ISSN : 2350-0743

www.ijramr.com

International Journal of Recent Advances in Multidisciplinary Research

Vol. 07, Issue 07, pp. 6102-6105, July, 2020

RESEARCH ARTICLE

PHYTOCHEMICAL SCREENING AND ELEMENTAL ANALYSIS OF (PILIOSTIGMA THONNINGII) STEM BARK EXTRACT FROM MUBI NORTH ADAMAWA STATE NIGERIA

Ezekiel Tagwi Williams, Saidu Hassan and *Nachana'a Timothy

Department of chemistry Faculty of Science Adamawa State University Mubi, Nigeria

ARTICLE INFO

Article History:

Received 21st April, 2020
Received in revised form
30th May, 2020
Accepted 07th June, 2020
Published online 26th July, 2020

Keywords:

Phytochemical, Screening, Elemental, Analysis, Piliostigma, Thonningii, Stem, Bark.

ABSTRACT

In this study the phytochemical screening and elemental analysis of piliostigmathonningii stem bark extract obtained from Mugulbu Mubi South. were determined. The phytochemical constituents were determined using high performance liquid chromatography (HPLC). Also the elemental content was determined using atomic absorption spectrophotometer (AAS) and flame photometer. The result of the phytochemical screening revealed that tannin, saponin, flavonoids, oxalate, steroids, phytates and glycosides were present. Also the result of the elemental analysis showed that manganese (0.049 ± 0.001 ppm), magnesium (1.990 ± 0.010 ppm), zinc (0.240 ± 0.032 ppm), sodium (0.430 ± 0.035 ppm), cupper (0.016 ± 0.001 ppm), potassium (0.130 ± 0.071 ppm), calcium (0.04 ± 0.001 ppm) and Iron (0.090 ± 0.007 ppm) while chromium and lead were not detected in the extracts. These indicate that the plant can be effective source fordrugs. The elemental analysis shows that it contained appreciable amount ofminerals which could be included in diets to supplement human daily nutrient needs and animal.

INTRODUCTION

Food is no doubt the most basic necessity for one to efficiently function in his own ecosystem (Rosemary and Donatus, 2012). Since creation, man has used plant as source of food and drug (Hussain *et al*., 203). The use of medicinalplants as food alternative traces back to ancienthuman civilization (Nwauzoma and Dawari, 2013; Boroomand and Grouh, 2012). The importance of plant to man is demonstrate by the useful product obtained directly or indirectly. According to FAO, about 1 billion peopleespecially in developing countries depend one edible wild plants in their diets (Agbo *et al.,* 2013). The use of wild edible plants in different localities provide optimum source of nutrients. Plants serve as indispensable constituents of human dietsupplying the body with mineral salts, vitamins and certain hormones precursors, in addition to protein and energy (Tairo *et al.,* 2011). Also plants serve as asource of medicinal product and shelter to man and his livestock. In the earlier stage man depended on wild food, which is much abundant within his immediate environment, as the population grows, however, sources of food became more difficult to him, which necessitated the evaluation of phytochemical nutrition content of available trees such as *Piliostigmathonningii*. *Piliostigmathonningii* is a leguminous plant belonging tothe family *Caesalpiniacea*, a family that comprises of trees, shrubs or very rarely scramblers.

***Corresponding author:* Nachana'a Timothy,**
Department of chemistry Faculty of Science Adamawa State University Mubi, Nigeria.

The tree is perennial in nature and its petals are white to pinkishcolour produced between November and April. While the fruits, which is a hairy, hard, flattish pod turns rustybrown, woody and twisted which splits at ripening and usually persistent on the tree are produced betweenJune and September (Schultes and Hofmann, 1973;Jimoh and Oladiji2005). *P. thonningii*grows in open woodland and savannah regions that aremoist and wooded grassland in low to medium altitudes.It is widely distributed inAsia and Africa. It is foundgrowing abundantly as a wild uncultivated tree in manyparts of Nigeria such as Lagos, Abeokuta, Ilorin, PlateauZaria and Bauchi, (Djuma, 2003Jimoh and Oladiji 2005). The stem of *P. thonningii*fruits have been reported to be eaten by African antelope and elephant while farmers in the lower Savanna region grind up the seed as fodder for cattle during winter months (Djuma, 2003). Although considerable information now exists on the nutrient composition of most well-known and easily cultivated legumes in Nigeria, no information could however be obtained concerning the nutritional properties of this plant which is not cultivated but well known. Moreover, different parts of *P. thoningii*have also been described as useful medicinally (Djuma, 2003). Its root and twig have been used for the treatment of dysentery, fever, infections, respiratory ailments, snake bites, hookworm and skin diseases. Despite this medicinal usefulness, no information could be obtained as regards the phytochemical chemical screening of the stem of this plant. Quantifying phytochemical composition is important inensuring the requirements of food regulationsand commercial specifications. According to Kubmarawa *et al.,* (2009) use of wild edible plant in different

