

RESPONSE OF TURMERIC EXTRACT (*Curcuma domestica* Val) USAGE AS FEED ADDITIVE ON THE NUMBER OF BACTERIA IN SMALL INTESTINE AND PERFORMANCE OF KULAWU SENTUL CHICKEN

Tuti Widjastuti^{1*}, Abun¹, Lovita Adriani¹

¹Faculty of Animal Husbandry, Universitas Padjadjaran, West Java, Indonesia

Abstract

Kulawu Sentul chicken is a specific one which comes from Ciamis region in West Java with grey feathers as its distinctive feature, with a variation of grey and brown yellows feathers and orderly arranged feathers on its breast like dragon scales. One alternative to improve the *Kulawu* chicken quality is by using Turmeric (*Curcuma domestica* Val.) as feed additive. Extract of turmeric is a medicinal plant containing active ingredients curcumin and essential oils that function anti-bacterial and can reduce cholesterol. The objective of this study was to obtain the optimal level of turmeric extract in ration on the amount of bacteria in the intestine and performance of *Sentul* chicken growth phase. The experiment used 100 *Kulawu* chicken that was kept for 12 weeks. The experimental design used was Completely Randomized Design with 5 treatment levels of turmeric extract, and 4 replications respectively. The treatment consisted of P0 (control); P1 (37 ml/kg extract); P2 (74 ml/kg ration); P3 (111 ml/kg ration) and P4 (148 ml/kg ration). Variable analyses were the amount of bacteria in the intestine (*Staphylococcus aureus*; *Escherichia coli*) and performance (feed intake, weight gain, carcass weight, feed conversion and meat cholesterol). Statistical analysis showed that the treatment significantly affected the levels ($P < 0.05$) of *Staphylococcus aureus*, but not significantly affected the *Escherichia coli* amount. The treatment with 74 – 111 mg/kg significantly ($P < 0.05$) increased weight gain, carcass weight, feed intake, feed conversion, and meat cholesterol decreased. It can be concluded that treatment 74 mg/kg turmeric extract could inhibit amount bacteria in the intestine, reduce meat cholesterol and gave the best performance on *Kulawu* chicken.

Key words: *Kulawu* chicken, turmeric extract, *Staphylococcus aureus*, *Escherichia coli*, carcass quality

INTRODUCTION

Sentul Chicken has various types including *Debu* chicken and *Kulawu* chicken which are considered pure types, Between the two types, *Kulawu* chicken has the advantage of a digestive organ that is bigger than the *debu* chicken. *Kulawu* chicken has the potential to be developed into a supplier of protein sources for humans. *Kulawu* chicken has several characteristics, such as the color of the feathers which are dominated by grayish color with gray shank color, red comb color, single comb shape, brown beak white color, and white skin [1] [2]. *Kulawu*

chickens are vulnerable to attack by pathogenic bacteria and which often attacks include *Escherichia coli* and *Staphylococcus aureus*. Parts of the intestine that contain lots of bacteria are jejunum and ileum [3]. Turmeric (*Curcuma domestica* Val) is a medicinal plant that functions as an antibacterial. Besides that the *atsiri* oil content in turmeric, namely xanthorrhizol is as an antibacterial against gram-positive and gram-negative bacteria. [4]. The other active ingredient is curcumin which can stimulate bile secretion so that it can digest fat properly. Curcumin is identified as the phytochemical in turmeric, which is responsible for biological effects [5]. The addition of turmeric extract in the ration if consumed by chicken will affect the

