In-vitro digestibility of Vigna unguiculata, Centrosema brassilianum and Flemingia macrophylla before and after ensiling for pigs

1Sonja Heinritz, 2Sandra Hoedtke, 3Siriwan Martens, 4Annette Zeyner

1Centro Internacional de Agricultura Tropical (CIAT)
Km 17, Recta Cali-Palmira
Apartado Aéreo 6713
Cali, COLOMBIA
s.martens@colciar.org

2University of Rostock
Institute of Farm Animal Sciences and Technology
Chair of Nutrition Physiology and Animal Nutrition
Justus-von-Liebig-Weg 8
18059 Rostock, GERMANY

1. Introduction

Tropical forages, in particular legumes with high protein content, present an attractive alternative to purchasing costly protein concentrates for smallholder pig producers.

In-vitro enzymatic degradability and gas production before and after ensiling was tested for three contrasting forages in order

- to reveal their potential to be included in pig diets
- to determine possible differences in quality between fresh and ensiled material
- to assess the influence of ensiling on the feedstuff.

2. Materials & Methods

- The legumes Vigna unguiculata CIAT 4555, Centrosema brassilianum CIAT 5234 and Flemingia macrophylla CIAT 21087 (Fig. 1 to 3) were harvested before flowering.
- Bromatological composition was determined from unfermented plants.
- Anti-nutritional factors (ANF) such as condensed tannins (CT) and trypsin inhibitory activity (TIA) were determined before and after ensiling.
- Silages were prepared in vacuum sealer bags on lab scale, inoculated with Lactobacillus CIAT S66.7 at 10^6 cfu/g fresh matter (FM) and 20 g sucrose/kg FM, and stored for 3 months at 25°C.
- Enzymatic hydrolysis: fresh and ensiled material (Fig. 5) was incubated at 39 °C for 2 h with porcine pepsin and 4 h with pancreatin (Fig. 4).
- Gas test: predigested material was incubated for 72 h at 39 °C with pig faeces and gas volume read from syringes.
- Ground maize was included in the digestion studies solely and in combination with Vigna as easily digestible and typical feedstuff.

3. Results & Discussion

- Vigna presented highest enzymatic dry matter (DM) degradability (D) and gas production (GP) among forages before ensiling (Fig. 6, Fig. 7).
- Vigna had lowest amounts of NDF and ADF (365 and 235 g/kg DM resp.) and highest values in non fibre-bound protein and water soluble carbohydrates (185 and 111 g/kg DM resp.).
- Flemingia and Centrosema contained ANF (CT 207 and 79 g/kg DM resp., TIA 198.8 and 8.9 mg trypsin inhibited/g DM resp.).
- Centrosema and Flemingia showed better D for the ensiled material.
  → reduction of CT during ensiling by 55 % and 84% resp..
  → GP of all ensiled forages decreased compared to “fresh” material (Fig. 7).
  → Calculated D of Vigna only when combined with maize rose to 608 g/kg DM.
  → Maize showed highest D and GP, followed by maize+ Vigna.

4. Conclusions & Outlook

- The chemical composition of the feed material was reflected in their in-vitro digestibility.
- Vigna unguiculata showed highest degradability.
- Combination of Vigna with cereals such as maize has potential as alternative protein supplement for pigs in tropical countries.
- Influence of ensiling:
  → Ensiling reduced ANF content and improved enzymatic digestibility.
  → Ensiling reduced gas production, possibly due to decreased availability of WSC in silages.

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