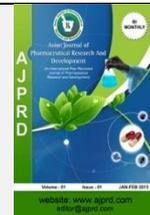


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Research Article

The Effect of Herbal Extracts and Probiotic Feeding On Productivity and Quality of Broilers

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ABSTRACT

Objective: To find out the effect of probiotics, javanese turmeric (*Curcuma xanthorrhiza*) and breadfruit (*Artocarpus altilis*) leaves extract in feed on productivity and quality of broilers.

Design: The design of this study was experimental research. The viscous herbal extract from javanese turmeric and breadfruit leaves were prepared by maceration with 96% ethanol and the probiotics used EM4 (Effective Microorganisms-4). This study used male chicks and divided into 5 groups: (1) negative control treatment (feed), (2) positive controls (feed+antibiotics), (3) feed+0.1% extract+1% probiotics, (4) feed+0.2% extract+2% probiotics and (5) feed +0.3% extract+3% probiotics. The positive control used erythromycin. Feed intake, body weight gain and feed conversion rate were observed for 35 days. Total cholesterol and crude protein levels were examined on day 35.

Interventions: The intervened variable was the concentration of extract used.

Main outcome measures: The main measurement in this study were feed conversion rate, total cholesterol and crude protein levels.

Results: The results showed that combination of probiotics, javanese turmeric and breadfruit leaves herbal extract increased body weight 10.71% and feed intake 61.60%, decreased feed conversion 13.97% and total cholesterol 27.95% of treatment group and significantly different with negative and positive control groups ($p < 0.05$) but did not affect ($p > 0.05$) to crude protein level of treatment group or negative and positive control group.

Conclusion: The administration of probiotics, javanese turmeric and breadfruit leaves herbal extract increased productivity and decreased cholesterol levels but did not affect crude protein levels in broilers.

Keywords: Javanese turmeric, Breadfruit leaves, Probiotics, Broilers, Productivity, Quality.

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INTRODUCTION

Antimicrobial compounds are commonly included in poultry feeds for growth promotion and diseases prevention¹. Because of the antibiotic resistance and the implications on human health, there is a need to find out safe alternatives to replace antibiotic as a growth promoters in the poultry industry². Feeds containing no chemical additives are increasingly used in poultry nutrition. In many countries, efforts are being made to ban all types of antibiotic growth promoters. For this reason, herbs and natural feed additives are being investigated as natural sources biologically important substances. Gou et al.³ have demonstrated that herbs and herbal products have a positive effect on broiler growth performance.

Breadfruit leaves (*Artocarpus altilis*) is widely used by Indonesian society as a traditional medicine, because flavonoids, antocyanin, hydrocyanic acid, acetylcholine, tannin, riboflavin, saponin, phenol, quercetin, champerol,

B-carotene, vitamin C and potassium are efficacious for treatment and functioning as antioxidant. Supplementation of breadfruit leaves powder in feed decreases abdominal fat, intramuscular meat fat and meat cholesterol content^{4,5}.

Curcuma xanthorrhiza (commonly known as javanese turmeric or temulawak in Indonesia), grows in South-East Asia and found both wild and cultivated in Indonesia. It is traditionally used for medicinal purposes. The rhizome and root of this plant contain beneficial constituents that have been used in the treatment of acne and skin inflammations. More recently, studies have demonstrated that products derived from *C. xanthorrhiza* showed antioxidative, detoxifying and anticarcinogenic characteristics⁶. The addition of probiotics feeds benefit the host animal by stimulating appetite⁷, improve intestinal microbial balance⁸, stimulate the immune system⁹, decrease pH and release bacteriocins¹⁰ that

compete with other microbes for adhesive site, improve egg mass, egg weight, egg size in layers^{7,11} and feed intake in layers and also depress serum and egg yolk cholesterol concentrations in hens^{12,13}. The aim of this study was to investigate the effect of javanese turmeric, breadfruit leaves extract and probiotics on broiler productivity and quality to replace antibiotic as a growth promoters in the poultry industry.

