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Proximate, mineral and anti-nutrient composition of *typhalatifolia*

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Abstract

Fresh samples of Typha latifolia were analysed for Nutritional and antinutritional determination using standard Analytical method. The values of the proximate composition were found to be: moisture content (87.3 ± 2.52), Ash content (4.31 ± 0.5), Crude fibre (4.30 ± 0.25), Crude lipid (3.40 ± 0.21), Nitrogen content (2.20 ± 0.21), crude protein (13.8 ± 0.01), Carbohydrate (74.4 ± 1.20) and caloric value (382.6). The analysis of the minerals indicated that potassium is the most abundant element in Typha latifolia while Cupper is the least having the value of (0.04mg/100g). In the analysis o antinutritional composition, the following value we obtained for oxalate (0.04 ± 0.02), phytate (1.61 ± 0.09) Nitrate (0.6 ± 0.10) and Hydrocyanic (0.03 ± 0.01). The values obtained were all below the critical toxic levels. The Anti-nutrient to Nutrient molar ratios has clearly confirmed the availability of some vital minerals. The results obtained from the analysis indicated that, Typha latifolia can serves as a good source of minerals, energy and carbohydrate. Therefore, Typha latifolia could contribute in supplementing human Nutrient requirement.

Keywords: Typhalatifolia, proximate, mineral, Anti-nutrient, edible plants

Introduction

The global population facing food and nutritional insecurity increase from 777 million in 2015 to 815 million in 2016 (FAOUN, 2017). This statistic underlines the fact that food scarcity is one of the most pressing problems facing humanity globally (Ecol. Nutr., 2006). In Nigeria, the handwriting of imminent food shortage had been on the wall for many years long before the concerned global organizations sounded warning. The combined effects of armed conflict, covid-19 pandemic and climate change

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have been ascertained as factors that would inevitably drag down the agricultural output (ILFC, 2021). The virtual war situation across the nation is at the root of rising food scarcity: Boko Haram insurgency, banditry, kidnapping/abduction and raping of women in farms have altogether dealt a massive blow to food production. Reports say that, no fewer than 78,000 farmers in Borno, Katsina, Zamfara,

Taraba, plateau and other states in the northern Nigeria have abandoned their farmlands as a result of the attacks by Boko Haram terrorists, bandits and herdsmen (Kafeero, 2021).

According to Igbedioh (1990), improper food intake could be the possible cause of malnutrition among population group. To arrest the situation, much attention has been given on the exploitation and utilization of unusual food plant especially edible flowers such as water lilly, cattails (Typhalatifolia) e.t.c which can be a potential source of nutrient (Madhumita and Naik, 2010).

Typhalatifolia commonly known as *Shalla* (Hausa language), is a generus of about 30 species of tall reedy marsh plant (family *Tyhaceae*), found mainly in temperate and cold region of the northern and southern hemisphere. The plant inhabits fresh to slightly brackish water and is considered aquatic or semi-aquatic. It is a large marshy plant that measures approximately 90-270 cm in height. *Typhalatifolia*plants are important to wildlife and many species. They are cultivated ornamentally as pond plants and dried flower arrangement. The long flat leaves of the common cattails are used in making mats and chair seats. The starchy rhizomes are eaten in some places. (Melissa, 2018). In Nigeria, especially in the northern region, due to the food scarcity caused by the insurgencies of Boko Haram and banditry, many people are today consuming some edibles plants as a source of food. With that regard, this study aimed to investigate and determine the nutritional and antinutritional content of *Typhalatifolia* to ascertain it is contribution to the local populace.

Materials and methods

Muffle furnace was used in Ash content determination. Depending on the parameters, (IUPAC 200), (AOAC 2006) and (Krishna and Ranjhan 1980) methods were used.

Sample collection and treatment:

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Cattails (*Typhalatifolia*) samples were obtained from the local pond of Yar-Dantsi, Mortgage Gusau Local Government Area of Zamfara State, Nigeria. The sample was taken to Botany unit Usman Danfodio University Sokoto state, Nigeria for identification. The samples were washed, dried in an oven at 70^{o}C and then cooled in a desiccator and finely ground for moisture content analysis.

Proximate analysis

Moisture content: moisture content was determined by using oven-drying method.

$$\text{I.e moisture content} = \frac{\text{(Mass of container - wet sample) - (Mass of container + dried sample)}}{\text{(Mass of container + dried sample) - Mass of container}}$$

$$= \frac{M2-M3}{M3-M1} \times 100\%$$

Ash content: Ash Content was determined by incineration of sample in muffle furnace at 500-600^{o}C according to IUPAC (IUPAC 2006).

