

EFFECT OF DIETARY COCOA BEAN SHELL MEAL ON FEED INTAKE AND WEIGHT GAIN OF WEANER PIGS

M. H. OGUNSIPE*, I. IBIDAPO, AND J. O. ADEJUMO

Animal Production Unit, Department of Agricultural Science,
Adeyemi College of Education, Ondo, Nigeria

*Correspondence: moogunsipe2009@gmail.com, 0803 5284422

ABSTRACT

The performance of weaner pigs fed cocoa bean shell meal was investigated in a twelve week feeding trial. Results showed lower final live weight and average weight gain in pigs fed 30 and 40% cocoa bean shell (CBS) meal when compared with pigs fed 0-20% CBS meal in place of maize.

Keywords: Cocoa bean shell meal, performance, pigs.

INTRODUCTION

The high cost of finished feeds has been attributed to be a major factor affecting intensive pig production in Nigeria. Pig being a voracious eater, consumes a lot of feed for growth. They also require high energy feed intake, particularly at the finishing stage for good pork production. Maize, a conventional energy source constitutes between 50 and 70% in the gross feed composition of non-ruminant animals (Akinfala *et al.*, 2002). The fluctuating production and competition for maize in Nigeria (World Data Atlas 2014) has contributed to its high price, making the continuous use of it as sole energy source in feed formulation uneconomical.

Cocoa bean shell, a by-product from cocoa processing factory, which is estimated at about 10, 500 metric tonnes per annum (FAO, 2002) constitutes environmental concern to the factory and the host community. The utilization of these wastes will help mitigate the environmental dangers occasioned from unwholesome dumping of these wastes. This study assessed the feed intake and weight gain of weaner pigs on dietary inclusion of cocoa bean shell meal.

MATERIALS AND METHODS

The study was carried out at the Pig Unit, Department of Agricultural Science, Adeyemi College of Education, Ondo. The cocoa bean shell (CBS) was collected from Cocoa Processing Industries, located at Km 5, Ondo-Akure Road, Ondo, Nigeria. They were kept a dry place prior use.

The dried and milled CBS meal was analyzed for its proximate composition and theobromine contents as described by the methods of AOAC (2002) and Gerritsma and Koers (1953),

respectively. Gross energy (GE) was by the Gallenkamp Adiabatic Bomb Calorimeter (Model CBB-330-0104).

Five diets (Table 1) were formulated such that diet 1 which was the basal diet contained 0% CBS meal while diets 2, 3, 4 and 5 contained 10, 20, 30 and 40% dietary CBS meal, respectively.

The experimental design was the completely randomization with five treatments replicated ten times of ten replicates per treatment of one weanling pig per replicate.

A total of fifty weaner pigs of crossbred and mixed sexes were used for the feeding trial. The pigs were on one week adaptation during which they were fed commercial grower diet and treated against parasitic infection by given 0.5ml ivermectin injection intramuscularly. After the adaptation period, they were randomly assigned to their respective diets and fed at 5% body weight with water served *ad-libitum* throughout the 12 weeks feeding trial.

Data collected on daily feed intake, weekly weight gain, feed: gain ratio, were analyzed by one way analysis of variance (ANOVA) using SPSS 2006. Where significant differences exist, the means were separated using Duncan new Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition

The chemical compositions (Table 2) with reference to crude protein, crude fibre and theobromine in this study were higher than those reported by Olubamiwa *et al.* (2006) and Oddoye *et al.* (2010).

Performance indices

Result on Table 3 shows that total feed and average feed intakes were similar in pigs fed the

control and CBS meal diets. The similar consumption of CBS meal and maize indicates the palatability of CBS meal by pigs. Levels of feed intake had been attributed to factors such as texture, taste and odour (Odunsi and Longe, 1995). Hence, the chocolate odour and crispy texture of CBS meal could be responsible for its acceptability by pigs.

