Addition of bidara leaves (Ziziphus spina – christi L.) in drinking water on production and mortality of broiler chickens

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Abstract. The bidara plant is known as a plant that contains active ingredients and phytochemicals that have the benefit of stimulating physiological processes in the body to run well and have a healthy effect. This study aimed to determine the effect of giving bidara leaf extract on the production performance and mortality of broiler chickens. A total of 60 DOC broiler chickens were used in this study with an average body weight of 45 g which was divided into 4 treatments, including T0: control, T1: 10% bidara leaf extract, T2: 15% bidara leaf extract, T3: 20% bidara leaf extract. Each treatment was repeated 5 times with 3 research units per plot. The study was carried out experimentally in vivo using the Completely Randomized Design (CRD) research method. The data was processed by analysis of variance with the F test at the 5% level and continued with Duncan's test. The results showed that the treatment had a significant effect (P<0.05) on production performance and mortality in broiler chickens at the 10% bidara leaf usage level. The use of bidara leaf extract can be used as a supplement in the maintenance of broiler chickens as a substitute for synthetic supplements.

1. Introduction
Broiler chickens are poultry that have been through genetic engineering and have very good growth. In the process of raising broilers, they depend on drugs, vaccines, and chemicals to prevent diseases that can lead to high mortality in broiler rearing. However, the Indonesian government issued a ban on the use of antibiotics in feed. This is written in Law No. 18 of 2009 [1] concerning animal husbandry and animal health. The above laws and regulations prohibit the use of antibiotics because there are so many negative effects, including antibiotics residues. Therefore, the research trend began to shift to the use of herbs as additional supplements to replace drugs, vaccines and chemicals.

One of the herbs that are rich in benefits and easy to grow in the territory of Indonesia is bidara leaf. Bidara plants commonly grow in India, but currently, it has been widely cultivated in Indonesia including in the Java, Madura, Maluku, and Bali. The bidara tree can grow at an altitude of approximately 500 meters above sea level. Bidara leaves have strong antioxidants [2]. In addition, there are also chemical constituents of flavonoids, alkaloids, triterpenoids, saponins, lipids, proteins, and betulinic acid [3]. The alkaloid content in bidara leaves can be used as anti-bacterial and anti-fungal [4]. Among these ingredients there are ingredients that have a function for the absorption of vitamins A, D, E, and K (lipids) and as bioactive compounds in the growth of animals and digestive microbes.
The content of this bioactive compound has the potential to be used for livestock by looking at its growth parameters. Production performance observed included daily weight gain (DWG), final weight gain, feed consumption, water consumption, feed conversion (FCR), and Production Index. The results of this study can be used as the basis for this research as a substitute for chemical antibiotics that have been banned by the government as stated in the law.

2. Materials and method
This study used 60 Day Old Chicken (DOC) with an average body weight of 45 g. The DOC were divided into 4 treatments, namely T0 = given ordinary drinking water as a control, T1 = given 10% bidara leaf juice, T2 = given juice bidara leaves 15%, T3 = juice bidara leaves 20%. Each treatment was repeated 5 times and each experimental unit consisted of 3 broiler chickens. Chickens were reared in plots of size P=75 cm; L=75cm; T=75 cm equipped with 20 feed and drinking containers. Feed is given twice a day with feed containing 22-23% protein and metabolic energy of 3100 kcal/kg. The bidara leaf extract was started on the 5th day once a day in the morning. Chickens are kept for 35 days until they are ready to harvest. The variables measured in this study were production performance and mortality. Production performance observed was DWG, final weight gain (FWG), feed consumption, water consumption, FCR, and production index.

2.1. Final weight gain
FWG measurement was carried out by means of post-harvest weighing.

2.2. Daily weight gain
DWG is the value of body weight gain of chickens reared with treatment per day. DWG was weighed once a week and then the DWG value was calculated from the difference in final body weight minus initial body weight divided by the number of days in a week.

2.3. Feed consumption
Calculation of feed consumption was done by weighing the remaining feed every day. It was defined as the amount of feeding minus the rest of the feed every day.

2.4. Water consumption
The calculation of drinking water consumption was done by measuring the remaining drinking water every morning.

2.5. Feed Conversion Ratio (FCR)
FCT is the amount of feed consumed to produce the product. The measurement was done by dividing feed consumption in kilograms by live weight in kilograms. The formula is as follows:

\[ FCR = \frac{\text{Total Feed Consumption (kg)}}{\text{Total Live Weight (kg)}} \]

2.6. Production index
Production Index is a measurement to assess the success of broiler farming based on survival, body weight, harvest age and FCR. The formula is as follows:

\[ \text{Production Index} = \% \text{ Live Chickens} \times \frac{\text{Mean body weight (kg)}}{\text{Age} \times \text{FCR}} \times 100% \]

2.7. Mortality
Mortality was calculated by dividing the number of chickens that die by the number of chickens that live in percent.
The data obtained were tabulated in a table, then analyzed using ANOVA (Analysis of Variance) and if there was a significant difference, continued using Duncan’s further test.