*Corresponding author: tuti_widjastuti@yahoo.com

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expenditure of salivary glands in the mouth, proventriculus, liver, pancreas, and intestine to increase the production of its enzymes, thus causing faster digestion [6]. The function of turmeric in improving the work of the digestive organs of poultry is to stimulate the walls of the gallbladder to secrete fluid and stimulate the discharge of pancreatic juice. Pancreatic juice containing amylase, lipase and protease enzymes is useful for improving digestion of feed ingredients such as carbohydrates, fats, and proteins [7]. The addition of turmeric can improve appetite, and metabolism which results in increased body weight gain so that chicken performance will increase resulting in carcass weight also increasing. Besides being an antibacterial, turmeric also has a colagoga effect which is to stimulate the secretion of bile so that it can reduce cholesterol levels. Therefore turmeric can be used as a feed additive in replacing antibiotics [8], [9]. Addition of temulawak (*Curcuma xanthorrhiza* Roxb) extract through drinking water with a dose of 0.50g /l drinking water has not significantly affected the performance of broiler chickens, but there was a decrease in intestinal pathogenic microbial populations of salmonella sp and blood cholesterol. This occurs because of the antibacterial activity of temulawak and plays a role in increasing the secretion of bile so that the lipase produced can reduce cholesterol levels. As a comparison, in the research of Tuti et al. [10] on the use of *Curcuma zedoaria* meal at the level of 3.5 -4.5%, can increase body weight gain and reduce meat cholesterol in broiler chickens. This is due to the effect of *atsiri* oils on the work of the digestive tract, especially the small intestine. Yarru et al. [11] that the addition of 0.5% turmeric meal containing curcuminoid 74 mg/kg ration gives the effect of increasing feed consumption as well as a significant increase in the weight of broiler chickens. However, if turmeric extract is used in high doses, the active ingredient content will increase, but

there are obstacles due to the smell and taste of turmeric which is not liked by chickens. Also by giving high doses it turns out to reduce the cholesterol content of meat but also result in decreased bodyweight, carcass weight and produces a high conversion value. Alipin [12] that by addition of curcuminoid at a dose of 74 mg/kg can improve the performance of broiler chickens, but at doses of 37 mg/kg and 111 kg/kg cause histological damage to the liver and kidneys. Therefore, the purpose of this study was to determine the role of turmeric extract as a natural feed additive and its effect on the number of bacteria in the intestine and the performance of *kulawu* chicken.

MATERIAL AND METHODS

One hundred day-old *Kulawu* chicks were raised in cages until 12 weeks old. The experimental design used was Completely Randomized Design with 5 treatment levels of turmeric extract, and 4 replications respectively. Data were analyzed using Variance Analysis and differences between treatments using Duncan Multiple Test. The treatment consisted of P0 (control); P1 (37 ml/kg ration); P2 (74 ml/kg ration); P3 (111 ml/kg ration) and P4 (148 ml/kg ration). Rations were prepared based on protein and metabolic energy requirement for Sentul chicken growth phase, ie.17 percent protein and metabolic energy 2750 kcal/kg [13]. Variable analyses were the amount of bacteria in the intestine (*Staphylococcus aureus*; *Escherichia coli*) and performance (feed consumption, weight gain, feed conversion, carcass weight, and meat cholesterol) of *Kulawu* chicken.

RESULTS AND DISCUSSION

Effect of treatment on the number of bacteria *Staphylococcus aureus* and *Escherichia coli*

The average number of *S. aureus* and *E. coli* bacteria in small intestine of *kulawu* chicken can be seen in Table 1.

Table 1 Number of *Staphylococcus aureus* and *Escherichia coli* E bacteria in the small intestine of *Kulawu* chickens

Parameters	P0	P1	P2	P3	P4
CFU(g).....				
<i>Staphylococcus aureus</i>	1.48 x10 ^{5a}	1.37 x10 ^{5a}	1.11x 10 ^{5b}	1.06 x10 ^{5b}	1.03x 10 ^{5b}
<i>Escherichia coli</i>	1.41 x10 ^{5a}	1.37 x10 ^{5a}	1.35 x10 ^{5a}	1.29 x 10 ^{5a}	1.26 x10 ^{5a}

Description : The same letter in the direction of the rows shows no significant difference (P>0.05)
P0 (control) ; P1 (37 ml/kg ration); P2 (74 ml/kg ration); P3 (111 ml/kg ration) and P4 (148 ml/kg ration).

