Effect of jamblang extract (Syzygium cumini L) on performance, carcass and giblet characteristics of broilers

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Abstract. The aim of this experiment was to determine the effect of using herbal feed ingredients jamblang leaves (Syzygium cumini L) as a feed additive on performance, carcass and giblet characteristics. A total of 100 DOC (CP 707) broilers were randomly assigned to 20 cage units with 4 treatments and 5 replications. Each treatment was given jamblang leaf extract in drinking water with different doses (P0 = control, P1 = 0.25 g/L, P2 = 0.50 g/L and P3 = 1 g/L). The feed used in this study was commercial feed for the DOC period up to the harvest period. Weight gain and feed consumption were calculated at the end of the study (4 weeks of rearing). All data were recorded to determine the performance, characteristics of the carcass and giblet. ANOVA was performed for data analysis. The difference between treatments was stated if P < 0.05. The results showed that the administration of jamblang leaf extract as a feed additive had no effect (P>0.05) on performance, carcass and giblet characteristics, but the wing carcass pieces showed a difference (P<0.05). From this study, it was concluded that jamblang leaf extract can be promote as alternative feed additive based on performance and carcass of broiler chickens results.

1 Introduction

Antibiotics as a growth promoter of livestock growth has been carried out for a long time. This is done because it is considered very profitable such as increasing livestock growth, livestock health, and feed efficiency. However, due to the negative effects arising from the use of antibiotics, there are residues in animal products produced in milk, meat and eggs, and can cause antibiotic resistance in humans [1], so the addition of antibiotics in feed as a growth promoter its use has been banned worldwide. The prohibition of the administration of antibiotics as a growth promoter requires to find alternative feed additive solutions to replace antibiotics. Phytogenics, often called botanicals are plant extracts containing compounds of nutritional value, non-nutritive or anti-nutritional which are added to rations or drinking water to increase livestock productivity through improving condition of digestive tract by controlling the number of good bacteria and improve the quality of livestock products [2, 3]. In addition, phytogenics have been shown to improve animal performance, improve feed

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conversion, improve the quality of carcass, increase food safety products, decrease stress responses, and increase livestock immune responses [4-7]. The content of bioactive ingredients in plants used as feed additives for phytogenic include flavonoids, polyphenols, saponins, tannins, alkaloids, essential oils and others [8-10]. One of the benefits of phytogenic feed additives is that it has antioxidant properties [11].

Antioxidants can act as inhabitation the reaction of reactive oxygen and nitrogen species (ROS/RNS) [12]. Antioxidants are able to perform stable unreactive free radicals or compounds that protect cells from the harmful effects of reactive oxygen free radicals [13] or more simply, antioxidants have the function of changing harmful compounds. In the body becomes harmless.

Cinnamon, eucalyptus, ginger, turmeric, betel leaf and temulawak are some of the herbal plants that have been studied which are used as alternative feed additives to increase livestock production and health. This herbal extract contains bioactive compounds and important metabolites that function as antioxidants and other functions that can be used by livestock to modify metabolic processes in the body to maintain health. Research conducted by Sari et al. [14] Jamblang leaf extract has a moderate but very active antioxidant content with an IC50 range of 8.85, meaning that it shows that Jamblang leaf can be used as a potential source of natural antioxidants. Samadi et al. [15] examined local herbal potencies in Aceh Province such as Vernonia amygdalina Del., and Syzygium cumini L concluded that herbal plants can be used as alternative feed additives because of their antimicrobial properties and antioxidant activity. The results showed that S. Cumini L is a plant extract that is better than other plant extracts.

Research by Biyatmoko et al. [16] the use of herbal phytobiotics with a combination of several herbal plants such as turmeric, ginger, garlic, kencur, galangal, temulawak, cinnamon and fermented betel leaf mixed into alabio duck feed to a level of 2% showed the best results for body weight final, weight gain and ration conversion. Research on the administration of jamblang to replace of antibiotics, especially for broilers, is very minimum. The purpose of this experiment was to evaluate the inclusion of S. cumini extract in drinking water for performance, carcass and giblet characteristics of broiler chickens.

