NUTRITIVE QUALITY OF BAMBOO LEAVES AS FEED RESOURCE FOR HERBIVOROUS ANIMALS

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ABSTRACT

Mixture of old and young bamboo leaves were harvested from Kogi State University campus, Anyigba and were analyzed for their proximate, fibre fractions, vitamin and mineral compositions. The bamboo leaves analyzed did not show the presence of vitamins B_6, B_{12} and D. However, vitamin C had the highest value (12.72mg/100gDM) while vitamin K had the least value (0.04mg/100gDM) among the vitamins evaluated. The mineral in bamboo leaves evaluated was highest for potassium (380mg/100gDM) while iron (Fe) had the least value (0.8mg/100gDM). The protein content of 14.65%, ether extracts (4.00%), and nitrogen free extracts of 48.11% were found to be adequate for ruminant, pseudo-ruminants and other herbivores. The crude fibre (21.36%), neutral detergent fibre (30.8%) and cellulose (24%) contents of bamboo leaves could be tolerated by ruminants. It was therefore concluded that the nutrients in bamboo leaves were adequate to meet the nutritional needs of ruminants, pseudo-ruminants and other herbivores. The use of bamboo leaves as feed for ruminants especially during the long dry season was recommended.

Key words: Bamboo leaves, Proximate Composition, Vitamins, Minerals, Feed resource.

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INTRODUCTION

The major challenge to ruminant livestock production both in the temperate and tropical regions are assuring adequate quantities of quality feeds throughout the year; seasonal patterns of rainfall that results in a variable supply of pastures both in quantity and quality. Majority of ruminants still live in ecological habitats which are similar to the ones from which they evolved. These animals are predominantly grazers and browsers which live off natural vegetation. Human have domesticated these species and their numbers have increased enormously due to husbandry (Larson, 2014; Darwin, 1868).

Grass land provides feed for the production of 55.3% of world meat production; this comprises 42.6% from cattle, 7% from sheep and 5.7% from others including goats, horses, camels and buffaloes (FAO, 1980). About 44.6% of world meat is produced from pigs and poultry. Pigs contribute 28% while 16% comes from poultry (FAO, 1980). Pig, rabbits and poultry also consume some forage as components at their feed due to the presence of caeca.

In Nigeria the savanna covers over 80% of the land mass (Agishi, 1985). About 55%-59% of the savanna area is available for grazing livestock (Adegbola, 1982). In the raining season the savanna could support animal growth because the protein content of grasses is between 6-10% and the mineral contents are adequate up to October,. Grazing animals have to be supplemented in the northern Guinea Savanna. Pasture and range land improvement is often regarded as a panacea to increased livestock production. Since low productivity of traditionally managed herds is in part due to the constraints imposed by the seasonal fluctuation in herbage quantity and quality in the savannas. Little wonder therefore that improvement of pastures has high priority amongst the targets set in livestock development projects and programmes. At a given level of management and diseases control, livestock production is a function of level of nutrition. Forages being the major nutritional impute for ruminants are the dominant component within any Nigeria livestock programme. Since most of the world's meat production depend on grasses, as feed then attention should be paid to their cultivation and management, one of such grasses that hold promise in the dry season feeding of ruminants is bamboo (*Oxytenanthera abyssinica*).

Bamboo is fodder specie that is currently underutilized in animal feeding. Bamboo can be found growing in forest margins with fodder having a high potential as feed resources for ruminants (Asaolu et al 2010). Bamboo is a group of perennial evergreen in the true grass (poaceae) family. Sub family bamboosoideae Bamboos are some of the fastest growing plants in the world (chan and Gregory 2002). They are capable of growing at 60cm or more per day due to a unique rhizome dependent system. Bamboos are of notable economic and cultural significance in East Africa and South East Asia. This study therefore aimed at evaluating the nutritional qualities of Bamboo leaves.

MATERIALS AND METHODS

Mixture of old and young bamboo leaves were harvested from Kogi State university campus, Anyigba and were analyzed for their proximate composition, pH, as well as their vitamins and mineral contents'. The proximate analysis was carried out according to standard procedure of AOAC, (1995). The dry matter content of the samples was determined by oven drying at 95^{o}C to constant weights. Crude protein was determined by Kjeldahl procedure, ether extract, Crude fibre, Ash content determinations were according to AOAC, (1995). The Nitrogen Free Extract (NFE) was calculated by subtracting the sum of percentages of crude fibre, ether extract, crude protein and ash from 100. For pH determination, ten grams (10g) of the sample was mixed with 100ml carbon dioxide free water for 15 minutes, shaken at 5 minutes interval and filtered with Whatman No14 filter paper. The pH of the filtrate was measured by inserting the pH meter (Model HM, 305, Tokyo Japan) into the filtrate and thereafter the reading was taken.

The mineral composition was determined with an atomic absorption spectro-photometer. The vitamin analysis was carried out using the method of AOAC (1995). And the fiber fractions were analyzed using the method of Van Soest *et al.* (1991). The fibre fractions determined were neutral detergent fibre (NDF) Acid detergent fibre (ADF), acid detergent lignin (ADL) cellulose and hemicellulose. These were determined using the method of Van Soest *et al.* (1991) percent hemicellulose content was obtained by finding the difference between neutral detergent and acid detergent fibre values.

All the analyses were carried out in triplicates and the mean values for each parameter was calculated.