Crude fibre: crude fibre was determined by treating the sample with dilute solution of H_2SO_4 and NaOH. (IUPAC 2006).

Crude lipid: crude lipid was extracted by using petroleum ether following the IUPAC method. (IUPAC 2006).

Nitrogen content: nitrogen content determination was done by treating the sample with Mercury catalyst, dilute H_2SO_4, Boric acid and NaOH solution according to IUPAC method. (IUPAC 2006).

Crude protein: crude protein was determined by multiplying the percentage nitrogen by a constant factor of 6.25. i.e %N X 6.25 (IUPAC 2006).

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Available carbohydrate: carbohydrate was determined by using difference method using the relation: 100- (%Ash + %Crude fibre + %Crude lipid + % Crude protein). (IUPAC 2006).

Energy content: the caloric value was calculated using the equation [(Energy Kcal/100g) = (%CHO X 4) + (%CP X 4)+(%CL X 9)] (Hassan et al. 2008).

Mineral analysis

The minerals were determined after the sample wet digestion with a mixture of $HNO_3/HCl_4O/H_2SO_4$ in a ratio of 9:2:1 v/v respectively. Sodium, Ca, Mg, Fe, Cu, Mn, and Zn were determined by using atomic adsorption spectrophotometer while phosphorus was determined by colorimetric method if analysis. (AOAC 2006).

Antinutritional analysis

The method of Krishna and Ranjhan (1980) was adopted for the determination of oxalate and nitrate. Phytate was determined by the method of Ola and Oboh (2000). While AOAC (2006) method was used in the determination of Hydrocyanic acid.

RESULTS

Table 1,2,3, and 4 show the results obtained from the analyses

Table 1: proximate composition of Thelatifolia .

Parameter	concentration (%DW)
Moisture content	87.3 ± 2.52
Ash content	4.31 ± 0.15
Crude fibre	4.30 ± 0.25
Crude lipid	3.40 ± 0.21

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Nitrogen content	2.20 ± 0.21
Crude protein	13.8 ± 0.01
Available carbohydrate	74.2 ± 1.20
Caloric value (Kcal/100g)	382.6 .

The data are mean ± standard deviation of triplicate result

Table 2: mineral composition of *Typhalatifolia* .

Element	concentration (mg/100g DW) .
K	309 ± 1.00
Na	107 ± 1.00
Ca	54.0 ± 0.70
P	45.0 ± 0.50
Mg	63.3 ± 0.31
Fe	0.91 ± 0.01
Cu	0.04 ± 0.01
Zn	0.22 ± 0.01
Mn	0.80 + 0.03

All values are mean ± standard deviation of triplicate result

Table 3: Anti-nutritional composition of t*yphalatifolia*. .

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Anti-nutritional factor	Concentration (my/100g DW).
Oxalate	0.04 ± 0.02
Phytate	1.61 ± 0.09
Nitrate	0.6 ± 0.10
HCN	0.03 +0.01

Data are mean + standard deviation of triplicate result.

Table 4: Antinutrient to nutrient molar ratio of *Typhalatifolia.*

Antinutrient to nutrient ratio	Value
[Oxalate]/[Ca]	$2.3X10^{-4}$
[Oxalate]/[Ca]+[Mg]	$5.3X10^{-5}$
[Ca][phytate]/[Zn]	0.1
[Phytate]/[Ca]	$1.8X10^{-3}$
[Phytate]/[Fe]	0.1
[Phytate]/[Zn]	0.07

Discussion

Proximate composition

The result of the proximate analysis has shown that, the *Typhalatifolia* has high moisture content of (87.3 ± 2.52, Table 1) which is within the range of (73.6 - 93.2 ± 2.6) reported for some edible flowers (Mudhamita and Naik 2010). However, a higher proportion of

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moisture in food lowers the storage duration but high moisture content in food influences the rate of food digestion and peristaltic movement on consumption (Ajibade et al., 2008). The Ash content of *Typhalatifolia* (4.30 ± 0.15) is low in comparison to (6.50 ± 1.00) and (6.67 ± 0.29) of *Parkia Biglobosa* and Balanitesaeggyptiaca respectively reported by (Hassan et al., 2011) and in (Hassan et al., 2014).

