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INTRACELLULAR AND EXTRACELLULAR FLUID ELECTROLYTES LEVEL IN LEAVES OF *TYPHA LATIFOLIA* (TYPHACEAE)

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ABSTRACT

This research was designed to devise the economic importance of *Typha latifolia's* leaf to chemical industries in order to overcome its proliferation in Hadeijia-Komadugu river by determining the qualitative phytochemicals present in the extracts, and evaluating the level of extracellular and intracellular fluid electrolytes in *Typha latifolia* leaves. This plant is use traditionally to treat cuts, wounds, burns and abnormal menstrual bleeding. The sample was collected from river Garbi, Nguru LGA, Yobe State, Nigeria, air dried and subjected to analysis. Total of 200g coarsely powdered leaves were soxhlet extracted using two solvents of different polarities; Petroleum ether and methanol. The extracts yields 3.7%$^{w}/_{w}$, 8.9%$^{w}/_{w}$, and 97.3%$^{w}/_{w}$ for petroleum ether extract, methanol extract and marc respectively, upon subjection to phytochemical screening, the results indicates presence of Alkaloids, Flavonoids, Cardiac Glycosides, Terpenoids, Tannins, Phenols and Steroids in all the extracts while Saponins was only present in methanol extract but quinones, sterols and carbohydrates are absent in all the extracts. The electrolytes concentrations showed Potassium 765.33 ± 0.99µg/g and Phosphate 198.60 ± 0.79µg/g, while Sulphate, Chloride, Sodium, Magnesium, Calcium and Lead had 12.36 ± 0.89 µg/g, 0.37 ± 0.06 µg/g, 11.62 ± 0.39 µg/g, 98.84 ±0.55 µg/g, 35.88 ± 0.52 µg/g and 0.36 ± 0.03 µg/g respectively. Presence of cationic and anionic electrolyte in the leaves of *Typha latifolia* made it a very good source for intracellular and extracellular fluid electrolytes hence it's important in controlling their movement and that of phytochemical for its pharmacological properties.

KEYWORDS: Intracellular, extracellular, electrolyte, cationic, anionic.

INTRODUCTION

Most developing countries depend heavily on the exploitation of its natural resources, especially biological resources. Most of these resources are found among very poor rural communities whose livelihood depends solely on the exploitation of these resources, one of such natural resources is aquatic plants that support the livelihoods of rural communities. The five main uses of aquatic plants are for medicines, food for humans, feed, ornamental or horticultural use, and as a source of non-medicinal chemicals.[1] A significant number of plants have also been used for making handicrafts and household goods, and as construction and structural materials.[2] In northern Africa, wetland vegetation can provide source of income to local people through the production and selling of household items, various utensils and craft products to customers including tourists.[3] Wild aquatic plants are also valued locally as medicines, foodstuffs (such as tea, salads and spices) or construction materials for thatching and hedging.

Wetlands have different socio-economic values that includes; provision of water, for human and livestock, fish harvesting, important sites for dry season grazing, resource extraction, raw materials supply, source of medicinal plants and sites for tourist attraction among others.

Despite the benefits gained from wetlands they are under threat from the conversion of wetlands for intensive irrigation, the expansion of human settlements, industrial pollution, agricultural pollution by pesticides, use of fertilizers, water diversion for drainage and the construction of dams.[4]

Typha latifolia (*kachala* in hausa language) has been used in Chinese medicine as anti-inflammatory and diuretic agent.[5] Leaves from *Typha latifolia* (Cattail) have been used by Native Americans to produce mats and the mature flower heeds have been used as padding for pillows. All of the parts of the cattail plants are considered to be edible and their rhizomes are high in

starch and protein content.[6] The sprouts can be use like asparagus[7] and as a vegetable after cooking, while its pollen can be used in baked and roasted products.[8] Cattails can be established and survive in waste water of polluted wetlands, they are also capable of taking up many chemical pollutants and heavy metals[9] that *T. latifolia* has the ability to remove and accumulate Cr, Cd, Pd, Mn and Fe from artificial lagoon subjected to complex mixture of waste water from industrial and municipal origin. For those reasons it can be use for bioremediation of polluted wetlands.[10] The experiment was designed to (a) determine level of extracellular and intracellular fluid electrolytes in *Typha latifolia* and (b) investigate the qualitative phytochemicals present in *Typha latifolia* leaves. This research will devise the economic importance of leaves of *T. latifolia* to chemical industries in order to overcome its proliferation in Hadejia- Komadugu river.

MATERIALS AND METHODS

Collection and preparation of sample

The *Typha latifolia* leaves sample was collected from river Garbi (an extension of Hadeija-Komadugu river) in Nguru Local Government Area of Yobe State, Nigeria. The plant was identified by Nguru wetland, transported, cut into small pieces and dried under shade in the laboratory at ambient temperature. The dried sample was grounded to powder for further analysis.

