

## Phytochemical and Mineral Analysis of *Culcasia Scandens* Leaves

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### Abstract

Determination of the phytochemical constituents and mineral contents of *Culcasia scandens* was carried out by method of AOAC and spectrophotometric methods respectively. The result of phytochemical analysis revealed that *C. scandens* contained alkaloids ( $1.52 \pm 0.01$ ), saponins ( $0.20 \pm 0.00$ ), flavonoids ( $0.04 \pm 0.00$ ), anthocyanide ( $0.25 \pm 0.00$ ), tannis ( $0.20 \pm 0.00$ ), oxalate ( $0.30 \pm 0.00$ ), steroid ( $0.4 \pm 0.00$ ), cyanide ( $6.22 \pm 0.00$ ) and phenol ( $0.23 \pm 0.00$ ). It also contained abundant mineral elements in the order of  $P > K > Mg > Fe > Na > Ca > Zn$ . The appreciable quantities of phytochemical and mineral compositions obtained suggest that the leaves as cheap sources of drug materials and macro- and micro-nutrients and can be incorporated into human and animal diet to meet their recommended daily allowance.

**Keywords:** Plant Material; Enutrients; Phytochemicals; Micronutrients

### Introduction

Plants have been used by human for medicinal purpose for many years ago and in modern times; they have served as a basis of many pharmaceuticals used today [1,2]. Plants make enormous secondary metabolites for defence against environment stress with other factors like pest attacks, wounds and injuries among others inclusive [3]. Similarly, the produced vast phytocompounds are used to execute vital biological functions and for defence against attack from predators like insect, fungi and herbivorous mammals [4]. These secondary metabolites demonstrate an assortment of therapeutic uses in medical services since ages [5].

*Culcasia scandens* P. Beauv. is a plant that grows on trunk of other plants which is of an order; Arales, family; Araceae and subfamily; Aroidae. It is of a native of Africa and about 28 species of this plant exist [6]. *C. scandens* P. Beauv. is an epiphytic with lean and wiry stems that are up to 5 m high. It always clings to tree trunks by means of clasping roots, and growing on forest and stream margins and savanna from Liberia, Ivory Coast, Sierra Leone, Nigeria and the Cameroun [7,8].

Traditionally, the plant parts with preparations made from them are used to take care of diversity of infirmities and conditions namely; analgesic for earache, toothache, tonsillitis and stomach complaints [9]. In addition, the plant is used as an anti-emetic, for various skin conditions, imbibed during pregnancy as an anti-abortifacient and for venereal diseases [8]. The sap of the plant is a skin-irritant. It has been reported that the plant is rich in alkaloids [6]. The use of the plant as a fish poison and as veterinary medicine for goat ailments is due to its high alkaloid contents. The mixture of maize seeds with powdered *Culcasia* roots and seeds have been reported to improved crop performance and this could be due to *Culcasia's* insecticidal and repellent properties [6]. Also, the leaves are claimed by local users to exhibit antipoisonous effects against individual bitten by wall gecko, kochroch etc. Leaves are fragrant and are used as a source of coumarin, a perfume ingredient [10]. The extracts from *Culcasia scandens* have been reported to show antimicrobial activity against *E. coli*, *S. aureus*, *B. subtilis*, *P. aeruginosa* and *S. typhi* [11].

Despite many studies on phytochemicals and mineral contents of different plant speies globally, little or no information on the phytochemical and mineral contents of *Culcasia scandens* leaves. However, the present study therefore aimed at assisting in closing this gap in

knowledge on *C. scandens* leaves especially from the Eastern part of Nigeria. This information will highlight the usefulness or otherwise of this under-utilized plant.

## Materials and Methods

### Materials

Fresh leaves of *Culcasia scandens* were gotten from Ogoji Ezzagu in Ishielu L. G. A. of Ebonyi State, Nigeria in the month of March 2015. The plant was identified and authenticated by Dr. Nnamani, K., a taxonomist in the Department of Applied Biology, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria. All chemicals and reagents were of analytical standard.

### Preparation of plant material

The leaves of *Culcasia scandens* were sorted, washed thoroughly with distilled water to remove dirt and debris, cut into smaller pieces before it was shade dried at room temperature ( $28 \pm 3^{\circ}\text{C}$ ). The dried leaves were pulverized into fine powder using manual grinder.

