



## **PHYTOCHEMICAL STUDIES AND ELEMENTAL ANALYSIS OF THE ROOT BARK OF *Piliostigma thonningii* (Schum.) OBTAINED IN SOKOTO**

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### **ABSTRACT**

***This study is aimed at evaluating phytochemical constituents and minerals contents of the root bark of Piliostigma thonningii. Standard procedures were used in carrying out the phytochemical and Atomic Absorption Spectrophotometry and Flame Photometry were used for the mineral analysis. Phytochemical screening revealed the presence of alkaloids, flavonoids and steroids in hexane, ethyl acetate and methanolic extracts. Saponins and glycosides were detected in the hexane and ethyl acetate extracts while hexane and methanolic extracts showed presence of tannins. All the three extracts showed absence of anthraquinones. The mineral analysis of the root bark of the plant yielded sodium-39.12 ±0.73 mg/100g, potassium-633.3±6.46 mg/100g, iron-32.57±0.50 mg/100g, zinc - 1.01±0.03 mg/100g and magnesium-128.63±2.65 mg/100g. The presence of some phytochemicals and some essential minerals proves that it is really an alternative source of medicine.***

### **INTRODUCTION**

Natural products are chemical compounds or substances isolated from plants or animals, they can be in form of primary or secondary metabolites (Bhat *et al.*, 2005). Plant secondary metabolites are organic compounds or phytochemicals that are not directly involved in the normal growth, development or reproduction of the plant and are classified into terpenes, phenolics compounds and nitrogen- containing compounds (Nwokeji *et al.*, 2016).

Phytochemicals are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans. Phytochemicals are not essential nutrients and are not required by the human body for sustaining life, but have important properties to prevent or fight some common diseases. Some of the common uses of phytochemicals include anticarcinogenic, antimutagenic, anti-inflammatory and antioxidant activities (Mamta *et al.*, 2013).

Plants have been used since ancient times to treat diseases worldwide. There is an upsurge in the utilization of medicinal plants in developing and developed countries since they are known to be readily available, cheap and possesses

bearable side effects compared to conventional drugs (Staines, 2011).

The World Health Organization (WHO) reported that about 80 % of the World's population depends mainly on traditional medicine for the treatment of diseases and the traditional treatment involves mainly the use of plant extracts (WHO, 1993).

Minerals are inorganic substances, present in all body tissues and fluids and their presence is necessary for the maintenance of certain physicochemical processes which are essential to life. Minerals are chemical constituents used by the body in many ways. Although they yield no energy, they have important roles to play in many activities in the body (Malhotra, 1998). Naturally grown herbs and plants also have plenty of phytonutrients which are extremely valuable for our body and good health. The most important and valuable phytonutrients include natural minerals such as zinc, iron, calcium, copper among others (Bongoni *et al.*, 2013). This study is aimed at evaluating the phytochemical constituents and mineral composition present in the root bark of *Piliostigma thonningii*.



Plate 1: Root of *Piliostigma thonningii*

#### **MATERIALS AND METHODS**

Root bark of *Piliostigma thonningii* was obtained from the tree in the Pharmacognosy farm, Usmanu Danfodiyo University, Sokoto, Nigeria and identified in the same Department. The root bark of the plant was rinsed in water, cut into smaller pieces for easy shade drying. The dried plant parts were ground using a milling machine and the powdery sample was packed into a polythene bag prior to further analysis.

#### **Qualitative Phytochemical Screening**

Phytochemical screening was conducted on the extracts of *P. thonningii* to validate the presence or otherwise of secondary metabolites such as alkaloids, saponins, cardiac glycosides, stereroids, anthraquinones tannins, among others using standard procedures as described by (Sofowora, 1993; Trease and Evans, 1996; Bhandari *et al.* 2012).

#### **Determination of Mineral Composition**

About One (1) g of the plant sample was weighed and placed into a digestion tube. Ten (10) mL of nitric acid and one tablet of selenium catalyst were added and heated at 350 °C until the mixture was clear. The mixture was then allowed to cool and 20 mL of distilled water was added and filtered into a 100 mL volumetric flask. The filtrate was made up to mark and used for mineral analysis (Uzoekwe and Mohammed, 2015).

Analysis of iron, zinc and magnesium was done using Atomic Absorption Spectrophotometer (AAS) (BUCK SCIENTIFIC AAS, 210VGP) while Sodium and potassium were analyzed using a flame photometer.

#### **RESULTS AND DISCUSSION**

From Table 1, the hexane root extract of *P. thonningii* contains alkaloids, flavonoids, steroids, tannins, Saponins and glycoside and anthraquinones was not detected in the extract. Similarly, the ethyl acetate extract showed the absence of tannins and anthraquinones. The methanolic extract contain alkaloids, flavonoids, steroids and tannins, while saponins, glycosides and anthraquinones were not detected. absent of anthraquinones in all the three extracts used might be because anthraquinones are insoluble in cold organic solvents but soluble in hot organic solvents, it is almost completely insoluble in ethanol near room temperature but 2.25 g will dissolve in 100 g of boiling ethanol (Macleod and Allen, 1934).

