The Effect of Feeding Fermented *Jatropha curcas* Meal on Percentage of Carcass and Giblets of Kampong Chickens

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Abstract

Jatropha curcas meal (JCM) is potential as poultry feed due to its rich in nutrients content (24.71% protein). Fermentation of JCM using Rhizopus oligosporus decreased the phorbolester, but the crude fiber and phytic acid were still high. The objective of this experiment was to evaluate the effect of feeding fermented JCM using Rhizopus oligosporus supplemented with cellulase and phytase on percentace of carcass and giblets of kampong chickens. The experiment used 40 birds of 200 kampong chickens which were reared from day old chicks up to 10 weeks of age. This experiment used completely randomized design with 5 treatment diets and 4 replications, each replication used 10 birds. The diets were: T0 (control diet, without JCM), T1 (the diet contained 5% untreated JCM), T2 (the diet contained 5% fermented JCM and cellulase 200 ml/ton), T3 (the diet contained 5% fermented JCM and 1000 FTU phytase), and T4 (the diet contained 5% fermented JCM and cellulase 200 ml/ton and 1000 FTU phytase). The parameters observed were percentage of carcass, heart, liver, spleen, kidney, gizzard and pancreas of 6 and 10 weeks old of the birds. The results showed that feeding untreated or fermented JCM 5% did not influence the percentage of carcass and giblets of 6 weeks old as well as of 10 weeks old kampong chickens, except for the gizzard of 10 weeks old. The gizzard of the T3 was higher ($p<0.05$) than that of the control. It was concluded that feeding untreated as well as fermented Jatropha curcas 5% was safe for the kampong chickens.

Keywords: carcass, fermentation, giblets, Jatropha curcas meal, kampong chicken

Introduction

Jatropha curcas meal (JCM) is potential as poultry feed due to its rich in nutrients content. JCM with shell contains 24.71% protein (Sumiati *et al*., 2008),

the seed kernels contains 31-34.5% protein (Martinez –Herrera *et al*., 2006). The gross energy of kernels ranged from 31.1 to 31.6 MJ/kg DM, and the levels of amino acids, except lysine, were higher than that of the FAO/WHO reference protein for a five year old child on a dry matter basis (Martinez –Herrera *et al*., 2006). The availability of this rich nutrients is limited by toxins and antinutrients contained in the meal. These toxic and antinutrients include curcin(lectin), tannin, trypsin inhibitors, phytate, saponin and phorbolesters (Francis *et al*., 2006). Apart from these, phorbolesters that are present at high levels in the kernels have been identified as the main toxic agent responsible for toxicity (Makkar *et al*., 1997). Untreated *Jatropha curcas* meal was toxic to rats, mice and ruminants (Becker and Makkar, 1998) as well as to poultry (Sumiati *et al*., 2007). Its need to detoxify the JCM in order to fully ultilize of the meal. Sumiati *et al*. (2007) conducted various treatments (physical, combination of chemical + physical, and biological) to detoxify Indonesian *Jatropha curcas* meal as poultry feed. Fermentation using *Rhizopus oligosporus* was the best method to detoxify the toxins and thus increasing the nutrititive value of the *Jatropha curcas* meal for poultry. However, the crude fiber and phytic acid of the meal were still high. Poultry can not digest fiber, especially cellulose, even the fiber could interfere other nutrients contained in the feed. Sing (2008) reported that phytic acid is an anti-nutritional constituen of plant derived feeds. As a reactive anion, it forms a wide variety of insoluble salts with mineral including phosphorus, calcium, zinc, magnesium and copper. Therefor, the objective of this experiment was to evaluate the effect of feeding fermented JCM using *Rhizopus oligosporus* supplemented with cellulase and phytase on percentace of carcass and giblets of kampong chickens.

Materials and Methods

The experiment used 40 birds of 200 kampong chickens which were reared from day old chicks up to 10 weeks of age. The JCM was fermented using *Rhizopus oligosporus*. This experiment used completely randomized design with 5 treatment diets and 4 replications, each replication used 10 birds. The diets were: T0 (control diet, without JCM), T1 (the diet contained 5% untreated JCM), T2 (the diet contained 5% fermented JCM and cellulase 200 ml/ton), T3 (the diet contained 5% fermented JCM and 1000 FTU phytase), and T4 (the diet contained 5% fermented JCM and cellulase 200 ml/ton and 1000 FTU phytase). The composition of experimental diets is presented on Table 1.

The parameters observed were weight percentage of carcass, heart, liver, spleen, kidney, gizzard and pancreas of 6 and 10 weeks old of the birds. The data were analysed using ANOVA (analyses of variance) according to Steel and Torrie (1995).

