PHYTOCONSTITUENTS, PROXIMATE AND MINERAL INVESTIGATIONS OF LEAVES OF *SECURIDACA LONGEPEDUNCULATA*

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ABSTRACT

The high incidence of death of children less than five years in developing countries like Nigeria due to incidence of persistence diarrhoea is raising an immense concern. Hence, this study was aimed at investigating the phytochemical and nutritional compositions of the leaves of *Securidaca longepedunculata* (violet tree) (Polygalaceae) plant from Ibadan, Oyo state Nigeria was carried out using standard methods. The phytochemical screening of the ethanol crude extract revealed the presence of flavonoids, terpenoids, alkaloids, saponin, tannins, phenols, cardiac glycosides and Phlobatannins. The proximate result confirmed that the leaf of *S. longepedunculata* have high protein (57.56 ± 0.02) and appreciable fibre content (10.50 ± 0.02). It follows the order protein> carbohydrate> fibre> ash> moisture>lipid. The mineral analysis results revealed: calcium (149.20 ppm), sodium (111.40 ppm), potassium (21.42 ppm), magnesium (13.84 ppm), iron (7.48 ppm), zinc (2.03ppm and copper (0.70 ppm). The results could justify the use of *Securidaca longepedunculata* in management of diseases in ethnomedicine.

Keywords: *Securidaca longepedunculata*, phytochemical, proximate, mineral, diarrhoea

INTRODUCTION

Medicinal plants have been employed from ancient times in management of diseases such as diabetes, infertility, cancer, skin infections, malaria and diarrhoea. World Health Organization have estimated that more than 80% of the world population still depend on plants as source of primarily health care needs. Plant kingdom provides a huge reservoirs of biologically active compounds with distinctive chemical properties which can prevent or cure diseases **(**Rahman *et al.,* 2103). Diarrhoea is a gastrointestinal disorder characterized by an increase in stool frequency and change consistency **(**Amole and Salahdeen, 2010). WHO initiated Diarrhoea disease control program to combat the menace of diarrhoea by study of traditional medicine practices and prevention approaches **(**Darmiki and Siva, 2011). Medicinal plants have been reported as potential source of anti-diarrhoea drugs (Darmiki and Siva, 2011). *Securidaca longepedunculata* plant (Polygalaceae), commonly known as (violet tree), Ipeta in Yoruba,uwar magunguna' in Hausa and 'eze ogwu' in Igbo; is highly regarded as medicinal and magical tree. It occurs in the North-West and Limpopo provinces of South Africa and Mozambique and widely distributed in tropical Africa. It is available between April and August each year **(**Ojewale, 2008).

Traditionally, the plant was used in treatment of inflammations, abortion, ulcers infertility, tuberculosis, venereal diseases, and toothache **(**Schmidt *et al.*, 2002). Secondary metabolites such as tannins, phlobatanins, alkaloid, flavonoid and cardiac glycoside have been reported from the root powder **(**Schmidt, *et al.*, 2002). The present study was to investigate the phytochemicals and nutrient composition of the leave of *S. longepedunculata*.

MATERIALS AND METHOD

Collection and Preparation of Plant Materials

The leaves of *S. longepedunculata* were collected from Ibadan, Oyo State, Nigeria. It was authenticated (LUH 6108) by Mr Oyebanji of the

University of Lagos Herbarium, washed, air-dried, pulverized and kept ready for use.

Extraction of Plant Material

100g of pulverized whole plant of *S. longepedunculata* was extracted with methanol for 72 h and filtered. The filtrate was concentrated to dryness using *vacuum oven* at 40ºC to obtain a crude dark green extract. The crude extract was kept in refrigerator at 4ºC for further use.

