

Feeding of inulin, papain enzyme, and combination in ration containing of protein and calcium microparticles source on passage of rate and crude fiber intake

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Abstract

The purpose of the research was to study the effects of feeding inulin and papain enzymes inside ration that contain protein and calcium microparticle on crude fiber intake and passage of rate. Experimental animals were 200 CP707 broiler chicken and the treatment were given at 8 days old chicken with average body weight of 137.63 ± 12.03 g. Feed additives added including inulin derived from dahlia tuber and papain enzyme by American health. Protein microparticle used for ration derived by fish meal and soybean meal, calcium microparticle derived by eggshell flour. The present experiment was assigned in completely randomized design with 4 treatments and 5 replications (10 birds each). Feeding treatments were as follows: P0 (Control Diet/CD), P1 (CD + extract of dahlia tuber 1.17%), P2 (CD + papain enzyme 0.15%), dan P3 (CD + extract of dahlia tuber 1.17% + papain enzyme 0.15%). Parameters measured were crude fiber consumption, digesta rate, and crude fiber intake. Data were subjected to ANOVA and followed by Duncan. The result indicated that feeding inulin derived from dahlia tuber powder form, papain enzyme mix, inside protein and calcium microparticle inducted in ration could increase passage of rate and crude fiber intake. In conclusion feeding inulin derived from dahlia tuber at 1,17% and papain enzyme mix at 0,15% could reduce passage of rate and increase crude fiber intake.

Keywords: Fiber intake, broiler, papain enzymes, inulin, passage of rate, microparticle

Introduction

Broiler chicken is one of poultry commodity mainly used for meat consumption with short raising period. Broiler's special characteristy including high feed efficiency, rapid weight gain, low feed conversion and high meat quality. One of the keys of maintaining broiler is to keep high growth rate to increase final weight of the commodity. Rapid weight growth can be obtained using feed supplements, one of which is using antibiotics growth promotor (AGP), lately AGP usage in poultry farm has been restricted caused by side effects from AGP usage that can be harm for further

consumption by human. The usage of Antibiotics growth promotoh has been restricted by local government by following new UU no 41 in 2014 that started in place by 2018, causing huge drop in poultry productivity in Indonesia [1].

The usage of microparticle protein in this research is using fish mill and soybean meal, meanwhile calcium microparticle based on egg shell mill. Protein and calcium induced microparticle obtained by refracting ingredients and sonification ingredients within range of 1,064 μm [2]. The aim usage of egg shell mill as organic microparticle ingredients is to increase calcium intake [2]. The purose of reduction of the feed ingredients is to increase the usage of the feed ingredients [3].

Dahlia tuber added as feed supplements can be used as inulin source [4]. Inulin is used as prebiotics that functioned as substrate, papain enzyme used for simplification of protein bond [5]. The usage of inulin and papain enzyme can be used as AGP replacement in poultry in hope for increasing broiler productivity in line with increasing digestive system health of the broiler chicken. Inulin is used as prebiotic that used for increasing lactate acid bacteria and decreasing patogenic bacteria, inulin will be used for fermentation proccess and will producting short chain fatty acid [6]. The increasing of short chain fatty acid will change pH atmosphere in small intestine making it acid. Acid atmospheric in small intestine will increase lactatic acid bacteria and protease activities. The acidity caused by fermentation in long time will decreased the crude fiber rate [7]. Lactatic acid bacteria can break the complex bond into simple bond for easier crude fiber absorbtion [8].

Based on previous description can be obtained that this research should be done for the study of the usage of ration containing protein and calcium microparticle with inulin and papain enzyme added on passage of rate and crude fiber intake on broiler chicken.

Materials and Methods

This study is using day old chicken broiler strain Cobb 707 with average body weight 49,17 g, for 35 days in Kandang Digesti and Nutrition and Feed Laboratory, Animal and Agricultural Faculty, Diponegoro University. The ingredients of the ration can be listed by ground corn, rice bran, microparticle soybean mill, microparticle fish mill, microparticle egg shell mill, premix, lysine, and methionine that mixed with 18,32% crude protein and 30001,26 Kcal/Kg Metabolic energy (Table 1).

Microparticle protein feed source is made by reducing feed particle. Small particle feed ingredients from previous step further displayed with ultasonic wave. Feed ingredients further mixed with aquadest wih 1:4 ratio, continued by 2 ml virgin olive oil inducted and displayed by ultrasonic wave for 60 minutes using ultrasound transducer [3]. Calcium microparticle obtained by egg shell mill started by cleaning proccess, further used in drying proces under sunlight, continued by grinding using untill its determined by size at 150 μm [9].

