EVALUATION OF THE PHYTOCHEMICAL AND ELEMENTAL COMPOSITIONOF*Andrographic paniculataLEAVES*

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ABSTRACT

This research work was designed to determine the phytochemical and elemental composition of *Andrographic pPaniculata* leaves grown in Ikot Ekpene Local Government Area of Akwa Ibom State, Nigeria. The analysis was carried out using standard procedures. The results of the phytochemical constituents were as follows: alkaloids (2.48 ± 0.36%), saponins (9.56 ± 0.77%), Flavonoids (4.57 ± 0.07%), Tannins ((12.34 ± 0.36%) and cardiac glycosides (0.39 ± 0.01%). The results of the elemental composition were as follows: Magnesium (3.02 ± 0.05mg/kg), calcium (5.57 ± 0.07 mg/kg), potassium (20.70 ± 0.11 mg/kg), sodium (1.58 ± 0.61 mg/kg), Zinc (2.17 ± 0.08 mg/kg), Copper (10.45 ± 0.14 mg/kg) and Iron (12.50 ± 0.21 mg/kg). The phytochemicalspresent inthis plant may be responsible for its medicinal properties. The elemental composition shows that the plant may be rich in minerals.

Keywords: *Andrographic Paniculata*, phytochemicals, mineral elemental

1.0 INTRODUCTION

Andrographis pPaniculata is an annual herbaceous plant in the family Acanthacea, native to India and Srilanka. It is widely cultivated in South Eastern Asia, where it has been believed to be a treatment for bacterial infections and some diseases(Ekanem, 2018).

*Andrographis pPaniculata*is a plant that grows in Shady places. The slender stem is dark green in colour. The leaves are lance-shaped measuring up to 8cm long by 2.5cm (Akbar, 2018). The fruit is a capsule around 2cm long and a few millimeters wide. The flowerings time is September to December,*Andrographis Paniculata* is a plant which grows in plane lands, hills, farms, moist habitat, seashores and roadsides. It can also be cultivated in gardens. This plant is commonly known as the king of bitters because of its intensely bitter taste.

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Andrographis Paniculata is being used in traditional medicine, as a remedy for the cold, fever and detoxification of the body (Pramono, 2016). *Andrographis Paniculata* leaves and stem work by stimulating the immune system. It alsoprevents viruses from binding cells in the body (Sharma, 2017). People commonly use *Andrographis paniculata* for the infection of the throat and a type bowel disease (Pramono, 2016).*Andrographis Paniculata* is a medicinal

plant traditionally used as anti-inflammation and anti-bacteria herb. It exhibits diverse pharmacological activities including anti-cancer, anti-obesity, anti-diabetic and other activities (Ekanem,2018). These medicinal activities of this plant are due to the present of certain phytochemicals in the plant. Phytochemicals, which is a bio-active chemicals components of plants, are considered as secondary metabolites, synthesized naturally in all parts of the plant body which plays major role in the medicinal activity of the plant (Akpabio *et al*., 2012 Akpakpan*et al*., 2017).

2.0 Materials and Methods

2.1 Sample Collection and treatment

The leaves of *Andrographis paniculata* were collected from a farm in Ikot Osurua village in Ikot Ekpene Local Government Area of Akwa Ibom State, Nigeria. The leaves were air dried for 7 days and later ground into powder form using an electric grinder. The powder sample were stored in air tight containers for the analysis.

2.2Chemical Analysis

Magnesium, calcium, potassium, sodium and the trace elements (Zinc, Copper and Iron) were determined according to method of Shahidi *et al.,* (2002).

Alkaloid was determined according to the method of Harbone, (1973),. Flavonoid was determined using the method of Boham and Kocipal, (1994). Saponin was determined according to method of Obadomi and Ochuko, 2001. Tannin was determine using the method of Van Burden and Roberson,1981. Cardiac glycosideswas determined using alkaline titration method of AOAC.

2.3 Statistical Analysis

All measurements were replicated three times and standard deviations were determined.

3.0 Result and Discussion

The result of the phytochemical and elemental composition of *Andrographis paniculata* is shown in Table 1 and2.

Table 1: Result of the phytochemical composition of *Andrographis Paniculata leaves*

Phytochemicals	Percentage composition (%)
Alkaloid	2.48 $\pm$ 036
Saponin	9.59 $\pm$ 0.72

Flavonoid	4.51 ± 0.02
Tannins	12.34 ± 0.04
Cardiac glycosides	0.39 ±0.01

3.1 Phytochemical Screening

The bioactive substances present in the *Andrographis Paniculataleaves*are presented in Table 1, these include; saponin, flavonoid, cardiac glycosides and tannins which were present in high concentration.Alkaloid was moderately present. The presence of alkaloid commonly used in drug preparation may account for the medicinal use of the plant (Akpabio *et al*., 2012, Uwanta*et al*., 2024). For example, alkaloids have many pharmacological activities including antihypertensive effects (many indole alkaloids), antimalarial activity (quinine), and anticancer actions (dimeric indoles, vincristine, vinblastine) (Wink *et al*., 1998, Akpakpan*et al*., 2017). Some alkaloids have stimulant property as caffeine and nicotine, morphine is used as an analgesic.Phytochemicals have roles in the protection of human health,when their dietary intake is significant (Akpakpan*et al*., 2017).

