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Research Paper

Characterization of Locally Selected Ruminant Leaves as Potential Raw Material for Animal Feeds

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ABSTRACT
One of the main challenges of ruminant feeds in the tropics is the scarcity of quality plants all the year round. The present study was embark on to appraise the proximate and chemical composition of five ruminant plants (Carica papaya, Helianthus annuus, Manihot esculenta, Pennisetum purpureum and Mangifera indica) Results showed that crude protein content was highest (25.80%) in Helianthus annuus and lowest (2.60%) in Mangifera indica. Crude fibre compositions ranged between 2.90-9.28% in plants respectively. A range of 1.18% - 4.80% and 1.16%-3.79% values were recorded for ash and crude fat respectively for the ruminant plants.The results showed that ash, crude protein, crude fibre and crude fat contents were significantly different ($p< 0.05$) among all the species. The values reported for mineral content showed considerable concentration of micro and macro elements. Helianthus annuus appeared to be the best ruminant plants with the high crude protein and richest in mineral elements amongst the ruminant plants

KEYWORDS: *proximate; chemical composition; ruminant plants; mineral content*

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I. INTRODUCTION

Ruminant refers to grazing animals that have ability to digest cellulose or plant fiber. These groups of animals are adapted to the use of forage due to the presence of microbes in their rumens. During Grazing, ruminant use to take plant available within their environment especially if soft with average high percentage of moisture and this serve as alternative feedstuffs for livestock livestock (Ammar *et al.*, 2004; Aregawi *et al.*, 2008; Rinehart, 2008; Fayemi *et al.*, 2011).

Adequate quality of green plant can supply if not all the energy and protein requirements of ruminant animals. Ruminant animals such as sheep, goat, cattle etc remove adequate supply of proteins, fibers mineral such as phosphorous, calcium, copper, zinc and reasonable amount of vitamins with water.

Grasses, shrubs as non woody broadleaf plants are good source of protein and other digestible nutrient though the percentages of the nutrients depend on the season and age of the plant while available nutrient can be improves by supplementation.

Phosphorous and chromium are bulk essential for reproduction while phosphorous affect production and health while chromium was found to improve insulin sensitive hisfuct feed supplement with phosphorous must be properly suited as excess will not remove growth and physiological characteristics (NRC 2000, Erickson *et al.*, 1999, Spears 2012).

Copper in feed increase minify and decrease the effect of bacteria (Weiss & Spears 2006) while zinc is good for lecturing cows and young ruminants animals that are in the grazing stage (NRC 2001).

Adequate mineral is generally essential for improving production and normal functioning of all metabolic process and inadequate supplies may result in freak economic losses.

In Nigeria, there is constant shortage of enough grazing and there can be serves the need of the farmers while the popular elephant grass is in adequate supply. This situation has given rise to crisis associated with the grazing of animals around farmland. A situation that have lead to several killing of innocent farmers and destruction of properties.

In order to ensure adequate feed supply, reduction of communal clashes and improve on quantity of productions there is the need to source for alternative and readily available leafy plants that can be used as ruminants feed. In south-west Nigeria there are abundant green leaves such as mango leaf, cashew leaf, pawpaw, oil palm that are consumed b y animals and that are found to be underutilizes as feed. Their application

of moderate moisture conduct can be on better alternative to address the problem associated with grazing of animals. If found useful it will enable farmers to keep their animals at close ranges. This work in to characterize selected local ruminants plant and determine their suitability for numerous feed formulations.

Sample collection and preparation

Five ruminant plants (*Carica papaya, Helianthus annuus, Manihot esculenta, Pennisetum purpureum and Mangifera indica)* were used for this study. Leaf samples from each of the plants were harvested from mature plants within Ado-Ekiti, Ekiti State, Nigeria.

0.5 kg of the leaves was collected from each plant species and maintained separately by species. The leaves were air dried at 35 ± 2^0C, pulverized, sieved (1 mm) and kept in an air tight container prior to analysis

Chemical Analysis

The pulverized samples were analyzed for crude protein, crude fibre, fat content and ash content following an established standard method as described by AOAC (1990). Crude protein was determined by the micro-kjeldahl procedure, ash by incineration at 500ºC for 2 hours in a closed furnace.

Drop of toluene acid (binder) was then added to 0.5g of the powdered sample and crushing continued until the mixture was returned to fine powder again, compressed under a hydraulic press machine at 10-tone pressure and converted from fine powder to pellet form. The pelletized samples was then analyzed using particle induced x-ray Emission (PIXE) techniques. The PIXE provides a rapid and non-destructive method for the analysis of trace and major element in geological, environmental and biological samples.

