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PROXIMATE STUDY, MINERAL AND ANTI-NUTRIENT COMPOSITION OF *CYMBOPOGON CITRANUS* LEAVES HARVESTED FROM ILORIN, NIGERIA: POTENTIAL BENEFITS IN ANIMAL NUTRITION AND HEALTH

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The leaves of *Cymbopogon citranus* (Lemon grass) were harvested from Kwara State metropolis in Nigeria during the late rainy season in June 2015 for the proximate, mineral and phytochemical analysis .This study was conducted to know the nutritive value of lemongrass harvested and its potential in Animal Production and health. The standard procedures of AOAC (2003) were used to analyze the proximate composition and mineral analysis. The results of proximate analysis revealed the presence of high crude protein (8.51% ±0.06). The leaves also contained appreciable amounts of crude fibre (4.49% ±0.02), ash (8.02% ± 0.04), crude fat (2.99% ±0.02). The total ash content showed it contained minerals, Ca (0.62% ±0.00), K (1.59% ±0.01), Na (280.00±0.01), Fe (286.5±0.01), Mn (61.56±0.15), Zn (21.91±0.06) and P (30.15±0.00) parts per million (ppm). Magnesium (0.44% ±0.00) and copper (5.73±0.00) were the least. The results of phytochemical analysis and antinutrients showed presence of tannins (0.006% ±0.00), saponins (0.67% ±0.00), alkaloid (0.53%±0.00), steroids (0.001±0.00), phenols (0.07±0.00) and flavonoids (0.001±0.00). The presence of these essential nutrients and minerals showed that Lemon grass is a potential source of feed supplement to enhance maximum productivity and improve growth performance of livestock.

Keywords: proximate, phytochemical, antinutrients, performance

Increased pressure in terms of food safety, raising concerns about animal health and environmental protection, increasing antibiotic resistance and strong global tendencies to reduce antibiotic growth promoters are some circumstances which tend to showcase phytogenic additives as a plausible alternative for profitable animal production (Steyregg/Hannoer, 2014; Karascova, 2015). Interest has grown in the utilization of what have come to be known as multipurpose plants. Few of such plants including *Moringa oleifera, Hibiscus sabdariffa and Cymbopogon citranus* which are the most widely cultivated in Africa, Central and South America, Srinlanka, India, Mexico, Indonesia and Philipines (FAO 1999). *Cymbopogon citranus*, Stapf (Lemon grass) is a widely used herb in tropical countries, especially in Southeast Asia, (Shah *et al*., 2011). Almost all parts of this plant have been used for various treatments of ascites, rheumatism and venomous bites and as cardiac and circulatory stimulants (Caceres *et al* 1992), The essential oil of this plant is used in aromatherapy. Lemongrass contains mainly citral (Schaneberg and Khan, 2002) and 1 to 2% essential oil on a dry basis (Carlson *et al*., 2001).The compounds identified in *Cymbopogon citranus* are mainly terpenes, alcohols, ketones, aldehyde and esters (Hasim *et al*., 2015). Some of the reported phytoconstituents are essential oils that contain Citral α, Citral β, Nerol Geraniol, Citronellal, Terpinolene, Geranyl acetate, Myrecene and Terpinol Methylheptenone. The plant also contains reported phytoconstituents such as flavonoids and phenolic compounds, which consist of luteolin, isoorientin 2'-O-rhamnoside, quercetin, kaempferol and apiginin. According to Nambiar and Matela (2012), the leaves of lemongrass are known

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to have phenolcompounds which can act as antioxidants. Studies also indicate that *Cymbopogon citranus* possesses various pharmacological activities such as anti-amoebic, antibacterial, antidiarrheal, antifilarial, antifungal and anti-inflammatory properties. Various other effects like antimalarial, antimutagenicity, antimycobacterial, hypoglycemic and neurobehavioral have also been studied (Shah *et al*., 2011). These results are very encouraging and indicate that this herb should be studied more extensively to confirm these results and reveal other potential therapeutic effects.

MATERIALS AND METHODS

The study was carried out at the Agricultural labouratory of the College of Agriculture, Kwara State University and Animal Science laboratory, University of Ibadan Oyo State.

