

NUTRIENT DIGESTIBILITY AND PRODUCTION PERFORMANCE OF NATIVE CHICKEN FED DIET COMPOSED OF FERMENTED RICE BRAN

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ABSTRACT

When a high amount of rice bran used in the diet results a low-nutritive diet. This is a common problem in poultry ration, especially for native chicken in Indonesia, because of its low protein, high fiber and anti-nutritive contents. Fermentation using rumen content/liquid of cattle as a starter, is a simple method that can be applied to increase quality of rice bran and it is possibly easy to be adopted by the farmer. Two hundred birds of one-month old of native chicken (initial body weight was 197 ± 17 g) were divided into 5 groups of treatment (4 replications and 10 birds each) based on the experimental diet that were provided in the present study. Compositions of experimental diet were as follows: (T₁). Raw rice bran (40%), yellow corn (40%) and concentrate (20%). (T₂). Fermented rice bran (FRB, 40%), yellow corn (40%) and concentrate (20%). (T₃). Diet T₂ + 0.075 % thyroid gland powder (TGP). (T₄). FRB (60%), yellow corn (20%) and concentrate (20%). (T₅). Diet T₄ + 0.075%TGP. The following parameters namely, digestibility of protein and crude fiber, body weight gain, carcass weight and concentration of blood cholesterol were statistically analyzed based on analysis of variance in a completely randomized design, and it was continued to Duncan for significance test. Crude protein and fiber digestibility body weight gain, and carcass weight were significantly increased by feeding 40% of FRB supplemented with (T₃) or without (T₂) TGP. However, feeding 40% of FRB added with TGP (T₃) and 60% of FRB with (T₅) or without (T₄) addition of TGP were found to decrease concentration of blood cholesterol as compared to that of T₁.

Key words: Native chicken, Rice bran, Thyroid hormone, Growth, Digestibility, Cholesterol.

INTRODUCTION

Low development and production performance of Indonesian native chicken are caused by many factors such as simple breeding management and provided low nutritive diet. Nutritive value of diet is closely related to its composition. The higher amount of rice bran used in the diet results the lower nutritive content. At the village farm level, rice bran is usually used in a large amount (Tangendjaja, 1988). Low nutrients digestibility of rice bran due to its low protein, high crude fiber contents and the presence of anti-nutritive factor resulted low production performance in poultry. Fermentation, using *Aspergillus sp.*, was able

to improve quality of rice bran through the increase in protein, Ca and P availability, and the decrease in cellulose content. (Swandyastuti *et al.*, 1996, and Wahyuni *et al.*, 1997).

Feeding fermented rice bran combined with thyroid gland powder, as a source of thyroid hormone, is expected to improve growth. The action and function of thyroid hormone will be optimal when the substrates (protein and energy) are available (Suthama *et al.*, 1991 and Suthama, 1991). In the present study, availability of substrates (nutrients) derived from fermented rice bran and supported by the role of thyroid hormone was observed in growing native chicken.

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Table 1. Composition of Experimental Diets and Chemical content (100 % Dry Matter basis)

Ingredients	T ₁	T ₂	T ₃	T ₄	T ₅ *
	----- (%) -----				
Raw Rice Bran	40	-	-	-	-
Fermented Rice Bran	-	40	40	60	60
Yellow Corn	40	40	40	20	20
Concentrate	20	20	20	20	20
Chemical Composition:					
Crude Protein	13.8	16.9	16.9	17.6	17.6
Fat	3.5	4.9	4.9	6.2	6.2
Crude Fiber	15.5	15.2	15.2	16.4	16.4
Calcium	0.44	0.43	0.43	0.54	0.54
Phosphor	0.42	0.42	0.42	0.44	0.44
Metabolizable Energi (kcal/kg)	2808.5	2969.0	3090.5	2620.0	2891.3

* Diets supplemented with 0.075 % thyroid gland powder.

MATERIAL AND METHODS

Experimental animal

One-month old of two hundred birds of native chicken with average initial body weight of 197 ± 17 g were grouped into 5 treatments (4 replications, 10 birds each). The treatments groups were set depending on the experimental diets provided in the present study. Chickens were reared during 2 months for observation. Birds were firstly housed in 80 x 70 x 60 cm of wire-bottomed cage, and one week before the experiment was terminated the birds were moved to 45 x 25 x 45 cm of individual cage (battery system) for the measurement of digestibility.

Experimental diet

Composition and nutritive value of the experimental diets provided in the present study were shown in the Table 1.

Fermented rice bran was prepared by mixing 20% of cattle's rumen content ("bolus") to rice bran (dry matter basis) and moisture content was adjusted to 70%. Drinking water and experimental diets were provided *ad libitum* until the birds were 3 months of age.

Parameter Measured and Statistical Analysis

Parameter measured in the present study were as follows; protein and crude fiber digestibility, blood cholesterol concentration, body weight gain and carcass weight. A marker of chromic oxide / Cr_2O_3 (0,4 %) was included in the diet (Ganzalo *et al.*, 1982). To measure nutrients digestibility and metabolizable energy (Scott *et al.*, 1982).

All parameters were statistically analyzed according to analysis of variance in a completely randomized design. For significance test, the analysis was continued to Duncan (Steel and Torrie, 1986).

