

## THE EFFECT OF COCONUT WASTE WITH TOFU WASTE MIXTURE FERMENTED BY *ASPERGILLUS NIGER* ON BROILER PERFORMANCE

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**Abstract:** This study aimed to determine the effect of the mixture of coconut waste and tofu fermented with *Aspergillus niger* in ration on feed intake, weight gain and feed conversion of broiler chickens. This research used Completely Randomized Design (CRD) consisted of 6 treatments, (the usage rate of fermentation products of 0, 5, 10, 15, 20 and 25 per cent) in the ration, and each treatment was repeated four times. Statistical tests performed by analysis of variance and differences between treatments effects were examined using Duncan's multiple range test. Results indicated that using up to level 20% in ration supported the performance of broiler chickens (feed consumption 2511.60 g; the final weight 1585.36 g, carcass percentage 68.13% and feed conversion 1.58kg/kg).

**Key words:** coconut waste, tofu waste, *Aspergillus niger*, fermentation, broiler

### Introduction

Utilization of waste as an alternative to animal feed is necessary because almost the constituent ingredients of feed rations are also human food. To avoid that, it is necessary to look for other feed ingredients that do not compete with human needs. Agricultural processing wastes, such as waste oil dregs and waste processing waste (VCO), can be utilized as raw material for animal feed rations constituent. The problem of using processing waste is the poor nutrition quality. The fermentation process can be applied to improve the quality of the waste using microbes.

*Aspergillus niger* is a type of mold that is used commercially in improving the quality of agricultural processing wastes, because of the easy handling, its ability to grow quickly and it is not harmful because it does not produce mycotoxins. This fungus can produce enzymes such as  $\alpha$ -amylase, amylase,

cellulase, gluco-amylase, catalase, pectinase, lipase, and galactosidase (Ratledge, 1994).

The use of *Aspergillus niger* fermentation product on agricultural wastes for animal feed has been tested by Abun (2003), using the fungus *Aspergillus niger* fermentation products as broiler feed ingredients, that can improved the broiler chickens performance. Therefore, it is interested to do disclosure of the extent the performance of broiler chickens using a mixture of coconut pulp (VCO waste).

## Material and Methods

### Materials

Preparation of fermentation products :

- Coconut waste (VCO waste), from the coconut oil processing home industry (VCO) North Minahasa, North Sulawesi, Indonesia.
- Tofu waste, obtained from the Industri Pengolahan Tahu Cikuda, Sumedang; West Java, Indonesia
- Fungus *Aspergillus niger*, obtained from the Laboratory of Biological Sciences, Institut Teknologi Bandung; Indonesia
- Rice, fresh sprouts, gelatin, sugar, obtained from Pasar Suci, Bandung, Indonesia.

### Animal experiment

Animal experiments used 120 Cobb strain (straight run) day-old chickens broiler from PT. Missouri Bandung, Indonesia for 5 weeks (35 days).

### Rations

Feed ingredients used in the experiment consisted of a compiler ration of yellow corn, fish meal, soybean meal, palm oil, DCP, Top Mix, CaCO<sub>3</sub>, and the mixture of coconut pulp (VCO waste) and fermented tofu products. Feed materials were obtained from PT. Missouri Bandung.

### Variables studied

Feed intake, body weight and feed conversion.

### Research Design

This research used Completely Randomized Design (Steel and Torrie, 1991), with 6 treatments and each treatment was repeated 4 times. (there are 24 experimental units using 120 chickens, so each unit were placed 5 chickens).

Treatment rations were given as follows:

R0 = Ration containing 0% fermentation products (CAKTAF) as control

R1 = Ration containing 5% fermentation products (CAKTAF)

R2 = Ration containing 10% fermented products (CAKTAF)

R3 = Ration containing 15% fermented products (CAKTAF)

R4 = Ration containing 20% fermented products (CAKTAF)

R5 = Ration containing 25% fermented products (CAKTAF)

Note: CAKTAF is Coconut Waste Mixture with Tofu Waste Fermented.

In Table 1, the composition of rations for each treatment is presented.