RESULTS

Proximate Composition and fibre fractions of bamboo leaves: The proximate composition and fibre fractions of Bamboo leaves is as presented in table 1 The crude protein, crude fibre, NFE, ether extract and ash content obtained was 14.65, 21.36, 48.11, 4.00 and 11.88% respectively. The acid detergent fibre, neutral detergent fibre, cellulose, hemicelluloses and lignin values was 28.00, 30.80, 24.00, 2.80 and 4.00 % respectively.

Table 1: Proximate composition and fibre fractions of bamboo leaves (%DM)

Nutrients	Compositions (%)
Crude protein	14.65
Crude fibre	21.36
Nitrogen free extracts	48.11
Ether extract	4.00
Ash	11.88
Carbohydrate	69.47
Acid detergent fibre	28.00
Neutral detergent fibre	30.80
Cellulose	24.00
Hemicellulose	2.80
Lignin	4.00

Vitamin profile of bamboo Leaves: The vitamin profile of Bamboo leaves is as presented in Table 2. Vitamins B_6, B_{12} and D were not present in the bamboo leaves analyzed. Value for vitamin A, B_1, B_2, C, E and K value were 1.42, 0.14, 0.23, 12.72, 0.16 and 0.04mg/100g respectively.

Table 2: Vitamin composition of bamboo leaves (mg/100g)

Vitamins	Composition
A (Retinol, β-carotene)	1.42
B_1 (Thiamine)	0.14
B_2 (Riboflavin)	0.23
B_6 (Pyridoxine)	Nil
B_{12} (Cobalamine)	Nil
C (Ascorbic acid)	12.72
D (Calciferol)	Nil
E (Tocopherols)	0.16
K (Phylloquinone)	0.04

Table 3: Mineral profile of bamboo leaves (mg/100g)

Mineral	Composition
Calcium	19.0
Phosphorus	45.0
Potassium	380.0
Iron	0.8
Magnesium	25
Sodium	320

Mineral Profile of bamboo Leaves: The mineral profile of Bamboo leaves is presented in table 3. The calcium, phosphorus, potassium, iron, magnesium and sodium value were 19.0, 45.0, 380.0, 0.8, 25 and 320mg/100g respectively.

DISCUSSION

The crude protein content of 14.65% was at par with 14.50% reported by Asaolu *et al*. (2010) but lower than 18.39% reported by Iniaghe *et al.* (2009) and fell within the range of 12-18% recommended for growing ruminants and pseudo-ruminants in the tropics (NRC, 1996) and also above the critical level of 8% crude protein reported (NRC, 1996) to be necessary to provide minimum ammonia levels required by rumen micro organisms to support optimum activities.

The crude fibre content obtained (21.36%) was within tolerable ranges for ruminant animals, but lower than 23.30% reported by Asaolu *et al*. (2010) and 25.88 percent reported by Ferrelly (1984). The ether extract content of 4.00% was lower than 5-6% reported to cause a depression in crude fibre digestion (Maithison, 1997). The nitrogen free extracts content of 48.11% was higher than 29.55% reported by Iniaghe *et al* (2009) and 42.8% reported by Asaolu *et al.* (2010). The ash content of 11.88% was at per with 11.50% reported by Asaolu *et al.* (2010) the high ash content may suggest high mineral content (Anita *et al.,* 2006).

The neutral and acid detergent fibre values (30.80 and 28% respectively) were lower than 68.8% and 42.3% reported by Asaolu *et al*. (2010). These disparities could be due to variety as well as stage of maturity of the bamboo leaves analyzed. The low ether extract content of bamboo leaves as well as their low moisture content would make bamboo leaves decay resistances as this will limit the growth of decay microorganism and prolong their storage life, thus the efficacy or bio-activity of extracts from the bamboo leaves as a potential organic preservative in preventing bio-deterioration of on-farm wooden structures and other natural resources where toxic conventional inorganic preservatives may be undesirable, need investigating.

Vitamins $B_{6,}$ B_{12} and D were not present in the bamboo leaves analyzed. Bamboo leaves can be said to be rich in vitamin C (12.72 mg/100g) and E (0.16mg/100g), and poor in vitamin K (0.04mg/100g). The calcium content (19mg/100g) obtained in this study was higher than 17mg/100g reported by Aduku (2004). The 45mg/100g phosphorus, 380mg/100g potassium and 0.8mg/100g iron were lower than 47mg/100g, 400 mg/100g and 0.9 mg/100g respectively reported by Aduku (2004). Asaolu *et al.* (2010) however reported 0.34, 1.12 and 0.70% for calcium, sodium and potassium respectively. These discrepancies could be attributed to differences in varieties, season/stage of maturity of the bamboo leaves analyzed. These values were however lower than 0.50, 0.6, 0.50 and 0.25%, levels of calcium, potassium, sodium and phosphorus respectively recommended for goats (NRC 1981). The iron (Fe) values of 0.8mg/100gram were adequate to sustain ruminants and pseudo-ruminants (McDonald *et al*., 2002).

CONCLUSION AND RECOMMENDATION

- Bamboo leaves contains adequate nutrients to sustain ruminants and other herbivorous animals. However there is need for supplementation with protein, energy and minerals during the long dry season.
- Since bamboos are evergreen they are recommended for dry season feeding of ruminants, pseudo-ruminants and other herbivorous animals.

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