
NUTRITIONAL VALUES OF SELECTED TROPICAL LEAVES AND THEIR COMPOSITE MIXES

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ABSTRACT

The nutritional values of selected tropical leaves and their composite leaf mix (CLM) were evaluated. Harvested fresh leaves and garlic were air-dried and milled to produce leaf meals. The CLM was a mixture of Moringa leaf, Bitter leaf, Scent leaf, Neem leaf, and Garlic in a 3:4:1:1:1 ratio, respectively. The proximate and mineral compositions of these leaf meals and their CLM were obtained using an appropriate methodology and statistical analysis conducted with the aid of Microsoft Excel. Results showed that moisture content was higher in Neem leaf meal (15.88%) while Scent leaf meal had the lowest (11.60%) compared to others, ranging from 11.60-15.88%. However, the crude protein ranged from 17.29-34.12% with Moringa leaf meal having the highest (34.12%) and lowest in Neem leaf meal (17.29%). The crude fibre ranged from 4.05% in garlic to 19.21% in Gliricidia leaf meal. Nitrogen free extract ranged from 21.09-52.64% with garlic having the highest (52.64%) and lowest in Moringa leaf meal (21.09%). The leaf meals also contained appreciable amount of micro and macro minerals, with Potassium, Calcium, and Zinc values at 32787.81mg/kg, 8300mg/kg, and 54.5mg/kg respectively. It can be concluded that these tropical leaves contained appreciable nutrients that could contribute towards meeting animal nutritional requirements for growth, and they can also be used as additives.

Keywords: Tropical leaves, Nutritive values, Minerals and Composite mix

INTRODUCTION

In Nigeria, the need to develop a readily available alternative feeding materials to support livestock growth has become imperative. Leaf protein sources obtained in tropical leaf as feed sources to all classes of livestock offer tremendous potentials. The nutritional value of tropical leaves were not known to people, farmers and livestock industries, so many people consume and give their animals these leaves because of their taste and as a source of food, and do not concern themselves with their nutritional composition. This knowledge in the recent past, has led to a shift of researchers into exploring the optimal use of underutilized tree leaves with emphasis on their nutritive value, health-benefit constituents, and dietary fibre (Hall *et al.*, 2009).

Some of these tropical tree species abound in Nigeria and most West African countries where they are used partly as condiments or spices in human diets or as a supplementary feed to livestock (rabbits, poultry, swine and cattle). These leaves are harvested at all stages of growth and fed either as processed, semi-processed or fresh to man while they are usually offered fresh to livestock. The nutritional interest in some of these leaves includes their rich contents of essential amino acids, vitamins, minerals, carbohydrate, and as abundant source of proteins. This is because of their ability to synthesize amino acids from a wide range of available primary materials such as water, carbon dioxide, and atmospheric nitrogen (as in legumes). Their use by non-ruminants is however limited because of their high-fibre contents (Agbede, 2003).

Nutritional composition of the tropical plant plays a significant role in nutritional, medicinal and therapeutic values. The chemical composition of the fibre fractions affects the digestibility of the feed, which directly or indirectly affect the feed's utilization by animals. (Al-kharusi *et al.*, 2009), Research findings from this work will help to sensitize livestock farmers on the nutrient composition of these tropical leaves in animal diets. Such tropical leaves include; Moringa (*Moringa oleifera*), Neem (*Azadirachta indica*), Scent leaf (*Ocimum gratissimum*), soursop (*Annona muricata*), Bitter leaf (*Vernonia amygdalina*), and Garlic (*Allium sativum*). This study therefore aim to determine the nutritional benefits and composition of the selected tropical leaves like Moringa, Neem, Soursop, bitter leaf, Scent leaf, and Garlic and their composite mix.

MATERIALS AND METHODS

Location of the Experiment

The laboratory analysis was carried out at the Prof Julius Okojie Central Research Laboratory, Federal University of Technology Akure, Ondo State, Nigeria.

Sourcing and Processing of the Selected Tropical Leaves

Fresh leaves of the selected tropical leaves (Neem leaf, Scent leaf, Bitter leaf, and Moringa) were harvested within the Federal University of Technology, Akure, Ondo State. The leaves were plucked from their branches, air-dried and milled to produce their respective leaf meal.

Production of Composite Leaf Meal

Composite Leaf Meal was a mixture of Moringa leaf, Bitter leaf, Scent leaf, Neem leaf, and Garlic in a 3:4:1:1:1 ratio, respectively.