2 Materials and methods

2.1 Animals and feed

This research was conducted in the cages of local breeders in Banda Aceh. The initial body weight measurement was carried out when the DOC chickens arrived in the cage and the final weighing was carried out after 30 days of rearing. Weighing of carcasses and giblets was carried out in the Laboratory of Animal Nutrition, Faculty of Agriculture, Universitas Syiah Kuala.

A total of 100 DOC broiler strain CP 707 were weighed and randomly placed in a cage unit with a size of 1 m × 1 m. The cage units were grouped into four groups with five replications consisting of five chickens per cage unit, a total of 20 cage units. Each treatment group was given a different concentration of jamblang leaf extract which was dissolved into drinking water with the following doses; P0= control. P1= 0.25 g/L, P2= 0.50 g/L and P3= 1 g/L. The jamblang leaf extraction process was carried out by referring to research conducted by Samadi et al 2020. The initial body weight of broiler DOC for each treatment was P0= 75.25±0.81, P1= 74.40±0.68, P2= 74.40±1.06 and P3=75.80±0.58. Chickens are reared in concrete-floored cages that are littered with sawdust. The temperature of the cage during the study was controlled from 35°C at the time of DOC and gradually lowered to 24°C. During
maintenance, feed and water are provided without restriction. The feed given during rearing is a commercial feed which has been prepared based on the needs according to the [17].

At the end of the study, 100 chickens were weighed according to the group to determine the final body weight. One tail in each treatment group was selected (20 in total) to be further slaughtered Islamically. Twenty selected chickens were then fasted overnight without being fed and only given water. After slaughter, the carcass, carcass percentage and offal were measured. Each carcass and offal were weighed and recorded for further data calculation.

2.2 Data analysis

This study was designed by a completely randomized design as follows:

\[ Y_{ij} = \mu + I + ij \]  

Where \( Y_{ij} \) is the response of individual observations who receive treatment to \(-i\) repetitions to \(j\), is the middle value, \(I\) is the treatment effect, and \(ij\) is the remainder. All data were statistically processed using the SPSS program. Data is presented in the form of mean \(\pm\)SEM. Duncan's Multiple Range Test was applied, if there is a difference between treatments according to Steel et al. [18].

3 Results and discussion

3.1 Broiler chicken performance

The effect of giving jamblang leaf extract on weight gain, ration conversion and consumption of broiler chicken rations is presented in Figure 1. The addition of jamblang leaf extract in drinking water with various concentrations has no significant effect on broiler performance, namely (a) weight gain, (b) ration conversion, and (c) ration consumption. The weight gain up to 4 weeks was \(P_0= 1470.60\pm34.94\), \(P_1= 1526.10\pm44.92\), \(P_2= 1496.80\pm49.91\), \(P_3= 1361.00\pm78.56\). The results of this study are in accordance with the research conducted by [19] where broiler chickens strain SR-707 were given betel leaf extract with doses up to a level of 2% did not show a significant difference to the final body weight. Likewise the results of research conducted by Rafiqi et al. [20] giving extract Temulawak in drinking water with concentrations up to 0.075% did not show significant differences in broiler performances and the consumption of drinking water.

Another study conducted by Samadi et al. [21] with the inclusion of the extract of jamblang leaf in drinking water with the concentration level of 1.0g/liter which was maintained for 4 weeks did not show a significant effect on broiler chickens on weekly weight gain, weekly ration conversion, weekly ration consumption, and drinking water consumption. In this study, the addition of jamblang leaf extract up to a concentration of 1.0g/L did not influence all the parameter of animal performance. This may be because of the addition of jamblang leaf extract up to a dose of 1 g/L showed a decrease in feed consumption. Feed consumption is closely related to the final body weight produced. The more feed consumed, the higher the final weight gain. This is in line with Seatiadi et al. [22] who concluded that the level of ration consumption will affect the growth rate and final weight, body shape and composition due to the accumulation of feed that enters the animal's body.

