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Preliminary Phytochemical and Proximate Analysis of the leaves of *Piliostigma thonningii* (Schumach.) Milne-Redhead

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Abstract

Piliostigma thionningii (Schumach) Milne-Redhead leaves from Idu Area of the Federal Capital Territory (FCT) Abuja. Nigeria, were collected and qualitatively analyzed for identification of phytochemical constituents. The results showed the presence of bioactive constituents of carbohydrates, glycosides, flavonoids, tannins, saponins, balsams, volatile oil, and terpenes. Phlobatannins, resins, alkaloids, anthraquinones and sterols were not detected. The proximate analysis of the leaves revealed a composition of 9.90% moisture content, 4.62% total ash value, 11.28% alcohol soluble extractive value, 2.50% water soluble extractive value and 0.91% acid insoluble ash value. More research work is recommended on the plant leaves for isolation and characterization of bioactive compounds that may be active against malaria parasites and other diseases.

Key words: *Piliostigma thionningii*, phytochemical screening, proximate composition.

Introduction

Piliostigma thonningii is a leguminous plant belonging to the family Leguminosae -Caesalpinioideae, a family that comprises of trees, shrubs or very rarely scramblers. The tree is perennial in nature and its petals are white to pinkish colour produced between November and April. The fruit is hairy, hard and flattish pod, which turns rusty brown, woody, twisted and splits at ripening and usually persistent on the tree between June and September (Jimoh and Oladiji, 2005). The plant usually grows as small to medium-size tree to 8m high short twisted bole and twisted branches. The wood is reddish-brown turning dirty brown (Burkill 1995).

The leaves are edible and chewed to relieve thirst by the Masai of East Africa. The fruit and seeds are also edible. The pods and foliage are nutritious and relished by cattle and elephant (Burkill 1995). The inner bark is used to make rope. The sapwood is straight grained and light brown, heartwood is pinkish to dark brown and contributes less bulk. A gum tapped from the bark is used in caulking. Three dyes can be obtained from the plant, the bark produces a red-brown dye, the pods produce a black and blue dye. The roasted seeds and root can also be used in dye production. The bark has a tannin content of 18%, though unquantified the roots have considerably high tannin content (Burkill 1995).

Piliostigma thionningii has been reported in literature to have age-long folkloric use in traditional medicine, especially in the treatment of malaria fever, wounds, ulcers, gastric/heart pain, gingivitis and as an antipyretic. According to the traditional healers in Doila, this plant is called child remedy as it is mainly used as a remedy for children except its use against arthritis, headache, hemorrhoids and backache. The most frequent of them according to citation frequency is the use against malaria (40%) followed by the use against the children digestive disorder called abdominal flatulence (16%) and child malnutrition (8%) (Ajali, 2002). In the literature the most frequent use of the bark of *P. thonningii* is in treating cough, usually as an infusion or by chewing of the bark. A common use in Uganda is to stop diarrhea, dysentery and intestinal upsets (Ajali 2002; Burkill 1995). The bark infusion or maceration also enters into the treatment of malaria and leprosy. Analgesic properties are ascribed to the barks; preparations are also used for sore throat, toothache, stomach-ache and earache (Cowan, 1999).

The leaf decoction is a laxative and is given to children .The infusion is given to new born babies as tonic, embrocating to massage mothers abdomen; it serves as a lotion for lumbago. The leaves after soaking in hot water are applied topically for wound dressing and a leaf decoction is applied to the excision wound in the south West African region (Odukoya, 2002).

Locally in Nigeria, the plant is called kalgo in Hausa, abafe in Yoruba and nyihar in Tiv. It is found growing abundantly as a wild uncultivated tree in many parts of Nigeria such as, Zaria, Bauchi, Ilorin, Plateau, Lagos and Abeokuta (Jimoh and Oladiji, 2005) and some part of Abuja.