Plant Collection and Preparation of *Cymbopogon citranus*

Fresh leaves of *Cymbopogon citranus* were collected early in the morning Ilorin, Kwara State. The leaves were removed from the roots, washed thoroughly with distilled water to remove impurities. The fresh leaves were spread under a shade for 10 days to obtain a dried sample which was later blended into powder by using speed blender for about 5 minutes. Finely pulverized *Cymbopogon citranus* leaves weighing 300g was packed inside an air tight container and stored till laboratory analysis commenced.

Proximate Analysis

The Association of Official Analytical chemists (AOAC, 1990) method was used for the determination of crude protein, crude fibre, moisture, ether extract and ash content of the samples. All determination was done in triplicates. Powdered leaf samples of *Cymbopogon citranus* (1 gm each) was used in triplicate to determine the moisture content by weighing in crucible and drying in oven at 105^0C, until a constant weight was obtained. Ash content determination was carried out at 550^0C for about 3 hours. Kheldah method (AOAC, 1990). The crude fibre content of samples was determined by the digestion method and lipid was carried out using Soxhlet extraction method (AOAC, 1990). The total soluble carbohydrate was determined by the difference of the sum of all the proximate composition from 100%. Crude protein and Crude fat were also determined according to the methods of (AOAC, 1990).

Mineral Analysis

The mineral content of *Cybopogon citranus* determined were potassium (K), sodium (Na), phosphorus (P), magnesium (Mg), calcium (Ca), iron (Fe), zinc (Zn), copper (Cu), manganese (Mn). These minerals were determined through the use of the Atomic Absorption Spectrophotometer as described by the methods of the Association of Official Analytical Chemists (AOAC, 1990) while Phosphorus was determined colorimetrically as described by Association of Analytical Chemists (AOAC, 1990). All determination was done in triplicates. Values of calcium, magnesium and potassium were reported in percentages while iron, sodium, manganese, copper, zinc, phosphorus were reported in parts per million (ppm).

Phytochemical analysis and anti-nutrients

The qualitative and quantitative phytochemical analyses of anti-nutrients were determined using the methods of Sofowora (1993). All determinations were done in triplicates.

Statistical analysis

All data obtained were analysed using descriptive statistics and statistical values were calculated using mean and standard error.

RESULTS AND DISCUSSION

Proximate and mineral composition of *Cymbopogon citranus* leaves

The result of the proximate analysis of *Cymbopogon citranus* leaves is shown in Table 1. Result showed that *Cymbopogon citranus* leaves contained low amount of crude protein (8.51%± 0.06). The average ash content (8.02%) of *Cymbopogon citranus* observed in this study is very low. This is an indication that *Cymbopogon citranus* contains a low amount of inorganic nutrients. The low **moisture content** (7.15%) of *Cymbopogon citranus* is desirable. This will prevent microbial attacks and enhance a very high storage capacity.

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The Nitrogen Free extract recorded is 70.28%. The carbohydrate content is high (76.84%). This shows that *Cymbopogon citranus* is a very good source of energy. The protein content is (8.51%) moderate, but higher compared with result obtained by Asaolu (2009) (4.56%). Protein is an important part of animal structure and metabolism as they constitute a major part of the body structure as component of muscle connective tissue and cell membrane. The crude fibre content (4.49%) of *Cymbopogon citranus* on the other hand is lower than that reported by Asaolu (2009) (9.28%). This makes *Cymbopogon citranus* to be a good source of crude fibre than other conventional leaves. The crude fat observed in this study (2.99%) is very low compared with the value reported by Asaolu (2009) (5.10%). The differences observed could be as a result of lack of similar geographical location in the developmental stages of the grass from seedling to maturity.