Preliminary Phytochemical Screening

Phytochemical tests were done using methanol extracts and pulverized leaf of *S. longepedunculata* to determine the presence of the active phytochemicals (such as alkaloids, phenols, tannin, cardiac glycosides, quinone, steroids flavonoids, terpenoids, cardenolide, saponin, anthraquinones and photobatannin). The metabolites were determined using adopted standard methods **(**Asekun *et al.,* (2013)

Proximate analysis

Analysis for proximate contents of the coarse leaves powder of *S. longepedunculata* was done by methods described by Association of Official for Analytical Chemistry **(**AOCS., 2000). The sample was analyzed for moisture contents, carbohydrates, crude fibre, crude protein, total ash, crude fats (lipids). The nitrogen value which is the precursor for protein of a substance was determined by micro kjeldahl method. The nitrogen value was converted to protein by multiplying to a factor of 6.25. All the proximate values were reported in standard deviation **(**Okwu, (2004), (Akindahunsi and Salawu, 2005)

Mineral analysis

The minerals content of the leaves of *S. longepedunculata* plant was investigated according to analytical methods **(**AOAC., 2003), for its elemental composition by using atomic absorption spectrophotometer (AAS). The solution for the determination of mineral element was prepared by wet digestion using the aqua-regia method. Pulverized plant sample (5g) was accurately weighed into a crucible and transferred into a preheated muffle furnace at 550ºC for 5 hours. To the ash sample, 10ml of aqua regia (nitric acid and hydrochloric acid, 1:3) was added and made up to 50 ml with de-ionized water. The resulting solution was stirred and filtered through a whatman no 540 filter paper and the filtrate taken for analysis. The elements magnesium, calcium, iron, copper, chromium, cadmium, potassium, sodium and zinc were determined from the above solution using the Atomic Absorption Spectrophotometer Analyst 200 model.

Statistical Analysis

Results were presented in simple concentrations based on percentages and all data were expressed as Mean ± S.D of three independent values for each variable.

RESULTS AND DISCUSSION

The result of phytochemical screening of *S. longepedunculata* is as shown in table 1. The phytochemicals such as alkaloid, phlobatannin, flavonoid, tannins, cardiac glycoside, terpenoids, saponin and phenol were present from this study. The result correlates with tannins, phlobatannins, alkaloids, flavonoids and cardiac glycoside in the root as reported **(**Schmidt, *et al.*, 2002). Saponins have been reported to show tumor inhibiting activity on experimental animals (*Rattus novergicus)* (Akindahunsi, and Salawu, 2005). The terpenes function as antioxidants, protecting lipids, blood and other body fluids from assault by free radical oxygen species (Higdon, 2007). The biological activities of flavonoids include action against allergies, inflammation, free radicals, hepatotoxins, platelet aggregation, microbes, ulcers, viruses and tumors **(**Osuntokun and Olajubu, 2014).

The result of proximate analysis is as follows fiber (10.50 ± 0.02), moisture content (10.50 ± 0.02), total ash (5.30 ± 0.07), lipids (3.58 ± 0.04), protein (57.56 ± 0.02), and carbohydrate (18.37 ± 0.01). The nutrient compositions follow the descending order: Protein> carbohydrate> fiber> Ash>

moisture> Lipid. The result revealed *S. longepedunculata* as a potential source of protein and fiber which need to be harnessed for health. The protein content from this study was very high (57.56%) compared to (22.31%) as reported **(**Gidado *et al*., 2013). The ash content was lower (5.30 %) than that (16.73%) reported **(**Gidado *et al*., 2013). The health benefits of protein include the involvement of its essential and non-essential amino acids as building block for protein synthesis, not only for growth of infants and children, but also for the constant replacement of turnover of the body protein in adults **(**Akindahunsi and Salawu, 2005). Fibre lowers the body cholesterol level, thus reducing the risk of cardiovascular diseases and diabetes **(**Higdon, 2007).