localities providesoptimum source of nutrients. The quantity ofnutrient and Phytochemicals varies not onlywith the species of edible plant but also (for thesame Varity) with the location in which theyare growing because of the variation of the soilon which they grow and other environmentalfactors of the location. Hence it is important toevaluate nutrient and phytochemicals of theedible plants in given location, beforerecommending them as sources of food for human and animal in thelocality. There is no information on the nutrient andphytochemicals of *P. thoningii* stemgrowing in the studyarea. The objective of the study is to investigate thephytochemicals and elemental constituents of *P. thoningii* stem bark extract. Thefindings will serve as a guide to dietetics andnutritionist whether or not to recommend it assources of drugs and food for human and animals in the locality.

MATERIAL AND METHODS

Sample collection: The *piliostigmathonningii* stem bark was collected in the month of June 2016 from Mugulbu, Mubi south local government Adamawa State. The plant was identified and authenticated by Mr Baba Taina Ministry of Education, Department of natural resources conservation (Forest Division), Mubi North local Government. The sample was preserved in chemistry Laboratory Adamawa State University Mubi.

Sample preparation: The *piliostigmathonningii* stem bark was dried at room temperature and grinded to obtain a coarse powder by using sterile mortar and pestle. The powdered sample was stored in air tight container and used for successive extraction.

Chemicals and reagents: All Chemicals and reagents used were of analytical grade.

Phytochemical screening: The presence of tannins, alkaloids, glycosides, saponins, flavonoids, steroids, oxilate and phytatewere detected by the method described byJimoh and Oladiji (2005).

Quantitative determination of phytochemical composition
The phytochemical composition was quantified using high performance liquid chromatography (HPLC) following the procedure adopted by AOAC (2000) and Selvam (2007)

Determination of elemental composition of the stem bark
The samples was weighed in crucible and placed in muffle furnace at room temperature and the temperature rise to 550^{o}C for three hours to complete ash. The ash was digested by concentrated nitric acid and perchloric acid (1:1v/v). Na, Ca and K were estimated using emission flame photometer, while Mg, Fe, Zn, Mn, Cu, Pb and Cr were determined using atomic absorption spectrophotometer following standard methods described by AOAC (2000).

Statistical Analysis: All determinations were replicated three times and results were reported in mean (±) standard deviation.

RESULTS AND DISCUSSION

Theresult of the qualitative phytochemical screening of piliostigmathonningii stem bark extract was presented in Table 1.

While Table2 contain the result ofthe quantitative analysis of the stem bark extract and the result ofthe elemental analysis of the stem bark extract were shown in Table 3. The result ofthe qualitative phytochemical screening of piliostigmathonningii stem bark extract showed that tannin, saponin, flavonoids, alkaloids, oxalate, steroids, phytate and glycoside were all present in piliostigmathonningii stem bark extract, in which tannin, saponin, alkaloids, steroids and glycoside were very highly present and phytates were moderately present while oxalate and flavonoids were slightly present (Table 1). The result of the quantitative phytochemicalanalysis of the piliostigmathonningii stem bark extract revealed that tannin (4.87 g /100 g), alkaloids (4.04 g /100 g) flavonoids (1.33 g 100/ g), saponin (4.00 g/ 100 g), oxalate (0.97 g /100 g), steroids (4.26 g /100 g), phytate (2.74 g /100 g) and glycosides (12.41 g / 100 g) were obtained (Table 2). Glycoside has the highest value followed by tannin, steroids,alkaloids,saponin, phytate, flavonoids and oxalate.Similar thing was reported byAkindahunsi and Salawu (2005).

