The use of Sun-Dried Cassava Tuber Meal, Brewers’ Dried Grains and Palm Oil to Simulate Maize in the Diet of Young Growing Pigs

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Abstract

Sun-dried cassava tuber meal, brewers’ dried grains and palm oil were weighed out at the ratio of 6:3:1 and thoroughly mixed to produce an energy product, CBP-mix, containing 10.20% CP, 5.26% CF, 12.12% EE, 4.36% ash and 68.06% NFE. Two diets were made such that diet 1 (control) contained maize as the main source of energy while diet 2 contained CBP-mix as the main source of energy, completely replacing maize. Each diet was fed for 8 weeks to a group of 8 young growing pigs replicated into 2. Feed was provided at 4% of body weight while water was provided ad libitum. The pigs were weighed at the start of the experiment and weekly thereafter and the quantity of the feed offered adjusted accordingly. The pigs on CBP-mix diet consumed significantly (P < 0.05) more feed than those on the control diet (734.20 g/d vs. 796.48 g/d). The pigs on CBP-mix diet also recorded significantly (P < 0.05) more body weight gain and daily weight gain than those on the control diet. Feed conversion ratio was not affected by the treatments but cost of production (₦/kg gain) was slightly lower for the pigs on CBP-mix diet.

Key words: Cassava, brewers’ grains, palm oil, maize, pigs

Introduction

The increasing unavailability and consequent high cost of feed directly or indirectly resulting from competition between man and his livestock over food grains has been the single most important problem encountered in animal production in Nigeria. Maize has been at the centre of this problem. This has tremendously contributed to the high cost of pig feeds with resultant high cost of pork and other pig products. There is the need therefore to search for alternatives to maize to reduce its demand pressure. Sun-dried cassava tuber meal is a good source of carbohydrates but its use as feedstuff is limited by the fact that it is dusty, contains very low crude proteins and is high in HCN which is highly toxic (Udedibie et al., 2004; Enyenih et al., 2009). Brewers’ grains, the by-product of the brewing industry, is relatively high in crude protein (about 28%) and crude fibre (about 12%) but low in digestible carbohydrates (Udedibie, 1984; Uchegbu and Udedibie, 1998). Palm oil is very rich in energy (about 8.0 Mcal/kg ME) and can serve as stabilizing agent to reduce dustiness of feeds. With the characteristics of sun-dried cassava tuber meal, brewers’ dried grains and palm oil described above, it might be possible to develop a product that could simulate maize in pig diet based on their appropriate proportions. Recent trials at the University of Uyo (Udedibie et al., 2009) and the Federal University of Technology, Owerri (Udedibie et al., 2012) have shown that such a mixture, which was called CBP-mix, could completely and effectively replace maize in the diets of finisher broilers and laying hens.

This paper reports the results of preliminary investigation on the use of CBP-mix as replacement for maize in the diet of young growing pigs.

Materials and Methods

The trial was carried out at the Pig Unit of the Teaching and Research Farm of the Federal University of Technology, Owerri-Nigeria.

Sources and processing of test materials: The fresh cassava tubers of bitter variety used for the study were bought from a local market close to the University. They were peeled, chopped into small pieces and sun-dried until they become crispy. The sun-dried chips were then milled and sieved to produce sun-dried cassava tuber meal. Brewers’ dried grains was bought from a local feed dealer and run through a milling machine to homogenize it. Palm oil was bought from the local market mentioned above. The sun-dried cassava tuber meal was analyzed for HCN content using the picrate paper method of Bradbury et al. (1999).
Production of CBP-mix and the experimental diets:
The sun-dried cassava tuber meal, brewers’ dried grains
and palm oil were weighed out at the ratio of 6:3:1 and
thoroughly mixed to produce a product that somehow
looked like yellow maize. In other words, to produce 100
kg of the product, the three items were mixed at the rate
of 60 kg sun-dried cassava tuber meal, 30 kg brewers’
dried grains and 10 liters of palm oil. The product was
subjected to proximate analysis according to AOAC
(1995) and HCN analysis according to Bradbury et al.
(1999).
Two diets were made such that diet 1 (control) contained
yellow maize as the major source of energy while in diet
2, CBP-mix was used to completely replace maize.
Each of the 2 diets contained the same amounts of the
other ingredients. Both diets were subjected to proximate
analysis as stated above. Ingredient and chemical
composition of the diets are shown in table 1.

Experimental animals and design: Sixteen (16) weaner
pigs of Large White breed weighing between 8 and 12kg
were used. They were individually weighed and
randomly assigned to the 2 experimental diets in a
completely randomized design. They were balanced for
weight and sex. Each group was further sub-divided into
2 replicates of 4 pigs each and each replicate housed in a
2m x 2m cement floor pen. Feed was offered at 4% of
body weight while water was provided ad-libitum. They
were weighed at the beginning of the experiment and
weekly thereafter and the quantity of feed offered
adjusted accordingly.

Data Collection and Analysis: Data were collected on
body weight gain, daily body weight gain, feed intake,
feed conversion ratio and cost of production. Data
generated were subjected to one-way analysis of variance
according Snedecor and Cochran (1978). Where analysis
of variance indicated significant treatment effects, means
were compared using least significant difference (LSD)
according to Snedecor and Cochran (1978).

