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NOTA BREVE

ENHANCING THE NUTRITIONAL VALUE OF WHOLE CASSAVA ROOT MEAL BY RUMEN FILTRATE FERMENTATION

MEJORA DEL VALOR NUTRITIVO DE LA HARINA INTEGRAL DE RAÍZ DE MANDIOCA POR FERMENTACIÓN CON FILTRADO DE RUMEN

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ADDITIONAL KEYWORDS

Duration of fermentation. Proximate composition.

SUMMARY

Mashed unpeeled whole cassava root meal was fermented in airtight plastic packs for 0, 24, 48, 72 and 96 hrs with N sources of CLW, PE and 1:1 mix of CLW:PE at 0, 25, 50 and 75 g/kg using bovine rumen filtrate as inoculum. Crude protein (CP) and ether extract (EE) values increased with fermentation duration. Peak CP yields of 13.58, 12.46 and 12.87 percent were obtained for cassava fermented with caged layer waste, pig excreta and CLW:PE mix. Prolongation of fermentation reduced the dry matter, crude fibre, ash, Ca, P and HCN values at the end of each of the periods of fermentation.

INTRODUCTION

Cassava is an important feed ingredient despite its low protein content. Noomhorm et al. (1992) reported that the conversion of a part of the starch in cassava root meal to protein by microbes during the process of solid-state fermentation has great potential as a means of improving its feeding value. Bovine rumen content is an abundant abattoir waste (Adeyemi and Familade, 2003). Abasiekong
(1991a,b) reported an improvement in the protein content of spent sorghum grain when refermented with some selected rumen microorganisms. Noomhorm et al. (1992) explained that the addition of N sources would provide the necessary nutritional requirements for the microorganism introduced into the cassava substrate. This work deals with the use of caged layer waste (CLW) and pig excreta (PE), (two readily available farm animal wastes) as nitrogenous sources for enrichment of cassava using fresh rumen filtrate.

**MATERIALS AND METHODS**

Aliquots of rumen content of freshly slaughtered and eviscerated cattle were collected, squeezed and the liquid portion filtered through a sieve. Droppings devoid of feathers and broken shells were collected from commercial layers, sun dried to a moisture level of <6 percent, milled and stored in plastic containers. Fresh pig excreta were collected from finishing/growing pigs fed wet brewers grains/palm kernel cake based diet, bulked, sun dried and milled.

Cassava roots (12 months old, variety TMS30572) were washed, mashed and gelatinized. 500 g of the gelatinized meal were placed in each of sixty 2 litre capacity plastic containers mixed with the various N sources (CLW, PE and CLW+PE 1:1) at the rates of 0, 25, 50 and 75 g/kg. Content of each plastic packs were sprayed with 100 ml of rumen filtrate and made airtight for fermentation durations of 0, 24, 48, 72 and 96 hours. The oven-dried fermented samples were analyzed for proximate fractions, calcium and phosphorus and gross energy using the methods of AOAC (1995). Data collected were subjected to statistical analysis appropriate for 3x4x5 factorial design using Minitab Analytical computer package (Minitab Inc., 1999).

**RESULTS**

The crude protein content of the biomasses increased with advancing duration of fermentation irrespective of the type of nitrogen source and level of inclusion of the nitrogen source (table I). It is important to note that all samples fermented with nitrogen sources had higher initial crude protein concentration compared with samples (p<0.01) without nitrogen sources. Peak crude protein values obtained at 72hrs of fermentation are 135.8, 124.6 and 126.0 g/kg DM for cassava fermented with CLW, PE and CLW+PE respectively at 75 g/kg inclusion level. The CP value of 48.9g/kg recorded at 72 hrs of fermentation for cassava root meal fermented at 0 g/kg inclusion level of nitrogen sources represented a 138.54 percent increase over the initial CP value of 20.5 g/kg. The initial CF content of samples fermented with the various nitrogen sources was higher than that without nitrogen source. Crude fiber value was significantly (p<0.01) reduced with advanced duration of fermentation in samples with and without added nitrogen sources. Fermentation with rumen filtrate significantly (p<0.01) increased the ether extract content of cassava root meal. All samples fer-
ENHANCING VALUE OF CASSAVA BY RUMEN FILTRATE FERMENTATION