The crude fibre of *Typhalatifolia* (4.30 ± 0.26) is slightly higher than that of *Parkiabiglobosa* (3.17 ± 0.29) (Hassan et al.., 2011) and (3.80 ± 0.29) reported for *Balanitesaeggyptiaca*(Hassan et al., 2014). Fibre in food lowers the cholesterol level in the blood and reduces the risk of various cancers. (Bello et al.., 2008). The crude lipid of *Typhalatifolia* (3.40 ± 0.21) is lower than (4.50 ± 0.50) reported for *Balanitesaeggyptiaca*(Hassan et al., 2014), but higher than the value obtained in *Gardenia aqulla* (1.90 ± 0.28) (Muhammad, A et al.., 2011). The value of Nitrogen content obtained in *Typhalatifolia* (2.20 ± 0.21) is like that of *TelfairiaOccidentalis* (2.3 ± 1.3) (Dongonyaro, et al.., 2020) but lower than 8.28 reported for *cachrous stride* (Mensah 2008). The crude protein content of *Typhalatifolia* (13.8 ± 0.01) is higher than (10.8 ± 0.49) of *Balanitesaeggyptiaca* as reported by (Muhammad, et al., 2011) and (4.26 ± 0.18) value of *Gardenia aqulla* (Muhammad, et al.., 2011). This value obtained indicated that, *Typhalatifolia* contains appreciable amount of protein.

The carbohydrate content of *Typhalatifolia* was found to be (74.2 ± 1.20) which is slightly lower than (78.9 ± 1.18) of *Parkiabiglobosa* reported by (Hassan et al.., 2011) and (76.0 ± 43.8) of *TelfairiaOccidentalis* in (Dongonyaro, et al., 2020). The high value of carbohydrate in *Typhalatifolia*shows that, *Typhalatifolia* can be a good source of energy. The caloric value obtained in *Typhalatifolia* (382.6) is slightly lower than (384.70) value of *Gardenia aqulla* and (386.70) of*Parkiabiglobosa*reported by (Muhammad, et al., 2011) and (Hassan et al., 2011) respectively. Although, the value is higher than (380.5) of *Balanitesaeggyptiaca* reported by (Hassan et al., 2011).

Mineral composition

The content of potassium obtained (309mg/100g) is high compared to (81.8mg/100g) of *Balanitesaeggyptiaca* (Hassan et al., 2014)). The values of sodium, calcium and magnesium were 107, 54.0 and 63.3mg/100g respectively and were lower than the respective values of 139.2, 615.1 and 196.2mg/100g reported for *Parkiabiglobosa*(Hassan et al., 2011). But in the same report, the phosphorus content of *Typhalatifolia* (45mg/100g) is higher than (2.53mg/100g) of *Parkiabiglobosa*. The Manganese content in *Typhalatifolia*

(0.8mg/100g) is higher than (0.02mg/100g) of *TelfairiaOccidentalis* as reported by (Dongonyaro, I et al.., 2020). Although, the respective values of Iron, Copper and Zinc were found to be 0.91, 0.04 and 0.22mg/100g were lower than 10.13, 2.80 and 4.17mg/100g reported for *Gardenia aqulla* (Muhammad, et al., 2011). (Mielcarz et al., 2005) reported that, optical intakes of elements

such as Sodium, Potassium, Magnesium, Calcium, Manganese, Copper and Zinc can reduce the individual's risk factor for health problem such as cardiovascular disease.

Anti-nutritional composition

The values obtained in the evaluation of antinutrient content of *Typhalatifolia* were all below the critical toxic level as reported by (Birgitta and Gullick 2000). The values obtained were oxalate (0.04mg/100g), phytate (1.61mg/100g), Nitrate (0.6mg/100g and HCN (0.03mg/100g). To predict the bioavailability of elements such as Calcium, Iron and Zinc antinutrient ratios were calculated. The data obtained indicated that, all values are below the critical level to impaired Zinc and Calcium bioavailability (Hassan et al.., 2008) and all the values are lower than the values reported for *Balanitesaegyptiaca* (Muhammad, et al.., 2011).

Conclusion

This study showed that, *Typhalatifolia* contains appreciable amount of carbohydrate, protein, energy lipid and some minerals like Na, Mg, K, and Fe. It was also reported that the level of antinutritional factor of *Typhalatifolia* were found to be below the toxic level. It can therefore be concluded that *Typhalatifolia* can contribute to the human nutrient requirement and it could be used as a source of nutrient supplement and if properly utilized would assist to reduce the level of malnutrition in the society.

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