Proximate Analysis and Determination of Minerals

The proximate composition of the selected leaves and their composite was determined for moisture, ash, Crude Protein (CP), Crude Fibre (CF), fat and carbohydrate contents according to AOAC (2000) method. The minerals composition were determined by Atomic Absorption Spectrometer according to Perkin Elmer (1994) and AOAC (2009).

Statistical Analysis

Data generated were subjected to analysis using Microsoft Excel to derive mean value, standard deviation and coefficient of variance.

RESULTS AND DISCUSSION

Proximate Composition of Leaf Meals and their Composite Mix

Table 4.1 shows the proximate composition of leaf meals and their composite mix. The moisture content varied among the leaves and their composite mix. The NLM has the highest moisture content (15.88%) and SLM had the lowest (11.6%) with coefficient of variance (CoV) of 10.51. The mean value for the moisture content of leaf meals (13.35) was slightly higher than that of composite leaf meal (12.956). The ash content was observed to be highest in SLM (15.53%) and lowest in GCM (5.26%) with a CoV of 37.48%. However, the MLM was adjudged to contain a higher crude protein (34.12%) and ether extract (13.16%) compared to others which ranged from 17.29 to 23.18% with CoV of 27.07% and 43.29%, respectively. The NLM had the highest crude fiber (12.97%) and the least crude fiber was recorded in GCM (4.05%). Meanwhile, the mean value for the crude fibre (8.67%) was almost the same with that of CLM (8.98%). On the other hand, GCM contains a higher Nitrogen free extract (52.64%) compared to other leaf meals and their composite mixes ranging from 21.09-40.45%, with a CoV of 26.7. From the proximate composition of the leaf meal and their composite mix, it was observed that the leaf meals and their composite contain various nutrient such as protein, moisture, crude fiber, ether extract, carbohydrate and ash.. All the leaf meals in this present study contain appreciable amount of protein, and ranged from 17.29-34.12%. The high protein content in Moringa leaf meal (34.12%) indicates its potential to be used as a protein source in animal feed, particularly for monogastric animals, when protein supply is limited. The chemical compound (amino acids) present may meet animals' protein and energy requirements and boost the immune system against diseases (Kyriazakis and Houdijic 2006). The moisture content reported ranged from 11.6-15.88%, with Neem leaf meal showing appreciable high moisture content (15.88%) which reveals that it could provide greater activity of water soluble enzymes and co-enzymes needed for metabolic activities in monogastrics. The high ash contents also suggest the presence of minerals which can serve as mineral sources to livestock animals, especially sandpaper leaf meal.

The high ether extract shows the presence of oil. The ether extract of the leaf meals ranged from 4.07 to 13.16% being higher in soursop leaf meal. Usunbon *et al.* (2015) reported a 21.21% ether extract, which was higher than the 13.16% obtained from this study. High crude fiber could aid digestion, absorption of water from the body and prevent constipation, since it also contains cellulose and lignin (Idris *et al.*, 2011). The higher fiber (12.97%) content of Neem leaf meal in this study suggest that it may be useful in the control of body weight and reduction of serum cholesterol level in animals especially in monogastric animals. High carbohydrate provides readily accessible fuel for physical performance and energy to power the cells and tissues of the body of monogastric animals on consumption. All the leaf meals can also serve the same purpose, especially garlic meal, being the highest (52.64%) in carbohydrate content. The composite mix were adjudged to have a higher

moisture, crude protein and carbohydrate contents, thus revealing the availability of major nutrients that could be harnessed in livestock nutrition.

Table 4.1 Proximate Composition (%) of some Leaf Meal and their Composite Mix

Parameters	MLM	BLM	SLM	GCM	NLM	CLM	Mean	STDEV	COV
Moisture	12.93	13.24	11.6	13.5	15.88	12.95	13.35	1.40	10.51
Ash	11.39	12.44	15.53	5.26	7.32	8.33	10.04	3.76	37.48
Crude protein	34.12	23.18	18.94	20.48	17.29	20.38	22.39	6.06	27.07
Ether extract	13.16	4.42	7.35	4.07	8.7	8.99	7.78	3.36	43.19
Crude fiber	7.31	10.38	8.38	4.05	12.97	8.9	8.66	2.99	34.52
Nitrogen-free extract	21.09	36.34	38.2	52.64	37.84	40.45	37.76	10.08	26.71

