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Improving Blood Protein and Albumin Level Using Dried Probiotic Yogurt in Broiler Chicken

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Abstract

Dried probiotics have a good effect on the digestive tract in inhibiting the growth of pathogenic bacteria and increasing the blood protein content. This study aims to identify the effect of dry probiotics on protein and blood albumin levels in broiler chickens. In the experiment, a Completely Randomized Design (CRD) consisting of five treatments and 4 replications was applied. The probiotic treatments included T0: basal ration (BR); T1: basal ration with dry probiotic A (100% fermented cow's milk/FCM); T2 : basal ration with dry probiotic B (fermented cow's milk/FCM and fermented mung bean milk/FMBM, with a composition of 75% : 25%), T3: basal ration with dry probiotic C (fermented cow's milk/FCM and fermented soy milk/ FCM, with a composition of 75% and 24%); and T4: basal ration with dry probiotic D (consisting of fermented cow's milk/FCM, fermented mung bean milk/FMBM and fermented soy milk/FSM, with compositions: 50%, 25% and 25%, respectively). The results showed that the difference in blood protein and albumin levels (P>0.05) was not significant. Dried probiotics tend to increase blood protein and albumin and have the potential to correlate with protein anabolism and broiler performance.

Keywords: dried probiotic, oven-dry, blood protein, albumin, broiler chicken

1. Introduction

Broilers in the form of poultry are used as meat producers and are widely consumed. The quality and consumer expectations of good broiler meat are weight and muscle contours. Weight gain is influenced by the amount of protein contained in the ration (high protein content plays a role in weight gain) (Saleh and Dwi, 2005). Broiler chicken feed must pay attention to the balance of energy and protein contained in the ration. Broiler chicken ration is an additional feed to optimize shelf life and increase efficiency during rearing. However, the side effects of feed additives can bring some health problems. Thus, probiotics are alternative feed additives that can improve livestock health, especially improving the digestive tract ecosystem through microflora balance. Administration of probiotics from an early period improves the balance of intestinal microbes (Adriani et al., 2019).

Blood proteins in plasma are albumin, globulin, and fibrinogen (Ganong, 2000). Total protein examination serves as an examination of health status by looking at changes in protein levels that occur. The protein profile in blood serum shows protein deposition, because if protein and albumin are high, the probability of protein deposition in meat is higher. Albumin is the main protein contained in blood plasma which is responsible for osmotic pressure and as a transport agent for various small molecules in the blood such as fatty acids and bile pigments (Mushawwir and Latipudin, 2011). Probiotics increase ration efficiency, egg production, and lower egg cholesterol and serum cholesterol levels. In addition, probiotics are also able to reduce non-protein nitrogen in the blood, concentrations of uric acid, ammonia and urea in the blood (Rusmana, and Adriani, 2020).

The experiment in this study was conducted to assess the impact of dry probiotics on several blood biochemical parameters, including blood protein and broiler albumin. The use of probiotics in combination with mung bean milk, FCM, and FSM has not been widely reported by previous researchers; therefore, this study studied the biochemical profile of broiler blood given dry probiotics. Previous studies have shown that the phenol content and antioxidant activity of fermented products appear to increase. This phenomenon is caused by the mobilization of the phenolic conjugate form during the fermentation activity (Xiao et al., 2015). Another study reported that microbes belonging to the lactate group were able to produce enzymes. One type of enzyme that is synthesized during the fermentation process is an enzyme that breaks down carbohydrates. This phenomenon is characterized by the release of phenolic compounds (Razak et al., 2015). In addition, it can reduce anti-nutrition (Susi, 2012).

Some researchers use liquid or dry yogurt with the dry fries method. However, in this study, drying was carried out using a simple technology at a very low cost to reduce

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feed prices. The result of drying probiotics produces low microbiota than liquid form. However, dried probiotics have beneficial because produce high lactic acid, bacteriocin, and several compounds from soybeans and mung beans (Lengkey and Adriani, 2009; Adriani et.al., 2015).

2. Materials and Methods

2.1. Materials

The materials used in this study consisted of Cow's milk (CM), soybean, mung bean, and the starter contains several types of bacteria, namely *Streptococcus thermophilus, Lactobacillus bulgaricus, Bifidobacterium bifidum, Lactobacillus acidophilus*, maltodextrin DE 10-12, spectrophotometer, and several blood biochemical kits. (Biolabo, Bandung).