It has been reported in literature that the D-3-0 methylchiroinositol, the anthhelmintic component of *P. thonningii* stem-bark extract, induce approximately 60% larval paralysis within 24hrs of contact with *Haemonchus contostus* larva at 4.4mg/ml .This level of activity confirms the use of *P. thonnigii* stem-bark extract to treat helminthiasis in African traditional medicine (Irvine, 1961)

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 the seeds of this plant that is not cultivated but not well known. Moreover, different parts of *P. thonningii* have also been described as useful medicinally. Its root and twig have been used for the treatment of dysentery, fever, infections, respiratory ailments, snake bites, hookworm and skin diseases (Jimoh and Oladiji 2005). However, although there are many reported folkloric claims on the medicinal usefulness of this plant and some research report on selected parts such as roots and stem bark, there is no report on the phytochemical chemical screening and proximate composition of the leaves of this plant especially with regards to the one obtained in Nigeria. The purpose of this work therefore was to establish and thus report the phytochemical and proximate composition of the leaves of *P. thonningii* as found in Abuja Nigeria.

Materials and Methods

The *P. thonningii* plant was collected from Idu area of Abuja and Identified at the Herbarium by the Ethnobotanist at the Department of Medicinal Plant Research and Traditional Medicine of the National Institute for Pharmaceutical Research and Development (NIPRD) Abuja, Nigeria. The sample for extraction and experimental work was collected fresh in late September 2008 during the raining season. The leaves were plucked and pulverized fresh using a mortar and pestle.

Phytochemical analysis: The pulverized sample was dried for two weeks and was used for phytochemical analysis to determine the secondary metabolites present using standard methods (Sofowora 2008).

Proximate analysis: were carried out to determine the moisture content, total ash value, alcohol and water soluble extractive value and acid insoluble ash value.

Determination of Total Ash Value: A nickel crucible was heated to a constant weight at 105^0C and 2g of powdered sample was weight into the crucible. The crucible with content was gently heated until temperature rose to 600^0C and allowed to ash for 6hrs. The crucible was cooled to room temperature in a dessicator and weighed.

Determination of Acid-insoluble Ash Value: The ash above was transferred into a beaker with 15mL 10% hydrochloric acid. The crucible was rinsed with 5mL of the same acid twice and the wash combined with the content of the beaker. The beaker was then boiled for 5 minutes and filtered hot through and ash less filter paper. The beaker was washed with water and passed through the filter paper. The washing was repeated trice and filtered in a manner that allow the residue collect at the tip of the cone of the filter paper. The funnel along with filter paper was dried in the oven at 105^0C. The crucible was also dried to a constant weight and the weight noted. The dried filter paper was folded into a small and transferred into

the crucible. The crucible was gently heated to 600^0C for 2hr for complete ashing of its content. The crucible and content was cooled to room temperature in a dessicator and weighed.

Determination of Alcohol Extractive Value: 5g of powdered material was weighed into 250mL stopper conical flask containing 100mL of 90% ethanol and the stopper replaced. The flask and content was placed in a mechanical shaker for 6hrs and then allowed to stand for 18hrs. The mixture was filtered and 20mL of the filtrate was measured into an evaporating dish with a known weight, and evaporated to dryness. The constant weight of the residue was gotten after drying in the oven at 105^0C for about 3 minutes. The extractive value was determined by extrapolation.

Determination of Water Extractive Value: The procedure was the same as above except that 0.25% v/v chloroform in water was prepared and used in place of 90% ethanol.

Determination of moisture content: A moisture content weighing balance was used.

Results and Discussion

The photochemical screening of *P. thionningii* leaves reveals the presence of tannins, flavonoids, glycosides, balsams, terpenes, saponnins and volatile oils. The leaves did not show the presence of steroids, anthraquinones, resins, alkaloid and phlobatannins. The presence of these secondary metabolites suggests that the plant might be of industrial and medicinal importance.

Cardiac glycosides are known to work by inhibiting the Na^+/K^+ pump. This caused an increase in the level of sodium ions in the myocytes and then led to a rise in the level of Ca^{2+}. This inhibition increase the amount of Ca^{2+} ions available for contraction of the heart muscle which improves cardiac output and reduces distention of heart; thus are used in the treatment of congestive heart failure and cardiac arrhythmia. (Ngbede *et al*., 2008).