MATERIALS AND METHODS

Preparation of herbal extracts

Javanese turmeric rhizomes were obtained from traditional markets Jamin Ginting street, Padang Bulan district, Medan regency, Sumatera Utara province, Indonesia. Breadfruit leaves were obtained from the Indonesian Medicinal Plant Garden (TOI), Faculty of Pharmacy University of Sumatera Utara, Medan. The plants were identified at Herbarium Medanese Laboratory. Javanese turmeric (1000 g) and breadfruit leaves extracts (1000 g) extracts were prepared using maceration method with 20 L 96% ethanol. Then the filtrate was evaporated in a rotary vacuum evaporator and made viscous by heating in a water bath.. The yield of ethanol extract of javanese turmeric was 195 g (19.5%) and breadfruit leaf was 115 g (11.5%). The yield of ethanol extract of javanese turmeric was 195 g (19.5%) and breadfruit leaves was 115 g (11.5%).

Material, chemical reagents and tools

The ingredients used in this study were breadfruit leaves (*Artocarpus altilis*), javanese turmeric (*Curcuma zanthorrhiza*), ethanol 96 %, Effective Microorganisms-4 (EM4) (PT. Songgolangit Persada) as probiotics, erythromycin as antibiotic, Bestaquam (Bestar) as desinfectant, Cosumix Plus 750 (Novartis), Biogreen (Laboratoires Biove), Neo Meditril (Medion), Linco Spectin (Zoetis Suzhou), ND vaccine, Gumboro vaccine, NaOH, H₂SO₄, CuSO₄, K₂SO₄ and mengsel indicator.

Experimental procedures

Chicks were placed into 4 cages per plot. Chicks were fed and drink according to the type of treatment, then chicks were weight as the initial body weight. The next day until the 35th day the feed was replaced every day according to the type of treatment. Broilers were weighed to determine weight gain once a week, leftover food was weighed every day to find out how much food were consumed.

Treatments

The study design used with 5 treatments:

- Co = Negative control (feed)
- C+ = Positive control (feed+antibiotic)
- T1 = Feed + 0.1% extract (0.1 g/100 g feed) + 1% probiotics (1 g/100 g feed)
- T2 = Feed + 0.2 % extract (0.2 g/100 g feed) + 2% probiotics (2 g/100 g feed)
- T3 = Feed + 0.3 % extract (0.3 g/100 g feed) + 3% probiotics (3 g/100 g feed)

Each treatment uses 12 male chicks divided into 3 cages (each cage contained 4 chicks) with three repetitions. Erythromycin was used as a positive control. The parameters measured were feed intake, body weight gain, feed conversion, cholesterol levels and crude protein levels¹³.

All treatments to the animal and procedure were evaluated according to Animal Research Ethics Committees/AREC Faculty of Mathematics and Natural Science, Biological Department, University of Sumatera Utara.

Determination of crude protein contents

The breast meat (0.05 g) was used as a sample for each group. Protein levels were measured by the Kjeldahl methods¹⁵.

Determination of total cholesterol contents

Examination of total cholesterol levels were performed using a spectrophotometer at the Regional Health Laboratory of North Sumatra Province. Blood was taken from the rear wing (*axillary vein*) as much as 0.5 ml, blood was inserted into the microtube, left at room temperature for 5 minutes, centrifuged for 10 minutes at a speed of 3000 rpm until the clear serum was produced. The serum was separated and total cholesterol levels were measured¹⁴.

Statistical analysis

Data were analyzed using SPSS 17.0 with Kolmogorov-smirnov normality test, one-way ANOVA and Kruskal Wallis to see differences between test groups with significance (p<0.05).

RESULT AND DISCUSSION

The effect of herbs and probiotics feeding on broilers can be seen in Table 1 and Fig. 1

Table 1: Effect of herbs and probiotics on broiler for 5 weeks

Group	Productivity parameter			Quality parameter	
	Body weight (g)	Feed intake (g)	FCR	Total cholesterol (mg/dl)	Protein (%)
Co	1866.13±26.0445	214.53±18.3	1.72 ± 0.06	164.67 ± 2.517	20.29 ± 0.10
C+	1980.54±75.3769 ^a	437.5±60.4 ^a	1.38 ± 0.11 ^a	162.67 ± 2.517	20.43 ± 0.34^b
T1	1977.99± 42.4860 ^a	474.64±136.7 ^a	1.42 ± 0.05 ^a	155.67 ± 5.686 ^a	20.45 ± 0.16^b
T2	1996.61± 26.0371 ^a	646.06 ± 21.17 ^a	1.46 ± 0.04 ^a	142.67±17.09 ^a	20.6 ± 0.43^b
T3	2090.46±26.6087 ^a	849.23±109.1 ^a	1.36±0.04 ^a	128.67±4.163 ^a	20.29± 0.10 ^b