Table 1. The composition of the experimental diets

Ingredient	Treatments (%)				
	T0	T1	T2	T3	T4
Yellow corn	51.23	53.21	53.21	53.21	53.21
Rice bran	20.50	15.00	14.50	14.50	14.50
Soybean meal	17.00	16.50	16.50	16.50	16.50
Untreated *J. curcas* meal	0.00	5.00	0.00	0.00	0.00
Fermented *J. curcas* meal	0.00	0.00	5.00	5.00	5.00
MBM	7.50	7.00	7.00	7.00	7.00
Palm oil	3.00	2.50	3.00	3.00	3.00
Salt	0.10	0.10	0.10	0.10	0.10
Vit-min mix	0.50	0.50	0.50	0.50	0.50
Dl-methionine	0.173	0.187	0.187	0.187	0.187
Total	100	100	100	100	100
Cellulase, ml/ton			200	0	200
Phytase, FTU/kg[1)]			0	1000	1000
Calculated nutrients[2)]					
ME, kcal/kg	2,855.64	2,862.71	2,865.11	2,865.11	2,865.11
CP, %	18.23	18.39	18.26	18.26	18.20
EE, %	5.60	5.15	5.43	5.43	5.40
CF, %	3.81	4.77	5.65	5.65	5.65
Ca, %	0.91	0.91	0.91	0.91	0.91
nPP, %	0.61	0.56	0.56	0.56	0.56
Na, %	0.14	0.13	0.13	0.13	0.13
Lysine, %	0.83	0.83	0.82	0.82	0.82
Methionine, %	0.36	0.37	0.37	0.37	0.37
Meth + cystine, %	0.62	0.62	0.62	0.62	0.62

[1)] DSM Nutrition Product
[2)] Nutrient compositions based on Leeson and Summers calculation (2005)

Results and Discussion

Fermentation JCM using *Rhizopus oligosporus* decreased phorbolesters, trypsin inhibitors, phytic acid, and saponin. Feeding untreated or fermented JCM 5% in the diets did not influence the percentage of carcass and giblets of 6 weeks old (Table 2) as well as of 10 weeks old (Table 3) kampong chickens, except for the gizzard of 10 weeks old. The gizzard of the T3 was higher ($p<0.05$) than that of the

control. The increasing of gizzard was due to higher crude fiber in the diet of T3, i.e. 5.65% compared to the control diet, i.e. 3.86%. Feeding 5% of untreated as well as fermented JCM were safe for the liver, heart, kidney, pancreas, and other giblets of the kampong chickens. It indicated that the phorbolesters contained in the diets was low, and it indicated that the JCM used in this experiment was from *J.curcas* seed contained low phorbolesters. Makkar *et al*. (1998) reported that there were different varieties of J.*curcas*, non-toxic and toxic varieties. The toxic varieties contained phorbolesters up to 2.7 mg/g kernel and non-toxic ones just contained up to 0.11 mg/g kernel. Sumiati *et al*. (2010) reported that untreated JCM used in this experi-

Table 2. Percentage of giblets of kampong chickens at 6 weeks of age

Giblets	Diet treatments (% of live weight)				
	T0	T1	T2	T3	T4
Heart (%)	0.58±0.09	0.50±0.08	0.51±0.04	0.63±0.08	0.60±0.15
Liver (%)	2.75±0.12	2.77±0.51	2.71±0.36	2.85±0.30	2.81±0.16
Spleen (%)	0.28±0.05	0.27±0.07	0.28±0.10	0.34±0.02	0.27±0.08
Kidney (%)	0.73 ± 0.13^{AB}	0.55 ± 0.20^{A}	0.78 ± 0.12^{AB}	0.97 ± 0.17^{B}	0.84 ± 0.26^{AB}
Gizzard (%)	4.04±0.34	4.23±0.49	4.88±0.31	4.00±0.67	4.41±0.40
Pancreas (%)	0.32±0.08	0.34±0.07	0.34±0.08	0.23±0.02	0.36±0.03

Mean values within the same row with different superscripts are significantly different (P<0.01). T0= control diet, without JCM, T1= the diet contained 5% untreated JCM, T2= the diet contained 5% fermented JCM and cellulase 200 ml/ton, T3= the diet contained 5% fermented JCM and 1000 FTU phytase, T4= the diet contained 5% fermented JCM and cellulase 200 ml/ton and 1000 FTU phytase.

Table 3. Percentage of giblets of kampong chickens at 10 weeks of age

Giblets	Diet treatments (% of live weight)				
	T0	T1	T2	T3	T4
Heart (%)	0.46±0.14	0.50±0.11	0.50±0.04	0.48±0.06	0.50±0.05
Liver (%)	1.95±0.43	2.28±0.26	2.05±0.30	2.01±0.16	2.18±0.24
Spleen (%)	0.30±0.06	0.32±0.12	0.22±0.05	0.23±0.05	0.40±0.22
kidney (%)	0.75±0.33	0.94±0.22	0.74±0.10	0.62±0.21	0.74±0.08
Gizzard (%)	3.20 ± 0.09^{a}	3.94 ± 0.12^{ab}	3.60 ± 0.13^{ab}	4.06 ± 0.95^{b}	3.40 ± 0.62^{ab}
Pancreas (%)	0.33±0.21	0.35±0.04	0.26±0.04	0.32±0.03	0.32±0.11

Mean values within the same row with different superscripts are significantly different (P<0.01). T0= control diet, without JCM, T1= the diet contained 5% untreated JCM, T2= the diet contained 5% fermented JCM and cellulase 200 ml/ton, T3= the diet contained 5% fermented JCM and 1000 FTU phytase, T4= the diet contained 5% fermented JCM and cellulase 200 ml/ton and 1000 FTU phytase.

ment contained 24,33 µg/g phorbolesters and the fermented meal contained 15.28 µg/g phorbolesters.

Feeding high phorbolesters *Jatropha curcas* meal at the level of 5% in the diet to the broilers caused 100% mortality at the age of 22 days and it damaged the liver as well as kidney (Sumiati *et al*., 2007)

Conclusions

It was concluded that feeding untreated as well as fermented jatropha curcas meal 5% in the diet was safe for the kampong chickens.

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