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Effect of various feed additives administration on performance and hematological parameters of local chickens (*Gallus domesticus*)

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Effect of various feed additives administration on performance and hematological parameters of local chickens (*Gallus domesticus*)

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Abstract. Antibiotics have been banned to be used as feed additives in animal feed recent years due to adverse effect of antibiotics. Alternative feed additives to replace the role of antibiotics such as pre-probiotics. The purpose of this study was to evaluate administration of various feed additives in animal feed on performance and hematological parameters of local chickens. Totally 200 mixed sex local chickens were randomly distributed based on the different treatment groups consisting to 4 treatments and 5 replications. Application of 4 treatments in this study was administration of different feed additives either in the water or mixed feed = control-vita chick 0.7 g p/ liter; A₁=20 ml per liter probio-FM; A₂=0.08 % MOS per kg in feed and A₃= phytogetic as herbal KI 5 ml per liter. Parameters evaluated in this study were animal performance [BW, FI and FCE] each month up to 3 months and hematological parameters. The results in this experiment indicated that there were no significant different [$P \geq 0.05$] between treatments for performance except for body weight in the first month. Application of feed additives significantly influenced [$P \leq 0.05$] hematological parameters [erythrosine, thrombosis and hemoglobin] of local chickens but not for leukocyte and hematocrit.

1. Introduction

Antibiotics have been used as sub-therapeutic dosages in animal feed since decades. Some studies indicated that application of antibiotics in animal feed were able to improve animal performance [1, 2]. However, due to adverse effects of antibiotics such as residue of antibiotics in animal products (meat, milk and eggs) and bacterial resistance of antibiotics resulting in prohibiting antibiotics as feed additives in animal feed. Europe countries according to European Parliament and Council Regulation EC No. 1831/2003 have banned antibiotics as growth promoters since 2016 and Indonesia officially has banned antibiotics in animal feed since 1st January 2018 based on article 16 No 14/2017. Kolawole and Shittu [3] stated that using of antibiotics as growth promoters may increase the number of bacterial antibiotic resistance.

Due to the prohibition of antibiotics as growth promoters in animal feed, other alternatives/replacement of antibiotics as feed additives in animal feed have been offered to produce the health and safety of animal-derived diet. It was well known that there are several alternatives feed



additives have been administrated as replacement of antibiotics in animal feed like pro- prebiotics, symbiotic, immunostimulants, phytogenic (plant extract), enzyme and organic acids. The results of some experiments concluded that applying of alternative feed additives in animal feed was able to improve growth and feed efficiency, decrease mortality rate, enhance animal health and produce good quality animal products [4-5].

Improving animal health by administration feed additives is by altering the useful micro-organism in the digestive tract. Studies conducted by [6] showed that fermentation of industrial by products such as soybean residue and palm kernel meal with *Aspergillus Niger* was able to keep non-pathogenic micro-organism and decreased the number of pathogenic micro-flora. In addition, research conducted by [7] concluded that broiler feed substituted by thyme powder as replacement of antibiotics significantly improved HDL-cholesterol but not for the concentration of protein, albumin, LDL-cholesterol. The hematological concentrations such as red and white blood cell count, hemoglobin and hematocrit were not also significantly influenced by administration of thyme powder up to 10 g per kg. The aims of this study was to evaluate administration of various feed additives (pro-prebiotics and herbal) as replacement of antibiotics in animal feed on performance and hematological parameters of local chickens.

2. Materials and Methods

2.1 Animal and Nutrition

The study was carried out at private small animal enterprise Banda Aceh and continued by hematological parameter analysis for leukocyte, erythrosine, thrombosis, hemoglobin and hematocrit at Veterinary Faculty, Syiah Kuala University, and Banda Aceh.

Totally 200 mixed sex chickens from growth study were randomly allocated based on four different treatments and five replications with 10 chickens per unit replication (total 20 cages). Chickens were grouped according to administration of different feed additives either in the water or in the feed as follow; A₀ = control-vita chick 0.7 gram per liter; A₁= 20 ml per liter probio-FM; A₂= 0.08% MOS per kg in feed and A₃= herbal leuser KI 5 ml per liter. The chickens were reared with free access to feed and water *ad libitum* under uniform conditions Chickens were fed with commercial feed with the content of 24% crude protein, 7.4% crude fat, 6% crude fiber, 8% ash and 3,200 kkal/kg. The temperature of the cages was controlled according to the age of chickens and kept constant from 35⁰ C at the beginning and decreased up to 24⁰C after 4 weeks.