Terpenes are very important group of organic compounds that have been reported as potent drugs used in treatment of wide range of ailments. They can be simple essential oils to the more complex triterpenes and teraterpenes. The most rapidly acting anti-malarial, artemisinin and its derivatives are terpenes (Evans 2002). The presence of terpenes will encourage further research for possible new drugs leads.

Saponins from plants have long been employed for their detergent properties. It is used as mild detergents and in intracellular histochemistry staining to allow antibody access to intracellular proteins. In medicine, it is used in hypercholesterolaemia, hyperglycaemia, antioxidant, anti-cancer, anti-

inflammatory and weight loss etc, (Ngbede *et al*., 2008). Seigler (1998) reported that saponnins have anti-carcinogens' properties, immune modulatory activity and cholesterol lowering activity. it is also been reported to have anti-fungal properties (Sodipo *et al*.1991). Some saponins glycosides are cardiotonics while others are contraceptives and precursors for other sex hormones (Evans 2002).

Tannins sacs are known to be common in Caesalpinoideae and known to exhibit antiviral, antibacterial and anti-tumor activities. It was also reported that certain tannins are able to inhibit HIV replication selectively and is also used as diuretic. Plant tannins are also source of commercial tannic acids and tanning agents (Evans 2002).

Balsams or balsamic resins have a wide variety of uses. Benzoin for instance, when taken internally, acts as an expectorant and antiseptic. Others like the balsam of Peru are used as parasiticides and as an antiseptic in dressing wounds. It is also used in the treatment of catarrh and diarrhea. It is also used widely used in foods, drinks, perfumes, toiletry, and as a component of incense (Evans 2002)

Flavonoid has been referred to as nature's biological response modifiers because of strong experimental evidence of their inherent ability to modify the body's reaction to allergen, virus and carcinogens. They show anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activities. Some flavonoids have also be reported to behave like the some coumarins in the inhibition of giant cell formation in HIV-infected cell cultures (Evans 2002)

The volatile oil may be useful analgesic and in industry as fragrance. Some volatile oils are used as antiseptics, sedatives, emollient and demulcents (Evans 2002). More work is however necessary to determine the yield and biological activity of the oil content of the leaves of *P. thionningii.*

The plant's leaves in its dried form may have a good shelf-life with reduced chance of microbial growth due to its relatively low moisture content of 9.90%. Total ash value of 4.62%, which is low, implies that the plant has good or high organic components and a rather low inorganic or mineral constituent. Alcohol soluble extractive value of 11.28% and the water soluble extractive value of 2.67% show that alcohol rather than water would be a better solvent of extraction of the leaves of the plant. Acid insoluble ash value of 0.91% shows that small amount inorganic compound is insoluble in acid and therefore the plant leaves may be readily digested and absorbed when consumed. This may have informed some of it ethno-uses in some communities.

In conclusion, the leaves of *Piliostigma thionningii* has been shown to possess secondary metabolites, some of which has also been reported in its fruits (Ngbede *et al*., 2008) and therefore may be a very important source of photochemical for new drug leads. It is our recommendation that bioassay guided

work be carried out on the leaves with a view to isolating a useful pharmacologically active component as a drug. We are currently investigating it for anti-malarial properties.

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Table 1: Results of the phytochemical screening of the leaves of *P. thonningii*.

Phytochemical constituents	Results
Glycosides	+
Terpenes	+

Steriods	–
Saponins	+
Tannins	+
Anthraquinones	–
Balsams	+
Resins	–
Alkaloid	–
Phlobatannin	–
Flavonoids	+
Volatile oil	+

Key: + = Present; - = Absent

Table 2: Results of the proximate analysis of the leaves of *Piliostigma thonningii*.

Parameter	**Values**
Moisture content	9.90%
Total Ash value	5.15%
Alcohol soluble extractive value	11.10%
Water soluble extractive value	2.50%
Acid insoluble Ash value	0.80%