

Feeding Fermented Product by *Phanerochaete chrysosporium* and *Neurospora crassa* in Broiler Diet

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Abstract – An experiment was conducted to evaluate the utilization of fermented product (banana peel) by *Phanerochaete chrysosporium* and *Neurospora crassa* in the diet of broiler. This study involved a completely randomized design (CRD) with 5 treatments (0, 5, 10, 15 and 20% of fermented product in the diets) and 4 replicates per treatment. Diets were iso nitrogenous (22% crude protein) and iso caloric (3000 kcal/kg diet). Measured variables were feed consumption, weight gain, feed conversion, carcass percentage, meat cholesterol. Result of this experiment, increasing level of fermented product in the diet not significantly affected on feed consumption, weight gain, feed conversion and carcass percentage but decreased ($P < 0.05$) meat cholesterol. In conclusion, fermented product by *Phanerochaete chrysosporium* and *Neurospora crassa* up to level 20% in broiler diet maintained performances and decreased meat cholesterol of broiler.

Keywords – *Neurospora crassa*, *Phanerochaete chrysosporium*, Performance, Meat Cholesterol.

I. INTRODUCTION

Banana peel has good potential used as animal feed, based on the production and nutrient content. Banana peel production at West Sumatra in 2010 are 100.52 tons (Department of Agriculture, 2011). Composition of banana peel contain: 66 % banana and 34% banana peel, so that estimated banana peel in 2010 approximately 34.10 tons. Banana peel containing 7.66% crude protein and 53.94% BETN, but its application as poultry feed still small. The problem in the utilization of banana peel is the high in its crude fiber content (23.33%), especially high of its cellulose (11.24%) and lignin (10.77%), and has tannin (0.03%) as anti nutrition. Banana peel could be included up to only 8% in broiler diet (Nuraini, 2008).

Therefore, to improve the quality of banana peel as poultry feed must reduced the content of lignin, cellulose and tannin through fermentation by *Phanerochaete chrysosporium*. Kersten and Cullen (2007) stated that *Phanerochaete chrysosporium* degraded lignin and cellulose effectively by producing extracellular peroxidase enzymes such as lignin peroxidase (LiP) and manganese peroxidase (MNP) and cellulase. Some species of white rot fungi of the class Basidiomycetes able to break down all the components of lignocellulose. *Phanerochaete chrysosporium* is white rot fungi is known the ability in lignin degradation (Zeng *et al.*, 2010). Nuraini *et al.* (2013) reported that fermentation cocoa pod by *Phanerochaete chrysosporium* increased crude protein of 33.79 % and decreased crude fiber of 33.02 % with inoculum of 10 % and fermentation length of 8 days.

Fermentation also with *Neurospora crassa* to produced β -carotene. *Neurospora crassa* was the highest fungus produced β -carotene pigmen, that was isolated from corn cob. This fungus also produced amylase, protease and cellulose enzymes (Nuraini, 2006). Cassava and tofu waste mixtured fermented by *Neurospora crassa* with inoculum of 9 % and fermentation length of 7 days, crude protein content increased from 9.13 % to 16.26 %, and crude fiber content decreased from 18.15 % to 12.06 % and produced β -carotene 270.60 mg/kg and utilization of fermented product by *Neurospora crassa* up to 30 % in the layer diet reduced egg cholesterol of 43.92% (Nuraini *et al.*, 2009).

Nutrient quality of banana peel after fermentation with *Phanerochaete chrysosporium* and *Neurospora crassa* (2:1) increased protein content from 13,61 % to 18,21%, decreased crude fiber from 19,33% to 12,10% and produced β - carotene 209.64 mg/kg. So that this experiment want to study the effect of feeding fermented product by *Phanerochaete chrysosporium* and *Neurospora crassa* in the diet of broiler.

II. MATERIALS AND METHODS

A. Fermented feed preparation

Culture of *Phanerochaete chrysosporium* and *Neurospora crassa* were reconstituted and subcultured were made with using Potatoes Dextrosa Agar (PDA) for 4 days. The inoculated subcultures were kept at room temperature. The fermented of banana peel was prepared as per the procedure described by Nuraini (2006). The substrates contain 80% banana peel with 20% tofu waste, added aquades (water content 60%). The substrates was autoclaved at 121⁰C for 30 minutes. The cooled fermented substrate was inoculated with 10% inoculum of *Phanerochaete chrysosporium*, and incubated for 8 days. After incubation, the fermented product were dried in oven at 80⁰C for 2 hours. The dried fermented products were ground in a grinding mill and stored until mixed with the other feedstuff. Own diets were formulated from ingredients such as corn, soybean meal, fish meal, rice bran, fermented product by *Phanerochaete chrysosporium* and *Neurospora crassa* coconut oil and CaCO₃.

