Digestibility and metabolizable energy of selected tropical feedstuffs estimated by *in vitro* and prediction equations

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Introduction

- Smallholder feeding rarely consider quality.
- Digestibility (dOM) and metabolizable energy (ME) are decisive in quality determination.
- *In vivo* is best but laborious and expensive.
- Nutrient analysis is routine, fast and cheap, but correlation with *in vivo* are mixed (Huhtanen et al., 2006; Stergiadis et al., 2015).

Objectives

1. Determine nutritive quality of locally used tropical feedstuffs
2. Compare digestibility and metabolizable energy of such feedstuffs using *in vitro* gas production method and some published equations.

Materials and methods

- In Lower Nyando, Kenya.
- 60 households, 20 villages (Feb'14 - May'15).
- 75 grass-, 46 other feedstuffs-samples
- Nutrient analysis; *in vitro*; comparison of dOM, ME values using different methods.
- Statistical analysis: Multiple comparison.

Results

Table 1: Proximate analysis of selected ruminant feedstuffs used in Lower Nyando, Western Kenya (Mean ± SEM).

		DM	CA	NDF	ADF	CP	EE	dOM	GE	ME
Feedstuff	**n**	g/100 g FM			g/100 g DM			g/100g OM	MJ/kg DM	
Pasture herbage	44	33 ± 2.6	10 ± 0.3	63 ± 0.5	32 ± 0.5	11 ± 0.4	1.2 ± 0.2	55 ± 0.5	17 ± 0.1	7 ± 0.1
Sugarcane tops	3	81 ± 3.0	05 ± 0.1	72 ± 0.4	39 ± 0.4	04 ± 0.1	0.6*	43*	17 ± 0.3	6*
Napier grass	5	20 ± 0.5	17 ± 0.6	65 ± 0.3	37 ± 0.2	08 ± 0.2	0.7*	59*	14 ± 0.1	9*
Sweet potato vines	3	26 ± 1.6	10 ± 0.2	41 ± 0.5	28 ± 0.2	10 ± 0.2	1.9*	65*	17 ± 0.1	7*
Mixed browsed leaves	16	38 ± 3.0	07 ± 0.6	37 ± 1.0	26 ± 0.7	14 ± 0.6	2.2*	53*	19 ± 0.2	7*
Banana stalks	6	09 ± 2.4	11 ± 1.0	66 ± 2.0	38 ± 2.3	03 ± 0.3	0.8*	54*	15 ± 0.3	7*
Banana leaves	3	14 ± 1.5	16 ± 0.4	56 ± 0.6	35 ± 1.1	11 ± 1.0	4.5*	42*	17*	4*
B. aegyptiaca leaves	2	48 ± 8.4	07 ± 0.5	59 ± 0.9	40 ± 0.9	08 ± 0.6	0.8*	43*	19*	6*
Rice stover, husks	1	88*	11*	69*	36*	4*	0.6*	48*	17*	6*
M. indica leaves	1	48*	15*	37*	27*	6*	2.4*	44*	16*	5*

FM, fresh matter; DM, dry matter; CA, crude ash; NDF, neutral detergent fiber; ADF, acid detergent fiber; CP, crude protein; EE, ether extract; GE, gross energy.
* Samples were pooled to give one sample each (no SEM).

Table 2: Comparison of digestible organic matter and metabolizable energy from the *in vitro* GP technique and some published prediction equations for pasture herbage in Lower Nyando, Western Kenya.

Parameter	dOM	ME
	In vitro[a]	*In vitro*[a]
	Hughes et al. (2014)[bc]	AFRC (1993)[ac]
	Stergiadis et al. (2015a)[c]	Stergiadis et al. (2015b)[a]
Methods	Aufrere & Michalet-Doreau (1988)[bc]	Corbett (1990)[c]
	Matlebyane et al. (2009)[ab]	Givens et al. (1990)[a]
	Daccord et al. (2016)[bc]	1 Menke & Steingass (1987)[b]
		2 Menke & Steingass (1987)[a]
		Sporndly (1989)[a]

Equations with the different superscript letters in a column are significantly different ($P < 0.05$)

Discussion and conclusion

- Nutrient concentrations are highly variable here and in literature may be due to differences in climate, soil fertility, species composition and stage of maturity (Suttle, 2010).
- CP, dOM and ME for pasture herbage, Napier grass and sweet potato vines were sufficient for ruminants (Leng, 1990) if adequate quantities of the feedstuffs are fed.
- The prediction equations for dOM yielded similar results but significantly different from *in vitro*.
- Differences could be due to quality (Madsen et al., 1997) as a result of presence of anti-nutritional factors (McDonald et al., 2010).
- Equation-derived MEs utilizing digestibility in determination (as opposed to chemical parameters alone) were similar.
- There is need for more characterization of feeds and region-specific equations for prediction dOM or ME.

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