Some of these chemical compounds have been reported to have inhibitory effectson some gram-negative bacteria such as Bacillus subtilize and Escherichia coli. Also they have prominent effects onmicrobial cells and animal systems (Ighodaroand Omole, 2012). The presence of these chemicalcompounds suggests the pharmacologicalactivities of P. thonninggi. Saponinsare glycoside component that have foamy nature and because ofthat is often referred to as 'natural detergent' (Busia, 2005). Depending on its concentration inthe sample, Saponins in seeds have been known to possess both beneficial and deleterious properties. Ighodaroand Omole (2012) reported that saponins have health benefits such as inhibition of the growth of cancer cells and cholesterol lowering activity as well as anticarcinogenic properties, immune modulation activities and regulation of cell proliferation. The concentration ofsaponins in P. thonningiistem bark therefore needs to be ascertained. Flavonoids have been reported to exert multiplebiological effects including antiviral, antitoxic, antibacterial and anti-inflammatory activities (Williams *et al.,* 2019). Some ofthese alleged effects offlavonoids have been attributed to their known functions asmetalchelators, strong antioxidants and free radical scavenger (Edijala, 2005). The toxic effects of glycosides and cardiac glycosides include decreased sympathetic activity, decreasedsystemic vascular resistance and decreased heart rate, (Ighodaroand Omole 2012). However, thepresence of some ofthese antinutrients could be reduced by various processing techniques (Lock and Simpson 1999; Hussain *et al.,* 2013).

The results of the analysis of themineral composition of piliostigmathonningii stem bark extractshowed that Mn (0.049 ± 0.001, Zn (0.240 ± 0.023), Mg (1.990 ± 0.010), Na (0.430 ± 0.035), Cu (0.016 ± 0.001), K (0.130 ± 0.071), Ca (0.04 ± 0.001), Fe (0.090 ± 0.007) while Cr and Pb were not detected. Magnesium is the most abundant element found in the extract similar thing was reported by Timothy (2018) and Alexander *et al.,* (2018). Mn is a microelement essential for human nutrient; it acts as an activator of many enzymes (Vashishtha*et al.,* 2007; Williams *et al.,* 2019) Mn activates several important enzyme systems and in this capacity it is required for the synthesis of acid mucopolysaccharides, such as chondroitin sulphate, to form the matrices ofbone and eggshell. It is also a cofactor of hydrolase, decarboxylase and transferees enzymes (Victor and Chidi 2009).

Table 1. Result of the qualitative phytochemical screening of piliostigmathonningii stem bark extract

Chemical constituent	Result
Tannin	+++
Saponin	+++
Flavonoids	+
Alkaloids	+++
Oxilate	
Steroids	+++
Phytate	++
Glycoside	+++

Key + Presence of constituents
++ High presence of constituent
+++ Very high presence of constituent

Table 2: Result of the quantitative analysis of the piliostigmathonningii stem bark extract (g / 100 g)

Chemical constituent	Result
Tannin	4.87
Saponin	4.00
Flavonoids	1.34
Alkaloids	4.04
Oxilate	0.97
Steroids	4.26
Phytate	2.74
Glycoside	12.41

Table 3: Elemental analysis of the piliostigmathonningii stem bark extracts (ppm)

Element	value
Na	0.430 ± 0.035
Mn	0.049 ± 0.001
Mg	1.990 ± 0.010
Zn	0.240 ± 0.032
Cu	0.016 ± 0.001
K	0.130 ± 0.071
Ca	0.040 ± 0.001
Fe	0.090 ± 0.007
Cr	ND
Pb	ND

ND = not detected

Consequently, when there is lack of Mn intake, skeletal deformity defects in shell quality occur (Mohammed and Sharif 2011). Magnesium is an important mineral element in connection with circulatory diseases such as heart disease (Nwauzoma and Dawari 2013). Zn is involved in the normal function of the immune system (Samy and Ignacimuthu 2000) Na is the principal cation in extracellular fluid. It regulate plasma volume and acid –base balance, preserves normal irritability of muscles and cell permeability, activate nerve and muscle function, main tenancy of membrane potential, transmission of nerve impulse andabsorptive processes of monosaccharide, amino acid, and bile salt, it alsoinvolve in the maintenance of osmotic pressure of the body fluid, (Wong 2005) Insufficient Na causes the low blood pressure of the body. Sources of Na are table salt, salt added to prepare food and most natural food contains Na.

Cu is a micronutrient necessary for the neurologic systems. Copper is an essential trace element in the human body, which is a concern with the release of Iron from the cell into the plasma and is involved in energy metabolism (Odoemelam 2005). It is also necessary for the growth and formation of bones, formation myelin sheaths in the nerves systems. The sources of Cu include liver, whole grains, molasses, legumes, nuts, shellfish and other seafood.

Copper deficiency is associated with cardiac hypertrophy and sudden cardiac failure (Timothy, 2018). Potassium is a mineral that plays many important roles in the body. Potassium is necessary for the function of all living cells. Food sources of potassium include fruits (especially dried fruits), cereals, beans, milk, and vegetables. Potassium is most commonly used for treating and preventing low potassium levels, treating high blood pressure, and preventing stroke. Potassium depletion or excess can result in numerous abnormalities, including abnormal heart rhythm and various electrocardiographic abnormalities. Potassium shift across nerve cell membranes and necessary for the normal nerve transmissions. Fresh fruits and vegetables are good dietary source of potassium (Raman, 2017). Therefore piliostigmathonningii stem bark extract can be a good source of K. Calcium plays an important role in building and maintaining strong bones and teeth, large part of human blood and extracellular fluids. Approximately 99% of the body calcium is stored in the bones and teeth (Oyvind and Kenneth 2006).