Mineral analysis results (Table 3) indicated high concentrations of calcium (Ca), sodium (Na) and magnesium (Mg) potassium and iron in the leaves of *S. longepedunculata.* The mineral contents in descending order: Ca —>Na —> K—> Mg—>Fe—>Zn—>Cu. The calcium and sodium content of *S. Longepedunculata* (Ca = 149.20 ppm and Na = 111.40 ppm) from this study were higher than the result (Ca = 71.50 ppm and Na = 52.76 ppm) reported for *Vernonia amygdalina* (Asaolu, *et al*., 2012). Minerals play vital role in the function, effectiveness and absorption of certain vitamins. Calcium is desired in herbs because it helps to ease insomnia and helps regulate the passage of nutrients through cell walls, without calcium the muscles in the body cannot contract correctly, the blood in the body will not clot and the nerves will not carry message **(**Payne, 1990. Sodium helps in the production of osmotic pressure and also regulates fluid exchange between the cell and the surrounding tissues in the body (Long *et al.*, 2007) Magnesium is needed in diet because it is an active components of several enzyme systems in which thiamine pyrophosphate (TPP) is a co-factor **(**McDowell, 1992). Iron performs several functions in the body hence desired in herbs for maintenance of good health. It helps in formation of blood, transfer of oxygen and carbon dioxide from one tissue to another **(**McDonald et al., 1995**).** Iron is an important trace element in the human body, it plays crucial roles in haemopoiesis, control of infection and cell mediated immunity **(**Bhaskaran, 2001). The deficiency of iron has been described as the most prevalent nutritional deficiency and iron deficiency anemia is estimated to affect more than one billion people worldwide **(**Trowbridge and Martorell, 2002). The consequences of iron deficiency include reduced work capacity, impairments in behavior and intellectual performance and decrease resistance to infection **(**Dioxon and Haris, 2004). Zinc plays a vital role in gene expression, regulation of cellular growth and participates as a co-factor in several enzymes responsible for carbohydrates, protein and nucleic acid metabolism (Lehninger, 1990).

CONCLUSION

The presence of secondary metabolites such alkaloids, phenolic compounds, saponins and anthraquinones, nutrients such as lipids, fiber and protein; and minerals like Mg, Fe, K , Na, Ca and Zn in *Securidaca. longepedunculata* may be responsible for its use in ethno-medicine. There is therefore, need to quantify the phytochemicals present and isolate the bioactive metabolites which may be a novel lead compound for drug discovery.

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TABLES AND FIGURES

Fig 1: *Securidaca longepedunculata* Plant

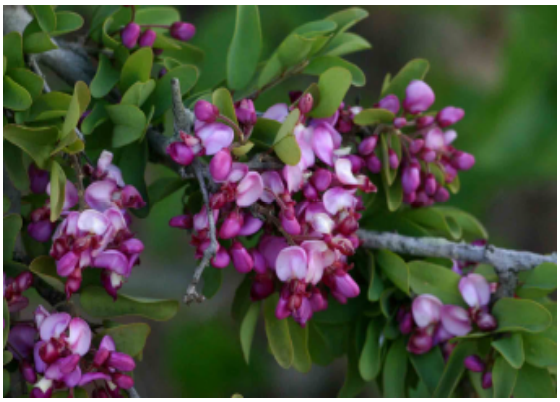

Table 1: Phytochemical Screening of leaves of *S. longepedunculata*

Phytochemicals	Methanol Extract
Alkaloid	+
Flavonoid	++
Tannins	+
Saponin	+
Phenols	+
Terpenoids	++
Quinones	**ND**
Anthraquinones	**ND**
Glycosides	++
Cardenolides	**ND**
phlobatannins	++

Key: ++ = Highly present;
+ = present;
ND = Not detected

Table 2: Results of Proximate Analysis of leaves of *S. longepedunculata*

Proximate	% Composition
Fiber	10.50 ± 0.02
Moisture	4.70 ± 0.05
Total Ash	5.30 ± 0.07
Lipids	3.58 ± 0.04
Protein	57.56 ± 0.02
Carbohydrate	18.37 ± 0.01

Results = mean ± SD of three determinants

Table 3: Mineral composition of *S. longepedunculata*

Elements	Concentration (ppm)
Calcium	149.20 ± 0.51
Magnesium	13.57 ± 0.10
Iron	7.48 ± 0.07
Copper	1.17 ± 0.04
Potassium	21.42 ± 0.20
Zinc	2.03 ± 0.01
Sodium	111.40 ± 0.45

Results = mean ± SD of three determinants