



NUTRITIONAL EVALUATION OF *Typha domingensis* L. AS AN ALTERNATIVE LIVESTOCK FODDER

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ABSTRACT

Typha domingensis is an invasive aquatic weed species dominating floodplains/wetlands, grazing and farmlands in the savannah zones of Nigeria, particularly in states like Jigawa, Kano and Yobe. This affects agricultural activities which threatens socio-economic developments in the region. Plants serve as a major source of food for both human as well as other animals. In this study, the nutritional value of this aquatic weed was assessed for use as an alternative fodder in relation to some common livestock fodder. Seedlings of *Typha domingensis* were collected from a harvested plot of *Typha* invaded area. Samples were air dried and then ground for determination of macro-elements and proximate composition using standard procedures. Results on the proximate composition revealed 80.01% moisture content, 11.68% ash content, 2.90% crude protein, 8.30% crude lipid and 6.90% crude fiber. The percentage of macronutrients determined which include Ca, Mg, K, Na, P, S and Cl were 0.93, 0.36, 0.12, 0.02, 0.11, 0.01 and 0.04 respectively. From the values obtained, the proximate composition of *T. domingensis* was relatively low, although the moisture and ash content were comparable to some fodder species. However, other important criterion such as crude protein; crude fiber and nearly all the macro-nutrients have low concentration. Hence *T. domingensis* is considered to have low nutritional value and cannot be effectively used as an alternative of fodder/forage in the affected areas.

Keywords; *Typha domingensis*, Proximate composition, Macro-element, Fodder

INTRODUCTION

Invasive aquatic weed species have become a major ecological challenge that results to persistent degradation of aquatic ecosystems which threaten both socio-economic developments. Weed species also regarded as environmental pests, have the capacity to compete with native species which often result to change in ecological processes by altering natural habitats in some cases entire ecosystem (Gherardi, 2007).

Nigeria, the most populous African country with one of the fastest growing population in the world, largely depends on agriculture relying on natural water resources for their survival (Nchuchuwe and Adejuwon, 2012). However, the flood plains/wetlands of the savannah zones of Nigeria that provides readily available water as well as residual moisture for various crop productions and other livelihood issues have been invaded by a notorious aquatic weed called *Typha domingensis*, locally known as "kachalla"/ "gerontsuntsu" in Hausa. It has overtaken grazing and farmlands particularly in states like

Jigawa, Kano and Yobe (Ringim *et al.*, 2015; Mukhtar and Abdullahi, 2020). This has made researches worldwide to focus on more productive ways to get rid of unwanted vegetation (Elsken, 2020). New perspective on *Typha* management reported by Krus *et al.* (2014); Ringim *et al.* (2015) and Mukhtar and Abdullahi (2020), emphasizes economic exploitation of *Typha* species since control measure employed by stakeholders were not successful.

Plants serve as a major source of feed for both human as well as other animals. The composition or concentration of nutrients in plants varies according to the type of plants, climatic conditions, soil type and several other factors. Evaluating aquatic plants such as *Typha species* (that generate enormous biomass) as a livestock feed could serve as a promising approach for sustainable management of the weed in the affected areas. The potential use of aquatic plants such as hydrilla and water hyacinth for animal nutrition has been reported by Tham and Udén, (2013) and Elsken (2020)

The major nutritional components of plant include water, protein, carbohydrates, minerals and vitamins. Nutrients in plants are part of growth requirements for all living organisms. Macro elements such as calcium, magnesium, sodium, sulphur, chlorine, potassium and phosphorus are essential for animals to remain healthy. Hence, the current study is aimed at evaluating the nutritional value of *Typha domingensis* for exploitation as an alternative fodder for livestock.

MATERIALS AND METHODS

Sample Collection and preparation

Typha domingensis seedlings were collected from harvested plot of *Typha* invaded areas located at latitude 11°47.868'N and longitude 8°27.764'E, Dawakin kudu Local government Area, Kano State. Seedlings were collected on weekly basis for a period of 5 weeks. The samples collected were transported to Department of Plant Biology, Bayero University, Kano for nutritional evaluation. Samples were air dried and then ground prior to analysis.

Determination of Proximate composition

Proximate composition which includes percentage moisture content, ash, protein, fat, ash and fiber were determined according to the methods of AOAC (2003).

Determination of Macro-elements

Double acid digestion method was employed for the digestion of grounded *Typha* samples for the determination of macro-nutrients which include Ca, Mg, Na, K P and S while Single acid digestion using H₂SO₄ was used for determination of Chlorine as adopted from Yusuf *et al.* (2003) and Udo *et al.* (2009). Calcium, magnesium and chlorine were determined using atomic absorption spectrophotometer (AAS. Agilent 240FS AA); Sodium and potassium were read on flame photometer (Jenway, PEP7); while Phosphorus and sulphur readings were determined using Spectrophotometer (Spectrumbab 752s UV/Visible spectrophotometer).

Statistical Analysis

Data obtained were subjected to descriptive statistics where the mean values and percentages were determined for each parameter.

