The effect of adding palm kernel extract in feed containing microparticle protein on fat absorption and meat quality in chicken broiler

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Abstract

This study aims to determine the effect of adding palm kernel extract in feed containing microparticle protein on fat absorption and meat quality. Materials used on this study are 200 day old chicken with 47 g average body weight, palm kernel extract (PKE) as a prebiotic, fish meal and soybean meal as microparticle protein feed. The design experiment that been used in this study was completely randomized design with 5 treatment and 4 replications (each unit consist of 10 chicken). The treatments that applied in this study were T0 (microparticle protein feed), T1 (microparticle protein feed + 0,2% PKE), T2 (microparticle protein feed + 0,4% PKE), T3 (microparticle protein feed + 0,6% PKE) dan T4 (microparticle protein feed + 0,8% PKE). Observed parameters include fat intake, abdominal fat relative weight, and meat fat content. The processed data was carried out by ANOVA test at 5% level and Duncan's significant difference test at 5% level. The result of this study showed that adding mannan from palm kernel extract (PKE) in the microparticle protein feed had a significant effect ($p<0.05$) on fat intake, abdominal fat relative weight, and meat fat content. The conclusion of this study is the addition of mannan from PKE 0.8% (T4) can reduce fat intake, abdominal fat relative weight and meat fat content.

Keywords: broiler, fat and palm kernel extract

Introduction

Broiler chickens are chickens that are raised for the purpose of utilizing their meat after about one month of rearing process with high characteristics of body weight and growth, low feed conversion and short maintaining period. Efforts to raise broiler chickens are strongly influenced by the management of feeding to increase broiler productivity. One way that can be done to support this is the provision of prebiotics in the ration which has a positive impact on the digestive process in livestock.

Prebiotics are substances that cannot be digested in the digestive process by enzymes but can be used as energy for microbes in the digestive tract so that they provide benefits in improving the health of the livestock

body [1]. Prebiotics can be naturally found in palm kernel cake which has been previously extracted in the form of mannan oligosaccharides. Mannan extract in palm kernel cake has a good impact on the intestinal tract because it can stimulate the development of beneficial bacteria and prevent pathogenic bacteria from sticking in the intestines [2].

Microparticle protein rations are rations that contain protein from feed ingredients that experience particle size reduction. The form of protein microparticles is able to increase the process of protein absorption. According to Suthama and Wibawa [3], changing the shape of the protein feed source into microparticle size can increase protein utilization. The feed ingredients that are processed into microparticle feed have sizes in the micrometer range. According to Harumdewi et al. [4], one of the efforts to process feed into microparticles is by using ultrasonic wave treatment which produces feed with a micrometer size.

Mannan contained in palm kernel cake as a prebiotic added to the microparticle ration can increase the population of lactic acid bacteria. According to Faradila et al. [5], prebiotics are able to lower pH through a fermentation process by beneficial bacteria in the digestive tract. One of the bacteria in the digestive tract is lactic acid bacteria which has the ability to produce enzymes so that it can affect fat levels. According to Alghazali et al. [6], lactic acid bacteria can produce bile salt hydrolase enzymes which have the ability to break long chain fatty acids into medium and short forms. BSH enzyme activity affects fat absorption in the small intestine. according to Krismiyanto et al. [7], the high absorption of fat is thought to be due to bile salts used to emulsify fat.

Materials and Methods

The materials used in the research include strains of broiler chickens CP 707 as many as 200 tails. The feed used was commercial feed BR 511B produced by PT Charoen Pokphand Indonesia and a ration consisting of a mixture of corn, rice bran, soybean meal, fish meal, CaCO3, premix, lysine methionine and palm kernel cake extract (PKE). The equipment that will be used are stove, brooder cage, feed and drink place, battery cage, digital scale with a capacity of 5 kg and accuracy of 0.01, a storage box. The composition of feed ingredients and the nutritional content of the rations used are presented in Table 1.