The studied plant (piliostigmathonningii stem bark extract) is essential in building up the level of calcium in the body. Fe is not a toxic metal because it serves as micronutrient. Iron is an essential element for blood production. About 70 percent of human body's iron is found in the red blood cells called hemoglobin and in muscle cells called myoglobin. Iron is an important component of hemoglobin, the substance in red blood cells that carries oxygen from the lungs to transport it throughout the body. If there is deficiency of Fe in the body, it can't make enough healthy oxygen-carrying red blood cells. A lack of red blood cells is called iron deficiency anemia (Abbaspour *et al.,* 2014; Ware 2018). Hence piliostigmathonningii stem bark extract can serve as a source of Fe supplement for the body. Cr (though not detected in the extract) in trivalent state is an essential trace element that potentiates insulin action and those influences lipid, carbohydrate, and protein metabolism (Bamishaiye*et al.,* 2011; Kim *et al.,* 2012). Lead (though not detected) occurs naturally in the environment. Everyone may be exposed to trace amount of lead through food, drinking water, air, soil, house hold dust, and various consumer products (Njidda *et al.,* 2013).

Conclusion

This study on the phytochemical screening and elemental analysis of piliostigmathonningii stem bark showed that tannin, saponin, flavonoids, alkaloids, oxalate, steroids, phytate and glycosides were present in the stem. Therefore the metabolites identified are believed to have antioxidant, anticancer, treatment of typhoid, fever and antiviral properties. In addition mineral element such as Na, Mg, Fe, Zn, Cu, K and Ca were present. This shows that the stem contains elements of vital importance in human metabolism. Piliostigmathonningii has diverse application; traiditionally used for the treatment of cough and diarrhea, it is therefore recommended that populace should use the stem of piliostigmathonningii due to the great quality of alkaloids, flavonoids, steroids tannin, saponin and minerals.. The stem can also be processed and used as drugs.

Conflict of interest: none

Source of funding: none

REFERENCES

Abbaspour N, Hurrell R and Kelishadi R. 2014. Review on iron and its importance for human health. *J Res Med Sci.* 2014 Feb; 19(2): 164–174

Akindahunsi AA and Salawu SO. 2005. Phytochemical screening and nutrient-antinutrient composition of selected tropical green leafy vegetables. *African Journal of Biotechnology*. 4(6):497–501. [Google Scholar]

AOAC 2000. Official Methods of Analysis of the Association of Official's Analytical Chemists, (17th edn.) *Arlington, Virginia*. pp. 96-105

Agbo OJ, Shomkegh SA and Mbakwe R. 2013. Local perception and proximate analysis of some edible forest plants around university of Agriculture Wildlife Park, Benue state, Nigeria. *Journal of Research in Forestry, Wildlife and Environmental.* 5(1):10- 22.

Alexander P, Timothy N and Dusa AA. 2018. Evaluation of Heavy Metals in Soil and Plants alongMubi-Gombi Highway, Adamawa State, Nigeria. *International Research Journal of Chemistry and Chemical Sciences*, 4(1): 067-072.

Bamishaiye EI, Olayemi FF, Awagu EF and Bamshaiye OM. 2011. proximate andphytochemical composition of moringaoleifera leaves at three stages ofmaturation. Advance Journal of Food Science and Technology. 3(4):233-237.

Boroomand N and Grouh MSH 2012. Macro element nutrition (npk) of medicinal plant.A review. J. Med plant Red. 6(12):2249-2255.

Busia K. 2005. Medical provision in Africa—past and present.Phytotherapy Research. 19(11):919–923.

Djuma 2003. Djuma Game Reserve Copyright(C)1998-2003. Elegbede JA 1998. Legumes.In: Nutritional quality ofplant foods. Osagie AU, Eka OU (Eds). Post- Harvest Research Unit, University of Benin. pp. 53-83.

Edijala JK, Asagba SO, Eriyamremu GE and Atomatofa U (2005). Comparative effects of garden egg fruit, oat and apple on serum lipid profile in rats fed high cholesterol diet. *Pakistan Journal of Nutrition*. 4:245–249.