### Methods

#### Quantitative Phytochemical Analysis

The method of Akubugwo., *et al.* [12] was adopted to assay for the quantitative phytochemical analyses to determine the concentrations of alkaloids, saponins, flavonoids, tannins, anthocyanides, oxalate, steroid, cyanide and phenols in the leaves of *Culcasia scandens*.

#### Measurement of selected minerals

The selected minerals; calcium, sodium, potassium, magnesium, phosphorus, iron and zinc were determined using Atomic Absorption Spectrophotometer (AAS) based on Association of Official Analytical Chemist A.O.A.C. [13].

#### Contribution to RDA (%)

$$\text{RDA}(\%) = \frac{\text{Concentration of the elements}}{\text{RDA}} \times 1000$$

Where RDA = recommended dietary allowance [14]

## Results

The result of the phytochemical analysis of *Culcasia scandens* showed that the leaves contained numerous phytochemicals. The plant contained high amounts of alkaloids, anthocyanide, phenol and tannins with low amounts of flavonoids and steroids.

Phytochemicals	Values (mg/100g)
Alkaloids	1.52 ± 0.01
Flavonoids	0.04 ± 0.00
Tannins	0.20 ± 0.00
Anthocyanide	0.28 ± 0.00
Phenol	0.23 ± 0.00
Steroids	0.04 ± 0.00

**Table 1:** Phytochemical constituents of *Culcasia scandens*.

The result is presented as mean ± standard deviation of the triplicate determination of leaves of *Culcasia scandens*.

The result of the phytochemical analysis of *Culcasia scandens* showed that the leaves contained numerous phytochemicals. The plant contained high amounts of cyanide and with low amounts of saponins.

Antinutrients	Values (mg/100g)
Saponin	0.20 ± 0.00
Oxalate	0.39 ± 0.00
Cyanide	6.22 ± 0.00

**Table 2:** Antinutrients constituents of *Culcasia scandens*.

The result is presented as mean ± standard deviation of the triplicate determination of leaves of *Culcasia scandens*.

The results of mineral analysis showed that the plant leaves contained mineral in the order of P > K > Mg > Fe > Na > Ca > Zn.

Minerals	Values (mg/100g)	RDA(mg)	Contribution to RDA (%)
Ca	10.80 ± 0.00	1200	0.9
Na	30.16 ± 0.00	500	6.03
K	375.00 ± 0.00	2000	18.75
Mg	40.51 ± 0.01	350	11.57
P	410.00 ± 0.00	1200	34.17
Fe	34.00 ± 0.00	10 - 15	226.67 - 340
Zn	5.20 ± 0.00	12 - 19	27.37 - 43.33

**Table 3:** Mineral contents of *Culcasia scandens*.

The result is presented as mean ± standard deviation of the triplicate determination of leaves of *Culcasia scandens*.

## Discussion

The results obtained from the phytochemical composition of *Culcasia scandens* showed that phytochemicals are in the order of cyanide > alkaloids > oxalate > anthocyanide > phenol > saponins/tannins > flavonoids/steroids in the leaves (table 1). These phytochemicals demonstrate various pharmacological and biochemical actions when ingested to animals. The value (6.22 ± 0.00) of cyanide is highest among all the phytochemicals analyzed in the plant. Cyanide is a compound that is poisonous in high level but can also be beneficial medically as it exhibits sedative and antispasmodic actions [15]. However, the value of cyanide find in this plant is not high to cause toxic effect in individuals with reference to value recommended by FAO/WHO. This finding is in conformity with the report of Uraku, *et al.* [5] and Akubugwu, *et al* [12]. The amount of alkaloids was found to be 1.5 ± 0.01. This high value clearly showed that the plant could play an essential role in elimination and reduction of human cancer. It also suggests that the plant could be beneficial in treatment and management of numerous diseases such as headache associated with hypertension, malaria, cold, fever, chronic catarrh. The oxalate content was found to be 0.39 ± 0.00. Oxalate is an antinutrient find in food that binds essential minerals in the digestive tract, resulting in mineral deficiencies. It binds with calcium to form calcium-oxalate crystals which are deposited as urinary calcium (stones) that are associated with blockage of renal tubules. Although, proper food processing like boiling would reduces anti-nutrient levels [16]. This result is in union with the work of Ogbe and George [17].