2.2. Methods

2.2.1. Experiment method

A total of 100 broiler DOC, 5 days old used in this investigation. This feeding treatment was carried out for 30 days study, accompanied by the physical recording of the environment and blood sampling. Giving dry probiotics was done by adding them to the ration. The dose of dry probiotics mixed into the ration was 2% of the total basal ration. A completely randomized design was used in this experiment, consisting of four treatments and five replications. The treatments include T0: BR; T1: BR with dried probiotic A (100% FCM); T2: BR with dried probiotic B (FCM and FMBM, with composition 75%: 25%), T3: BR with dried probiotic C (FCM and FSM, with composition 75% and 24%); and T4: BR with dried probiotics D (consisting of FCM, FMBM and FSM, with a composition, each: 50%; 25% and 25%).

2.2.2. Processing of probiotics

The basic ingredients used for fermentation in this experiment have been soy milk, CM, and green bean milk. The microbes that have been added to this fermentation process are Streptococcus thermophilus, Lactobacillus bulgaricus, Bifidobacterium bifidum and Lactobacillus acidophilus. Fermented milk mixed with 10-12 5% DE maltodextrin, serves as a nutritional supplement for microorganisms. Furthermore, probiotics were dried for 25 hours using an oven (simple method) at a temperature of 40^{o}C.

2.2.3. Detection Method

Blood sampling through the external pectoralis vein using a 5 mL EDTA tube was performed randomly on 20 broilers (consisting of 5 birds per replication, and treatment of 4 birds per replication). Blood plasma samples were analyzed according to the kit protocol (Biolabo, France). The absorbance of the sample was determined using a spectrophotometer at the Laboratory of Animal Physiology and Biochemistry, University of Padjadjaran. The blood biochemistry observed included total protein and albumin in blood plasma. Blood samples were taken when the chickens were 2 and 4 weeks old as much as 3 ml. using a syringe containing EDTA, then the plasma is separated for further analysis. Analysis of total protein and albumin used a spectrophotometer.

2.2.4. Data Statistical analysis

The data of plasma protein and albumin were analyzed using the variance of one-way analysis method. The significant difference between feed treatments was determined by Tukey's analysis with the degree of significant difference at P <0.05. As a basis for statistical analysis, the hypothesis has been established that dry probiotic levels can increase blood protein and albumin levels in broiler chickens.

3. Results and Discussion

Table 1. Effect Dried Probiotic on Blood Protein and Albumin Broiler Chicken

Variable	T0	T1	T2	T3	T4	p-value
Blood Protein (g/dl)	2.52 ± 0.20	2.59 ± 0.85	3.22 ± 0.47	2.60 ± 2-0.12	2.81 ± 0.51	0.074; n=100
Albumin (g/dl)	1.30 ± 0.36	1.36 ± 0.66	1.44 ± 0.91	1.32 ± 0.35	1.38 ± 0.51	0.062; n=100

The results showed that the administration of dry probiotics had no significant effect on increasing blood protein and albumin (P>0.05). Although there was no significant difference, blood protein and albumin levels increased by 21.74% and 10.77% at T2 (FCM + FMBM dry probiotic mixture, with a ratio of 75%: 25%). Sugiharto et al. (2017) showed that the normal range of blood protein ranges from 2.14 to 3.12 g/dl. Analysis of variance showed that dry probiotic feeding showed no significant difference (P>0.05). The results of the current investigation seem to agree with the findings of Djouvinov et al. (2005), and Aluwong et al. (2012) who found that probiotic supplementation did not affect protein and total albumin levels in chickens. Although not significantly different, there is a tendency to increase protein levels in the blood. Based on previous research, Arslan and Saatci (2004) and El-Rahman et al. (2012) showed an increase in plasma protein concentration with the addition of probiotics in the diet. The high protein content in the blood indicates that the protein deposition in the meat is also high; on the contrary, the low protein value in the blood or below the standard indicates that the chicken lacks nutrition. Optimal liver function will be followed by an increase in plasma protein because most plasma proteins are synthesized in the liver (Widhyari., et al. 2014). Previous studies have also shown that plasma protein can be a valid indicator in determining the status of tissue function (Mushawwir, A et al, 2020; Tanuwiria and Mushawhir, 2020. This is related to the function of liver tissue as a producer of albumin protein. It is known that 75% of plasma protein blood is albumin.