Preliminary phytochemical screening of *Piliostigma thonningii* revealed the presence of alkaloids, tannins, saponins, flavonoids, phenols and steroids while terpenoids, glycoside and proteins were absent (Thagriki and Dahiru, 2018). This result is in line with finding of Egharevba and Kunle (2010) where the leaves of this plant was reported to contain tannins, flavonoids, glycosides and saponins. Similarly, Halilu *et al.* (2017) reported that the leaves extracts of *P. thonningii* leaves contain tannins, flavonoids, cardiac glycosides, alkaloids, steroids/triterpenoids, anthraquinones and saponins. *P. thonningii* young and matured leaves was found to contain alkaloids, flavonoids, Saponins, tannins, Terpenoids, Steroidal nucleus and cardiac glycoside and the absence of Anthraquinone (Ibrahim *et al.*, 2019).

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*Piliostigma thonningii* has been used in traditional medicine in Northern Nigeria for treatment of inflammation, bilharzias, treatment of eye diseases, cancer, malaria, elephantiasis and migraine (Halilu *et al.*, 2017). Preparations of the root bark of *P. thonningii* are used to treat pain, rheumatism, diarrhea, stomach problems,

and edema in children, infertility rashes, mouth sores, and chest problems and as a galacticosogogue. These medicinal properties may be due to the presence of flavonoids, tannins, cardiac glycosides, saponins, steroids, terpenoids and alkaloids (Uzoekwe and Mohammed, 2015).

**Table 1: Phytochemical Constituents of root bark of *P. thonningii***

Extract	Alkaloids	Flavonoids	Steroids	Tannins	Saponins	Glycosides	Anthraquinones
HRE	+	+	+	+	+	+	-
ERE	+	+	+	+	-	+	-
MRE	+	+	+	+	-	-	-

Key: + = present; - = absent. HRE: Hexane Root Extract, ERE: Ethyl acetate Root Extract, MRE: Methanolic Root Extract.

Table 2 showed the concentrations of various essential elements run with AAS. Potassium and magnesium have the highest concentration of  $633.3 \pm 6.46$  and  $128.63 \pm 2.65$  mg/100g respectively while zinc has the least concentration of  $1.01 \pm 0.03$  mg/100g. Iron and sodium have a moderate concentrations of  $32.57 \pm 0.50$  and  $39.12 \pm 0.73$  mg/100g respectively. This research is in line with finding of Ibrahim *et al.* (2019) where Na, Ca, P, and K were present in the concentration 240, 82, 39, 11 and 30, 78, 10, 18 ppm respectively for matured and young leaves of *Piliostigma thonningii* respectively. The concentration of K  $633.3 \pm 6.46$  mg/100g (6333 ppm) is very much greater than the 18 ppm reported on the leaves, this differences could be due to variation of soil from place to place. Sodium with concentration of 39.12 mg/100g (390.12 ppm) is in close agreement with 240 ppm reported by Ibrahim *et al.* (2019). Jimoh and Olajidi, (2005) reported that *P. thonningii* seeds contain Fe, Zn, with concentrations of  $781.70 \pm 232.90$  and  $0.016 \pm 0.06$  ppm. The iron concentration of  $32.57 \pm 0.50$  mg/100g (325.7 ppm) is lesser than  $781.70 \pm 232.90$  ppm reported by Jimoh and Oladije (2005). However, the concentrations of Zn are in agreement with this findings. The micronutrient deficiencies which are of greatest public health significance are iron deficiency, causing varying degrees of

impairment in cognitive performance, lowered work capacity, lowered immunity to infections, pregnancy complications, for example, babies with low birth weight, poor learning capacity and reduced psychomotor skills (Batra and Seth, 2002).

Zinc functions as a cofactor and is a constituent of many enzymes like lactate dehydrogenase, alcohol dehydrogenase, glutamic dehydrogenase, alkaline phosphatase, carbonic anhydrase, carboxypeptidase, superoxide dismutase, retinene reductase, DNA and RNA polymerase.

High potassium content ( $633.3 \pm 6.46$  mg/100g) obtained in this result (Table 2) showed that *P. thonningii* root plays a vital role in normal cell function including neuro-transmission, muscle contraction, and maintaining acid-base balance (Trease and Evans, 1989).

Sodium is the principal cation in extracellular fluid in the body, and is an essential nutrient necessary for maintenance of plasma volume, acid-base balance, transmission of nerve impulses and normal cell function. In healthy individuals, nearly 100% of ingested Na is absorbed during digestion. Although the minimum intake level necessary for proper bodily function is not well defined, it is estimated to be as little as 200–500 mg/day (Holbrook *et al.*, 1984).

**Table 2: Mineral Compositions of the root bark of *P. thonningii***

S/N	Analyte	Concentration (mg/100g)
1	Na	$39.12 \pm 0.73$
2	K	$633.3 \pm 6.46$
3	Fe	$32.57 \pm 0.50$
4	Zn	$1.01 \pm 0.03$
5	Mg	$128.63 \pm 2.65$

## CONCLUSION

Based on the research findings in this work, it can be concluded that the use of *Piliostigma thonningii* in the treatment of various diseases by traditional healers has scientific basis. The phytochemical screening carried out on the root bark extracts of *P. thonningii* revealed that at least one extract of the plant possesses alkaloids, tannins, saponins, cardiac glycoside,

steroid, flavonoids. In addition to this, minerals such as K, Fe, Mg, and Na were confirmed in good quantities which Zn was found in traces. This study is another confirmation of the earlier stated facts that these plants are good sources for developing new and potent drugs. We recommend further studies on isolation of bioactive compounds from the plant to develop new and potent drugs.

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