Moringa Oleifera Seed Fractions and the Inhibition of Proteolytic Activity in Mixed Rumen Microbes *in Vitro*

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Introduction

The seed of *Moringa oleifera* Lam, a tropical tree is believed to harbour potentials to limit ruminal proteolysis.This study aimed at characterising the moringa seed and its various fractions with respect to inhibition of rumen proteolysis *in vitro* on a substrate background representing a concentrate rich diet.

Materials and Methods

- Moringa seed: From Nicaragua, and after storage for *ca* six years; ground to pass through 0.1mm mesh size.

- Incubation system: Reading pressure technique (RPT) (Mauricio et al., 1999a).
- Substrate: Maize silage (450 mg), barley grain (225 mg), soybean meal (150 mg), bovine serum albumen (10 mg) moringa seed fractions (150 mg by substituting 150 mg of maize silage), monensin (positive control).
- Medium: 75 ml of buffered rumen fluid in 125 ml bottles.
- Gas reading: routine measurement of pressure over head space after 1,3,4.5, 6, 7.5,9,10.5 and 12 h.
- Sampling: 1 ml aliquots withdrawn after 1,6,9 and 12 h
- Analyses:
  - Chemical composition, NDF and ADF of seed fractions
  - Short chain fatty acid (SCFA) by Gas Chromatography
  - Ammonium (NH4) assay (Korleff, 1976)
  - Quantitative protein analysis by dot blot assay (Hoffmann et al.,2003)

Results

Table 1. Chemical composition of moringa seed fractions

Fractions	Dry matter	Crude Ash	Crude protein	Crude Lipid	NDF	ADF
	g/kg FM	g/kg DM	g/kg DM	g/kg DM	g/kg DM	g/kg DM
Moringa whole seed	954	31	283	322	44*	32*
Moringa shells	933	31	178	130	691	548
Moringa kernels	959	32	342	437	58*	42*
Defatted kernel	946	61	622	nil	97	70

DM, dry matter; FM, fresh matter; NDF, neutral detergent fibre; ADF, acid detergent fibre;
* Calculated from the values of defatted kernel using mass fraction factors.

- Defatted kernel had the highest CP content (Table 1)
- Defatted kernel significantly reduced($P<0.05$) iso-SCFA yield to 45 % of control; comparable to monensin, a feedlot antibiotic (Fig 1).
- Soluble protein concentration in defatted kernel was constant through out incubation while that in the control decreased steadily (Fig 2).
- Lower efficacy of other fractions was compensated by increasing their dosages (Table 2).

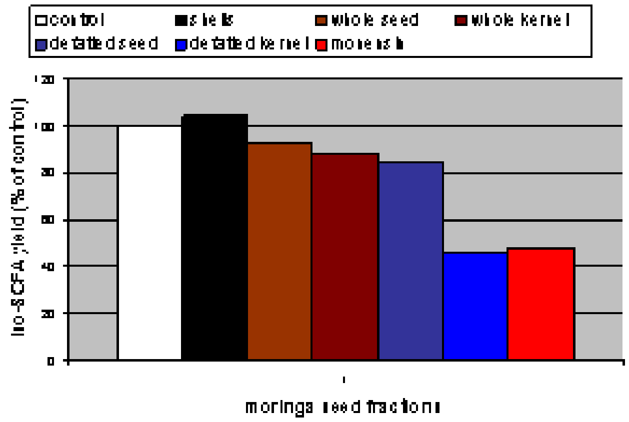

Fig 1. iso-SCFA yield of moringa seed fractions relative to control

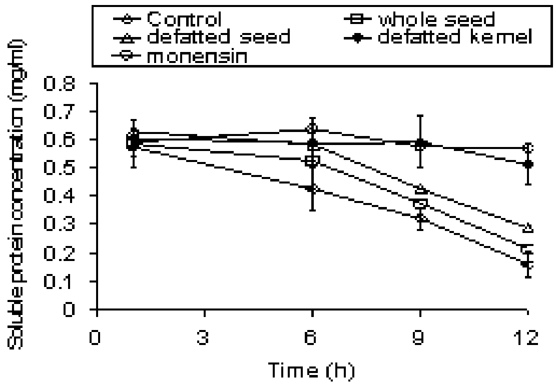

Fig 2. Degradation of soluble substrate proteins with moringa seed fractions

Table 2. Effect of increased dosages of moringa seed fractions on end products of fermentation

Fractions	*def. kernel	def. Seed	w. kernel	w. seed	control	monensin
Dosages (mg)	150	233	250	333	0	(5µM)
Parameters						
Gas/l (ml/g)	64.75[a]	66.22[ab]	63.99[a]	70.61[b]	103.31[d]	81.60[c]
SCFA/l (µmol/g)	36.08[ab]	41.21[b]	31.48[a]	34.72[a]	51.99[d]	45.22[cd]
Iso-SCFA/l (µmol/g)	0.08[a]	0.11[a]	0.11[a]	0.28[b]	0.31[c]	0.26[b]
NH4 (mM)	8.31[ab]	8.13[a]	8.72[b]	9.61[c]	11.95[d]	8.69[ab]
Degradation rate of proteins (µg/ml/h)	6.61[a]	2.51[a]	3.51[a]	4.21[a]	32.31[b]	4.82[a]

Data based on 1 incubation with 2 subreplicates each
values in rows bearing different superscripts differ ($p<0.05$)
*def. kernel-defatted kernel; def. Seed-defatted seed; w. kernel-whole kernel; w. seed-whole seed.

Conclusion and Outlook

- Anti-proteolytic effect of crude moringa seed fractions was proven with batch incubation system.
- Results obtained for moringa seed fractions were comparable to those of monensin, a feedlot antibiotic.
- Results suggest that moringa seed fractions if included in *in vivo* diets could improve N utilisation.

References

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