

Energy Value and Crude Protein Fractions of Brewery Byproducts for Ruminants – Ethiopian Perspective

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Introduction

In Ethiopia, more than two-thirds of the population own livestock.

Feed scarcity becomes a substantial issue in terms of quantity and quality.

Brewery byproducts, like brewers grains (BG) and tella-atella (TA, byproduct of locally produced tella drink), could enhance protein and energy values of cereal crop residues and herbage from pastures, and thus contribute to sustainable resource use.

Research question

What is the nutritive value and extent of variation in terms of protein and energy of BG and TA?



Fig.1. Sample collection and drying



Fig. 2. Wet Tella-atella (TA) samples

Materials and Methods

- 21 samples were collected and oven-dried:
 - BG (n=17), from 8 commercial breweries and 1 micro-brewery, and TA (n=3), from 3 tella brewers, from Ethiopia; and
 - 1 BG, from Germany
- Chemical feed analysis (VDLUFA 2012)
- Crude protein fractionation (Licitra et al. 1996)
- In vitro* rumen gas production was applied to estimate energy value (Menke and Steingass 1988)

Results

- Substantial contents of neutral detergent fibre (aNDFom), starch, sugar and ether extract contribute to energy value of BG (Table. 1), with a considerable variability between breweries.
- BG and TA contained high CP concentrations.
- Moderately (B2) and slowly (B3) degradable CP fractions constitute together a mean proportion of more than three-fourth of CP.
- High content of cell wall associated CP fractions indicate low rumen protein degradation of BG and TA.

Highlights

- BG and TA are good sources of protein and energy supplements in ruminant diets.
- Variability between BG in terms of energy and protein values were prominent in Ethiopian breweries related to inconsistent use of raw ingredients and unmalted cereal grains.
- A periodic evaluation of chemical composition and feeding value might be vital for efficient utilization of Ethiopian brewery byproducts.

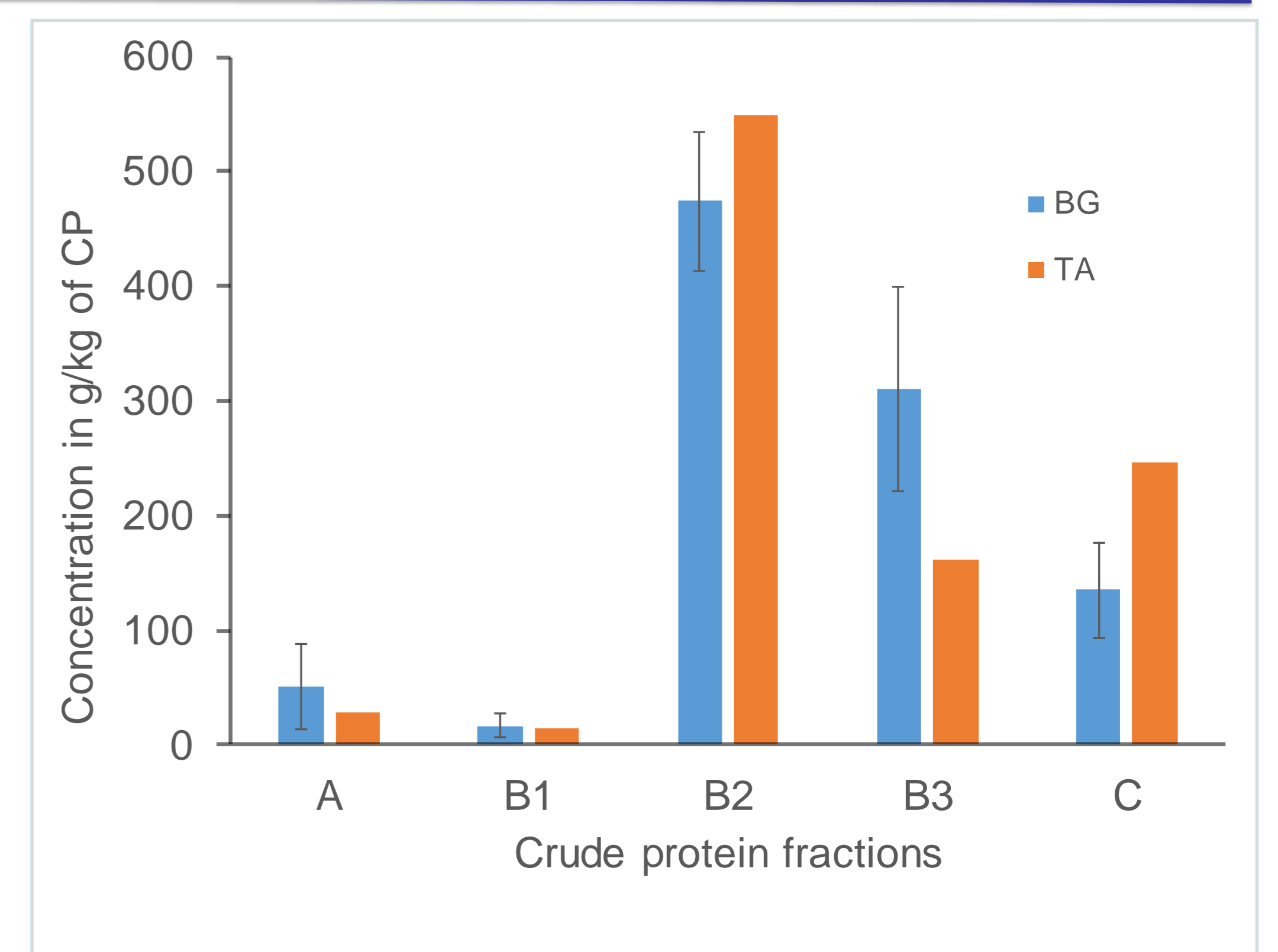


Fig. 3. Concentrations of crude protein fractions (g/kg of CP) of brewers grains (BG) and tella-atella (TA)

- TA compared to BG exhibited a comparable or higher energy value indicating the potential to be used as a supplement in ruminant feed.
- Particularly high starch concentrations (220–280 g/kg DM) in TA samples were most likely related to the brewing process and type of grains used.
- All chemical nutrients including energy, and CP values considerably varied among BG, and with TA.

Table 1. Chemical composition and energy values of brewers grains and traditional brewing byproducts (tella-atella)

	(g/kg)		(g/kg DM)							(MJ/kg DM)	
	DM	Ash	CP	EE	aNDFom	ADFom	ADL	Starch	Sugar	ME	NEL
Brewers grains (n=17)											
Mean	264	41	238	103	646	255	65.0	87.6	17.3	9.8	5.6
SD	35.1	4.6	30.5	14.0	78.0	28.3	20.3	64.1	24.4	1.2	0.8
Min	199	31	187	70.5	443	195	38.5	43.1	0.0	8.2	4.6
Max	313	48	299	120	738	299	115	255	84.4	12.8	7.8
BG18*	220	40	264	103	718	285	61.7	60.5	2.4	10.3	6.0
Traditional brewing byproducts (tella-atella) (n=3)											
Mean	148	35	192	94.4	422	220	80.0	250	4.2	11.8	7.1

DM, dry matter; CP, crude protein; EE, ether extract; aNDFom, neutral detergent fiber analysed with heat stable amylase and expressed exclusive residual ash; ADFom, acid detergent fiber expressed exclusive residual ash; ADL, acid detergent lignin; ME, metabolizable energy; NEL, Net energy for lactation; and n, number of samples.

*Sample obtained from a German brewery.

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