Table 1, shows that the increased level of turmeric extract added to the basal ration caused the number of *S. aureus* bacteria in the small intestine of *Kulawu* chicken to decrease. Turmeric is a medicinal plant that functions as an antibacterial. According to Sinurat et al. [4] turmeric contains an *atsiri* oil called xanthorrhizol which functions as an antibacterial so that it can suppress the growth of pathogenic bacteria in the intestine. Analysis results statistics on the number of *S. aureus* bacteria showed that the addition of turmeric extract treatment in the ration had a significant effect (P <0.05). In treatment P0 and P1, the number of bacteria in the intestine was significantly higher than in treatments P2, P3 and P4. This means that the addition of turmeric extracts starts from level 74 - 111 ml/kg ration, causing increasing xanthorrhizol activity as an antibacterial to suppress the growth of *S. aureus* bacteria in the small intestine of *Kulawu* chickens. The resistance of a bacterium to the pressure of antibacterial substances is also influenced by the structure of the cell wall. *S. aureus* bacteria are a group of gram-positive bacteria that have a single-layered cell wall (*peptidoglycan*) so that it is more easily penetrated by antibacterial substances [14].

However, the number of *E. coli* bacteria on treatment added turmeric extract starting from 37-110 ml/kg ration did not significantly reduce the number of bacteria. so it is stated that the active substances contained in turmeric do not have antibacterial activity against *E. coli*. *E. coli* bacteria are a group of negative bacteria that have a multilayered cell wall, namely lipoprotein, the outer membrane of foplipid and lip polysaccharide. Outer membrane of phospholipids can reduce the entry of antibacterial substances into cells [14]. This is proven that the addition of turmeric extract can not reduce the amount of *E. coli* bacteria in *Kulawu* chicken intestines. This is consistent with the opinion of Widodo [15] that the active substance in ginger has antibacterial activity against gram-positive bacteria, but does not have activity against gram-negative bacteria.

Effect of treatment on performance and meat cholesterol of *Kulawu* chicken

Performance of *Kulawu* chickens on different dietary treatments were presented in Table 2. during week 1 until week 12 of study

Table 2 Effect of Turmeric Extract in Rations on Performance and Meat Cholesterol of *Kulawu* Chicken

Parameters	P0	P ₁	P ₂	P3	P ₄
Feed consumption (g)	2456.45a	2376.30 a	2180.68 b	2106.16 b	2093.80 b
Weight gain (g)	634.60 a	656,20 a	720.85 b	680.05 b	610.44 a
Carcass weight (g)	465.50 a	498,10 a	680.50 b	578.85 b	455.65 a
Feed conversion	3.87 a	3.78 a	3.15 b	3.24 bc	3.43 c
Meat Cholesterol (mg/dl)	100.71 a	96.36 a	90.65 b	85.12 b	84.00 b

Description : The same letter in the direction of the rows shows no significant difference (P>0.05)
P0 (control) ; P1 (37 ml/kg ration); P2 (74 ml/kg ration);
P3 (111 ml /kg ration) and P4 (148 ml/kg ration).

Feed consumption

Table 2, it can be seen that the addition of turmeric extract treatment on the basal ration caused feed consumption to decrease compared to the control treatment. Analysis of variance showed (Table 2) that the addition of turmeric extract significantly affected feed consumption ($P < 0.05$). The addition of turmeric extract in level 37 -148 ml/kg ration (treatments of P1, P2, P3, and P4) the feed consumption was significantly lower than the P0 treatment, even though the ration was made with relatively similar protein and energy levels. It is suspected that in the treatment of P1, P2, P3, and P4 added turmeric extract in the basal ration adds a distinctive odor and bitter taste to reduce appetite and reduce palatability. In line with what was stated by Bintang et al. [16] that the addition of turmeric meal to a higher level can reduce the palatability of rations so that the ability of chicken to consume rations will decrease. This can occur because turmeric contains *atsiri* oils with a distinctive odor and bitter taste, thereby reducing appetite. Although the ability to smell the chicken is low, but a sensitive taste on the tip of the tongue causes the chicken to be sensitive to ration so that the chicken knows the preferred type of ration [17].