3. Result and discussion
Broiler chicken that were given bidara leaf extraction showed a significant effect on DWG (p <0.05). The administration of bidara leaf extract in this study gave better body weight compared to chickens that were not treated with bidara leaf extract. The average DWG listed in table 1 with the value ranging from 42.11 (T0) to 54.73 (T3). The growth of broiler chickens is influenced by gender, environmental factors and chicken strains [5]. One of the environmental factors is feed and supplemental additives consumed by chickens. According to previous research, high and low weight gain of broiler chickens is influenced by the amount of feed consumption, genetics, and nutrients both qualitatively and quantitatively [6]. Table 1 shows that the feed consumption and drinking water consumption in the treated groups also showed significant differences (p<0.05). The amount of bidara leaf extract consumed by chickens increased in higher concentration. In addition, the slaughter weight data results were in line with DWG and feed consumption. The FCR parameter also shows similar results. In this study, the feed consumption of each treatment is listed in table 5.

| Table 1. The average of performance production |
|-----------------------------------------------|
| Parameters                                      | Treatments |
| Daily weight gain (g/day)                      | T0   | T1   | T2   | T3   |
|                                                | 42.11±6.71<sup>b</sup> | 54.28±1.97<sup>a</sup> | 53.07±1.63<sup>a</sup> | 54.73±1.15<sup>a</sup> |
| Final weight gain (g)                         | 1,518.93±234.77<sup>b</sup> | 1,944.99±68.95<sup>a</sup> | 1,902.66±57.21<sup>a</sup> | 1,960.86±40.40<sup>a</sup> |
| Feed consumption (g/day)                      | 185.56±19.81<sup>b</sup> | 218.36±11.63<sup>a</sup> | 217.68±2.21<sup>a</sup> | 221.37±13.64<sup>a</sup> |
| Water consumption (ml/day)                    | 179.36±19.05<sup>b</sup> | 212.57±13.08<sup>a</sup> | 212.28±3.70<sup>a</sup> | 216±14.82<sup>a</sup> |
| Feed Conversion Ratio                         | 1.43±0.09<sup>b</sup> | 1.30±0.08<sup>a</sup> | 1.33±0.03<sup>ab</sup> | 1.31±0.07<sup>a</sup> |

High or low FCR number depends on the feed consumed by the chickens and the feed that becomes meat. It is due to the increased appetite of broiler chickens after being treated with bidara leaf extract. The alkaloid compounds contained in bidara leaves are antibacterial and antifungal which can inhibit the performance of harmful microorganism in the digestion of chickens, so as to increase feed consumption and productivity in broiler chickens [4]. Previous research showed that administration of red jeringau extract that has similar content to bidara, namely antibacterial compounds flavonoids, alkaloids, terpenoids, and saponins, resulted in increased body weight gain in broiler chickens [7,8].

The number of chickens that died during this study were 2 chickens from the T0 group that was not given bidara leaf extract in drinking water. The percentage of broiler mortality is 3%. Mortality of broiler chickens usually occurs in the starter phase and maintenance is categorized as good/successful if mortality is less than 5% during maintenance until harvest [9]. The antibiotic content in bidara leaves has a way of working to kill bacteria so that the immune system of broiler chickens is immune and not susceptible to disease [3,4,7].

Production index is one of the measures used to assess the success of broiler farming based on vitality, body weight, harvest age, and feed consumption. In this study, the percentage of live chickens was 97% with an average body weight at harvest of 1.83 kg. Chickens were reared for 35 days with an overall FCR average of 1.34. The calculation of the production index (IP) is as follows:

$$Production\ Index = \% \ Live\ Chickens \times \frac{Mean\ body\ weight\ (kg)}{Age \times FCR} \times 100$$

$$= 97 \times \frac{1.83}{35 \times 1.34} \times 100$$

$$= 378.48$$

In this study, the production index of broiler chickens treated with bidara leaf extract resulted in 378.38. Based on the calculation, the production index in this study was good because the mortality parameters were small, feed consumption was good and final weight was good. Mortality rate affects production index [10]. Production index is said to be good if it is more than 200, the better the
maintenance of broiler chickens resulted in higher production index. Production index between 200-250 is categorized as good, 250-300 is very good, and above 300 is excellent [11]. The administration of bidara leaf extract in the drinking water showed that at a level of 10%, it can increase broiler production performance. The higher the level of use of bidara leaf extract, the higher the performance of broiler chicken production was.

4. Conclusion
The use of bidara leaf extract has a significant effect on broiler production performance which includes DWG, slaughter weight, feed consumption, water consumption, FCR, production index, and mortality. The use of bidara leaf extract at the level of 10% can improve production performance and reduce broiler mortality. This research still needs to be studied to see the effect of adding bidara leaf juice on its physiological parameters.

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