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# Performance of Weaner Pigs Fed Graded Levels of Yam and Sweet Potato Peel Meal in Place of Maize in a Maize Based Diet

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**Abstract**
24 weaner pigs were used to investigate the performance of weaner pigs fed graded levels of combined yam peel and sweet potato peel meal (test feedstuff) in maize-based diets. They were allocated to four (4) dietary treatments. Each treatment had three replicates and two pigs in a completely randomized design (CRD). Diet 1 was a maize-based diet, while Diets 2, 3 and 4 contained test feedstuff at 5%, 10% and 15% in place of maize respectively. Feed and water were given *ad-libitum*. The crude protein and gross energy of the test feedstuff were 9.11% and 3.010 Kcal/kg respectively. The test feedstuff contains hydrogen cyanide 0.23 mg/kg, phytic acid 0.56% and tannin 0.46%. Growth performance showed significant differences ($p<0.05$) in all the parameters measured except initial weight and feed intake/pig/day. For feed conversion ratio, the least value occurred in T1 (3.24) while the highest value occurred in T4 (4.62). The feed cost analysis (₦) revealed that the cost/kg of feed, cost of feed consumed and cost of production were lower than the control diet while the control diet had the least cost/kg weight gain (diet 1 (220.61), diet 2 (230.86), diet 3; (230.25) and diet 4 (243.84)) and highest gross margin values (diet 1; 47.18, diet 2; 41.66, diet 3; 41.45 and diet 4; 40.31). Judging from the least value of feed conversion ratio, cost/kg weight gain and highest gross margin of diet 1, the test feedstuff could not replace maize even at 5% dietary level of inclusion.

**Keywords:** Performance, pig, maize, yam-sweet potato

## Introduction

In Nigeria, due to high price of animal products stemming up from high cost production (Akinmutimi, 2011), the search for alternative energy sources for animal feeding is continuous due to general increase in human population and the use of cereals especially maize as a source of energy (Akinmutimi *et al.,* 2009). This has led to a keen competition among animals, man and industry with animals at a disadvantage (Touluen and Patrick, 2007). This has led to poor animal protein intake. One of the plausible ways of solving this problem is the use of kitchen waste such as yam peel and sweet potato peels (Anakebe, 2007). They are cheap, widely available and are of no industrial use (Akinmutimi and Anakebe, 2008). Sweet potato peel meal contains about 6.3% crude protein, metabolizable energy of about 3411 kcal/kg (Osuagwu, 2006) while yam peel meal contains about 11% crude protein and metabolizable energy of about 2604kcal/kg (Akinmutimi and Osuagwu, 2008).

Information on combined use of these peel meals in weaner pig feed in place of maize in a maize-based diet is yet to be reported. This forms the objective of the study.

## Materials and methods

The experiment was carried out in the Piggery Unit of Michael Okpara University of Agriculture Umudike, Abia State, Nigeria. 24 large white weaner pigs were allotted randomly to four (4) dietary treatment groups T1, T2, T3 and T4 and each treatment was replicated three times with 2 weaner pigs per replicate in a completely randomized design. The experiment lasted for 56 days. Feed and water were given *ad-libitum.* Four (4) diets were formulated; Diet 1 was maize-based (control) while the test ingredient (yam peel and sweet potato peel meal) replaced maize at varying levels of 5, 10 and 15% respectively.

The proximate composition and gross energy of the test ingredients and the experimental diets were determined using the procedure of AOAC (1990). The hydrogen cyanide was determined using the method of Bradbury *et al*. (1999). The method of Maga (1983) was used to determine the tannin and phytate contents of the test ingredient.

Table 1: Experimental diets

| Feedstuff | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Maize | 45.00 | 40.00 | 35.00 | 30.00 |
| Sweet potato peel meal | _ | 3.00 | 6.00 | 9.00 |
| Yam peel meal | _ | 2.00 | 4.00 | 6.00 |
| Maize offal | 20.05 | 20.05 | 20.05 | 20.05 |
| Soya bean meal | 13.00 | 13.00 | 13.00 | 13.00 |
| Palm kernel cake | 13.00 | 13.00 | 13.00 | 13.00 |
| Blood meal | 3.00 | 3.00 | 3.00 | 3.00 |
| Fishmeal | 2.00 | 2.00 | 2.00 | 2.00 |
| Bone meal | 3.00 | 3.00 | 3.00 | 3.00 |
| Common Salt | 0.50 | 0.50 | 0.50 | 0.50 |
| Vitamin premix | 0.25 | 0.25 | 0.25 | 0.25 |
| Methionine | 0.10 | 0.10 | 0.10 | 0.10 |
| Lysine | 0.10 | 0.10 | 0.10 | 0.10 |
| Total | 100. 00 | 100. 00 | 100. 00 | 100. 00 |
| Crude protein (%) | 17.9055 | 17.7235 | 17.7235 | 17.6325 |
| ME(kcal/g) | 2782.13 | 2764.92 | 2764.92 | 2747.63 |

**Results and Discussion**

Table 2 reveals the proximate composition and gross energy of experimental diets. The crude protein determined was in line with the calculated one and with the crude protein requirement of weaner pigs as reported by Akinmutimi *et al*. (2011). Table 3 shows the proximate composition and gross energy of test ingredient. The gross energy value of 3.010 kcal/g reveals the potential of the test feedstuff as an energy source. Table 4 reveals the anti-nutritional factors in the test ingredient. There are hydrogen cyanide, phytic acid and tannin in the test feedstuff of which, phytic acid is the highest in the test feedstuff. This implies the possibility of the negative influence of these anti-nutrients in the overall performance of the animals. Table 5 shows the growth performance of weaner pigs fed graded level of combined sweet potato and yam peel meal.