Table 1: Ingredient and Chemical Composition of the Experimental Diets

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Control 1</th>
<th>CBP-mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>50.00</td>
<td>0.00</td>
</tr>
<tr>
<td>CBP-mix</td>
<td>0.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>18.00</td>
<td>18.00</td>
</tr>
<tr>
<td>Fish meal</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Blood meal</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Palm kernel cake</td>
<td>10.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Wheat offal</td>
<td>13.00</td>
<td>13.00</td>
</tr>
<tr>
<td>Bone meal</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Common salt</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Vit./trace mineral premix*</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>L-Lysine</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>L-Methionine</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Chemical Composition

<table>
<thead>
<tr>
<th></th>
<th>Control 1</th>
<th>CBP-mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein, % dm</td>
<td>19.31</td>
<td>20.86</td>
</tr>
<tr>
<td>Crude fibre, % dm</td>
<td>4.91</td>
<td>5.70</td>
</tr>
<tr>
<td>Ether extract, % dm</td>
<td>3.52</td>
<td>8.02</td>
</tr>
<tr>
<td>Calcium, % dm</td>
<td>1.78</td>
<td>1.80</td>
</tr>
<tr>
<td>Phosphorus, % dm</td>
<td>0.69</td>
<td>0.72</td>
</tr>
<tr>
<td>ME (Mcal/kg) (Calc.)</td>
<td>2.68</td>
<td>2.69</td>
</tr>
</tbody>
</table>

*Each kg of diet contained: Vit. A, 10, 000 iu; Vit D₃, 4, 000 iu; E, 8 mg; Vit. K, 2 mg; Vit. B₁₂, 8 mg; Riboflavin, 3 mg;
 Penthoteric acid, 6 mg; Niacin, 20 mg, Choline, 400 mg; Folic acid, 5 mg; Mg, 60 mg; Iodine, 2 mg; Fe, 20 mg; Cu, 3
 mg; Zn, 0.5 mg
Results and discussion
Cyanide and proximate composition of the experimental cassava and CBP-mix:
The fresh cassava tubers used for the study contained 800 ppm HCN. After drying, the HCN dropped to 50 ppm. The values compared favourably with the values earlier obtained by Udedibie et al. (2008) and Enyenihi et al. (2009). It therefore followed that the CBP-mix used for the study contained about 30 ppm HCN since the sun-dried cassava tuber meal constituted 60% of the product. Therefore the CBP-mix diet which contained 50% CBP-mix contained 15 ppm HCN. The WHO safe level of HCN is 10 ppm (Udedibie, 2007).
The CBP-mix contained 10.20% CP, 5.26% CF, 12.12% EE, 4.36% ash and 68.06% NFE. It was similar to maize in crude protein and energy but higher in crude fibre and ether extract.

Performance of the experimental animals:
The performance of the experimental animals is presented in table 2.

Table 2: Performance of the experimental animals

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>CBP-mix</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. initial body wt. (kg)</td>
<td>10.17</td>
<td>10.30</td>
<td>0.20</td>
</tr>
<tr>
<td>Av. final body wt. (kg)</td>
<td>38.42</td>
<td>39.62</td>
<td>1.04</td>
</tr>
<tr>
<td>Av. weight gain (kg)</td>
<td>28.25b</td>
<td>29.32a</td>
<td>0.36</td>
</tr>
<tr>
<td>Av. daily wt. gain (g)</td>
<td>404.32a</td>
<td>443.59a</td>
<td>3.48</td>
</tr>
<tr>
<td>Av. daily feed intake (g)</td>
<td>734.20a</td>
<td>796.48a</td>
<td>5.72</td>
</tr>
<tr>
<td>Feed conversion ratio (g feed/ g gain)</td>
<td>1.82</td>
<td>1.80</td>
<td>0.03</td>
</tr>
<tr>
<td>Cost of feed (N/kg)</td>
<td>71.27</td>
<td>69.24</td>
<td>-</td>
</tr>
<tr>
<td>Cost of production (N/kg gain)</td>
<td>129.71</td>
<td>124.63</td>
<td>-</td>
</tr>
<tr>
<td>(N/kg gain)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Means within a row with different superscripts are significantly different (P<0.05).

Feed intake and body weight gain: The pigs on CBP-mix diet consumed significantly (p<0.01) more feed than those in the control diet. This agrees with the earlier findings of Udedibie et al. (2009) on the reaction of broiler chicks to CBP-mix diet. The broiler chicks at the finisher phase significantly (P<0.05) consumed more feed than those on the control diet. It is believed that palm oil in CBP-mix must have added some flavour to the diet that enhanced feed intake. The group on CBP-mix diet also recorded significantly (P<0.05) more body weight gain and daily body weight gain than those on the control diet. The higher body weight gain of the pigs on CBP-mix diet could be due to palm oil and brewers’ grains content of the diet. Palm oil contains essential fatty acids and brewers’ grains are believed to be rich in unidentified growth factors. These factors are of great importance in the nutrition of non-ruminants (Oluyemi and Roberts, 1997; Udedibie, 1984). It followed that 15 ppm HCN which the diet contained had no effect on the pigs.

Feed conversion ratio and cost of production: There was no significant difference between the 2 groups in feed conversion ratio (1.82 vs 1.80). However, CBP-mix diet was about 3% cheaper than the control diet based on the costs of the raw materials at the time of the experiment. Consequently, it cost ₦129.91 and ₦124.63 to produce 1kg of the pigs in the control and CBP-mix groups, respectively. This amounted to about 4% savings in cost of production by using CBP-mix diet in place of maize-based diet.

Conclusion
The study has shown that sun-dried cassava tuber meal, brewers’ dried grains and palm oil can be mixed in the ratio of 6:3:1 to make an energy product (CBP-mix) which can be used to completely replace maize in the diet of young growing pigs. It is cheaper than maize and reduces cost of production of pigs. It is, however, recommended that in using the product, the feed should not be allowed to keep for a long time to avoid spoilage that may occur due to oxidative rancidity of the palm oil in it.

References
Bradbury, M.E., Egan, S.V. and Bradbury, J.H. (1999). Picrate paper kit for determination of total cyanogens in cassava roots and all forms of...


