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# Performance and cost effectiveness of feeding maize cob ash treated cocoa pod husk diet to weaner pigs (Large White x Landrace)

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**ABSTRACT: The stiff competition between man and livestock for scarcely available feed resources poses a cost challenge to monogastric production in Nigeria. To overcome this challenge, the option of sourcing for cheap alternatives appears attractive. Cocoa pod husk has the potential of becoming an important, cheap and locally available feed resource when properly harnessed. A feeding trial was conducted to evaluate the effect of dietary inclusion of cocoa pod husk on the performance and economy of weaner pigs. Eighteen Crossbred (Large White x Landrace) pigs between the ages of 6-8weeks with an average initial weight of 8.93kg were assigned to three dietary treatments with six animals, each being a replicate in a completely randomized design (CRD). Dietary treatments consisted of control (treatment A) which was without cocoa pod husk (CPH) treatment B having maize cob ash treated cocoa pod husk (MCACPH) and treatment C containing untreated cocoa pod husk (UCPH). Dry matter, crude protein, crude fibre, ether extract, ash, nitrogen free extract, feed intake, weight gain and economics were determined. The maize cob ash treated cocoa pod husk and untreated cocoa pod husk had 83.35% and 87.78% dry matter, 7.90 and 7.81% crude protein, 11.16 and 18.00% crude fibre, 1.50 and 3.58% ether extract, 9.81 and 6.01% ash and 52.78 and 53.39% nitrogen free extract respectively. Dietary treatments did not significantly (P>0.05) affect feed intake and body weight gains. Feed convertion ratio value was highest for control (3.33) followed by treatment C (2.58) while treatment B was least (2.41). The same trend was observed for feed cost per kilogram gain indicating improved efficiency of feed utilization and cost reduction with inclusion of CPH moreso with MCACPH. The best feed cost/kg gain and cost saving was observed in treatment B. The results suggest that MCACPH improved performance and was cost effective for feeding weaner pigs.**

**Keywords:** Cocoa pod husk, Maize cob ash, Pigs, Performance and Economy

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## INTRODUCTION

Embracing the production of fast maturing and highly prolific monogastric species is a key to addressing the animal protein deficit in many Nigerian homes. Pigs have been described as one of the most prolific and fast growing livestock species that can convert food waste to valuable products (Eusebio, 1980). It has been observed that among red meat animals, such, as cattle, sheep and goats, the pig excels in converting feed to flesh (Ikani and Dafwang, 1995). Their production has therefore been advocated as a short term measure toward alleviating the

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animal protein and calorie deficit especially in areas where there are no religious edicts preventing their production and consumption (Kalla *et al*, 2003). One of the objectives of the National Agricultural policy is improving the quality of the diet of Nigerians at reasonable cost (Sobayo *et al*, 2008). Therefore any intervention that contributes to making protein of animal origin more available to Nigerians particularly at a cheap cost is welcome. The high cost of conventional sources of protein and energy is largely responsible for the present high price of finished feeds (Adejinmi *et al*, 2011). This calls for evaluation of cheap alternative feed resources. Cocoa pod husk is one of the many under exploited feed resources with potential as an energy source for pig feeding. It is the first by product of the cocoa industry which has been shown to contain sufficient amount of utilizable nutrient for it to be used as livestock feed (Smith and Adegbola, 1985, Opeke 1997). This by-product has been used extensively for ruminant feeding (Smith and Adegbola, 1985) and to a limited extent poultry (Sobaminwa and longe, 1994; Adejinmi *et al*, 2011) and pig (Fleisher *et al,* 1994; Iyayi *et al,* 2001). Crude fibre content of the cocoa pod husk (21.49-34.92%) hampers its utilization (Abiola and Tewe, 1990). However, chemical treatments of fibrous crop residues such as Kola pod husk, cowpea hulls similar in composition and nutritive value to cocoa pod husk have improved their utilization (Jackson, 1977). Chemicals are expensive and where safety apparels are not available could be corrosive.Therefore a cheaper option of using locally available maize cob ash was adopted. Several million tons of corn-cobs that had no immediate use to humans accumulate on farm processing units and contribute to land and air pollution. A sizeable percentage is burnt to provide space for other useful purposes and ashes used as fertilizer in crop farming (Oladeinde, 2000). The objective of this study was therefore to determine the effect of inclusion of cocoa pod husk with or without maize ash treatment on the performance and cost implication of crossbred (Large White and Landrace) weaner pigs.

