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Phytochemical screening and proximate analysis of the bark of *Piptadeniastrum africanum* Hook (Fabaceae)

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ABSTRACT

Herein, the stem bark extract of *Piptadeniastrum africanum* Hook (F.) (used in folklore medicine for treating several illnesses), were screened for phytochemicals. The chemical screening revealed the presence of some phytochemicals - saponins, alkaloids, tannins, anthraquinones, glycosides and cardiac glycosides. Other phytochemicals - phenols and flavonoids - were absent in the bark extract. Proximate analysis on the bark extract also showed the presence of ash, fat, carbohydrate, moisture content and crude protein. The presence of these phytochemicals lends credence to the medicinal benefits it has been used for in the past years.

Keywords: *Piptadeniastrum africanum*, phytochemical screening, proximate analysis, plant bark extracts

1. INTRODUCTION

For centuries, man has used various parts of plants in the treatment and prevention of many ailments (Chah *et al.*, 2006). Plants provide a source of medicines, which are helpful in treatment of various categories of human ailments and conditions (Omotayo and Borokini, 2012). Historically all medicine preparations were derived from plants, whether in the simple

form of plant parts or in the more complex from crude extracts, mixtures, etc. (Principle, 2005). The evaluation of phytochemicals from medicinal plants, fruits and vegetables has been exploited extensively and used as alternatives in the treatment of several diseases and illnesses.

Piptadeniastrum africanum family Leguminosae, Genus *Piptadeniastrum*, is a large buttress tree of about 50m or more in height, has leaflets which are alternate and bipinnately compound. The leguminosae are mostly tropical and subtropical trees and shrubs, comprising about 40 genera and 2000 species, the tree sprouts freeing from the stump, the sapwood when fresh is pale reddish-yellow or pinkish-white and comparatively wide. The tree commonly called African greenheart is found in Tropical Africa in mixed deciduous and evergreen forest. It occurs naturally in almost all the tropical countries in Africa. It often stands alone on farmland and used in Agroforestry (it is planted or left during forest clearing as a shade tree in coffee, cocoa and banana plantation). In Nigeria the tree is called 'Kiryar kurmi' in Hausa, 'Ofie' in Igbo and 'Agboin' in Yoruba (Hutchinson and Dalziel, 1972).

Seeds for planting are collected from the wild and sown as soon as it is ripe since it has a very short viability and cannot be stored for more than one month. It does not show dormancy and usually germinates in 1-3 weeks. Seedlings growth is slow and they may stay in d nursery for more than one year before transplanting to the forest. Wildlings are sometimes collected for planting from under the mother tree. However, they grow very poorly in shades, where they may be only 20-35cm tall when 3years old, whereas they may reach up to 150cm tall after 4years in less shaded conditions (Tafokou, 2008).

Piptadeniastrum africanum is widespread in different forest types in West and Central Africa, it is common in many regions and it is gaining importance as a commercial timber tree (Hawthorne W. and Jongkind C., 2006). There is much demand on the international timber market although the applications of the wood are somewhat limited due to the high shrinkage rates. The wood is considered as excellent replacement for oak (*Quercus spp.*) in Europe, and it is sometimes called 'African oak'. (Phongphaew 2003). The wood has an unlikable ammonia smell when freshly cut and when timber is wet. The sawdust may irritate skin and mucous membrane.

Piptadeniastrum africanum is not just the source of a valuable wood; the plant parts are also traditional medicine. The bark is commonly partially removed for application in traditional medicine, sometimes the roots and leaves also. Although the stem bark has several medical uses, it is very toxic. The bark is used as arrow poison, ordeal poison and fish poison; mixed with rice is also used to poison mice. Pygmy people in Cameroon and DR Congo use both the root bark and the stem bark as an ingredient of arrow poison (Tafokou, 2008). Root extracts are applied against mental disorder and as an abortifacient and aphrodisiac. Leaf decoctions are applied as an enema to treat gonorrhoea and abdominal complaint. Bark decoctions are used internally to treat cough, bronchitis, headache, mental disorders, stomach-ache, dysmenorrhoea and male impotence, and as an antidote; externally, they are applied to treat fever, toothache, pneumonia, oedema, skin complaints and decoction of the bark also enters in a complex treatment of leprosy (Neuwinger, 2000). It is also a source of fibre and soap substitute. A lot of work has been done on the commercial value of the tree as timber product (Prota base data), in African traditional medicine (Ateulack *et al.*, 2015) and as fishing gear (Prota base). Its various ethnomedicinal potentials spurs the reason to identify the phytochemical and proximate compounds contained in the bark of *Piptadeniastrum africanum*.