Note: Note: FCR: Food Conversion Rate; Co= Negative control (feed); C+ = Positive control (feed+antibiotic); T1= Feed + 0.1% extract + 1% probiotics; T2 = Feed+0.2% extract + 2% probiotics; T3=Feed+0.3 % extract + 3% probiotics

^aSignificant difference with negative control (p<0.05)

^bNot significant difference with negative control (p≥0.05)

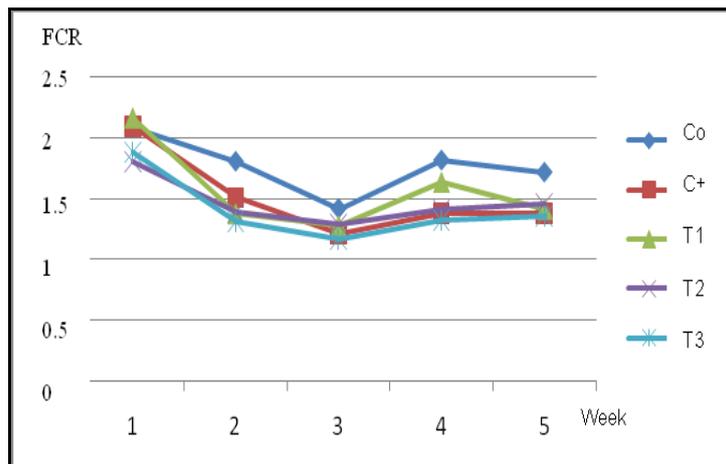


Figure 1: Effect of herbs and probiotics on broiler feed conversion rate for 5 weeks (g/head/week)

Note: FCR: Food Conversion Rate; Co= Negative control (feed); C+ = Positive control (feed+antibiotic); T1= Feed + 0.1% extract + 1% probiotics; T2 = Feed+0.2% extract + 2% probiotics; T3=Feed+0.3 % extract + 3% probiotics

The Effect of herbs and probiotics on broilers body weight

Based on observations, it was shown Table 1. that chicks treated as controls showed weight gain from the first week to the last week of the experiment. Statistical analysis showed a very significant difference between the control and treatment ($p < 0.05$). Combination of herbal extracts and 3% probiotics increased body weight 10.71% higher than the negative and positive control group.

The results of the study were supported by the results of the study of Astuti¹⁶ which showed that the highest concentration of liquid probiotics added to feed increased weight gain and had a very significant effect ($p < 0.05$) on broiler body weight.

Whereas Sinurat et.,al¹⁷ reported that the administration of javanese turmeric flour in broiler rations did not have a significant effect on broiler weight gain. Differences in the results of research on the use of bioactive plants in rations are often reported. One possible cause is the difference in the content of the active ingredients contained in the material used¹⁷.

Increased of feed intake was strongly associated with increased body weight. So that in this case, combination of probiotics, javanese turmeric, and breadfruit leaves herbal extract showed the highest increase (61.60%) then positive and negative control group, presumably because of the effect of the content of each herbal extract on treatment.

The Effect of herbs and probiotics on feed intake

As can be seen from Table 1, the T3 group showed increase in feed intake from the first week to the fifth week (34.6 g to 136.43 g), lower than positive and negative control group but had highest increase in body weight parameter. This is in Accordance with the study

by Haddanin et al.¹⁸ that using probiotics in the feed of laying hens on egg production. Feed intake at the level of probiotics is lower than feed without probiotics Astuti¹⁶ reported that the higher the concentration of probiotics given, the higher the bacteria contained in it, the livestock will be more efficient in consuming feed. This could be due to the more probiotics given, the more feed contain *Bacillus* sp. the more villi on the intestinal surface. The more villi in the intestine, the better digestion in chickens so that they consume less feed¹⁹.

The effect of herbs and probiotics on Feed Conversion Ratio (FCR)

As can be seen in Table 1. all group of treatments given the lowest of FCR found in group T3, this result was also supported by statistical analysis where there was a very significant difference between the control and treatment of extract ($p < 0.05$).

On the other hand Yasni et al.²⁰, also reported that curcuma extract can reduce ration consumption in mice made with diabetes. However, based on Tugiyanti⁵, supplementation from breadfruit leaves powder did not significantly affect feed conversion in 9-week-old Tegal duck. FCR in meat is strongly related to feed efficiency or conversion of feed into meat.

