Nutritional characterisation of *Vigna unguiculata* as an alternative protein source for monogastric animals

L.S. Muñoz¹, P. Sarria¹, S. Martens², M. Peters², P.A. Aguirre¹ and C.A. Montoya¹

¹Universidad Nacional de Colombia sede Palmira, Colombia (lsmunoza@palmira.unal.edu.co).
²Centro Internacional de Agricultura Tropical (CIAT), A.A. 6713, Cali, Colombia

1. THE MESSAGE

*Vigna unguiculata* grain has the potential to partially replace soybean as protein supplement in monogastric animal diets.

![Vigna unguiculata 9611 grain](image1)

![V. unguiculata, 10 weeks old at Palmira](image2)

2. INTRODUCTION

- *Vigna unguiculata* (Figs. 1 and 2) is a fast growing annual tropical legume.
- It grows on a wide range of soils, including acid soils of low fertility, has good seed production and is drought tolerant.
- Its seed is high in protein, starch and mineral content.
- In Colombia, it was evaluated as an alternative source of plant protein for monogastric animals to complement or replace soybean.

3. MATERIALS AND METHODS

- **Feeding trial with rats:**
  - Substitution of the protein of the control diet by 33, 67 and 100 % of crude *V. unguiculata* grain maintaining the same crude protein and energetic levels and similar fibre contents.
  - To calculate the basal endogenous protein losses, a diet without protein was included.
  - Determination of apparent and true fecal and ileal digestibility of dry matter (DM), nitrogen (N) and energy.
  - The true ileal digestibility was analysed using Cr₂O₃ by a colorimetric method.
- Determination of *in-vitro* digestibility of protein, measured using the ophtalidialdehyde method simulating the action in stomach and small intestine of monogastrics.

4. RESULTS

- The higher the inclusion rate of *V. unguiculata* grain, the lower the N digestibilities and the higher the N-flux (Table).
- Good correlation between *in-vitro* and *in vivo* N digestibility, \( R^2 = 0.978 \) (Fig. 3).

<table>
<thead>
<tr>
<th>Inclusion level of cowpea %</th>
<th>Control</th>
<th>33</th>
<th>67</th>
<th>100</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM</td>
<td>85a</td>
<td>83a</td>
<td>78a</td>
<td>77b</td>
<td>0.008</td>
</tr>
<tr>
<td>AND</td>
<td>78a</td>
<td>57b</td>
<td>38c</td>
<td>39c</td>
<td>0.001</td>
</tr>
<tr>
<td>TND</td>
<td>84a</td>
<td>63b</td>
<td>44c</td>
<td>44c</td>
<td>0.001</td>
</tr>
<tr>
<td>ENF</td>
<td>3.9c</td>
<td>6.8b</td>
<td>11.1a</td>
<td>11.2a</td>
<td>0.001</td>
</tr>
</tbody>
</table>

![% N-digestibility](image3)

5. CONCLUSIONS

- The low fecal and ileal N digestibility in the diets where the soybean protein was replaced with 67 and 100 % cowpea grain might be explained by the presence of anti-nutritional factors (ANF) which inhibit the protein hydrolysis.
- It is suggested that *V. unguiculata* enhances the stimulation of digestive secretions which increase the endogenous losses.
- Nevertheless, it is concluded that *V. unguiculata* grain can be utilized as protein supplement for monogastric animals.
- Connected to that the use of thermic treatment to reduce ANF is being investigated.

The financial support of the Systemwide Livestock Program (SLP) to carry out this work is gratefully acknowledged.