MLM- Moringa leaf meal; BLM- Bitter-leaf meal; SLM- Scent-leaf meal; GCM- Garlic meal NLM- Neem leaf meal; CLM = Moringa leaf meal + Bitter-leaf meal + Scent-leaf meal + Garlic meal + Neem leaf meal; COV- coefficient of variance

Mineral Composition of Leaf Meals and their Composite Mix

The mineral composition of the selected leaves and their composite leaf meal shown in Table 4.3 revealed that the potassium content varied among the leaves and their composite mix. The BLM had the highest Potassium (38054.36 mg/kg) while GCM had the lowest (18991.25 mg/kg) with CoV of 24.92. The Potassium in CLM (32787.81mg/kg) was considerably high. The Sodium content was higher in BLM (3433.48 mg/kg) and lowest in NLM (1797.6 mg/kg) with a CoV of 21.83. However, the SLM contain the higher Calcium (16650 mg/kg) and iron (517.5 mg/kg) compared to others which ranged from 0100-12950 and 241-401.5 mg/kg, respectively with 92.84 and 30.51 CoV, respectively. The SLM had the highest Zinc (74 mg/kg) and the lowest recorded in NLM (4.05 mg/kg). However the mean value for Zinc (54.3mg/kg) was almost the same with CLM (54.5 mg/kg). The CLM contains higher Copper (17 mg/kg) with SLM (16 mg/kg) almost the same. MLM contain higher Manganese (56.5 mg/kg), The BLM and CLM had the same concentration of Manganese (52.5 mg/kg). However, Manganese was not observed in SLM. The GCM had higher Phosphorous (2030.4 mg/kg) compared to others which ranged from 705.15-1759.55 mg/kg.

The high mineral content in the leaf meals and their composite mix is an evidence of the high ash content recorded in this study. Bitter leaf meal (3433.48 mg/kg) and garlic meal (2030.4 mg/kg) showed considerably a high sodium and potassium content which are involved in the regulation of plasma volume, acid –base balance, nerve and muscle contraction (Akpanyung, 2005). Scent leaf meal contains Zinc and Iron which are necessary components of haemoglobin and myoglobin for oxygen transport and cellular processes of growth and division (Kozat, 2007). Copper is vital for the immune system. Moringa leaf meal contain high manganese (56.5 mg/kg) compared to the higher value (61.75 mg/kg) reported by Sandip *et al.* (2016). The various minerals are considerably high in the composite mix and thus suggest the possibility of using the CLM as feedstuff.

Table 4.3 Mineral Composition of some Tropical Leaf Meal and their Composite Mix (mg/kg)

Parameters	MLM	BLM	SLM	GCM	NLM	CLM	Mean	Stdev	CoV
K	23132.18	38054.36	26750	18991.23	25499.33	32787.81	27535.82	6861.34	24.91
Na	2155.17	3433.48	2650	2807.02	1797.6	2595.94	2573.20	561.68	21.82
Ca	12950	4525	16650	689	100	8300	7202.33	6686.31	92.83
Fe	401.5	261.5	517.5	241	295	320.5	339.5	103.59	30.51
Zn	46.5	52.5	74	58	40.5	54.5	54.33	11.45	21.08
Cu	7.5	5	16	8	4	17	9.58	5.57	58.13
Mn	56.5	52.5		11.5	17	52.5	41.25	21.08	51.11
P	1556.15	1215.5	1759.55	2030.4	705.15	1364.15	1438.48	460.50	32.01

K: Potassium; Na: Sodium; Ca: Calcium; Fe: Iron; Zn: Zinc; Cu: Copper; Mn: Manganese; P: Phosphorus

CONCLUSION

Tropical leaves contained nutrients high in protein, fat, carbohydrate, moisture, crude fibre. Moringa leaf meal contained a higher crude protein while garlic meal is high in nitrogen free extract. The leaf meals contained high contents of useful minerals such as; K, Na, P, Ca, Zn, Cu and Mn. Phosphorus, sodium and potassium are high in garlic meal, avocado meal and bitter leaf meal, respectively. The composite mix (Moringa leaf, Bitter-leaf, Scent-leaf, Garlic and Neem leaf meals) contained high moisture, protein and carbohydrate contents. This suggests that the leaves if consumed in sufficient amount, would contribute greatly towards meeting animal nutritional requirement for growth and adequate protection against diseases and can be used as a feed additive with multiple purposes.

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