Hussain J, Najeeb UR, Abdul LK, Liaqat A, AhmedA, Zabta KS, Hidayat H and Tania SR. 2013. Proximate based comparative assessment of five medicinal plants to meet the challenges of malnutrition. *European Journal of Medicinal Plants*. 3(3):444-453.

Ighodaro M O and Omole O J. 2012. Effects of Nigerian Piliostigmathonningii Species Leaf Extract on Lipid Profile in Wistar Rats. ISRN Pharmacol. : 387942. Online 2012 Sep 6. doi: 10.5402/2012/387942

Jimoh F.O. and Oladiji A.T. 2005. Preliminary Studies on Piliostigmathonningii seeds: Proximate analysis, mineral composition and phytochemical screening. African Journal ofBiotechnology Vol. 4 (12), pp. 1439-1442,

Kim H N, Camp B J and Grigsby R D. 2012. Issolation ofN – methylmorpholine from the seed of cassia occidentalis (coffesenna) *J. Agric Food Chem.* 19 (1): 198 – 199.

Kubmarawa D, Andenyang IFH and Magomya AM. 2009. Proximate composition and amino acid profile oftwo non-conventional leafy vegetables (*hibiscus cannabinus and haematostaphisbacteri*). *African Journal ofFood Science.* 3(9):233-236.

Lock JT and Simpson MJ 1999. Legumes of West Tropical Asia. 3rd ed. Academic Press Inc, London. pp. 216-220.

Mohammed MI and Sharif N. 2011. Mineralcomposition of some leafy vegetables consumed in Kano, Nigeria. *Nigerian Journal of Basic and Applied Science.*19(2):208-211.

Njidda AA ,Olatunji EA and Garba MG. 2013. Insacco and in vitro organic matterdegradability (omd) of selected semi-aridbrowse forages. *IOSR Journal of Agriculture and Veterinary* Science.3(2).9 – 16 e-ISSN: 2319-2380, p-ISSN: 2319-2372,

Nwauzoma AB and Dawari SL. (2013) Study on the phytochemical properties and proximate analysis of piper umbellatum (linn) from nigeria. American Journal of Research Communication.1(7):164-177.

Odoemelam SA. 2005. Proximate compositionsective phytochemical properties of the seeds of African oil bean. Afark J. Nutr.4:382–383.

Oyvind MA and Kenneth RM. (2006) chemistry, biochemistry and applications. bocaraton. CRC Press.871.

Raman R. 2017. www.healthline.com/nutrition/what-does-potassium-do on September 9, 2017

Rosemary IU and Donatus EO. 2012. An evaluation of the phytochemical and nutrient composition of the seeds and stem bark of detariumsenegalensegmelin. *Journal of Natural Sciences Research. 2*(5): 107-111.

Samy RP and Ignacimuthu S. 2000. Anti-bacterial activity of some folklore medicinal plant used by tribals in Western Ghats ofIndia. *J. Ethnopharmocol.* 69(1):63–71.

Selvam V (2007). Trees and shrubs ofthe Maldives.Thamada Press Co. Limit. Bangkok pp239.

Schultes RE and Hofmann A (1973).The Botany and Chemistry ofHallucinogens, Charles C.Thomas, Spring Fields III. p. 267.

Tairo E, Jesse TN, Lukhoba W C and Herbert VM. 2011. Lyaruu. Nutritive and anti-nutritive qualitiesof mostly preferred edible woody plants inselecteddrylands of iringa district, tanzania. Pakistan Journal of Nutrition. 10(8):786-791

Timothy N. 2018. Determination of heavy metalsin soil and plants along major road inHong Local Government Area, AdamawaState, Nigeria. Chemical science International Journal. 25(4):1-10.

Vashishtha V, Amod K, Jacob TJ and Nayak NC. 2007. *Cassia occidentalis* poisoningas the probable cause of hepatomyoencephalopathy in children in Western Uttar Pradesh. Indian J. Med Res. 125:756–728.

Victor N and Chidi O. 2009. Phytochemical constituents of selected medicinal plant.African Journal of pure and appliedchemistry.3(11):228–233.

Ware M 2018. Iron: Recommended intake, benefits, and food sources. Everything you need to know about iron. www.medicalnewstoday.com/articles/287228.php

Wong DWS. 2005. Mechanism and theory infood Chemistry, 4th ed; CBSpublishersand Distributors, New Delhi. 1-550.

WilliamsTE, Timothy N and Chika A 2019. Phytochemical Screening, Elemental and Proximate Analysis of Maeruaangolensis (Capparaceaea) Stem Bark. *International Journal of Biochemistry Research & Review* 27(4): 1-10, 2019; Article no.IJBCRR.51549

****