Extraction procedure

The extraction was carried out using soxhlet extractor with petroleum ether and methanol consecutively as solvent. 100g of the powdered leaves sample was used and the temperature of the soxhlet was adjusted to the boiling point of the solvent used. Each extract was concentrated using rotary evaporator followed by oven drying at between 40-45^{o}C.

Phytochemical screening

The phytochemical screening to detect the presence of secondary metabolites in extracts of *Typha latifolia* was carried out using combined methods.[11,12,13]

Cationic and Anionic evaluation

Cationic and anionic levels were determined,[14] using AAS 210GP model and DR2000 spectrophotometer.

RESULTS

Elemental and anionic content of the leaf of *T. latifolia*

Table I showed the concentrations of the cations and anioins obtained, potassium, magnesium and calcium have higher concentrations of 765.33 ± 0.99µg/g, 98.84 ±0.55 µg/g, and 35.88 ± 0.52 µg/g respectively followed by sodium and lead that had 11.62 ± 0.39 µg/g and 0.36 ± 0.08 µg/g respectively but cadmium was not detected, while others are; 198.60 ±0.79 µg/g, 12.36 ± 0.89 µg/g and 0.37 ± 0.06 µg/g for phosphate, sulphate and chloride respectively.

Table I: Elemental and anionic contents of the leaf of *Typha latifolia.*

S/N	Elements/Anions	Concentration (µg/g) Mean ± SD
1	Phosphate	198.60 ±0.79
2	Sulphate	12.36 ±0.89
3	Chloride	0.37 ±0.06
4	Potassium	765.33 ±0.99
5	Sodium	11.62 ±0.39
6	Cadmium	Not detected
7	Magnesium	98.84 ±0.55
8	Calcium	35.88 ±0.52
9	Lead	0.36 ±0.08

Phytochemical analysis

Table II shows the extraction profile of the two extracts i.e. petroleum ether and methanol, the percentage weight by weight ($\%^{w}/_{w}$) yield of methanol extracts was found to be higher (8.9) than that of the petroleum ether extract (3.7). The results for the qualitative phytochemical screening of the two extracts was shown in Table III the results indicated the presence of Alkaloids, Flavonoids, Cardiac Glycosides, Terpenoids, Tannins, Phenols and Steroids in all the extracts while Saponins was found in only methanol extract and quinones, sterols and carbohydrates are absent in all the extracts.

Table II: The extraction profile of air dried powdered of the leaf of *Typha latifolia.*

S/N	Fraction	Colour of extract	Texture of extract	Weight of powdered sample	Weight of crude extract	% of the extract	% of the marc
1.	Petroleum Ether	Green	Oily	100g	3.7g	3.7%	97.3%
2.	Methanol	Dark green	Oily	100g	8.9g	8.9%	89.7%

Table III: Phytochemical screening of crude extracts of *Typha latifolia* leaves.

S/N	Phytochemicals	Results	
		Petroleum ether extract	Methanol extract
1	Flavonoids	+	+
2	Tannins	+	+
3	Saponins	-	+
4	Alkaloids	+	+
5	Quinones	-	-
6	Terpenoids	+	+
7	Steroids	+	+
8	Sterols	-	-
9	Cardiac Glycosides	+	+
10	Carbohydrates	-	-
11	Phenols	+	+

Key: (-) = Absent, (+) = present.

DISCUSSION

Low level of potassium in blood (hypokalemia) can be treated by either taking potassium supplement through mouth or other routes. Most researches showed taking potassium supplement can lower blood pressure, lower pre-meal blood sugar level (prediabetes), and improve muscle weakness. Presence of sodium and chloride in *Typa latifolia* can aid when chewed in balancing the level of fluid and electrolytes in the body, as such can be good in managing bone metabolism, cardiac excitability and neuromuscular condition. In addition to the afore properties, presence of calcium and phosphate in *Typa latifolia* can enhance its use in keeping strong bones by protecting osteoporosis (bone loss) or osteomalacia (weak bones). Moreover, phosphate and sulphate as part of the anions found in the plant are also building block of DNA and are required for cell growth and development, biosynthesis and detoxification.[15] Presence of lead can be attributed to the tendency of the plant acting as phytoremediator.[9] The secondary metabolites present in *Typha latifolia* are responsible for some of the medicinal as well as physiological activities and its high efficacy in the treatment of different ailments.

CONCLUSION

It has been concluded that presence of some cationic and anionic electrolyte in the leaves of *Typha latifolia* made it a very good source of intracellular and extracellular fluid electrolytes hence important in controlling their cellular fluid movement.

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