**Table 1. Composition of Rations Research (%)**

Feed Contents	Treatments					
	R0	R1	R2	R3	R4	R5
Corn meal	56.44	52.44	48.44	44.44	40.44	36.44
Soybean meal	29	28	27	26	25	24
Fish meal	9	9	9	9	9	9
Coconut oil	2.5	2.5	2.5	2.5	2.5	2.5
Methionine	0.16	0.16	0.16	0.16	0.16	0.16
Top mix	0.5	0.5	0.5	0.5	0.5	0.5
CaCO <sub>3</sub>	0.9	0.9	0.9	0.9	0.9	0.9
Dicalcium phosphate	1.5	1.5	1.5	1.5	1.5	1.5
CAKTAF	0	5	10	15	20	25
Total	100	100	100	100	100	100

Note: Compiled by standard requirement by Lesson and Summer (2001)

From Table 1, the compositions are differs only in corn meal, soybean meal and CAKTAF. And in Table 2, the substances contents of feed experiments.

**Table 2. Substances Content of Feed contents**

Feed Contents	Treatments					
	R0	R1	R2	R3	R4	R5
Protein (%)	22.56	22.49	22.43	22.37	22.31	22.25
EM Kcal/kg)	3023.97	3025.61	3027.25	3028.89	3030.53	3032.17
Fat (%)	6.45	6.41	6.36	6.31	6.28	6.22
Crude fiber (%)	3.40	4.44	4.32	4.40	4.41	4.41
Lysin (%)	1.33	1.33	1.33	1.33	1.32	1.32
Methionine (%)	0.60	0.59	0.59	0.59	0.59	0.59
Met + Cyst (%)	0.93	0.93	0.92	0.91	0.91	0.90
Ca (%)	1.08	1.09	1.09	1.09	1.09	1.09
P-non phytate (%)	0.52	0.52	0.52	0.51	0.51	0.51

## Results and discussion

The average of feed consumption, body weight and feed conversion were obtained from the results of the study are shown in Table 3.

**Table 3. The average of feed consumption, body weight and feed conversion**

Component	Treatments					
	RO	R1	R2	R3	R4	R5
Consumption (g)	2590.67	2585.30	2556.04	2549.22	2511.60	2329.78
Body Weight (g)	1650.32	1633.85	1618.21	1608.84	1585.36	1411.07
Feed Conversion (Kcal/kg)	70.79	69.49	69.78	69.78	68.13	67.20

### The effects on Feed Consumption

From the observations, the average of feed consumption during the study (5 weeks) ranged from 2329.78 g to 2590.67 g, as shown in Table 3. The effect of feed consumption were analyzed by variance test. Results of the variance test showed that CAKTAF treatment levels used in the ration has significantly effects ( $p < 0.05$ ) on feed consumption of broiler chickens. To find out how much the differences between the treatment on feed consumption were used Duncan's multiple range test, and the results are presented in Table 4.

**Table 4. Duncan's Multiple Range on Feed Consumption Test During Research**

Treatments	Average Feed Consumption (g)	Significancy ( $p < 0.05$ )
R0	2590.67	a
R1	2585.30	a
R2	2556.04	a
R3	2549.22	a
R4	2511.60	a
R5	2329.70	b

Note : The same letter in the significancy column showed no significant

By Duncan test, results showed that the usage rates of CAKTAF (5%, 10%, 15% and 20%) in the rations raised the chicken feed consumption; which were not significantly different ( $p < 0.05$ ), but the using of 25% CAKTAF has

By Duncan tests, showed that the body weight of R1, R2, R3, R4 and R5 decreased compared to R0, but R1, R2, R3, and R4 has significance ( $p < 0.05$ ) than R5. It means that CAKTAF (5%, 10%, 15% and 20%) in the diet has no significant on weight gain of broilers ( $p < 0.05$ ) compared to R0, but 25% CAKTAF in ration showed significant difference ( $p < 0.05$ ); that decreased the weight gain compared to the ration 0% CAKTAF (control) and contained CAKTAF of 5%, 10%, 15%, and 20%. This illustrated that the addition until 20 CAKTAF in the ration, still useful on weight gain of broilers.

This results are supported to the improvement on nutritional value, especially on coconut and tofu dregs fermented mixture. In accordance with the facts found in the first and second phase of the research; that the protein content increased, decreased crude fiber and crude fat, and metabolizable energy value and protein digestibility increased compared with CAKTAF ration. The fermentation process by *Aspergillus niger* is able to break down the proteins into smaller compounds in the form of amino acids, was easily absorbed by broiler chickens.

The low weight gain of broilers that fed ration content 25% CAKTAF is caused by the reduced of feed intake. That is, in line with the opinion of *North and Bell (1990)*, who stated that the growth rate depends on the amount of feed intake, in addition to gender and age.