200 Broiler chicken were raised until 35 days of age. By the age of 1-7 days of age is feeded with BR B11S as an adaptation phase, furthermore at 8-35 days of age birds were given dahlia tuber extract and papain enzyme added feed. During raising phase feed and drink intake, weighing and feed leftover were monitored. Body weight wighting is done once every week. Cumullative collection is done for 4 days using Fe₂O₃ as indicator. Completely randomized design with 4 treatments and 5 replications (10 birds each) the treatments applied were:

P0 = Protein and calcium microparticle induced feed/PCMIF
P1 = PCMIF + dahlia tuber extract 1,17%
P2 = PCMIF + papain enzyme 0,15%
P3 = PCMIF + dahlia tuber extract 1,17% + papain enzyme 0,15%

Table 1. Research Feed Ingredients and Nutrient Value

Feed Ingredients	Composition (%)
Ground Corn	54,51
Rice Bran	15,24
Microparticle soybean mill	20,40
Microparticle fish mill	9,00
Microparticle egg shell mill	0,30
Premix	0,25
Lysine	0,10
Methionine	0,20
Total	100,00
Nutrient Value:	
Metabolical Energy (kcal/kg)**	3.001,26
Crude Protein (%)*	18,32
Crude Fat (%)*	4,48
Crude Fiber (%)*	5,84
Calcium (%)*	1,088
Phospor (%)*	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 [10]

Parameter measured for this research including crude fiber intake and passage of rate broiler chicken. Crude fiber intake and passage of rate is measured using cumullativve collection using Fe₂O₃ as indicator at 33, 34, 35 and 36 days of age. Broiler chicken were raised in battery type cage feeded with dahlia tuber extract and papain enzyme mixed with 0.5% Fe₂O₃ as indicator in daily ration.

Crude fiber intake is measured using cummulative collection using Fe₂O₃ as indicator. Passage of rate is measured using cummulative collectio method using Fe₂O₃ as indicator and observing time at first red coloured excreta came out for futher monitoring. Passage of rate calue is obtained by time difference from Fe₂O₃ induced excreta first came out.

Obtained data further used for analyzing using Analysis of variance using 5% significance level. If real significance were proven during analysis futher Duncan test analysis is used at 5% 5% significance level.

Results and Discussion

Inulin, papain enzyme and combination added in ration contain protein and calcium microparticle is giving a real significance ($p < 0,05$) towards passage of rate and crude fiber intake as presented in table 2.

Table 2. Passage of rate and crude fiber intake broiler chicken

Parameter	Treatment			
	P0	P1	P2	P3
Passage of rate	249.8±9.7 ^c	268.2±10.1 ^b	277.4±8.4 ^{ab}	285.2±8.1 ^a
Crude Fiber Intake	1.212±0.1 ^b	1.288±0.1 ^{ab}	1.318±0.2 ^{ab}	1.416±0.2 ^a

^{a,b} Difference in superscript indicate real significance ($p < 0,05$)

Based on table 2 passage of rate in broiler chicken given combination of inulin 1,17% and papain enzyme 0,15% (P3) is having a slower passage of rate compared to the other treatments. Inulin added as prebiotics can increased the bacteria count in digestive system that caused slower passage of rate [11]. The slower passage of rate will increase feed intake for consumed ration, short passage of time will reduce nutrient degradation time for enzyme [12].

Inulin can helped Fermentation proses happened in small intestine that will increase crude fiber digestion and increasing crude fiber intake in poultry, higher crude fiber rate will increase rate of passage on digestive system [13]. Inulin that used as prebiotics functioned as feed supplements for lactic acid bacteria used in fermentation proses resulting in short chain fatty acid and lactic acid for decreasing pathogenic bacteria in small intestines [14].

Integral inulin structure cause inulin cannot be digested by digestive system enzyme [15]. Undigested nutrient in the digestive tract will be used for fermentation by pathogenic microbe [16]. The combination of papain in ration have a role in increasing undigested nutrient intake inside broiler chicken digestive system. Papain enzyme have a role to increase protein digestibility as a protease [17]. Higher digestibility affected by passage of rate inside digestive system, longer passage of rate will increase nutrient digestibility [12].

Conclusions

The conclusion of this research is that the combination of inulin 1,17% and papain enzyme 0,15% added in microparticle protein and calcium induced ration (P3) can slow down passage of rate and increasing crude fiber intake for broiler chicken.

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