In this study, administration of jamblang leaf extract did not influenced on feed consumption, so the final weight gain of broiler chickens given jamblang leaf extract was also not affected. The FCR in this study was the lowest at 1.49 (P1) and the highest at 1.60 (P3). However, Figure 1 shows weight gain, ration consumption, and ration conversion in P1
treatment depicting good results, where P1 feed consumption is lower than P0, but weight gain and ration conversion value are more than P0 although statistically there is no significant effect. The results of this study are different from the research conducted by Wati et al. [23] with the addition of plant extract with a dose of 150 mg/kg can increase body weight gain 6.20% and ration efficiency 9.94. In another study conducted by Paraskeuas et al. [24] the addition of essential oils from mint, star anise and cloves mixed with silicium dioxide and sodium chloride as carrier agents at a dose of 100 mg/kg resulted in a 7.5% live weight gain and increase ration efficiency by 5.17%.

The research of Hassan et al. [25] with the addition of commercial phytogenic feed brand Bodgen 40® containing Cynara scolymus extract and choline chloride 150g/ton increased live weight gain of broilers 3.8% and ration efficiency 3.5%. Khan et al. [26] stated that the administration of 5% black cumin seeds into the ration increased the growth of life by 8.71% and the efficiency of the ration by 11.31%. Research [27] with commercial phytogenic additives brand BIOSTRONG® 510, (Austria) derived from a mixture of essential oils, with thymol and anethole as the main active substances as much as 250 mg/kg in broiler feed improved live weight gain 3.72% and increased the value of ration efficiency is 5.75%.

Fig. 1. Effect of jamblang leaf extract on (a) weight gain, (b) ration conversion, and (c) ration consumption of broiler chickens reared for 28 days. P0 (control), P1: 0.25 gram/liter of water, P2: 0.50 gram/liter of water, P3: 1 gram/liter of water.

3.2 Characteristics of carcass and offal

The carcass characteristics of broiler supplemented with jamblang leaf extract in water in various concentrations are presented in Table 1. The results indicated that the inclusion of jamblang leaf extract with different doses was not significantly effect (P>0.05) neither on
the carcass, nor carcass percentage. But at the dose of 0.50 g/l tends to be higher than the control. The results of this study are in accordance with the study conducted by [19] where broiler chickens were given betel leaf extract in drinking water up to a level of 2% had no effect on the percentage of broiler carcasses reared for 5 weeks. As seen in table 1, the average carcass percentage from highest to lowest was P2 (76.13%), P0 (75.84%), P3 (74.73%) and P1 (74.48%). It is possible that the administration of jamblang leaf extract up to 1 gram / litre did not respond to the growth of broiler body weight so that the percentage of broiler carcasses obtained was not significantly different. High and low carcass weight is strongly influenced by final live weight and feed consumption.

To achieve maximum profit in the poultry business, it can be realized if the percentage of products that are worth selling is higher than the products that cannot be sold. To achieve maximum sales, farmers must provide their chickens with high-quality feed to meet the needs of livestock production. Table 1 shows that the carcass pieces (breast, thigh, and back) of broiler chickens given jamblang leaf extract were not significantly different (P>0.05) between treatments. However, the wing carcass section showed a significant difference (P<0.05) from the control. The average of the highest to lowest wing carcass pieces, respectively, was P3 (116.55%), P2 (145.81%), P0 (136.29), and P1 (128.51). The research of Rahayu et al. [28] showed that the addition of a combination of bitter leaf extract and soursop leaf in drinking water given to broilers did not affect the carcass percentage. Similar results were concluded by Umatiya et al. [29] on broilers added to the powdered feed of ginger and garlic had no a significant influence on the percentage of heart, liver, ampelous and spleen of broilers.

