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Effect of nucleotides and turmeric extract on blood protein and body weight of broiler kept in open cages

Effect of nucleotides and turmeric extract on blood protein and body weight of broiler kept in open cages

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Abstract. Indonesia's wet tropical climate is a condition that does not support the development chickens. Therefore, this study aims to analyze the effect of nucleotides and turmeric extract in basal feed on broilers' blood protein and body weight. Data was collected using a Completely Randomized Design (CRD) with 7 treatments that comprised of negative and positive control. Meanwhile, the negative aspects include basal feed + plus Zink Bactitracin 0.1 g, while the positive control consists of N0K1, N1K0, N1K1, N2K0, and N2K1. The results showed that nucleotide supplementation and turmeric extract in the feed had no significant effect on blood PCV, TPP, albumin levels, and broiler body weights. Furthermore, blood protein increases due to the high levels of nucleotides and turmeric extract. The 5 g of nucleotide supplementation and turmeric extract produce the same broilers blood protein and body weight.

1. Introduction

Indonesia's wet tropical climate is a condition that does not support the development of chickens. Therefore, broilers reared above the thermoneutral zone are vulnerable to environmental heat stress and exhibit behavioral, as well as physiological changes. This study result showed that 75% of the chicken industry was controlled by large breeders and integrator, while the remaining 25% is for smallholder farmers who uses open cages. However, entrepreneurs play an important role in trade dynamics and the country's economy because livestock production facilities such as breed, feed, vitamins, and cage equipment are not available for selling without their presence. These smallholder farmers often face the problems of broiler growth that takes a long time of about 37-42 days before it reaches the target body weight. In Indonesia, nucleotide synthesis is insufficient because the tropical climate conditions cause these chickens to experience heat stress. Nucleotide deficiency tends to reduce the performance of immune organs[1]. Therefore, it is necessary to find safe feed additives including nucleotides and turmeric extract for broilers and the people that consume them.

Turmeric contains curcuminoid compounds consisting of curcumin, desmethoxycumin, bisdemethoxycurcumin, and essential oils, 1-3% fat, 3% carbohydrates, 30% protein, 8% starch, 45-55% vitamin C, as well as mineral salts including iron, phosphorus, and calcium[2]. The curcuminoids and turmeric are efficacious just like antihepatotoxic, enthelmintic, antiedemic, analgesic, anti-inflammatory, and antioxidant[3]. Therefore, turmeric helps to increase appetite, work digestive organs, absorb nutrients in the body, and livestock endurance. This situation affects the ability of broilers to digest and absorb protein.

Nucleotides are semi-essential nutrients because they code and translate genetic information, contribute to energy metabolism, participate in coenzyme structures, regulate lymphocyte maturation,

activate phagocytosis and macrophages, as well as enhance immunological responses[4]. Previous studies indicated that adding nucleotides to feed tends to increase body weight gain and reduce FCR [5]. Moreover, 0.1% nucleotide supplementation help to decrease the effect of infection and Clostridium perfringens [6]. This supplementation did not significantly affect the immune organs' performance at different environmental temperatures. Therefore, it needs to be combined with turmeric extract which is antimicrobial and antioxidant to enable chicken growth to remain fast. This study examines the effect of nucleotide supplementation and turmeric extract on broilers' blood protein and body weight.

2. Materials and methods

2.1. Animals, diet, and experimental design

A total of 168 Day-old chic were placed in an open cage with 30 plots measuring 1.5 x 1.5 x 1 m. The starter period basal diet contains 21% protein and EM 3100 kcal/kg. Table 1 shows the nutrient content of the feed. However, BioNutrend® nucleotide Feed Grade produced by Wuhan Sunhy Biology Co. Ltd., China was used at the level of 0.25 g and 0.5 g [7] because the extra turmeric used is 0.6g [8].

Table 1. Nutrient content of the treatment.

Treatment	DM(%)	% DM				
		CP	EE	CF	Ash	NFE
NC	89.10	14.54	4.92	7.97	15.11	57.46
PC	89.33	13.98	5.52	7.56	15.86	57.08
N0K1	90.31	14.79	5.66	7.79	16.59	55.17
N1K0	90.08	14.02	5.80	7.00	15.18	58.01
N1K1	90.07	14.70	5.60	10.60	13.29	55.82
N2K0	90.45	14.89	5.60	11.16	15.68	52.66
N2K1	90.51	18.07	5.62	11.95	16.23	48.13

Table 1 consists of DM, CP, EE, CF, NFE, NC, PC, N0K1, N1K0, N1K1, N2K0, and N2K1.

Data were collected using a randomized design with 7 treatments that are comprised of negative and positive control. Meanwhile, the negative aspects consist of basal feed+zinc batriacin 0.1g, while the positive contains N0K1, N1K0, N1K1, N2K0, and N2K1. Turmeric extract is calculated based on the percentage of dry matter. Therefore, there are 28 experimental units because treatment was repeated 4 times.

2.2. Research procedure

Disease control was performed by giving NCD vaccines through eye drops while the chickens were 4 days old. Meanwhile, the vitamin was given a day before the broilers were vaccinated, but the weighing was performed weekly. The PCV measurement is performed by taking a specimen in venous or capillary blood from the brachial vein. Blood was put into 2/3 or 3/4 of two microhematrochitic tubes where one part was closed using clay or a micro burner. However, the speed of centrifuge for 5 minutes is 11,000-16,000 rpm using a microhematocrit calculator. The result tends to be re-examined if it has a difference of ±2%. Meanwhile, TPP was measured using the biuret method with Automated Chemical Analyzer Diasys Response 920, while albumin was calculated by centrifuging 3-5 ml to obtain serum or plasma. The reagents and specimens were allowed to stand at room temperature.

