study aims to evaluate the effectiveness of herbal plant-based feed additives, specifically fermented garlic, cinnamon, and betel leaves, on the performance and quality of broiler carcasses. This study employed a completely randomized design (CRD) featuring four treatments and five replications. For a duration of 30 days, the treatments administered to the broilers included: P0 (control), P1 (herbal concoction at 1.5 ml per 500 ml of water), P2 (herbal concoction at 2.5 ml per 500 ml of water), and P3 (herbal concoction at 3.5 ml per 500 ml of water).The variables measured in this study included feed consumption, body weight gain, and feed conversion. The administration of herbal medicine did not have a significant effect ($P > 0.05$) on feed consumption, body weight gain, or feed conversion in broilers. However, the level of herbal medicine administration showed some trends: P3 (3.5 ml herbal medicine per 500 ml of water) was associated with better feed consumption and body weight gain, while P2 (2.5 ml herbal medicine per 500 ml of water) indicated a tendency for improved feed conversion.

Keywords: feed additives, medicinal plants, performance, broiler

INTRODUCTION

Broilers are continually improving due to advancements in genetic selection aimed at achieving optimal productivity. Key factors in this selection process include performance and carcass quality. Broilers play a crucial role in supplying animal protein to consumers, as they can be harvested for marketing or consumption in a relatively short time. For broiler producers, achieving excellent performance is a primary goal, as it leads to significant economic benefits.

Antibiotics have been commonly used as feed additives in the poultry industry, but their use was banned by the Indonesian government. This prohibition on antibiotics as growth stimulants, known as Antibiotic Growth Promoters (AGP), is outlined in Law No. 41/2014 concerning Animal Husbandry and Animal Health. It is further reinforced by Permentan No. 22/2017 regarding the Registration and Distribution of Feed, which mandates that producers must declare they do not use AGP in the feed formulas they register. Given this regulation against the use of AGP, it is essential to explore alternative solutions for feed additives in the broiler industry.

On the other hand, the rapid growth rate of broilers is also followed by an increase in body fat, especially in the abdomen. This fat can be used as a reference for the fat content of broiler meat. The fat content of meat is one aspect that is currently of concern to consumers because it can be a source of atherosclerosis disease which is a risk for the heart. Therefore, low fat content in meat is one of the parameters of good carcass quality for consumers. Efforts to produce broilers with good performance and quality can be done by utilizing herbal plants as feed additives. Active compounds in herbal products have been shown to improve ecological conditions, morphology and function of the digestive tract, physiological conditions, antioxidant status, carcass characteristics, and immune competence of broilers (Sugiharto dan Ayasan, 2023; Teymouri *et al*., 2021). Several bioactive compounds in herbal plants have several benefits as antimicrobial pathogens in the digestive tract of broilers, such as cavicol (essential oil components), allicin flavonoids, curcuminoids, coumarins, tannins, alkaloids, xanthones, terpenoids, phenolics (Ali *et al*., 2021; Chen *et*

al.,2021). These bioactive compounds can be found in garlic, betel leaves and cinnamon. In garlic, a chemical compound called allicin (diallyl thiosulfate) is found which is classified as an amino acid but a non-protein amino acid. Garlic bioactive compounds have many biological functions, such as anti-inflammatory, anti-microbial, anti-carcinogenic, anti-diabetic, antioxidant, anti-mutagenic, anti-carcinogenic, anti-atherosclerotic, anti-mutagenic, and immune modulation activities (Chen *et al*., 2021). In cinnamon bark that is commonly used by the community is cinnamon oil because it is believed to have antioxidant properties (Mulyanti *et al*.,2023).

The incorporation of bioactive compounds from herbal plants as feed additives can enhance the performance and quality of broiler carcasses. A study indicated that garlic extract improves feed efficiency, promotes body weight gain, and reduces both abdominal fat and blood serum cholesterol levels in chickens (Wibawa *et al*.,2016). Herbal plants can be administered to poultry either individually, in the form of simplicia, or as concoctions (herbal medicine), typically through drinking water or mixed into feed. Utilizing fermentation biotechnology can enhance the nutritional value of these herbal concoctions. The positive effects of using herbal plants in poultry include improved feed efficiency, growth, health, and stamina, leading to optimal productivity. The growth performance of broiler chickens that are given fermented herbal products can be linked to improved feed digestibility in the birds(Xie *et al*., 2021).