The research procedure consists of 3 steps, the preparation step, the maintenance step, then the last step is sample analysis and data processing. The preparation step begins with the palm kernel cake extraction process. Palm kernel cake extraction process refers to the method of Anindita et al. [8] which have been tried. The procedure is to weigh 200 grams of palm kernel cake and prepare 3,000 ml of distilled water and put it in a 2 L beaker. Next, the palm kernel cake is cooked until it boils and then stirred for 3 hours. After that, the sample was filtered using fine sari paper to obtain the filtrate. The next stage, the filtrate was given an isoprofile as much as 2,000 ml then closed and allowed to stand until a precipitate was formed. The results are then dried in the sun, then mashed with a blender and stored in a plastic container.

Table 1. Research Feed Ingredients and Nutritient Value

Feed Ingredients	Nutrient Value (%)
Ground Corn	54,55
Rice Bran	15,22
Microparticle soybean meal	20,38
Microparticle fish meal	9,00
$CaCO_3$	0,30
Premix	0,25
Lysine	0,10
Methionine	0,20
Total	100,00
Nutrien*(%)	
Metabolic Energy**(kkal/kg)	3.000,86
Crude Protein	18,31
Crude Fat	4,47
Crude Fiber	5,84
Calcium	1,09
Total Phosphor	0,86

* Proximate analysis result from Nutrient and Feed Laboratory, Faculty of Animal and Agricultural, Diponegoro University (2021)

** Result from calculation using formula by Balton (1967)

The next stage of preparation is the preparation of the cage which is carried out through a process that includes cleaning the cage, liming the walls, floors and bulkheads, spraying formalin and preparing cage equipment in the form of feed and drinking places.

The broiler rearing step lasts for 35 days. The rearing process begins with the chick in day old chick (DOC) process which is weighed as the initial weight. Drinking water was given ad libitum while feeding was given every morning and evening. The initial feed given was 100% commercial feed and then in the second week, namely the age of the two chickens, they were given feed combined with research rations in stages with a ratio of 75% commercial ration + 25% research ration, 50% commercial ration + 50% research ration at the age of 8th, 25% commercial ration + 75% research ration at age 9 and 100% research ration at age 10 and then up to 35 days.

The design experiment that been used in this study was completely randomized design with 5 treatment and 4 replications (each unit consist of 10 chicken). The treatments that applied in this study were:

T0 = microparticle protein feed
T1 = microparticle protein feed + 0,2% PKE
T2 = microparticle protein feed + 0,4% PKE
T3 = microparticle protein feed + 0,6% PKE
T4 = microparticle protein feed + 0,8% PKE

The measured data collection includes fat intake, relative weight of abdominal fat and fat content of broiler chicken meat. The calculation of fat digestibility begins with the treatment of the total excreta collection which lasts for 4 days in the final week of the maintenance period. The excreta that were collected during the total collection process were sprayed with 0.1 N HCL every 2 hours to prevent nitrogen evaporation. The collected excreta were cleaned of chicken feathers and adhering dirt and then weighed to obtain wet weight data, then dried in the sun to dry and weighed again to obtain dry

weight data. The next step is that the excreta are homogenized by crushing it first using a blender as a sample to test the fat content using Soxhlet with the aim of knowing the fat content of the excreta. Fat absorption was calculated using the formula according to Moningkey et al. [9] below:

$$\text{Fat absorption} = \frac{\text{ration fat intake (g) - excreta fat content (g)}}{\text{ration fate intake (g)}} \times 100\ \%$$

Abdominal fat was measured by weighing the fat in the abdominal cavity and digestive organs including the gizzard, small intestine, abdominal muscles and abdominal cavity wall and then the relative weight was calculated. The relative weight of abdominal fat can be calculated by the formula according to Mangais et al. [10] below:

$$\text{Relative weight of abdominal fat} = \frac{\text{abdomen fat weight (g)}}{\text{live weight (g)}} \times 100\ \%$$

The data was tested by analysis of variance based on a completely randomized design (CRD) by comparing the calculated F value with the table F value at a significance level of 5%. If there is a real treatment effect, it is continued with Duncan's test at the 5% level.