2.3. Statistical analysis

Data were analyzed using variance with the help of SPSS IBM version 26.

3. Results and discussion

High ambient temperature negatively affects broilers' physiological condition and productivity. Therefore, chickens especially those above three weeks old find it difficult to adapt to changes in

environmental temperatures. These physiological conditions are indicated through the protein profile of the broilers' blood and growth.

Table 2. Effect of nucleotide supplementation and turmeric extract on PVC, TPP, albumin, and broiler body weight.

Parameter	Treatment							Sig.
	NC	PC	N0K1	N1K0	N1K1	N2K0	N2K1	
PCV (%)	19.5 ± 0.3	21.25 ± 0.6	20.75 ± 0.9	23.0 ± 1.3	21.8 ± 0 .9	23.5 ± 0.9	24.3 ± 1.2	ns
TPP (g/dl)	2.35 ± 0.1	2.7 ± 0.1	2.5 ± 0.1	2.7 ± 0.1	2.5 ± 0.1	2.65 ± 0.2	3.1 ± 0.2	ns
Albumin (g/dl)	40.5 ± 2.0	46.6 ± 1.7	43.1 ± 2.2	46.6 ± 2.1	43.1 ± 2.2	45.7 ± 3.9	53.4 ± 4.3	ns
BW (g)	824.8 ± 36.7	830 ± 63.4	919 ± 27.6	863 ± 22.2	868.8 ± 26.0	840.5 ± 30.1	868.3 ± 22.4	ns

Table 2 comprises NC, PC, N0K1, N1K0, N1K1, N2K0, N2K1, PCV, TPP, and BW.

3.1. Blood protein

The comfort zone environment tends to affect chickens' feed and consumption, blood protein, as well as productivity including growth and body weight [18]. Meanwhile, high temperatures cause broilers to experience heat stress and dehydration which damage blood viscosity and proteins [19].

Table 2 shows the average blood protein including packed cell volume, total plasma protein, and albumin levels. The analysis result showed that nucleotide supplementation and turmeric extract did not significantly affect broilers' PCV, TPP, and albumin levels in tropical climates ($P<0.05$). However, the highest pack cell volume in the N2K1 treatment was 24.3±1.2 %. Table 2 shows that adding 0.6 g of turmeric extract on N0K1 led to a lower PCV than the positive control. This is in line with the study of Hartati [9] that the chickens' pack cell volume of 100 gr/kg BW was lower than PC. The addition of 0.25 g of nucleotides in the N1K1 treatment leads to a higher PCV value. Although, the increase in nucleotide is not significant but was directly proportional to the development of pack cell volume. Meanwhile, heat stress conditions do not allow chickens to meet nucleotides adequacy through the de novo and salvage pathway mechanisms [20].

The PCV indicates the blood's ability to transport oxygen and nutrients[10] because its high blood viscosity reduces blood flow and improves heart performance. Meanwhile, a low pack cell volume shows that nutrient absorption is inhibited and lead to erythrocyte damages [10], while normal PCV range from 22-35%[11]. In this study, the PCV value was normal at N1K0, N2K0, and N2K1 but was low at other treatments. This is possible because de novo synthesis does not meet the needs of erythrocyte growth and differentiation.

The same thing was indicated in TPP and albumin with the highest N2K1 treatment of 3.1±0.2 g/dl and 53.4±4.3 g/dl respectively. However, the combination of 0.5 g nucleotide supplementation and 0.6 g turmeric extract lead to higher TPP and albumin values. This is because nucleotides play a role in the growth and replacement of damaged cells. Also, the content of curcumin in turmeric extract acts as an anti-inflammatory to protect hepatocyte cells and prevents inflammation in the liver to enable protein synthesis to occur optimally [12].

3.2. Body weight

Under tropical climates, broiler production is encumbered by several constraints which make it difficult in attaining their genetic potential. Therefore, the harsh environmental conditions with thermal stress become one of the challenges that hinder chicken optimal growth.

Table 2 shows the average body weight of broilers. The analysis result showed that nucleotide supplementation and turmeric extract do not significantly affect chickens' bodyweight in tropical climates ($P<0.05$). This is indicated by using nucleotides from *Saccharomyces cerevisiae* in broiler [13].

Although, the increase in nucleotides is not significant but leads to the development of body weight. Meanwhile, the availability of nucleotides helps to improve intestinal performance by enhancing intestinal villi and gut mucosal immunity [7,14,15]. The nucleotides failed to increase feed intake despite its development in body weight [5]. Therefore, the increase in nucleotide without turmeric extract leads to low body weight. This shows that additional nucleotides are needed to optimize de novo synthesis at a high temperature [16].

The highest body weight was 919±27.6 g in the N0K1 treatment because turmeric extract contains antioxidants and antimicrobials that reduce lipid peroxidation and improve intestinal morphology and ecology, as well as the immune response and absorption of body nutrients [3]. In heat stress, 0.5% turmeric extract supplementation had better body weight gain and feed intake [17]. Therefore, the combination of the two results is higher than the control with 868.3±22.4 grams.

4. Conclusions

In a wet tropical environment, a total of 5 g of nucleotides and turmeric extract produce the same blood protein and body weight

Conflict of interest

The author certifies that there is no conflict of interest with any financial organization regarding this study

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