Weight gain reveals a decrease in final live weight and average weight gain in pigs fed 30 and 40% CBS meal when compared with those on 0-20% CBS meal diets while feed: gain ratio decreased progressively in pigs fed 20-40% CBS meal diets when compared with those on 0 and 10% CBS meal diets. The decrease in weight gain and feed: gain ratio at higher substitution levels might be attributed the theobromine content which could affect nutrient digestibility and absorbability (Yeong *et al.*, 1989). Growth performance of livestock has been reported to be affected by dietary concentrations of theobromine (Day and Dilworth, 1984). Also, the low catabolic process of theobromine to either 7-methylxanthine or 3-methylxanthine then to xanthine and subsequent oxidation to uric acid in the liver (Dash and Gummadi, 2006) might result to poor nutrient utilization and subsequent poor growth rate (Adamafio, 2013). Economic implications shows a progressive decrease in the feed cost ₦/kg as evidenced in the 2.70-10.6% cost reduction with substitution of CBS meal at the expense of maize in the diet. Although the cost of gain was similar but the feed cost ₦/kg gain, which is a measure of the economic efficiency of feed utilization was least at 10% CBS meal substitution, thus suggesting this level as the optimal biological and economic levels of using CBS meal as energy substitute for maize in pig diet. The negative values obtained in the saving cost and relative cost benefit of pigs fed 20-40% CBS meal diets implies additional cost incurred to raise a kg of pig weight.

CONCLUSION AND RECOMMENDATION

Result shows that 20% was the optimal biological level of CBS meal as energy substitute for maize in pig diet. Pig farmers in this part of the world where CBS abound are encouraged to utilize CBS meal as energy substitute for maize in pig diet.

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Table 1. Gross composition of experimental diets

CBS meal (%)	0	10	20	30	40
Diets	1	2	3	4	5
Ingredients (kg)					
Maize	56.2	50.6	45.0	39.3	33.7
Cocoa bean shell	-	5.6	11.2	16.9	22.5
Wheat offal	9.00	9.00	9.00	9.00	9.00
Soybean meal	14.00	14.00	14.00	14.00	14.00
Groundnut cake	8.00	8.00	8.00	8.00	8.00
Palm kernel cake	7.00	7.00	7.00	7.00	7.00
Fish meal	2.50	2.50	2.50	2.50	2.50
Bone meal	1.50	1.50	1.50	1.50	1.50
Oyster shell	0.50	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50	0.50
Lysine	0.15	0.15	0.15	0.15	0.15
Methionine	0.15	0.15	0.15	0.15	0.15
Salt	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100

Table 2. Chemical composition of cocoa bean shell (%)

Nutrients	Cocoa bean shell
Dry matter	93.5
Crude protein	15.4
Crude fibre	39.3
Ether extract	8.49
Ash	5.17
Nitrogen free extract	25.1
Gross energy (kcal/kgDM)	20.8
Theobromine (g/kg)	2.88

Table 3. Performance and cost implications of pigs on varying levels of cocoa bean shell meal

CBS (%)	0	10	20	30	40	SEM	Sig
Diets	1	2	3	4	5		
Performance characteristics							
Initial weight, kg	9.98	9.97	10.10	9.93	9.93	0.17	0.52
Final live weight, kg/pig	44.8 ^a	45.3 ^a	43.6 ^a	38.5 ^b	39.5 ^b	3.05	0.003
Total weight gain, kg/pig	34.8 ^a	35.3 ^a	33.6 ^a	28.6 ^b	29.6 ^b	2.94	0.001
Average weight gain, kg/pig/d	0.41 ^a	0.42 ^a	0.40 ^a	0.34 ^b	0.35 ^b	0.04	0.001
Total feed intake, kg/pig	92.6	95.7	96.0	92.2	90.2	2.04	0.18
Average feed intake, kg/pig/d	1.10	1.14	1.14	1.09	1.07	0.03	0.19
Feed: Gain	2.69 ^a	2.71 ^a	2.83 ^b	3.22 ^c	3.07 ^d	0.32	0.002

^{abcd} Means with different superscripts along the same row are significant at $P < 0.05$.