Potential of *Croton megalocarpus* nut as an alternative protein supplement for ruminant feeding in the tropics

Njoroge, E K; Wambui, C C; Wasike C.B.
Livestock Efficiency Enhancement Group (LEEG), Department of Animal Science, Maseno University,
P.O. Box: Private Bag, 40105, Maseno, Kenya
Corresponding author: wambuicc@gmail.com

Name: Elias Kabochi Njoroge
Institution: Maseno University

Introduction

- Livestock production is a source of livelihood, wealth and nutrition thus an important economic activity by communities in the rangelands (Nabarro & Wannous 2014).
- However, increased frequency and length of the dry seasons decreases quantity of dry matter and quality of herbage in terms of carbohydrates and nitrogen concentration in forages and feeds meant for livestock (Huho et al. 2012).
- This results to poor body conditions of animals and increased mortality which greatly affects productivity (Ojwang et al. 2010).
- Inadequate feeding is thus a major setback to the growth of livestock industry in the arid and semiarid lands (ASAL) and calls for identification and evaluation of alternative low cost non-human competitive feed resources which could be used for feeding livestock.
- Various alternative, non-conventional feed resources for use in feeding livestock to enhance availability of feed and minimize competition from humans have been proposed. Croton (*Croton megalocarpus*) is a one such tree whose nuts have been reported to contain high content of crude protein and hence could be exploited for feeding livestock (Ndegwa et al. 2011).
- However, to utilize a resource as livestock feed, nutritional as well as feeding value need to be demonstrated which is lacking for Croton nut.
- This study was aimed at evaluating the nutritional composition and *in sacco* DM degradability of the various processed forms of croton nut in order to provide insights on potential utilization as a protein supplement in ruminant diets.

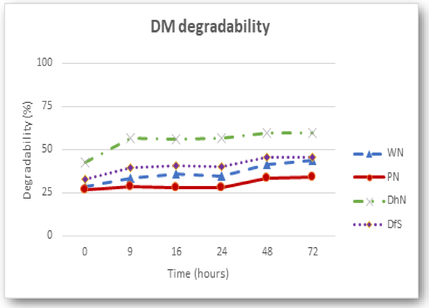
Methodology

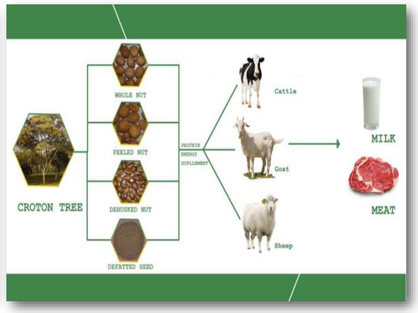
- Samples of Croton nut were collected from Laikipia County found on the Northwest zone of Mount Kenya.
- The nuts were processed to give the four forms used in this analysis namely: Whole nuts (WN) – where no processing was done, Peeled nuts (PN) - where outer seed coat was removed, De-husked nut (DhN) - where husks were removed Defatted seeds (DfS) - seeds whose oil had been extracted which was obtained from a commercial plant that extracts bio-diesel from croton in Laikipia County.
- Ground samples of the various forms of croton were subjected to proximate analysis to determine DM, Ash, CF, EE and CP and expressed on dry matter basis according to AOAC (1990).
- *In sacco* degradation analysis was carried out following the procedure of (Ørskov 2000). Nylon bags were incubated for 0, 9, 16, 24, 48 and 72 hours in the rumen of the three fistulated steers.
- The exponential equation of Ørskov & Mcdonald, (1979) was used to fit the data. Where: ***P*** is the disappearance of dry matter DM (%) incubated in the rumen at time ***t***, ***a*** the rapidly soluble fraction, ***b*** is the insoluble but fermentable fraction, **c** is the rate of constant degradation per hour and ***e*** is 2.7182 (the base for natural logarithm)

Results

Form of croton nut	Chemical composition (DM%)						
	DM	Ash	CF	EE	CP	OM	NFE
Whole Nut (WN)	89.2	5.9	52.2	18.5	8.9	94.7	14.3
Peeled Nut (PN)	96.2	2.2	57.8	17.4	8.0	97.8	14.2
Dehusked Nut (DhN)	91.7	2.3	33.6	36.2	15.7	97.7	11.9
Defatted Seed (DfS)	91.9	3.8	47.6	11.3	19.8	96.5	17.4

Form of croton nut	Dry matter degradability parameters (%)							
	24 h	48h	*a*	*b*	*a+b*	c	*IV*	*ED*
Whole Nut (WN)	38.7	43.7	30.8	12.5	43.4	0.04	44.6	31.75
Peeled Nut (PN)	32.7	34.5	27.2	12.9	40.2	0.03	39.5	28.07
Dehusked Nut (DhN)	60.7	60.5	52.1	8.6	60.7	0.16	88.3	53.05
Defatted Seed (DfS)	48.3	50.3	36.1	12.2	48.4	0.08	58.2	37.1





Discussion

- The DM content in all forms was above 86% which is the recommended level for storage of feeds as it impends growth of fungi and consequently reduces aflatoxin contamination.
- The CP level in all forms was above the recommended (8%) required for maintenance in grazing ruminant animals (NRC 2001)
- Processing by removal of the husk (hard woody pericarp) and fat reduced the fibre fractions and enhanced the CP profiles of croton nut
- High rapidly degradable fraction in both DhN and DfS could be attributed to higher nutrient composition in these forms.
- High levels of CP and NFE in DhN and DfS increases the population of rumen microbes and hence ability to act on fibre in the feed (Olivares-Palma et al. 2013)
- High fibre content reduces degradability of the feed as observed in PN which had high fibre content and low DM degradability

Conclusion

- Processing had a profound effect on the degradability of croton with the later forms (DhN and DfS) being more degradable compared to the fore forms (WN and PN).
- High Effective degradability recorded in DhN and DfS implies that nutrients are more readily available for utilisation by ruminants.
- Processing of the nut by removal of the peel, husks, and oil improves nutrient availability and degradation of croton nut.
- Dehusked and defatted croton seeds have potential for inclusion in ruminant rations in ASAL to avert the effects of protein deficiency occasioned by drought hence improving productivity

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