Broiler performance can be seen through weight gain, feed consumption and feed conversion. While carcass quality can be seen in fattening. Therefore, the use of herbal concoctions consisting of white onion, cinnamon and betel leaves is expected to improve the performance and quality of broiler carcasses which will then become an alternative feed additive to replace AGP.

RESEARCH METHODS

A total of 80 day-old broilers (DOC) were placed in an experimental unit cage measuring 50 cm in height, 60 cm in width, and 100 cm in length. The study utilized a completely randomized design consisting of four treatments, with five replications, each containing four birds per replication. Herbal concoctions were prepared using 250 grams of each type of herb, including garlic, betel leaves, and cinnamon. The activation of the fermenter involved *Lactobacillus casei* (1.5 x 10 cfu/ml), *Saccharomyces cerevisiae* (1.5 x 10 cfu/ml), and *Rhodopseudomonas palustris* (1.0 x 10 cfu/ml), mixed with molasses and left to ferment for 24 hours prior to being added to the herbal concoction. A ratio of 1 liter of each fermenter was combined with 10 liters of water and added to the herbal mixture, which was then fermented for 14 days. The commercial ration B11A used in the experiment was antibiotic-free and contained the following ingredients: fish meal, corn, soybean meal, rice bran, meat bone meal, crude palm oil, corn gluten meal, limestone (rock flour), pollard, sodium bicarbonate, a premix of minerals, and essential vitamins. The composition of the ration is detailed in Table 1.

The treatments (P) in the study consisted of, Control (P1), P2 (basal ration + herbal concoction 1.5 ml/500 ml water), P3 (basal ration + herbal concoction 2.5 ml/500 ml water), and P4 (basal ration + herbal concoction 3.5 ml/500 ml water).

Table 1. Nutritional content of commercial feed B11A

Number	Nutrition	Persentage (%)
1	Water content	13,0
2	Protein	22.0-23,5
3	Fat	5,0
4	Fiber	5,0
5	Ash	7,0
6	Calcium	0,9
7	Phosphorus	0,6

Source: Labels on commercial feeds used

Measured Variables

In this study, broiler performance is measured by assessing feed consumption, weight gain, and feed conversion (Hasan *et al*., 2020; Irmawaty *et al*., 2020).

- Feed Consumption; Feed consumption is determined by weighing the total amount of feed provided over the course of a week, subtracting the amount of feed remaining at the end of the week, and then dividing that number by the total number of chickens.
- Gain of Body Weight; The gain in body weight is calculated by subtracting the initial body weight from the final body weight each week, using the following formula.
  GBW (g/head/week) = $BW_t - BW_{t-1}$
  Description: GBW: Gain of body weight
  BWt: Body weight at time t
  BWh-1: Body weight at the previous time
  h: Time period of one week
- Feed Conversion; Feed conversion is measured by comparing the amount of feed consumption with the increase in body weight for each week.

Data analysis

The data were statistically analyzed using analysis of variance with a completely randomized design. Additionally, tests for the smallest significant differences were conducted to identify differences in each treatment if they showed a significant effect (P<0.05).

RESULTS AND DISCUSSION

The results of the broiler performance research conducted for 30 days, including gain of body weight, feed conversion and feed consumption are presented in Table 1.

Table 1. Average performance of broilers raised for 30 days

Parameter	Perlakuan				P. Value
	P0	P1	P2	P3	
Feed Consumption (g/head/week)	450,6±14,40	427,84±21,43	425,88±19,80	452,38±23,58	0,09
Weight Gain (g/head/week)	317,26±14,64	304,06±17,50	305,1±17,78	318,42±14,61	0,37
Conversion (head/week)	1,42±0,4	1,40±0,3	1,40±0,3	1,39±0,10	0,89

Description P0: Control, P1: Administration of herbal concoction 1.5 mL/500 mL water, P2: Administration of herbal concoction 2.5 mL/500 mL water, P3: Administration of herbal concoction 3.5 mL/500 mL water