2. METHODOLOGY

Bark samples of *Piptadeniastrum africanum* were obtained from Sakponba Forest Reserve located in Orhiwon Local Government, Edo State, Nigeria. The tree was identified by the Taxonomist of Moist Forest Research Station, Mr Emmanuel Isebemhe and authenticated by the Forestry Research Institute of Nigeria Herbarium in Ibadan, Oyo State. The bark was peeled from the stem using a machete. The bark was air dried at ambient room temperature, pulverized to powder and filtered using a 4mm sieve. The powdered sample was then taken to the University of Benin Pharmaceutical Chemistry Laboratory for phytochemical screening and proximate analysis. The powdered bark was extracted with the required solvent, and necessary reagents added to the right quantity of the extract. The proximate composition of the bark extract was determined using the methods of the AOAC (1990). Detailed phytochemical examinations were carried out for the extract as per the standard methods adopted by Sofowara (1982), Harborne (1973, 1993), and Ogboru et al., 2015. All observation was recorded.

3. RESULTS

Table 1. Phytochemical screening of the bark of *Piptadeniastrum africanum*

Phytochemical Component	Scoring
Tannins	+
Anthraquinones	+
Steroids	ND
Cyanogenic glycosides	+
Trepenoids	ND
Saponins	+
Glycosides	+
Flavanoids	-
Sugar	-
Alkaloids	+

+ = Present, - = Absent, ND = Not detected

The quantitative phytochemical analysis carried out on the bark extract of *Piptadeniastrum africanum* revealed the presences of Tannin, Anthraquinones, Cariat glycosides, Saponins, Glycosides, Saponins, and Alkaloids. This is shown in Table 1 below.

Most of which are in trace amount except for Alkaloids and Saponins with content value of 33.79 ± 0.014 mg/100g and 13.72 ± 0.05 mg/100g respectively as shown in Table 2. Table 3 indicates the proximate analysis result which revealed high fat ($41.06 \pm 0.015\%$) and crude protein ($27.51 \pm 0.203\%$) content values, moderate content value for moisture content ($15 \pm 0.076\%$) and carbohydrates ($9.42 \pm 0.127\%$), with ASH having the lowest content value of $3.124 \pm 0.064\%$.

Table 2. Quantitative phytochemical analysis of the bark of *Piptadeniastrum africanum*

Phytochemical	Composition (mg/100g)
Tannins	0.40 ± 0.02
Anthraquinones	0.02 ± 0.01
Cyanogenic glycosides	0.031 ± 0.00
Glycosides	0.12 ± 0.05
Alkaloids	33.79 ± 0.014
Saponins	13.72 ± 0.05

Table 3. Proximate analysis of the bark of *Piptadeniastrum africanum*

Proximate	Composition (g/100g)
Ash	3.124 ± 0.064
Fat	41.06 ± 0.015
Carbohydrate	9.42 ± 0.127
Moisture content	15 ± 0.076
Crude protein	27.51 ± 0.203

4. DISCUSSION

The bark of *Piptadeniastrum africanum* from the phytochemical analysis contains Tannins, Alkaloids, Saponins, Anthraquinones, Glycosides, as well as Cyanogenic glycosides. These phytochemicals can often account for the therapeutic action of the plant. Tannin is used not only in tanning leather, dyeing fabric or making ink, it is also used in various medical applications (Okuda 2005). Several alkaloids exhibit significant biological activities such as the relieving action of ephedrine for asthma, the analgesic action of morphine, and the anticancer effects of vinblastine according to Lee (2011), Benyhe (1994) and Li *et al* (2007). Alkaloids with the highest content value of 33.79 ± 0.014 mg/100g are among the most important active component in natural herbs, and some of these compounds have already been

successfully developed into chemotherapeutic drugs such as Comptothechin (CPT), Topoisomerase 1 (Top1), Inhibitors (Huang *et al.*, 2007) and Vinblastine which interacts with tubulin. Some alkaloids are used to treat epilepsy and diarrhea. Glycosides enclosed by plants are also of therapeutic value. Cardiac glycosides are used to treat heart conditions such as congestive heart failure and arrhythmia (trouble in the rhythm of the heartbeat). Anthraquinone glycosides possess a laxative or purgative property. Saponins are extremely toxic to cold blooded animals, their oral toxicity to mammal is low. Saponin can be utilized for their insecticidal, antibiotic, fungicidal, and other pharmacological properties due to their toxicity to various organisms (Francis *et al.*, 2001). According to Shi *et al* (2004) and Tadros *et al* (2008), saponin is liable for many important activities such as Molluscidal, Anthelmintic, Antiulcerogenic, Anticancer, Antioxidant, Immuno-modulatory, Anti-malarial, Anti-bacterial, Eczema, Analgesic, Anti-nociceptive, and hepatoprotective.

Proximate analysis shows that adequate nutrient is contained in the bark extract. This study therefore reveals the bark of *Piptadeniastrum africanum* contains medically active compounds with essential nutrients which accounts for its use in traditional medicine.

5. CONCLUSION

The phytochemical and proximate analysis of the bark of *Piptadeniastrum africanum* revealed significant phytochemicals and essential nutrients. Phytochemicals generally have a wide range of action and most of these constituents of medicinal attributes are useful in the synthesis of many drugs. It is nutritionally adequate in proximate compounds but with a very high content of fat. This calls for caution in the use of any decoction of the bark of *Piptadeniastrum africanum*.

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