RESULTS AND DISCUSSION

The proximate composition of *Typha domingensis* seedling as presented in Figure 1 showed high moisture content with an average of 80.01%. High moisture content which is the amount of water present in a sample, would

lead to higher digestibility when the plant is consumed. Findings of Grosshans (2014) has also reported moisture content of fresh *Typha* species as quite high (at over 70%). However, the percentage of ash contents determined within the study period ranged from 10-15 % with an average of 11.68%. This is relatively lower to the fodder species such as *Amaranthus viridis* L., *Chenopodium album* L. *Medicago denticulate* etc (Bahadur *et al.*, 2011). Gravalos (2010) also reported *Typha angustifolia* with 3.43% ash content, which was also lower than the range obtained from the current study. These differences could be as a result of these fodders being different species as well as other environmental influences. The mean value of ash content of 11.68% is comparable to that of *Cynodon dactylon* (Bahama grass), *Cenchrus ciliaris* (Anjan grass) and *Cynodon plectostachyus* (African star grass) as presented in Table 1.

The composition of feeds in a ration depends on the type of animals being fed and their stage of production. Cattle and goats, being ruminants, are better equipped to digest crude fiber than pigs or chickens. Young animals need more protein than adult animals, while animals in milk need higher protein content in the ration than non-lactating animals. The crude protein content is the most important criterion for judging foodstuffs and it varies according to the type of fodder and in growing plants, with the stage of maturity. Young growing grasses have Crude protein (CP) percentage content ranging from 8 - 16 %, while grass legume mixtures can reach up to 25 %. According to Upretiet *et al.* (2006), crude protein can be classified as high (>20%), moderate (10.01-19.99%) and low (<10%). From the values obtained, young shoots of *Typha domingensis* which ranged from 1.4-7.01% fall below the range of 8-16% in young growing grasses and therefore, can be classified as having a low percentage of crude protein contents. Crude fibre is a measure of the indigestible portion of plant material, although some of it can be partially digested by micro-organism in the rumen. The higher the fiber, the lower the energy content of a feed. The results of crude fiber contents in the current study ranges from 5.52-9.11% which were also relatively lower to what was obtained by Bahadur *et al.* (2011) whom reported crude protein range of 14.82-25.62%. ANG (2012) also reported percentage Crude fibre of 28% and 26% in *Cynodon dactylon* (Bahama grass) and *Pennisetum purpureum* (elephant grass) respectively as presented in Table 1.

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This could be as a result of the growth stage of the plant being at seedling stage. The percentage of crude lipid contents in *T. domingensis* from the current study ranged from 6.72-9.44. The mean percentage of 8.31% was higher than those reported for *C. dactylon* (1.4%), *Pennisetum purpureum* (0.9%), *Cenchrus ciliaris* (0.8%) and cowpea stalk widely used as animal fodder which was reported to have 3% crude fibre (ANG, 2012). Crude lipid content in a feedstuff is an energy source but crude lipid content greater than 6% is not recommended for ruminant animals as it may affect the population of microorganisms in the rumen.

Nutrients are part of growth requirements for all living organisms. Aquatic plants (free floating or submerged) obtained nutrients directly from the water. These macro elements (Ca, Mg, Na, S, Cl, K and P) are essential for animals to remain healthy (ANG, 2012). Deficiencies in any of the macro-nutrients could adversely affect plant growth. The percentage concentration of macro-elements which include calcium, magnesium, potassium, sodium phosphorous, sulphur and chlorine are presented in Figure 2. The macro element with the highest concentration is calcium followed by magnesium, whereas sulphur had the least concentration, followed by chlorine. The percentages of these elements were also compared with some

commonly used fodders (*C. dactylon*, *Vigna sinensis* (hay), and *Arachis hypogea* (groundnut straw)), as presented in Table 2. Only calcium and magnesium are comparable to these fodders but all other macro-elements determined have lower percentages than in these fodders. The percentage concentrations of macro-elements in young shoots of *Typha domingensis* as presented in Figure 2 indicated that Calcium had the highest percentage of 0.93%, while magnesium is just 0.36%. These values of calcium were relatively higher than that of *C. dactylon* (Bahama grass) but lower than *Vigna sinensis* (Cowpea hay), *Arachis hypogea* (Groundnut straw) reported by ANG (2012). The concentration of magnesium is also relatively higher than in some fodder species such as *C. dactylon* (Bahama grass) and *Arachis hypogea* (Groundnut straw) but less than *Vigna sinensis* (Cowpea hay). All other macro-nutrients determined (Na, P, K, S and Cl) were found to have lower concentration when compared to some other feedstuff used as fodder species. However, Grosshans (2014) reported higher concentration of Nitrogen (0.71-0.98 %), sulphur (0.14-0.31%), potassium (0.7-0.98%) and Sodium (0.52%) in *Typha* species. In general, the concentrations of these macro-nutrients could also be influenced by other environmental conditions such as poor nutrients source in soils.