## MATERIALS AND METHODS

The study was conducted in the Piggery Unit of the Teaching and Research Farm of the University of Calabar, Calabar. Eighteen weaner (Large White x Landrace) pigs with average weight of 8.93±1.27kg at six to eight weeks of age were allotted to the three treatments comprising six animals per treatment each being a replicate in a completely randomized design experiment. Cocoa pod husk (CPH) was collected from farm processing sites in Etung Local Government Area of Cross River State. The CPH was chopped to smaller bits with cutlass and sun-dried. Dried CPH were milled and screened with a 2.5m sieve. Maize cobs were collected from Mbukpa market and burnt to ashes ready for use. About 1.2kg of NAOH was required for 20kg of material. According to Adebowale (1985), 1kg of NAOH was equivalent to 4.4kg ash. It was therefore estimated that 5.28kg of maize cob ash would be needed to treat 20 kg of cocoa pod husk. Maize cob ash (5.28kg) was dissolved in 20litres of water and left for ten minutes to allow the ash dissolve after which it was filtered. The filtrate was poured into 20kg of processed cocoa pod husk, mixed properly and ensiled in black polythene bags for 24 hours. After ensiling, the treated cocoa pod husk was air dried before incorporating into the diet. Three diets were formulated (Table 1). Control diets contained 0% cocoa pod husk (CPH). Maize cob ash treated cocoa pod husk (MCAPH) and untreated cocoa pod husk (UCPH) were included in diets 2 and 3

respectively at 10%. The animals were dewormed and housed in pens with concrete floor which were demarcated with wooden barriers for each treatment. The pens were disinfected and proper sanitary condition was maintained throughout the feeding trial. The experiment lasted six week. The maize cob ash treated cocoa pod husk, untreated cocoa pod husk and control diets were analyzed for proximate composition using method of AOAC (1995). Data on body weight gain and feed intake were analyzed using the analysis of variance (ANOVA) method of Steel and Torrie (1980).

**Table 1: The gross composition of the experimental diets**

| Ingredient (% Inclusion) | Treatments | | |
|---|---|---|---|
| | TA | TB | TC |
| Maize | 50 | 50 | 50 |
| Soybean | 20 | 19.6 | 20.71 |
| P.K.C | 10 | - | - |
| Maize Cob Ash treated CPH | - | 10 | - |
| UCPH | - | - | 10 |
| Wheat offals | 10 | 10.4 | 9.29 |
| Fish meal | 5 | 5 | 5 |
| Bone Meal | 2 | 2 | 2 |
| Oyster Shell | 1 | 1 | 1 |
| Lysine | 0.5 | 0.5 | 0.5 |
| Methionine | 0.5 | 0.5 | 0.5 |
| Salt | 0.5 | 0.5 | 0.5 |
| Premix | 0.5 | 0.5 | 0.5 |
| Crude protein | 20 | 20 | 20 |
| Energy | 2.8 Kcal/ME | 2.8 Kcal/ME | 2.8 Kcal/ME |

## RESULTS AND DISCUSSION

Table 2 shows the chemical composition of treated and untreated CPH. The values obtained were 82.35% DM; 7.90% CP; 11.16% CF; 1.50% EE; 9.81% Ash and 69.63% NFE for maize cob ash treated CPH while those obtained for untreated CPH were 87.88% DM, 7.81% CP; 18.00% CF, 2.58% EE, and 6.01% ash and 65.60% NFE. The DM values for both MCACPH and UCPH were lower compared to 92.0% reported by Iyayi *et al* (2001). The crude protein value of MCACPH (7.90%) was higher than UCPH (7.81%) and 7.00% reported by Sobaminwa (1992). The 1.1% increase in CP for MCACPH over UCPH agrees with increased CP levels of straw after ash solution treatment. The crude fibre level of the MCACPH (11.16%) was lower than that of the UCPH (18.16%). Similar observations of reduced crude fibre value after alkali treatment of straw have been reported (Faniyi and Ologhobo, 1999). It is probable that the ash solution and subsequent ensiling of the CPH brought about degradation of cell wall constituents. Alkali treatment is capable of causing hydroxylation and swelling which makes the cells of fibrous materials swell beyond proportion and later breakdown (Faniyi and Ologhobo, 1999). The lower EE value for MCACPH compared to that of UCPH agrees with reports of lower EE values after alkaline treatment (Faniyi and Ologhobo, 1999). The ash content of MCACPH was higher than that of UCPH and 6.30% obtained by Iyayi *et al* (2001) but lower than 10%