Final Body Weight And Carcass Weight

The results of the analysis of variance showed that the addition of turmeric extract in the basal ration as a feed additive had a significant effect ($P < 0.05$) on final body weight and carcass. Duncan's multiple range test results on body weight gain in treatments P0, P1 and P4 were not significantly different, but for treatments P2 and P3 the final body weight and carcass were significantly higher compared to treatments P0, P1 and P4. Rations that contain turmeric extract can increase appetite so that the amount of ration consumption increases, nutrients that enter the body of *Kulawu* chicken can be used for growth and tissue formation, the active ingredient of turmeric extract, namely curcuminoid can function as an anti-bacterial and can suppress the number of bacteria pathogen in the intestine so that the absorption of nutrients is better and cause an

increase in body and carcass weight. Curcumin also acts as a *colagoga* could stimulate gall juice secretion and stimulates the release of pancreatic fluid that contains amylase, protease, and lipase enzymes to increase the metabolism of carbohydrates, proteins, and fats. Following the [18] the active substance in Turmeric may stimulate protein synthesis particularly increases the secretion of digestive juices and improved the gastro-intestinal condition so that nutrients that enter the chicken body can be utilized for tissue growth and body formation. In the treatment of P4 (148 mg/kg ration), there was a decrease in body weight gain due to an increase in the concentration of turmeric extract in the ration, then the content of the active substance also increased and was active to stimulate pancreatic fluid release to improve digestion in the small intestine. However, because the feed consumed is small, the amount of nutrients absorbed is insufficient to be able to provide stimulation to increase maximum final body weight and carcass weight.

Feed conversion

Variance analysis results (Table 2) show that the treatment has a significant effect ($P < 0.05$) on the value of feed conversion. The lowest conversion value is seen in P2 treatment. This is because the active ingredient of turmeric namely curcumin and *atsiri* oils has an effect on antimicrobial activity, can balance the number of pathogenic, and non-pathogenic bacteria in the digestive tract so that the process of digestion and absorption of food substances will increase, but due to unpleasant odors and the taste of turmeric extract with increased levels of ration will reduce consumption. This occurs in P4 treatment, which is a higher conversion value because the effect of *atsiri* oil functions can work on the digestive tract, especially the small intestine is not balanced and is toxic. Following Rahmat et al. [19] which states that excessive administration of turmeric extract will be toxic and will reduce feed consumption and increase the value of feed conversion.

Meat Cholesterol

From Table 2 the average content of *Kulawu* chicken to 12 weeks is around 84.00 - 100.71 mg/dl. It was seen that with the increase in the addition of turmeric extract as a feed additive followed by a decrease in meat cholesterol. Results The results of statistical analysis showed that the addition of turmeric extract significantly reduced meat cholesterol in *Kulawu* chicken ($P < 0.05$). The turmeric extract has a cologoga effect which is to stimulate the secretion of gall juice so that it can reduce cholesterol. Table 2 shows that the treatment of P0 and P1 with the addition of turmeric extract as much as 37 mg/kg ration and P0 without turmeric extract did not significantly reduce meat cholesterol. This is because the effect of the active substances in turmeric extract is not enough to stimulate the liver to release bile, so cholesterol which is a bile material is not widely used. In contrast to treatment P2, P3 and P4 by added turmeric extract until doses 74 - 148 mg/dl, the active substance in turmeric extract could enough to stimulated gall juice secretion into the duodenum, so could the suppressed the meat cholesterol. The opinion of Afifah et al.[20] which states that in herbal concoctions especially ginger and turmeric can reduce levels meat cholesterol also is *hypercholesterolemia*.

CONCLUSIONS

The results of the study can be concluded:

The addition of turmeric extract up to 74 mg/kg given to the *Kulawu* chicken ration can inhibit amount bacteria in the intestine, meat cholesterol and gave the best performance on *Kulawu* chicken.

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