Table2: Proximate composition and gross energy of experimental diets

| Composition (%) | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Crude protein | 17.98 | 17.64 | 17.85 | 17.91 |
| Ether extract | 3.53 | 2.58 | 3.64 | 3.70 |
| Crude fibre | 3.69 | 3.93 | 4.23 | 4.36 |
| Ash | 5.71 | 5.77 | 5.83 | 6.03 |
| Dry matter | 90.16 | 90.27 | 90.33 | 90.24 |
| Gross energy (kcal/g) | 3.01 | 3.03 | 3.03 | 3.04 |

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Table 3: Proximate composition and gross energy of test ingredient

| %Crude protein | %Crude fat | %Crude fibre | %Ash | %Dry matter | Gross energy (kcal/g) |
|---|---|---|---|---|---|
| 9.11 | 1.20 | 3.47 | 6.89 | 89.10 | 3.010 |

Table 4: Anti-nutritional factors in the test ingredient

| HCN (mg/kg) | %Phytic Acid | %Tannin |
|---|---|---|
| 0.23 | 0.56 | 0.46 |

Table 5: Growth performance of weaner pigs fed graded level of yam peel and sweet potato meal in place of maize

| Parameter (kg) | D1 | D2 | D3 | D4 | SEM |
|---|---|---|---|---|---|
| Initial weight | 10.25 | 10.25 | 10.25 | 10.25 | 0.25 |
| Final weight | $25.25^{a}$ | $24.25^{b}$ | $24.00^{b}$ | $22.75^{c}$ | 0.28 |
| Weight gain/pig/day | $0.14^{a}$ | $0.12^{b}$ | $0.12^{b}$ | $0.12^{b}$ | 0.00 |
| Feed intake/pig/day | 0.46 | 0.45 | 0.44 | 0.50 | 0.03 |
| Feed conversion ratio | $3.24^{b}$ | $3.61^{b}$ | $3.62^{b}$ | $4.18^{a}$ | 0.56 |

$^{a-c}$ Means in the same row with different superscripts are significantly different ($p<0.05$)

There were significant differences ($p<0.05$) for all the parameters measured except for initial weight and feed intake/pig/day. The final weight ranges from 22.75 kg in T4 to 25.25 kg in T1. The downward decrease in the value of final weight from T1 – T4 will be attributed to the effect of anti-nutritional factors such as hydrogen cyanide. Hydrogen cyanide has been reported to have a negative effect on growth as a result of using sulphur amino acid such as methionine for detoxification, instead of being used for growth. The resultant effects are poor growth and poor final weight (Aletor and Fasuyi 1997; Akinmutimi, 2011). Phytate has also been reported to form compounds with anions and proteins, thus making the protein unavailable for enzymatic activities leading to poor growth (Akinmutimi, 2004 and Akinmutimi, 2006). The weight gain per pig/day followed a similar pattern, in that the highest weight gain occurred in T1 while the least value occurred in T4. This probably may be due to the reason given above. The feed conversion ratio increased as the dietary level of inclusion of the test ingredient increased, making T1 to have the least value while T4 had the highest value. T1 with a value of 3.24 for feed conversion ratio becomes a superior diet since the lower the feed conversion ratio the more the value of the diet (Ogbonna *et al*., 2000). Judging from the final weight, weight/pig/day and feed conversion ratio, diet 1 was superior to all the diets containing the test ingredient.

Table 6 reveals the cost analysis of the experimental diets The economic implications of the diet reveals that the cost/kg of the feed, cost of feed consumed and cost of production support the diet containing the test feedstuff probably due to the lower cost of the test ingredient as compared to the cost of maize, while cost/kg weight gain, revenue and gross margin are in support of control diet probably due to good weight gain, making it a superior diet among the diets, since the higher the gross margin, the more the economically viable the diet (Akinmutimi, 2004).

Table 6: Cost analysis of experimental diets

| Parameter (₦) | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Cost/kg of feed | 68.89$^{a}$ | 65.59$^{b}$ | 61.89$^{c}$ | 58.38$^{d}$ | 0.00 |
| Cost of feed consumed | 31.79$^{a}$ | 29.39$^{b}$ | 24.95$^{b}$ | 28.93$^{b}$ | 2.18 |
| Cost of production | 9.82$^{a}$ | 8.14$^{b}$ | 7.55$^{c}$ | 6.89$^{d}$ | 0.18 |
| Cost/kg weight gain | 220.61 | 230.86 | 203.25 | 243.84 | 15.64 |
| Revenue price | 57.00$^{a}$ | 49.80$^{b}$ | 47.20$^{b}$ | 47.20$^{b}$ | 1.13 |
| Gross margin | 47.18$^{a}$ | 41.66$^{b}$ | 41.45$^{b}$ | 40.31$^{b}$ | 0.95 |

$^{a-d}$ treatment means in the same row with different superscripts are significantly different ($p<0.05$)

**Conclusion and Recommendation**

It could be deduced from the performance evaluations that the test feedstuff could not replace maize even at 5% dietary level of inclusion but, however, reduced the overall cost of production. Effort should be targeted at looking for possible methods of reducing the anti-nutrient factors to see if the test feedstuff could support better performance.

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