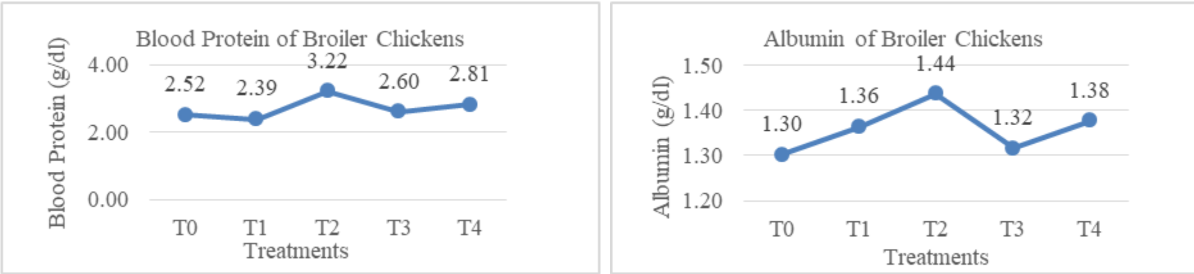

Figure 1. Effect Dried Probiotic on Blood Protein and Albumin Broiler Chicken

The average albumin for each treatment (Table 1) ranges from 1.30-1.44 g/dl. Blood albumin levels from lowest to highest include T0: 1.30 g/dl, T3: 1.32 g/dl, T2: 1.36 g/dl, T4: 1.38 g/dl, and T2: 1.44 g/dl. Blood albumin in the study is in the normal range about 1.06 - 1.39 g/dl (Owo Sibo *et al*., 2013). The variance analysis results showed that supplementation of dry probiotics did not show a significant difference (P> 0.05). However, there is a tendency to increase blood albumin levels.

Albumin and blood protein plays a major role in the deposition of protein into the meat. In accordance with Liu et al. (2015) which states that albumin affects the growth rate of broiler chicken. It means low albumin will have an effect on total protein. Consumption of less protein causes reduced blood albumin so that protein deposition into the meat will also decrease. Parmentier *et al*. (2009) and Savary-Auzeloux *et al*., (2010) reported that blood albumin produced in the liver forms the majority of all plasma proteins (consisting of 60% albumin). The content of blood protein values is normally used for weight gain (Saleh and Dwi, 2005). Blood protein and albumin were highest in T2 with dry probiotics combined with 75% FCM and 25% FSM. Probiotics in the ration increase the content of lysine analogue and aminoethyl cysteine in the digestive tract which is converted to amino acid lysine and cysteine so as to increase the retention of proteins that play a role in meat formation (Candrasih and Bidura. 2001; Farhana *et al*., 2012; Saikat *et al*., 2017).

One of the causes of weight gain in living things is the activity of probiotic bacteria. Previous researchers reported that the increase in digestive efficiency is caused by the use of nutrients and absorption of nutrients by absorptive cells (Lengkey and Adriani, 2011; Sheval et al., 2020). The results of previous studies showed that an increase in digestive enzyme activity and an increase in the morphometric surface of intestinal villi occurred due to the presence of probiotic bacteria (Muhannad et al., 2019). This physiological condition also has an impact on increasing digestibility, absorption of nutrients, as well as the formation and increase in the size of new tissues (Lengkey and Adriani, 2011; Priastoto et al., 2016; Adriani et al., 2019). The results of the same study have also been reported by other researchers (Hernawan et al., 2017; Mushawwir et al., 2018; Adriani and Mushawwir, 2020). An increase in the number and width of the jejunal villi from feed plus probiotics that affect the final body weight of broilers has also been reported by Adriani et al. (2019). In addition, several researchers, including Toghyani et al., (2015), Astuti (2015), Jin et al., (2000) emphasized that increasing the population of microbes that are beneficial to livestock will prevent the development of pathogenic microbes in the digestive tract of food.

4. Conclusion

Dried probiotics can increase protein in the blood by 27.77%, and albumin by 10.76% compared to control, in the FCM + FMBM mixture treatment by 75% and 25%, respectively. Although all treatments were able to increase blood protein and albumin, the results of increasing levels were not significantly different in broiler chickens. Interestingly, the increase in plasma protein and albumin may be a valid indication of increased protein anabolism and overall broiler performance.

5. Significant statement

This study found that the application of FCM, FMBM and FSM as probiotics added to broiler feed was beneficial for increasing blood protein and albumin in plasma. The results of this study have helped researchers to explore more deeply the effect of various combinations of FCM, FSM, and FMBM as probiotics to increase protein metabolism in supporting the immune and performance of broiler chickens. Thus, the new theory about the application technique and the impact of using FCM, FMBM and FSM in broiler rations can be accepted.

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