II. RESULTS AND DISCUSSION

Table 1.0: Proximate composition of locally selected ruminant leaves

Parameter %	*Carica papaya*	*Helianthus annuus*	*Manihot esculenta*	*Pennisetum purpureum*	*Mangifera indica*
Ash	1.18a	4.80ce	3.00bc	3.52ba	2.80b
Crude fat	1.51a	3.79b	1.60a	1.50a	1.16a
Crude fiber	5.80c	3.40b	2.60a	9.28cd	2.90ab
Crude Protein	7.10b	25.80cd	2.90a	16.85c	2.60a
Carbohydrate	84.41b	62.21a	89.90bc	68.85a	90.54c

abcd= means on the same column with different letters are significantly different (P < 0.05),

Table 2: Macro and micro mineral composition (g/kg) of locally selected ruminant leaves

Element	*Carica papaya*	*Helianthus annuus*	*Manihot esculenta*	*Pennisetum purpureum*	*Mangifera indica*
Mg	0.074a	0.507d	0.205b	0.137ab	0.308c
P	0.173ab	0.297b	0.327c	0.151a	0.418cd
S	0.147ab	0.303c	0.465d	0.138a	0.144ab
Cl	0.208b	0.626d	0.446c	0.282b	0.042a
K	0.489d	0.370a	2.766c	2.650c	0.759ab
Ca	1.000a	2.793bc	1.787b	0.630a	1.474ab
Mn	0.015ab	0.020b	0.011a	0.001a	0.021b
Fe	0.021b	0.010a	0.035ab	0.011a	0.060c
Zn	0.000a	0.001a	0.000a	0.001a	0.000a

abcde= means on the same column with different letters are significantly different (P < 0.05),

The results from Table 1 indicated that ash content range from 1.18-4.80 which is an indication of the mineral level in all ruminant plants analysed and the values in this present work is lower to study which reported ash ranges of 9.79 to 11.85% (Mbomi *et al.,* 2011).

The fiber content which depends on inadequate texture of plant and may be attributed for maturity. was relatively high in elephant grass and pawpaw leaf, (5.80-9.28%) while other plants analyzed range from 2.60 - 3.40%.

Crude fat is the lipid component and the energy derived from it is utilized by the animal for body maintenance and oduction. (Foidl *et al.*, 1998) [24] reported that fat content in the feed is also a source of carotene and pigment, but it is observed in this work that Crude fat was generally is compared favourably and highier than report of Isah *et al.*,(2013) on some browse species in Edo State, Nigeria(0.31- 1.08%).

Carica papaya, Helianthus annuus, and *Pennisetum purpureum* species in this study have their crude protein level higher than the acceptable range while *Manihot esculenta and Mangifera indica* falls below the acceptable range (7-14%) for ruminants (Nastis and Malechel, 1981). The difference in crude protein content among species and between values from samples collected in different studies can be explained by inherent characteristics of each species related to the ability to extract and accumulate nutrients from soil and/or to fix atmospheric nitrogen, which is the case for leguminous plants. In addition, high protein in the forage should be aimed at as it will favourably enhance intake and digestibility.

The plant analyzed were rich in plant carbohydrate

Router and Robinson (1997) suggested Ca requirement for maintenance of growing and lactating sheep to be 1.2-2.6 g/kg. *Helianthus annuus, Manihot esculenta* and *Mangifera indica* meet these requirements except *Carica papaya* and *Pennisetum purpureum*. However, all the assessed ruminant plants had lower Ca than the endorsed requirement (g/kg-1DM diet) for growing cattle (2.6-10.8), pregnant cows, (2.1 - 3.5) and lactating cows (2.9 – 5.3) (Shamat *et al*.,2009).

The ruminant plants had lower levels of P and Mg with concentration of 0.151- 0.418 g/kg and 0.074-0507 g/kg respectively. The observation in the P and Mg contents of these ruminant plants suggests that enhancement with phosphorus rich feed is vastly essential. The discrepancy in the content of detected P could be owing to the accessible soil P and soil pH, ruminant plants stage and quantities of leaf and stem fractions harvested for mineral analyses and sampling season.

The ruminant plants had lower level of K concentration and this may appeared to vary as a function of absolute age of the leaf as well as the environmental conditions.

The concentrations of S and Cl in the study were consistence with the low range of data reported.

Regarding micro minerals, these elements had lower levels of Mn, Fe and Zn than the required concentration for dairy and beef cattle (50 mg/kg DM). Therefore, there is to supplement with micro minerals rich diet.

III. CONCLUSION

The study reveals the examined ruminant plants had competitive nutrient levels. Nonetheless, the nutritional composition of these ruminant plants showed that they can be utilized as sole feed or supplements to balance low quality forages for ruminants due to the high CP level, moderate levels of both macro and micro mineral elements especially *Helianthus annuus* and *Pennisetum purpureum.*

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