According to the study, the plant contained appreciable amounts of anthocyanide and this might has supported its use as antiseptic, anti - inflammatory and capillary - protecting agents [15].

The plant also contained phenol, saponins and tannins in moderate amounts with low levels of flavonoids and steroids. The moderate amounts of phenol and saponins indicate that the plant could help to protect the body against cancer and other degeneratives diseases by scavenging free radicals while tannin as an antinutrient helps to reduce the uptake of blood glucose by binding with calcium. However, tannin has been reported to be one of the most key of the bioactive components of plants. It is also known to possess antioxidant, anti-viral, antibacterial, anti-inflammatory and antitumor activities [18]. Research has revealed that certain tannins inhibit HIV replication

selectively, are used as diuretic as well as for soothing relief, skin regeneration and diuresis [19]. The low amount of flavonoids in the plant may affect its use as antioxidant, antibacterial, anti-inflammatory, antiallergic, antimutagenic, antiviral, antineoplastic, antithrombotic and vasodilatory agent. However, report showed that there is interplay among phytochemicals present in plants [20] and this inplay may potentiate its use in afore mentioned roles.

The study revealed the presence of the following mineral in *Culcasia scandens* in order of  $P > K > Mg > Fe > Na > Ca > Zn$  (table 2). The phosphorus content was  $410.00 \pm 0.00$  mg/100g and is useful in bones and teeth formation. The obtained result is higher than that of Idris [21]. According to Guil – Guerrero, *et al.* [22], for good calcium and phosphorus intestinal utilization, Ca/P ratio must be close unity but *C. scandens* leaves had a high ratio (1:100). This showed that the leaves are good sources of P over that of Ca; consequently, the diet based on this leaves required to be supplemented with other food material rich in Ca. The potassium content in the sample was  $375.00 \pm 0.00$  mg/100g. The result indicated that plant leaves are useful potassium sources which are advantageous health wise since any diet rich in this mineral element is imperative in preventing hypertension as potassium depresses blood pressure. A high amount of K is similar with report of Bouba, *et al.* [23] for *A. daniellii* leaves, *D. glomerata*, *C. frutescens* and *E. giganteus*. In this study, Mg content was found to be  $40.51 \pm 0.001$  mg/100g. High Mg concentration in these leaves is expected since Mg is a component of leaves chlorophyll. The human body needs iron for the formation of oxygen carrying protein; haemoglobin and myoglobin.  $34.00 \pm 0.00$  mg/100g was recorded as iron content in *Culcasia scandens* leaves. The leaves of the plant are good sources of the analyzed mineral element based on the RDA for iron which are 10 mg/day for adult male and children (7 - 10 years), 13 mg/day for pregnant and lactating mothers and 15 mg/day for adult female respectively [14].

The combination of sodium and potassium in the human system is involved in maintaining proper acid – base balance and proper nerve transmissions. The leaves of *Culcasia scandens* recorded  $30.16 \pm 0.00$  mg/100g as Sodium concentration. Calcium plays an important role in building strong and keeping healthy bones and teeth both early and later in life. The calcium level in the *Culcasia scandens* leaves was  $10.80 \pm 0.00$  mg/100g. Zinc helps to speed up the healing process after injury. The concentration of zinc in *Culcasia scandens* leaves was  $5.52 \pm 0.02$  mg/100g. Compared to the RDA of zinc which is 10 - 19 mg/day, the leaves of *Culcasia scandens* are moderate sources this mineral element. The contribution of mineral elements by *Culcasia scandens* leaves to the dietary intake of essential elements was evaluated and presented in table 2. The leaves are rich sources of Fe, Moderate source of Zn, P and K and Poor source of Ca, Na and Mg when compared with their respective recommended dietary allowances. This indicated that the leaves supplement other dietary sources of Fe, Zn, P and K.

## Conclusions

The result of this findings revealed that *C. scandens* leaves are good source of phytochemicals. The leaves are good source of Fe which meets the recommended daily allowance. The appreciable content of K and poor levels of Na may suggest that the plant can serve as better diets for hypertensive patients. Thus, adequate consumption of this plant may help in treatment of diseases and preventing adverse effects of dietary deficiencies.

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## Conflict of Interest

Authors declare that there is no conflict of interest to reveal.

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