**Table 2: Chemical composition of maize cob ash treated and untreated CPH (%)**

| Constituents | Ash Treatment | UCPH |
|---|---|---|
| DryMatter | 82.35 | 87.88 |
| Crude protein | 7.90 | 7.81 |
| Crude Fibre | 11.16 | 18.00 |
| Ether Extract | 1.50 | 2.58 |
| Ash | 9.81 | 6.01 |
| Nitrogen Free Extract | 69.63 | 65.60 |
| Moisture | 16.65 | 12.22 |

obtained by Faniyi Ologbobo (1999). Higher ash content of MCACPH could be attributed to the trapped ash in the cocoa pod husk fibres during ensiling. Lower NFE value of MCACPH than UCPH is similar to reports of lower value of NFE for wheat straw after alkaline treatment (Adebowale, 1985). Table 3 shows the proximate chemical composition of the experimental diets. Crude protein value for treatment B (22.3%) was numerically higher than treatment C (21.44%) and treatment A (21.00%) indicating improvement in the crude protein of the pod husk. Improvement in crude protein of ash treated straw has also been reported (Adebowale, 1985). The lower ash content of treatment B (6.5%) is a reflection of probable degradation of cell well components of the CPH. Clawson *et al* (1990) had reported delignification and improved feed value for alkaline treated cocoa pod husk. Given the low EE values (1.50%) of MCACPH (Table 2), one would have expected the same for treatment A, however that was not the case. Treatment B had highest values of EE (5.5%) compared to treatment A (5.0%) and C (5.25%). Similarly, the trend for ash in diets corresponds to reports where level of ash was highest in the untreated Kola-nut husk diet (Sanwo *et al,* 2006). The reason may not be easily deduced given results of MCACPH ash content (Table 2). However, it is not unlikely that efficiency of proximate determination, method used and the actual feed ingredient used may vary. The performance characteristics of the pigs on cocoa husk based diets are presented in Table 4. The values obtained for weight gain and feed intake were not significantly (P>0.05) influenced by dietary treatments. However, treatment B (2.41) had the best feed conversion ratio followed by treatment C (2.58) and treatment A (3.33). It is likely that the alkali treatment caused delignification which brought about marked effects in feed/ gain ratio, efficiency of gain and good animal performance (Clawson *et al* 1990). The high cost of feed (Table 4) in treatment B and C compared to treatment A is attributed to the extra cost of transportation of CPH from Etung L.G.A and processing. The additional cost for ash treatment accounts for the higher cost of MCACPH diet (Treatment B). Therefore treatment A consistently had lower average cost of feed/pig (N1,188.3) and least cost of feed/kg (N47.5) followed by Treatment C (N1,366.5) and (N54.66) and Treatment B (N1,386.3) and (N55.30) respectively. However, given the lowest feed conversion ratios obtained for treatment B (2.41) the resulting better efficiency of feed utilization is reflected in the cost per kilogram gain of the treatment. Treatment B had the best cost per kilogram of gain followed by treatment C and then treatment A. This implies that is cheaper to produce one kg of meat using MCACPH based diet than UCPH and control diets respectively, in spite of the apparent high unit cost of MCACPH diets.

**Table 3: Proximate chemical composition of experimental diet**

| Constituents | Treatment A | Treatment B | Treatment C |
|---|---|---|---|
| Crude protein | 21.0 | 22.31 | 21.44 |
| Crude Fibre | 7.25 | 6.5 | 7.75 |
| Ether Extract | 5.0 | 5.5 | 5.25 |
| Ash | 4.5 | 6.5 | 8.0 |
| NFE | 62.25 | 59.19 | 57.56 |

**Table 4: Effect of cocoa pod husk based diets on the performance and economy of (Large White x Landrace) pigs**

| Parameter | T A | T B | T C | SEM |
|---|---|---|---|---|
| Initial weight (g) | 9.00 | 8.90 | 8.90 | 0.033 |
| Final weight (kg) | 16.20 | 19.00 | 18.40 | 0.851 |
| Mean weekly weight gain (kg) | 7.23 | 10.07 | 9.37 | 0.854 |
| Mean weekly feed intake (kg) | 24.1 | 24.3 | 24.2 | 0.057 |
| Feed conversion Ratio | 3.33 | 2.41 | 2.58 | 0.283 |
| Cost of feed (₦) | 7,130.00 | 8,299.00 | 8,199.00 | 374.1 |
| Average cost of feed/pig (₦) | 1,188.3 | 1,386.3 | 1,366.5 | 62.96 |
| Cost of feed/kg (N) | 47.50 | 55.30 | 54.66 | 2.50 |
| Cost of feed/kg live weight gain (₦) | 158.18 | 133.27 | 141.02 | 7.36 |

## CONCLUSION

The results of this study have shown that feed intake weight gains and feed conversion ratios of pigs fed cocoa pod based diets are not inferior to those of control diet. Although the cost of control diet appeared cheaper, feed cost per gain was cheapest for MCACPH diet (Treatment B). The inclusion of CPH based diets brought about comparable performances and improved efficiency of feed utilization particularly MCACPH. It is concluded that maize cob ash treatment improved the efficiency of CPH utilization in weaner pig diets. However, trials at farm locations in cocoa producing areas would likely give more impressive results with higher cost saving.

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