Table 1. Effects of N source, level of inclusion and duration of fermentation (DF) on composition (percent) and gross energy (kCal/kg). (Efecto de la fuente de N, nivel de inclusión y duración de la fermentación (DF) sobre la composición (p.100) y energía bruta ((kCal/kg)).

<table>
<thead>
<tr>
<th>Source of Nitrogen</th>
<th>Level of Nitrogen (g/kg)</th>
<th>SEM</th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLW</td>
<td>35.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>34.90&lt;sup&gt;b&lt;/sup&gt;</td>
<td>35.16&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.061**</td>
<td>DM</td>
<td>32.43&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CP</td>
<td>6.64&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.17&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.20&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.072**</td>
<td>CP</td>
<td>3.33&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>EE</td>
<td>1.59&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.86&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.76&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.05**</td>
<td>EE</td>
<td>1.06&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CF</td>
<td>5.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.45&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.29&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.07**</td>
<td>CF</td>
<td>5.01&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Ash</td>
<td>5.14&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.96&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.45&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.02**</td>
<td>Ash</td>
<td>2.74&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>Ca</td>
<td>0.24&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.23&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.22&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.05**</td>
<td>Ca</td>
<td>0.18&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>P</td>
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<td>0.15</td>
<td>0.16</td>
<td>0.01ns</td>
<td>P</td>
<td>0.11&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>GE</td>
<td>4285.78</td>
<td>4308.53</td>
<td>4321.27</td>
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<td>p&lt;0.05</td>
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<td>CP</td>
<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
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<tr>
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<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
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<tr>
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<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
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<tr>
<td>Ca</td>
<td>p&lt;0.01</td>
<td>p&lt;0.01</td>
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<tr>
<td>P</td>
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<td>NS</td>
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<td>GE</td>
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<td>NS</td>
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</tbody>
</table>

Figures in a row bearing different superscripts are significantly different (**p<0.01).

DM: Dry mater; CP Crude protein; EE: Ether extract; CF: Crude fibre.

mented with nitrogen sources also exhibited similar increment in the EE values. The terminal Ca and P values for cassava root meal fermented with the nitrogen sources at the various levels were however higher than that obtained for cassava root meal fermented without nitrogen source. The type of nitrogen source did not affect the gross energy value of cassava (p>0.05), however level of nitrogen source and duration of fermentation significantly (p<0.01) reduced the gross energy value of cassava root meal.

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DISCUSSION

The decline in DM content was associated with increased moisture content with advanced fermentation duration. Earlier fermentation reports (Abasiekong, 1991a,b; Nguyen and Nguyen, 1992; Adeyemi and Familade, 2003) indicated a similar trend of reduction in dry matter content with fermentation. The increase in the crude protein content is thought to be associated with the proliferation of microbial bodies. Other reports (Moo-Young et al., 1983, Ghoul and Engasser, 1983, Nguyen and Nguyen, 1992) indicated an increase in protein synthesis by microbial fermentation of cassava.

The gradual reduction in crude fiber content of the cassava root meal with higher duration of fermentation is similar to earlier reports (Abasiekong 1991a,b; Noomhorm et al., 1992). Higher initial CF content of samples supplemented with nitrogen sources is attributed to the crude fiber in the nitrogen sources used in the study that are farm animal wastes which are known to be fairly high in crude fiber content (AAFCO, 1982).

The results obtained at the end of the study indicated an improvement in the Crude Protein value of whole cassava root meal when enriched with two common farm animal wastes and fermented with bovine rumen filtrate.

REFERENCES


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