B. Birds Housing and Feeding

One hundred (100) of three days old CP 707 broiler chicks were study in this experiment. The chicks were individually weighed and randomly selected and allotted to each of the four different level of fermented product by *Phanerochaete chrysosporium* and *Neurospora crassa*. The experimental design used was Completely Randomized Design (CRD) with 5 treatments were: 0, 5, 10, 15 and 20% fermented product (FP) in the diet and 4

replicates. All the chicks were provided with uniform feeder and waterer space, the floor and were reared under standard management condition throughout the experimental periode of five weeks. The birds were given the diets with 22% crude protein (isonitrogenous) and 3000 ME kcal/kg feed (isocaloric). Feed and water were provided for *ad-libitum*. The variable observed were feed consumption (g/bird), weight gain (g/bird), feed conversion, carcass (%), meat cholesterol (mg/100g).

C. Statistical Analyses

Data on body weight and feed intake were recorded every week. All the data obtained were subjected to Completely Randomized Design (CRD) as per the procedur of Steel and Torrie (2000). The significance differences occurred were compared using Duncan Multiple Range Test (DMRT) at probability of 0.05 and 0.1 percent levels.

III. RESULTS

The effect of feeding fermented product by *Phanerochaete chrysosporium* followed by *Neurospora crassa* on broilers performance are presented in Table 1. Increasing utilization fermented product in the broiler diet were not significantly affected feed consumption, weight gain and feed conversion but significantly ($P < 0.05$) affected meat cholesterol of broiler.

IV. DISCUSSION

Using fermented product up to level 20% in the diet have no significant different effect on feed consumption of broiler. It showed that the fermented product (banana peel and tofu waste mixtured) by *Phanerochaete*

chrysosporium and *Neurospora crassa* preferred (palatable) up to 20% in the diet; eventhough with the reduction of corn and soybean meal in each of these treatments. In accordance with the opinion of Murugesan *et al* (2005), fermented products have a preferred flavor and a few vitamins (B1, B2, and B12) that are preferred when compared to original material.

The similar body weight gain and carcass percentage in 20% FP group compared to 0% FP group are caused by feed consumption also similar at all the treatments. Feed intake meaned amount of nutrients consumed and digestion also similar especially protein and energy, caused similar of body weight and carcass. According to Rizal (2006) stated body weight affected by nutrient content in the diet and feed intake.

Feed conversion ratio at all the treatment also similar is caused by feed consumption and weight gain also not significantly different. According Varkoohi *et al* (2010), feed conversion ratio is the ratio between feed intake in producing a number of meat. Feed conversion can be used as a picture of the production coefficient, the smaller value mean more efficient use of feed to produce meat.

The lowest meat cholesterol of broiler in 20% FP treatment compared to other treatments, associated with fermented product high of β -carotene. Increasing fermented product by *Neurospora crassa* in the diet caused the higher content of carotenoid (β -carotene). β -carotene is hyphocholesterolemia agent. According to Nuraini (2006) and Nuraini *et al.* (2009) that fermented product by *Neurospora crassa* produced β -carotene, that can inhibit the action of the enzyme-CoA reductase Hydroksimetyl Glutaryl (HMG Co-A reductase), that play a role in the formation of mevalonat in the synthesis of cholesterol, so that cholesterol is not formed

Table 1: Broiler performance feeding fermented product (FP)

Parameter	Diet				
	0% FP (A)	5% FP (B)	10% FP (C)	15% FP (D)	20% FP (E)
Feed Consumption (g/bird)	1742.60 ± 5.45	1721.45 ± 4.30	1718.60 ± 4.51	1714.70 ± 5.45	1707.15 ± 5.10
Body Weight Gain (g/bird)	940.69 ± 6.35	932.25 ± 2.34	924.38 ^b ± 2.30	919.56 ^a ± 2.39	911.63 ± 2.40
Feed Conversion	1.85 ± 0.35	1.85 ± 0.25	1.86 ± 0.30	1.86 ± 0.27	1.87 ± 0.27
Carcass (%)	68.24 ± 1.38	70.05 ± 1.25	71.40 ± 1.25	72.69 ± 1.22	72.69 ± 1.22
Meat Cholesterol(mg/100g)	120.20 ^a ± 2.05	112.60 ^b ± 2.12	105.40 ^{bc} ± 2.09	99.20 ^c ± 2.15	89.20 ^c ± 2.15

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