### **The effect on Feed Conversion**

From the observations, the average of broiler feed conversion during the study (5 weeks) ranged from 1.6174 Kcal/kg to 1.5661 Kcal/kg, as shown in Table 3. The differences in the treatments, has effects on feed conversion analysis of variance. The variance analysis showed that the rations containing fermentation products was not significantly influenced ( $p > 0.05$ ) the value of broiler feed conversion. The feed conversion ratio was not different between treatments due to the balance between feed intake and body weight gain. It means that the chicken which consumed high diets would generate high weight gain, otherwise the chicken which consumed low diets would generate low weight gain, in accordance with the statement of *Leeson and Summers (2001)*, the feed conversion ratio obtained from the comparison between feed intake and weight gain achieved during a certain time.

The average value of broiler feed conversion during the study ranged from 1.57 Kcal/kg to 1.62 Kcal/kg. This results is in line with the Cobb standard, that the value of feed conversion of Cobb strain broilers during 5 weeks maintenance ranged from 1.47 Kcal/kg to 1.61 Kcal/kg. High value of feed conversion showed that the sum of ration needed to increased the weight gain. So, the lower the value of the feed conversion, the better the ration quality. Thus the value of broiler feed

conversion results are in the normal range. A low value of feed conversion describes the efficiency of using ration to produce a good weight gain. It means that the quality of the ration in this study are good.

## Conclusion

From the observation and analysis performed, showed that using a mixture of coconut pulp (VCO waste) and tofu fermented by *Aspergillus niger* up to 20% in broiler rations can support the performance of broiler chickens.

## Uticaj smeše kokosovog i otpada tofua fermentisane pomoću *Aspergillus niger* na proizvodne rezultate brojlera

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## Rezime

Ova studija ima za cilj da utvrdi uticaj smeše kokosovog otpada i tofua fermentisane sa *Aspergillus niger* u obroku na unos hrane, prirast i konverziju hrane brojlerskih pilića. Ovo istraživanje koristi kompletno nasumični dizajn ogleda (CRD) koji se sastojao od 6 tretmana, (stopa upotrebe proizvoda fermentacije od 0, 5, 10, 15, 20 i 25 odsto) u obroku, a svaki tretman je ponovljen četiri puta. Statističko testiranje je obavljeno korišćenjem analize varijanse i razlike između tretmana efekata ispitane su korišćenjem Duncan-ovog testa višestrukog opsega. Rezultati ukazuju da korišćenje do 20% u obroku podržava proizvodne performanse brojlera (konzumacija hrane 2511,60 g, konačna masa 1585,36 g, randman trupa 68,13% i konverzije hrane 1.58).

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significant effect ( $p < 0.05$ ), which were lower in comparison with other treatments (without CAKTAF- 0%; 5%, 10%, 15% and 20% CAKTAF). This facts illustrated that the addition of CAKTAF up to 20% level ( R0 till R4) in ration, on feed intake were able to well respond.

Feed consumption of broilers was influenced by the palatable of feed ingredients making up the ration. The low of 25% CAKTAF (R5) consumption was caused by the expandable nature of fermentation products used in the ration. The higher it expands, it will accelerate the onset of strain that causes chicken gizzards stopped in feed consumption. This is consistent with *Amrullah, (2004)*; who stated that feed consumption was also determined by whether or not the cache is full, so effort to increase the feed intake; according to the energy needs per day is limited. Beside that, feed intake is influenced by the palatable of feed ingredients making up the ration.

Ration palatable are depends on smell, taste, color and texture of the feed material (*Parrakasi, 1995*). CAKTAF usage at a rate of 25% in the ration, significantly influenced ( $p < 0.05$ ) the decrease in feed intake compared to the control ration treatment (R0). This illustrated that the diet containing CAKTAF at a rate of 25% raises the texture or expands the ration so that the palable ration decreased.

### The effects on BodyWeight

The results of the average value chicken weight gain during the study (5 weeks) ranged from 1441.07 g until 1650.32 g, as seen in Table 3. Then the differences of the treatment on weight gain were analyzed. Results show that the ration which contents of fermentation products showed significance ( $P < 0.05$ ) on body weight of broiler chickens. And then, by Duncan multiple range test to find out the differences between treatments are shown in Table 5.

Table 5. Duncan's Multiple Range Test on Body Weight

Treatments	Average Body Weight (g)	Significancy ( $p < 0.05$ )
R0	1650.32	a
R1	1633.85	a
R2	1618.21	a
R3	1608.84	a
R4	1585.36	a
R5	1441.07	b

Note: The same letter in the significancy column showed no significant difference