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Table 2: Result of elemental composition of *Andrographis paniculata* leaves

Minerals	**Concentration (mg/kg)**
Magnesium (Mg)	3.02 ± 0.05
Calcium (Ca)	5.57± 0.07
Potassium (K)	20.70 ±0.11
Sodium (Na)	1.58 ± 0.61
Zinc (Zn)	2.17 ± 0.08
Copper (Cu)	10.45 ± 0.14
Iron (Fe)	12.50 ± 0.21

Data are mean ± standard deviation of triplicate determinations on dry weight basis

As presented in Table 2, the concentration of potassium is 20.70 ± 0.11 mg/kg. Potassium plays a major role in maintaining the physiological balance within the human body (Gupta *et al.*, 2003). It is an electrolyte that works in tandem with sodium to regulate fluid balance, nerve impulses, and muscle contractions. Potassium is particularly important for the proper functioning of the heart. It helps to maintain the electrical conductivity of Cardiac cells and also contribute to regular heartbeat (Abai and Ekanem,2020). The concentration of

sodium is 1.58 ± 0.61 mg/kg in the leaves of the plant. Sodium is a vital element in the human body, playing a crucial role in maintaining fluid balance, nerve function and muscle contraction (Gupba*et al.,* 2003). It is an essential electrolyte that works in conjunction with potassium to regulate the distribution of water in and out of the body cells. Sodium also plays a pivotal role in generating electrical impulses within nerve cells, by facilitating the transmission of signals through the nervous system (Abai and Ekanem, 2020).

The concentration of Calcium in the leaves of *Andrographis paniculata* is (5.57 ± 0.07mg/kg). Calcium is an essential mineral that plays a crucial role in numerous physiological functions within the human body (Hefsi and Debez, 2015). Primarily, calcium is known for its role in bone health providing strength and rigidity.

Approximately 99% of the body's calcium is stored in bones and teeth, contributing to their development, maintenance, and overall structural integrity. Beyond its skeletal function, Calcium is also vital for various cellular processes, including muscle contraction, nerve transmission and blood Clotting (Hefsi and Debez, 2015).

The concentration of magnesium is 30.22 ± 0.05mg/kg in the leaves of the plant. Magnesium is a vital mineral that plays a multifaceted role in maintaining various physiological function, within the human body (Cakmak *et al.,* 2008). As an essential cofactor for more than 300 enzymatic reactions, magnesium in involved in energy metabolism, DNA and RNA Synthesis and the regulation of ion channels. It contributes significantly to muscle and nerve function, supporting muscle contractions and the transmission of nerve impulses (Abai and Ekanem,2020).

The concentration of Zinc is 21.66 ± 0/08mg/kg in the leaves of the plant. Zinc is an essential trace element that plays a vital role in various physiological processes within the human body. As a cofactor for numerous enzymes, zinc is involved in the regulation of gene expression, immune function, wound healing and DNA synthesis(Abai and Ekanem, 2020).

It is particularly crucial for the proper functioning of the immune system, as zinc supports the development and activity of immune cells, helping the body defend against infections and illnesses (Ansari *et al.,* 2004). Additionally, zinc plays a role in cell division, growth and the maintenance of healthy skin.

The concentration of copperis 10.45± 0.14mg/kg in the leaves of the plants. Copper is an essential trace mineral that plays a crucial role in various physiological function within the

human body. As a cofactor for numerous enzymes, copper participates in fundamental processes such as energy metabolism, the formation of connective tissues and the synthesis of neurotransmitters (Ansari *et al.,* 2004). One of the notable roles of copper is its involvement in the formation of hemoglobin, the protein responsible for transporting oxygen in the blood. Additionally, copper contributes to the maintenance of healthy bones and connective tissues by promoting the cross-linking of collagens (Abai and Ekanem ,2020).

The concentration of Iron is (12.50 $\pm$ 0.71mg/kg) in the leaves of the plant. Iron is a vital trace element that plays a crucial role in several essential functions within the human body (Briat *et al.,* 2007). Its primary function involves oxygen transport, as iron is a key component of hemoglobin, the protein in red blood cells responsible for binding and carrying oxygen from the lungs to tissues throughout the body(Abai and Ekanem,2020). Additionally, iron is a critical component of hemoglobin, a protein that facilitates oxygen storage and release in muscle cells, supporting muscle function. The toxicity of any metal is a function of its concentration in the sample, exposure and chemical nature of the metal ions(Etuk*et al.,* 2020).A man requires between 2 and 3 mg/l of iron per day and 60% to 70% of ingested amount are metabolized (WHO 2011). However, the high concentration of iron does not appear to present health hazard butit may affect the taste of beverages or medicine made from the plant (Nsi*et al.,* 2020).

4.0 CONCLUSION

The elemental content of *Andrographis Paniculata* reveals significant concentration of key elements essential for human health, which include potassium, calcium, magnesium and sodium, alongside trace amounts of zinc, copper and iron. These findings underscore the potential nutritional value of *Andrographis Paniculata* as a rich dietary supplement, as well as its potential in the treatment of various inflammatory conditions, including diabetes and inflammatory bowel disease. The study also revealed that *Andrographis paniculata* possesses medicinal properties and therefore should be used in herbal medicine for the treatment of various illnesses.

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