Results and Discussion

The addition of EBIS in the ration containing protein microparticles had a significant effect ($p<0.05$) on fat intake, relative weight of abdominal fat and meat fat content in broiler chickens.

Table 2. Effect of Treatment on Fat Intake, Relative Weight of Abdominal Fat and Meat Fat Content

Parameter	Perlakuan				
	T0	T1	T2	T3	T4
Fat Absoprtion (g)	5,41±0,19[a]	4,46±0,18[b]	3,88±0,7[c]	3,85±0,21[c]	3,59±0,1[c]
Relative weight of abdominal fat (%)	1,61±0,2[a]	1,60±0,08[a]	1,28±0,17[b]	1,24±0,36[b]	1,19±0,06[b]
Meat fat content	1,39±0,11[a]	1,16±0,11[a]	1,10±0,13[b]	1,01±0,11[b]	0,89±0,11[b]

[a,b] Superscripts on the same line showed significant differences ($p<0.05$)

Fat Absorption

Based on Table 2. it can be seen that the provision of rations containing protein microparticles with the addition of 0.8% PKE (T4) can reduce fat intake. Mannan from palm kernel cake extract acts as a prebiotic that can reduce fat intake. The addition of prebiotics affects the pH of the digestive tract which will decrease due to the soluble carbohydrate fermentation process that produces lactic acid and short chain fatty acids (SCFA). The impact resulting from the decrease in pH is an increase in the population of lactic acid bacteria and an increase in protease activity. The decrease in pH also results in reduced lipase activity so that fat absorption

decreases. According to Amalia et al. [11], the lipase enzyme will work optimally as the pH increases to an alkaline atmosphere starting from 6-7. The increase in lactic acid bacteria has a healthy impact on the digestive tract in broiler chickens. According to Mulyono et al. [12], prebiotics function as a balance of microbes in the digestive tract by reducing pathogens and increasing beneficial bacteria so that the digestive tract becomes healthier.

Relative Weight of Abdominal Fat

Based on Table 2. it can be seen that the microparticle ration with the addition of 0.8% palm kernel cake extract (T4) can reduce the relative weight of abdominal fat. This is in line with the fat intake in the T4 treatment was able to reduce fat deposition in the abdomen. The decrease in fat deposition is the effect of the addition of prebiotics in the form of mannan which contains crude fiber. According to Fajrih and Khoirudin [1], the crude fiber consumed will bind to each other with fatty acids so that it inhibits the performance of bile in the fat absorption process. Fatty acids and crude fiber that cannot be absorbed by the body will be wasted from the digestive tract. A decrease in abdominal fat deposition occurs due to fatty acids bound to crude fiber are wasted from the body through excreta [13].

Meat Fat Content

Based on Table 2. it can be seen that the microparticle ration with the addition of 8% palm kernel cake extract (T4) can reduce the fat content of the meat. The decrease in fat in meat is in line with the decrease in fat intake and the relative weight of abdominal fat which is presented in Table 2, thus affecting the decrease in fat content of broiler meat. The decrease in fat content of broiler meat was caused by the addition of prebiotics. According to Daud [14], the addition of prebiotics in the feed can reduce fat content, especially in the thighs. The mechanism of fat reduction by prebiotics is due to the process of bacterial fermentation in broiler digestive tract with prebiotics. Prebiotic fermentation with bacteria in the digestive tract produces fatty acids in the form of propionate which can inhibit the process of lipogenesis in the liver [15]. The decrease in meat fat will have an impact on improving the quality of meat and carcass. The low fat content of broiler meat is expected where the accumulation of fat that is too high as a by-product will reduce the carcass weight of livestock that can be consumed [16].

Conclusions

The result of this study showed that adding mannan from palm kernel extract (PKE) in the microparticle protein feed had a significant effect ($p<0.05$) on fat intake, abdominal fat relative weight, and meat fat content. The conclusion of this study is the addition of mannan from PKE 0.8% (T4) can reduce fat intake, abdominal fat relative weight and meat fat content.

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