Table 1. Effect of jamblang extract in drinking water on weight and percentage of broiler carcasses.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatment</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P0</td>
<td>P1</td>
</tr>
<tr>
<td>Carcass Weight</td>
<td>1275.28±60.87</td>
<td>1240.55±47.73</td>
</tr>
<tr>
<td>Carcass percent</td>
<td>75.84±0.90</td>
<td>74.48±0.75</td>
</tr>
<tr>
<td>Chest weight</td>
<td>443.23±12.40</td>
<td>420.35±28,26</td>
</tr>
<tr>
<td>chest percent</td>
<td>34.86±0.81</td>
<td>33.78±1.27</td>
</tr>
<tr>
<td>Wing weight</td>
<td>136.29±9.45 ab</td>
<td>128.51±4.86 ab</td>
</tr>
<tr>
<td>Wing percent</td>
<td>10.67±0.36 a</td>
<td>10.37±0.26 a</td>
</tr>
<tr>
<td>Thigh weight</td>
<td>356.8±21.65</td>
<td>355.99±8.51</td>
</tr>
<tr>
<td>Thigh percent</td>
<td>27.93±0.36</td>
<td>28.79±0.80</td>
</tr>
<tr>
<td>Back weight</td>
<td>316.91±7.14</td>
<td>278.80±9.86</td>
</tr>
<tr>
<td>Back percent</td>
<td>25.06±1.53</td>
<td>22.55±0.87</td>
</tr>
</tbody>
</table>

Information: P0 (control), P1: 0.25 gram/liter of water, P2: 0.50 gram/liter of water, P3: 1 gram/liter of water.
The administration of jamblang leaf extract (S. cumini L) in drinking water on the weight and percentage of broiler visera is presented in Table 2. The results indicated that the administration of jamblang leaf extract did no significant influence (P>0.05 on weight and percentage). Chicken offal (liver, heart and gizzard). This means that the administration of jamblang leaf extract does not have a detrimental impact on the internal organs of broilers that are kept. The average weight of chicken innards obtained is 32.28-38.44 g (2.03%-2.32%), 6.20-7.39g (0.39%-0.44%), and 31.42-34.44 g (1.97%-2.13%) for each giblet (liver, heart and gizzard). This study is similar to research carried out by Rafiqi et al. [20] with the inclusion of lempuyang extract in drinking water had no significantly effect on the weight and percentage of broiler giblets. Research conducted by Horhoruw et al. [30] with the addition of 2% brown sugar and 20 grams of turmeric with broiler, the highest average giblet weight of 75.73 g did not effect on the giblet weight of broiler chickens.

Table 2. Effect of jamblang extract in drinking water on weight and percentage of giblet of broiler chickens.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatment</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P0</td>
<td>P1</td>
</tr>
<tr>
<td>Heart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unwilling</td>
<td>36.72±2.79</td>
<td>38.44±1.82</td>
</tr>
<tr>
<td>Heart percent</td>
<td>2.18±0.12</td>
<td>2.31±0.10</td>
</tr>
<tr>
<td>Heart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart weight</td>
<td>6.75±0.53</td>
<td>7.39±0.64</td>
</tr>
<tr>
<td>Heart rate</td>
<td>0.40±0.02</td>
<td>0.44±0.03</td>
</tr>
<tr>
<td>Gizzard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>33.09±1.65</td>
<td>34.44±1.86</td>
</tr>
<tr>
<td>Percent</td>
<td>1.97±0.06</td>
<td>2.07±0.10</td>
</tr>
</tbody>
</table>

Description: P0 (control), P1: 0.25 grams/liter of water, P2: 0.50 grams/liter of water, P3: 1 gram/liter of water.

4 Conclusion

The addition of jamblang leaf extract can be applied as an alternative feed additive to replace antibiotics as a growth booster for broiler chickens due to no detrimental effect on broiler performances. Based on the study indicated that administration of jamblang leaf extract did not influence the performance, carcass and giblet of broiler chickens.

Thank you very much to Universitas Syiah Kuala supporting the grand of this study under Professorship scheme in 2019. Thanks also for LPPM USK that supported research administration and Yog Saputra, Anggara for assistance of growth study in the field and data collection.

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