Table-1 Proximate composition of *Cymbopogon citranus*

Nutrients analyzed (% DW)	Mean composition (% ±SE)
Crude Protein (CP)	8.51 ± 0.06
Ash	8.02 ±0.04
Ether extract	2.99 ±0.02
Crude fibre	4.49 ±0.15
Dry matter	92.95 ± 0.00
Carbohydrates	76.84 ±0.01
Nitrogen Free Extract	70.28 ±0.01

The results of mineral analysis are shown in Table 2. These results showed that *Cymbopogon citranus* has an appreciable quantity of minerals needed by animals for proper development. Iron had the highest value (268.5±0.81), followed by manganese (61.56±0.15), phosphorus (30.15±0.00), zinc (25.91±0.06), copper (5.73±0.00), potassium (1.59%±0.01), calcium (0.62%±0.00), magnesium (0.44%±0.00) and sodium (0.28±0.01) parts per million (ppm) in descending order. Some of these values are comparable to those reported by Asaolu (2009). For effective muscle activity, skeletal development and normal growth, an appreciable amount of minerals (e.g calcium) is required in the diet. Phosphorus is required in the regulation of acid-base balance in heat stressed animals, Magnesium is needed in the intestinal absorption, while Manganese play a role in energy production and immune system support (Oluyemi, 2006; Muhammad *et al*., 2011). These observed nutrient content shows that *Cymbopogon citranus* could be healthy and suitable for poultry. The absence of some heavy metals makes it desirable for consumption.

Table 2: Mineral profile of *Cymbopogon citranus* harvested in Ilorin, Kwara State, Nigeria

Elements	Mean composition (± SE)
Potassium (%)	1.59 ±0.01
Sodium (ppm)	0.28 ± 0.01
Calcium (%)	0.62 ±0.00
Magnesium (%)	0.44±0.00
Phosphorus (ppm)	30.15±0.00
Iron (ppm)	268.5±0.81
Zinc (ppm)	21.91±0.06
Copper (ppm)	5.73±0.00
Manganese (ppm)	61.56± 0.15

The results of qualitative phytochemical analysis of *Cymbopogon citranus* (Table 3) shows that it contains alkaloids, saponins, tannins, steroids, phenols, flavonoids, glycosides and phlobatannin. While anthraquinones, terpenes, cardenolides were not detected. Each of these phytochemicals is known for various protective and therapeutic effects. Table 4 shows the quantitative phytochemical analysis of *Cymbopogon citranus*. The lowest values were observed in flavonoids and steroids (0.001%) while the highest value was recorded in saponin having 0.67%. The observed levels of these phytochemicals are

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low. Alkaloid has been documented to inhibit phosphodiesters which normally destroy cAMP which is involved in breakdown of fats and carbohydrates thereby altering storage of carbohydrates & fats. Unlike tannins, many alkaloids are not unpalatable to livestock and in some instances seem to be preferred. Saponin when present in high quantity can cause reduced feed intake and lowered serum cholesterol below the physiological normal range. Khalil and Eladawy (1994) established the negative influence of saponin on the red blood cells. The presence of tannin in the diet of poultry form complex bond with metal ions and complex compounds such as protein, thereby negatively influencing feed conversion and depressing growth (Dei *et al*., 2007). One of the positive consequences of tannins in grazing forages is that it can reduce the potential for bloat in livestock (Taiz and Zeiger, 2002). Tannin level (0.006%) and other phytochemicals recorded in this study are very low. This shows that lemon grass can be used in feeding livestock without affecting the feed efficiency because of its low tannin content. The phenol level of *Cymbopogon citranus* observed in this study is 0.07%. According to Adesanya and Sofowora, (1983), phenol has been known to be an erythrocyte membrane modifier.

Table 3: Qualitative phytochemical composition of *Cymbopogon citranus* from Ilorin, Kwara State

Parameters	Qualitative analysis (%)
Alkaloid	++
Saponin	+++
Tannins	+
Steroids	+
Phenols	++
Flavonoids	+
Anthraquinone	-
Glycosides	+
Terpenes	-
Cardenolides	-
Phlobatannin	+

Tables 4: Quatitative phytochemical composition of *Cymbopogon citranus* from Ilorin, Kwara State

Parameters	Quatitative analysis (%) (± SE)
Alkaloid	0.530±0.00
Saponin	0.670 ±0.00
Tannins	0.006 ±0.00
Steroids	0.001 ±0.00
Phenols	0.070 ±0.00
Flavonoids	0.001 ±0.00

CONCLUSION

It can be concluded that *Panicum mombasa* - *Centrosema poscourum* gave numerically higher total dry matter yield among mixtures. This is not unexpected given the relatively higher yield of both grass and legume in the mixture and higher competitive ability of *Centrosema poscourum* as attested by its higher relative crowding coefficient value among legumes in mixtures.

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