The Effect of herbs and probiotics on crude protein and cholesterol

In all treatment groups given a combination of herbal extracts and probiotics, crude protein levels were almost the same in all control and treatments, the lowest cholesterol levels found in T3 group (combination of herbal extracts and probiotics with highest concentration) were 128.67 mg/dl, decreased 27.95 %. Based on statistical tests, it was found, there were significant differences in the negative control cholesterol level, positive control and T1, T2 and T3 groups ($p < 0.05$) as can be seen on Fig. 2.

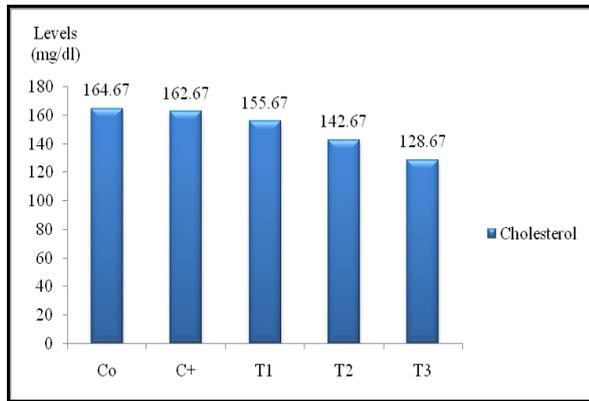


Figure 2: The Effect of herbs and probiotic on broiler total cholesterol for 5 weeks

Note: Co = Negative control (feed); C+ = Positive control (feed+antibiotic); T1= Feed + 0.1% extract + 1% probiotics; T2 = Feed+0.2% extract + 2% probiotics; T3=Feed+0.3 % extract + 3% probiotics.

Combination of probiotics, javanese turmeric extract and breadfruit leaves affect the production and increased bile secretion leading to greater cholesterol metabolism, cholesterol will come out with feces resulting in decreased blood cholesterol. Javanese turmeric can metabolize body fat and can reduce cholesterol levels resulted in hypocholesterolemia. Curcuminoid in javanese turmeric has activity increasing bile production and secretion, stimulates the release of pancreatic enzymes which can increase the metabolism of carbohydrate, protein, and fat ingredients so that the digestion process is fast and optimal. Probiotic bacteria can reduce cholesterol levels, this ability comes from anti-cholesterol substances produced by bacteria that inhibit the work of cholesterol-forming enzymes, cholesterol reduction also occurs because during the growth of bacteria absorb a certain amount of cholesterol into the cells¹⁷.

Probiotics can degrade cholesterol into coprostanol which cannot be absorbed by the intestine and then excreted along with feces so that the cholesterol absorbed by the body becomes low. In line with the hypothesized by Ignatova et al.²¹ that supplementation of probiotics can reduce serum triglycerides and cholesterol in poultry. The administration of *Streptococcus thermophilus* lactic acid bacteria has reduced broiler blood cholesterol levels¹⁶.

Breadfruit leaves contain flavonoids, vitamin C and carotene which can function as antioxidants. This antioxidant, in addition to inhibiting the oxidation process can inhibit the activity of HMG-CoA reductase enzyme in the process of cholesterol synthesis. Inhibition of the activity of this enzyme causes the absence of mevalonate

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from HMG-CoA; mevalonate will be converted to squal, lanosterol, dihydrolanosterol, D 8-dimethylsterol, 7-dihydrocholesterol and finally cholesterol. Besides that, Flavonoids also have a positive effect on decreasing serum total cholesterol levels through increasing bile acid excretion with impurities⁵.

The administration of probiotic, javanese turmeric and breadfruit leaves extract had no significant effect ($p > 0.05$) on the percentage of crude protein. According to the study of Tugiyanti et, al.⁴, that breadfruit flour does not increase the protein content of duck meat, because the content of anti-nutrients in breadfruit leaves flour such as tannins, saponins and crude fiber inhibits the digestive process, so it also reduced the process of absorption of protein in the small intestine.

Supplementation of breadfruit leaves flour into feed has no significant effect on the levels of male chicken broiler meat protein because the antioxidant content in breadfruit leaves is able to maintain meat protein levels because antioxidants that have many OH groups that scavenge free radicals. The more active antioxidants contained in the feed, the more they can maintain their protein levels⁴.

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CONCLUSION

Based on the results of the study it can be concluded that the administration of curcuma herbal extract, breadfruit leaves extract and probiotic increased the productivity and decreased cholesterol levels but did not affect crude protein levels of broilers.

CONFLICT OF INTERESTS

All authors have no to declare

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