The results of the study indicated that the treatment had no significant effect (P > 0.05) on feed consumption, body weight gain, or feed conversion in broilers raised for 30 days. The average feed consumption and body weight gain were highest with the use of 3.5 ml of the herbal concoction, while feed conversion remained relatively consistent across all treatments. The data suggest a positive correlation between feed consumption and body weight gain. Feed consumption is a key variable influencing various aspects of broiler productivity, as it is directly related to feed conversion and weight gain, ultimately affecting overall broiler performance (Hasan *et al*., 2020). Although the differences between the herbal concoction treatment and the control group were not statistically significant, the use of fermented herbal products appeared to have a positive impact on growth performance in broilers (Adli *et al*., 2024). The results regarding feed consumption in this study align with other research on the use of garlic, cinnamon, cloves, and turmeric in herbal concoctions, which also showed no significant differences (Lestari *et al*., 2019).

According to (Adli *et al*., 2024), the use of fermented herbs can significantly improve production parameters (P <0.05) such as gain of body weight gain, body weight and feed conversion. However, in this study, the performance of broilers that received fermented herbal concoctions was not statistically different from broilers that were not given herbal concoctions. This shows that each herbal concoction used will provide a different response to broiler performance gain of body weight, including feed consumption, and feed conversion. Factors that affect chicken performance include cumulative drinking water intake, gain of body weight, feed consumption, final weight, mortality and feed conversion (Welerubun dan Sairudy, 2023).

The herbal concoction evaluated in this study did not produce a significant effect on improving feed conversion rates. The essential oil content of the herbal mixture also failed to yield optimal results in enhancing feed conversion.

Previous research indicated that administering essential oils to broilers via drinking water can lead to improved feed conversion rates and greater body weight gain compared to broilers that do not receive essential oils (Adaszýnska-Skwirzýnska dan Szczerbínska, 2019). This discrepancy between the two studies suggests that, although the herbs used contain essential oils, they can elicit varying responses in broilers.

The content of secondary metabolic compounds in various herbal plants used as feed additives is expected to improve broiler productivity. Each herbal plant has a different secondary metabolic compound content, so that herbal plants used as herbal medicine formulations for broilers can synergize and complement each other. The use of medicinal plants or herbs, such as garlic, betel leaves and cinnamon in the form of liquid herbal concoctions is the result of fermentation. This is done because fermented herbal products have been shown to increase the active components in herbal products, increase antioxidant activity, and increase the effectiveness of herbal products for therapeutic applications (Hussain *et al*., 2016).

Garlic, betel leaves, and cinnamon contain secondary metabolic compounds, such as essential oils, that can enhance nutrient absorption in the digestive tract of broilers. These compounds inhibit the growth of pathogenic bacteria that interfere with nutrient absorption in livestock, leading to improved meat formation (Alzari dan Kamil, 2022). Previous studies have shown that herbal mixtures comprising garlic, betel leaves, and cinnamon can suppress the growth of harmful bacteria, including *Bacillus subtilis*, *Salmonella typhi*, *Escherichia coli*, and *Staphylococcus aureus* (Hidayat *et al*., 2013; *Jamili et al*., 2013). Additionally, essential oil compounds effectively stimulate chickens' sense of smell, which can increase their consumption of water and feed, resulting in weight gain (Adolph, 2023). In this study, the use of 3.5 ml of herbal concoction demonstrated better performance in broilers compared to other treatments. This suggests that the level of secondary metabolic compounds in the herbal mixture positively impacts broiler performance. Garlic, in particular, has medicinal properties and acts as an antibiotic (Saputra *et al*., 2016). It also contains phenolic compounds, flavonoids, vitamin C, beta-carotene, and vitamin E, all of which are classified as antioxidants and include allicin (Nuzulia, 2014). Metabolic compounds such as scordini in garlic may function as "growth promoters," stimulating growth by binding and breaking down proteins in the body (Hasanah *et al.*, 2018).

CONCLUSIONS

The study's results indicated that administering herbal mixtures containing garlic, cinnamon, and essential oils did not affect feed consumption. In fact, a dosage of 3.5 ml improved the body weight gain of broilers, while a dosage of 2.5 ml enhanced feed conversion.

SUGGESTIONS

The research results can be used as a basis for further research on the use of garlic, cinnamon and betel leaves by adding other types of herbs or giving them to poultry in the form of flour.

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