Twenty chickens from growth study at the age of 90 d were selected for hematological analysis. Blood was collected in no heparinized tubes by brachial vein puncture, then centrifuged for serum separation and stored for at 20⁰C for further analysis. Total leukocyte, erythrosine, thrombosis, hemoglobin and hematocrit were analyzed using auto hematology analyzer (Model: BC-2800, Shenzhen Mind ray Biomedical Electronics, Germany).

2.2 Statistical Analysis

This experiment was subjected to one way ANOVA and designed to completely randomized design with 4 treatments and 5 replications. Variables observed in this study were animal performance (BW, FCE and FI) and hematological parameters (leukocyte, erythrosine, thrombosis, hemoglobin and hematocrit). All experiment data were statistically analyzed using SPSS and differences between treatments were stated [P<0.05] by using Duncan Multiple Range Test [8].

3. Results and Discussion

3.1 Performance

Performance results of the growth study each month up to three months are presented in Figure 1. As indicated from Figure 1 for body weight (a), feed intake (b) and feed conversion efficiency (c),

administration of different feed additives was not significantly different from control ($P>0.05$) except for body weight in the first month (A0=251.16, A1=247.20, A2=246.84 and A3=248.70 for A0, A1, A2, and A3 respectively). The weight of animal up to 3 months ($g\pm SEM$) was $1,040.33 \pm 50.93$; 983.80 ± 55.03 ; $1,082.93 \pm 44.62$; 961.38 ± 39.32 ; $1,020.08 \pm 52.27$ for A0, A1, A2, and A3 respectively. From the figure, the growth of local chickens increased linear up to 3 months. The weight of local chickens was different from meat type chickens in which at the age of 42 d was 2200 g [9].

Feed intake was not significantly influenced ($P>0.05$) between treatments based on each month statistically calculation. At the-3 month measurement, feed intake [$g\pm SEM$] of animals was 1362.20 ± 21.20 ; 1271.70 ± 27.22 ; $1323, 28 \pm 25.25$; $1277, 35 \pm 7.28$; $1232, 03 \pm 62.72$ for A0, A1, A2, and A3 respectively. Research conducted by [9]. At the age of 42 d feed intake of chickens was about 4000 g with FCR of was about 1.87. Genetic of animals influenced growth, feed intake and feed conservation of animals.

As shown in Figure 1 (a, b, c) that performance of local chickens was not affected by administration of various feed additives. Our study was different from research conducted by [10]. in which administration of essential oil from herbs as one of feed additives added at basal diet of 24, 48 or 72 mg per kg diet and an antibiotic at 10 mg avilamycin per kg diet significantly improved body weight and feed intake but not at the age of 42 d. Natural antimicrobial compounds have been used as feed additives such as thymol, limestone because of their biological activities [11]. These compounds were able to stimulate effect on digestive of animals to produce enzymes for food digestion [12].

Our research was in accordance with [13] adding of extracted *Zingiber zerumbet* rhizome as feed additives in diet up to 6% had no effect on final body weight, body weight gain, feed intake, feed conversion ratio, and mortality of chickens. Research relating to feed additives administration on animal performance was relatively different from one results and others. Some studies concluded that feed additives had significantly different on animal performance and the others were not significantly difference depending on several factors such as stress, comfortable environment and other factors.