RESULTS AND DISCUSSION

Protein digestibility, body weight gain and carcass weight were improved ($P < .05$) by feeding 40% fermented rice bran with (T₃) or without (T₂) supplementation of thyroid gland powder (Table 2). The increase in crude fiber digestibility was found only in the chicken fed 40% fermented rice bran added with thyroid gland powder (T₂), on the contrary, feeding 60% fermented rice bran (T₄) decreased fiber digestibility. Feeding 40% fermented rice bran (T₂) resulted the highest blood cholesterol level ($P < .05$)

Table 2. Nutrients Digestibility and Growth Performance in Native Chicken Fed Fermented Rice Bran

Parameter	T ₁	T ₂	T ₃	T ₄	T ₅
Protein Digestibility (%)	52.3 ^b	67.5 ^a	71.9 ^a	52.2 ^b	57.9 ^b
Crude Fiber Digestibility (%)	52.6 ^b	57.7 ^b	67.8 ^a	44.3 ^c	53.3 ^b
Blood Cholesterol (mg / dl)	116.9 ^b	131.3 ^a	103.5 ^c	106.6 ^{bc}	86.8 ^d
Body Weight Gain (g / bird)	446.2 ^b	486.2 ^a	505.4 ^a	407.2 ^b	433.9 ^b
Carcass Weight (g)	370.3 ^b	426.8 ^a	405.6 ^a	337.0 ^b	352.3 ^b
Feed Consumption (g / week)	338.2 ^a	312.2 ^a	317.8 ^a	326.9 ^a	335.9 ^a

Value of each parameter in each row followed by different superscripts indicating significantly different ($P < .05$).

but thyroid gland powder reduced significantly ($P < .05$) this blood fat when added to the diets of 40% and 60% fermented rice bran (T₃ and T₅) as compared to that of T₁ and T₂.

Diet composed of 40% fermented rice bran in average improved digestibility and productivity. There are several factors affected protein digestibility, but in the present study, the increase in quality and availability of protein can be assumed as one of among other factors. The increase in quality and availability of protein due to the fermentation is possible to improve digestibility. This phenomenon was supported by previous finding of Suthama and Tristiarti (unpublished data) who reported that growth of broiler was improved by feeding fermented tapioca-industry waste due to its increase in protein digestibility, Nitrogen retention and reduce in fiber content. Fermented feedstuff is known to improve protein quality and availability of some amino acids as reported by Santoso (1987). As shown in Table 2, the increase in body weight gain and carcass weight were supported by the higher availability of nutrient via the increase in protein digestibility. Rumen microbes used in the fermentation of rice bran are possible to form single cell protein and this protein contains more essential amino acids, which are very easy to be digested.

The improvement of growth performance due to the supplementing effect of thyroid hormone substances were much better in the chicken fed diet of 40 %

fermented rice bran than that given higher (60 %) fermented rice bran. The higher amount of fermented rice bran was fed the lower protein and fiber digestibility was resulted. The higher rate of nutrient digestibility, especially protein, acts as a facilitator to build better balance between substrate (nutrient) and hormone, particularly hormone responsible on growth. In case of T₃ group, since protein and crude fiber digestibility were higher than those of T₅ group, therefore, the better balance between amino acid (Nitrogen) and thyroid hormone was achieved. This condition is assumed to be the important rôle in the controlling growth of young animal. This phenomenon has been clarified by Suthama *et al.* (1991) and Suthama (1991) that the growth of broiler could be improved by supplementing synthetic thyroxine into diet contains medium level of protein and low crude fiber. It is clear that the appropriate amount of inclusion of thyroid hormone substance should be considered in relation to the possible supply of nutrient for metabolic fate.

Simple method of rice bran fermentation using "bolus" (rumen content) was useful for poultry, especially when it is seen from the viewpoint of nutrient availability for cell metabolism. In the present study, fermented rice bran at an appropriate amount (40%) resulted the use of nutrient (protein) more efficient than the other, and this is indicated by feed consumption of T₂ dan T₃ groups were the same (no significant difference) but the growth was much higher (Table 2).

The most interesting result shown in the present study is that the concentration of blood cholesterol was decreased by either the increasing level of fermented rice bran or the supplementing effect of thyroid gland powder. However, when 40% fermented rice bran was given, blood cholesterol showed the highest concentration (Table 2). It is well known that thyroid hormone functions as lipolytic substance (Akiba *et al.*, 1983), and, this hormone is not only act the important role on protein deposition, but also on body fat breakdown including the reduce in blood cholesterol level, as have been reported previously (Suthama and Atmomarsono, 1995). Therefore, there are two advantages of feeding fermented rice bran combined with the addition of thyroid hormone substance namely, improved growth with higher protein deposition and lowered body fat.

CONCLUSION

Chicken fed 40 % fermented rice bran resulted better nutrients digestibility and growth performance than that fed 40 % raw rice bran, although the level of blood cholesterol was the highest. Digestibility and growth performance were improved and blood cholesterol concentration was reduced by the supplementation of thyroid gland powder, and the improvement was higher when the diet of 40 % fermented rice bran was fed.

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