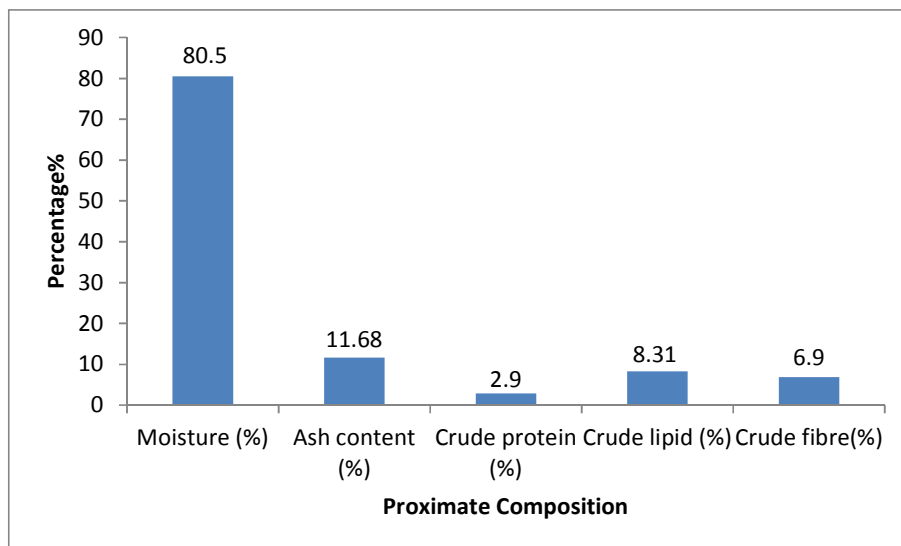


Fig 1: Percentage of Proximate Composition of *Typha domingensis* Seedlings

Table 1: Percentage (%) of Proximate Composition of *Typha domingensis* Seedlings in relation to Common Fodder species

Grass species	Ash content	Crude protein	Crude lipid	Crude fibre
(b) <i>Typha domingensis</i> (Cattail)	11.68	2.9	8.3	6.9
(a) <i>Cynodon dactylon</i> (Bahama grass)	11.6	8.4	1.4	20.2
<i>Cenchrus ciliaris</i> (Anjan grass)	10.2	4.9	0.8	32.9
<i>Cynodon plectostachyus</i> (African star grass)	10.8	5.4	0.9	37.6
<i>Leersia hexandra</i> (rice grass)	14.9	6.3	1.5	31.4

Source: (b) Field work (2018) and (a) ANG, (2012)

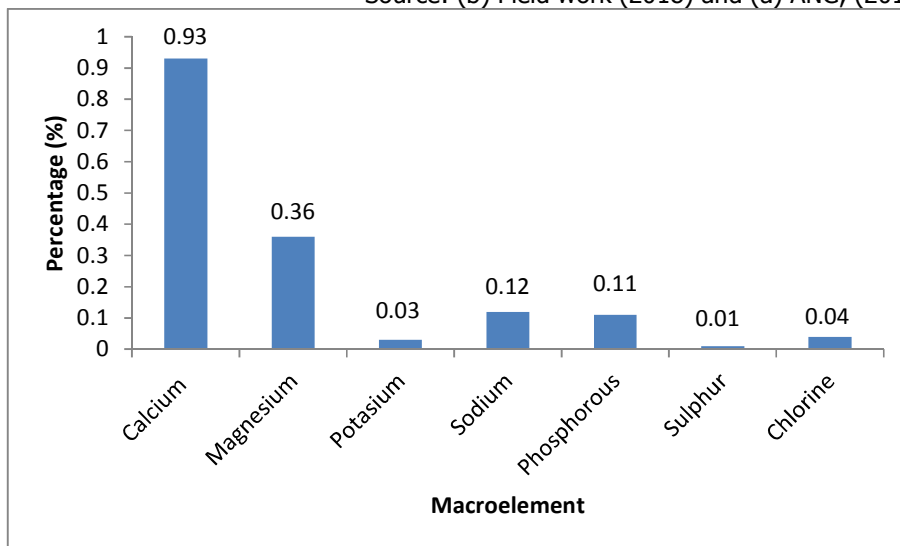


Figure 2: Percentage Concentration of Macro-elements of *Typha domingensis* seedlings

Table 2: Percentages (%) of Macro-elements in *Typha domingensis* in Relation to Some Common Fodders

Plant species	Calcium	Magnesium	Potassium	Sodium	Phosphorus	Sulphur	Chlorine
(b) <i>Typha domingensis</i> (Cattail)	0.93	0.36	0.12	0.02	0.11	0.01	0.04
(a) <i>Cynodon dactylon</i> (Bahama grass)	0.47	0.17	1.53	0.08	0.17	0.21	-
<i>Vigna sinensis</i> (Cowpea hay)	2.33	0.45	2.26	0.27	0.88	0.35	0.17
<i>Arachis hypogea</i> (Groundnut straw)	1.24	0.21	0.51	0.69	0.65	-	-

Source: (b) Field work, (2018); (a) ANG, (2012)

CONCLUSION

The current findings have revealed that *Typha domingensis* is considered to have low nutritional value and as such, it is not palatable

for animals feeding but further studies to improve its value as a fodder is pertinent because of its considerable abundance in the areas.

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