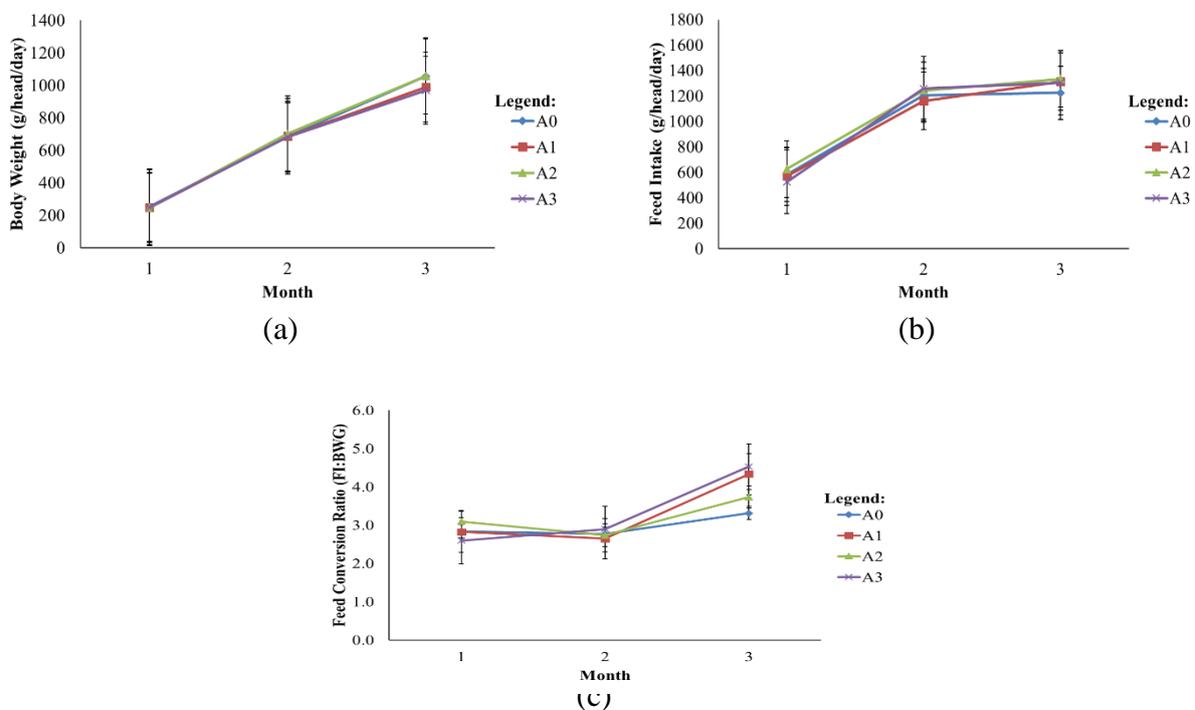


Figure 1. The Effect of various feed additives administration on body weight (a), feed intake (b) and feed conversion efficiency (c) of local chickens (*Gallus domestics*) measured each month up to 3 months (A₀ = control-vita chick 0.7 gram per liter; A₁= 20 ml per liter probe-FM; A₂= 0.08% MOS per kg in feed and A₃= herbal leuser KI 5 ml per liter).

Hematological parameter usually for health status information of animal after diet treatment in which blood parameter can be used as indicators for pathological, physiological of animal after supplying of animals with feed additives in diet. Ganong [14] stated that concentration of leucocytes in blood improved sharply after the body was infected. Result as the effect of administration various feed additives are presented in Table 1. As shown in Table 1, hematological parameters (erythrosine, thrombosis and hemoglobin) were significantly affected ($P \leq 0.05$) by administration of feed additives significantly but not for leukocyte and hematocrit concentration of local chickens.

Our results were in accordance with the research conducted by [7] concluded that broiler feed substituted by thyme powder as replacement of antibiotics significantly had no significant different on the concentration of leucocytes in the blood plasma. But in our study, other hematological parameters such as erythrosine, thrombosis and hemoglobin were significantly affected ($P \leq 0.05$) by administration of feed additives. Study carried out by [15] concluded that there were significantly increased of hematological parameters (RBC, HCT, Hb and WBC) in comparison to the control group. This was in correlation with our experiment, in which concentration of thrombosis and hemoglobin tended to increase by adding of feed additives in basal diet.

Table 1. The Effect of various feed additives administration on hematological parameters of local chickens (*Gallus domestics*) measured each month up to 3 months (A₀ = control-vita chick 0.7 gram per liter; A₁= 20 ml per liter probio-FM; A₂= 0.08% MOS per kg in feed and A₃= herbal leuser KI 5 ml per liter).

Hematological Parameters	A0	A1	A2	A3	$\bar{X} \pm SE$	P _{value}
Leukocyte	231.60 ^{ab}	229.86 ^{ab}	235.40 ^b	224.58 ^a	230.36 ± 1.64	0.104
Erythrosine	14.13 ^a	15.04 ^b	16.64 ^c	13.70 ^a	14.88 ± 0.29	< 0.001
Thrombosis	3.13 ^a	3.44 ^b	3.78 ^c	3.15 ^a	3.37 ± 0.07	< 0.001
Hemoglobin	45.53 ^a	49.82 ^b	54.76 ^c	44.34 ^a	48.61 ± 1.06	< 0.001
Hematocrit	6.75 ^a	6.60 ^a	5.50 ^a	4.50 ^a	5.84 ± 0.64	0.620

*Means within row with different superscripts differ at $P < 0.05$

4. Conclusion

In conclusion, administration of various feed additives in basal diet did not significantly influence ($P \geq 0.05$) performance of local chickens except for body weight in the first month. Hematological parameters (erythrosine, thrombosis and hemoglobin) were significantly affected ($P \leq 0.05$) by administration of feed additives significantly but not for leukocyte and hematocrit concentration.

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