

# The effect of replacing maize with fermented palm kernel meal (FPKM) on broiler performance

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## Abstract

The purpose of this study was to determine the effect of substitution of maize by fermented palm kernel meal on the performance of broilers. There were 5 treatments of fermented palm kernel cake replacing maize at 0, 15, 30, 45 and 60% of the diet, with each treatment replicated four times.

There were curvilinear responses in feed intake, live weight gain and feed conversion as the proportion of FPKM in the diet was increased. The optimum response appeared to be when the FPKM was about 30% of the diet.

**Keywords:** *Aspergillus niger*, *Cellulomonas*, maize, soybean

## Introduction

Indonesia imports large quantities of maize and soybean (300 tonnes/year). the staple components of feed for broilers. Reducing imports of feed ingredients is one way of reducing greenhouse gas emissions to which sea freight is a major contributor. A potential local feed ingredient that could be used to replace maize is palm kernel meal (PKM). PKM has high crude

fibre content but this can be reduced by fermentation using *Aspergillus niger* and *Cellulomonas* (Leke et al 2013).

## Methods and materials

### Experimental design

The birds used in this study were 100 day-old broiler chicks with an average weight of  $38.7 \pm 1.19$  g. The treatments were levels of 0, 15, 30, 45 and 60% FPKM replacing maize (Table 2).

### Preparation of the fermented palm kernel meal (FPKM)

The PKM was sifted to separate the meal from the remaining shells, then placed on the floor that had been coated with trash bags and sacks. Suspensions of *Cellulomonas* and molasses were homogenized in a blender then added at 40 ml and 20 ml per 1 kg of PKM. The next step was to add *Aspergillus oryzae* at 9g per kg of PKM. The last step was putting the PKM in a sack with holes to allow entry of air and storing for 3 days at room temperature after which it was sun-dried (Sjofjan et al 2020).

### Feed ingredient

**Table 1.** Chemical composition of the feed ingredients (% air-dry basis)

	DM	CP	CF	Fat
Maize	88	8.0	2.4	8.2
Soya bean meal	89	37.6	5	5
Rice bran	90	10	26	3.5
Palm kernel meal	94	16	2.04	6.5
FPKM	93	17.4	1.45	5.1

**Table 2.** Ingredient composition of the diet

	FPKM replacing maize, %				
	0	15	30	45	60
Maize	60	45	30	15	0
FPKM	0	15	30	45	60
Rice bran	5	5	5	5	5
Soybean	31	31	31	31	31
Limestone	1.1	1.1	1.1	1.1	1.1
Salt	0.3	0.3	0.3	0.3	0.3
Soybean oil	2.8	2.8	2.8	2.8	2.8
Vitamin premix	0.05	0.05	0.05	0.05	0.05
Mineral premix	0.05	0.05	0.05	0.05	0.05

Vitamin premix (per kg of diet); vitamin A 12,500 IU; Vitamin D3, 2,500; Vitamin E 20 IU;

Mineral premix (Per kg of diet); Fe 70 IU, Zn, 90 IU; CU, 10 IU; Mn, 80 IU

**Table 3.** Calculated analysis of the diets (%)

	FPKM replacing maize, %				
	0	15	30	45	60
DM	93	92	94	91	91
CP	22	22	22	22	22
Fat)	4.4	4.5	4.4	4.4	4.4
CF	5.2	5.3	5.3	5.2	5.4

Dry matter (DM), crude protein (CP), crude fibre (CF)

#### Statistical analysis

Data were subjected to analysis of variance using the general linear model in the ANOVA program of the SAS Version 4.0 software. Sources of variation in the model were treatments and error.

#### Measurements

The broilers were weighed at the beginning of the experiment, and every week thereafter until the end of the experiment.

#### Results and discussion

There were curvilinear responses in feed intake, live weight gain and feed conversion as the proportion of FPKM in the diet was increased (Table 4; Figures 1-3). The optimum response appeared to be when the FPKM was about 30% of the diet. Similar findings were reported by Mirnawati et al (2020) feeding broilers with palm kernel meal fermented with *Bacillus subtilis*. The growth rate was enhanced with up to 30% of the fermented palm kernel meal in the diet but was depressed at higher levels.

**Table 4.** Mean values for feed intake, live weight gain and feed conversion (FCR) in broilers fed increasing levels of FPKM replacing maize

	% FPKM					SEM	p
	0	15	30	45	60		
Feed int., g	537	546	562	590	550	11.1	0.34
FCR	1.84 <sup>a</sup>	1.86 <sup>a</sup>	1.90 <sup>a</sup>	2.00 <sup>ab</sup>	2.12 <sup>b</sup>	0.12	0.02
LWG, g	260	275	284	27	252	65	0.14

<sup>ab</sup> Mean values in the same row without common superscript differ at  $p < 0.05$

FCR = Feed intake/LW

**Figure 1.** Effect of FPKM on feed intake

**Figure 2.** Effect of FPKM on live weight gain

**Figure 3.** Effect of FPKM on feed conversion

### **Conclusions**

- Replacing maize with fermented palm kernel meal in broiler diets lead to improvements in live weight gain and feed conversion up to the 30% level of substitution.
- Higher levels of substitution led to reduced growth rate with poorer feed conversion.

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