

Ethnobotany, Phytochemistry and Pharmacology of *Pericopsis laxiflora* (Baker) Meeuwen (Leguminosae)

Abstract

Pericopsis laxiflora (Family Leguminosae) is a medicinal plant that is ubiquitous especially in the tropical and savannah regions. There are many reports on folkloric and traditional medicinal uses that include haemorrhoids, rheumatism, abdominal pain treatment, diarrhoea, and dysentery, fever, skin diseases and jaundice. Peer-reviewed articles were gathered by consulting the databases of Scopus, Medline, Web of Science, PubMed, Science Direct and Google Scholar. Phytochemical investigations have revealed many bioactive compounds such as β -carboline derivative and tryptamine derivative. The plant has been examined on the basis of the *in vitro*, *in vivo* or clinical evaluations and shown to possess major pharmacological activities. These include anti-trypanosomal, antimicrobial, antibacterial, antioxidant and anti-malarial activities. In the present review, an attempt has been made to congregate the traditional, phytochemical and pharmacological studies performed on *Pericopsis laxiflora*. Comprehensive safety and efficacy studies must be conducted on the plant. Generally, there are knowledge gaps that must be filled. Thus this review is intended for practitioners and researchers in the fields of ethnopharmacology, natural product chemistry and drug discovery related research.

Key words: Ethnobotany, *Pericopsis laxiflora*, Pharmacology, Phytochemistry,

Introduction

Tremendous interest in natural plant products for prevention and treatment of various diseases has increased globally (Ekor, 2014). Traditional medicines from plants have attracted major attention because of their potential pharmacological importance in spite of the available conventional drugs (Ouôba *et al.*, 2006).

Plants are used for various reasons, these include affordability, availability and the perception that plants are less toxic than conventional medicines (Ouôba *et al.*, 2006). It is worth noting that plants are a major source of conventional drugs including artemisinins, vincristine and vinblastine from *Artemisia annua* and *Catharanthus roseus*. According to the World Health

Organization (2002), nearly 80% of the population in developing countries depend on traditional medicine for health care. In several African countries, diabetes is becoming a very serious disease and a public concern. Recently, it was found that many people were at risk of diabetes above the age of 40 years and 66% of diabetic patients were women (Koevi *et al.*, 2014).

Pericopsis laxiflora is a plant that is regularly used by diabetes patients. In Cameroon, Bum (2011) reported *Pericopsis laxiflora* as a medicinal plant that possess anti-diabetic effect when compared to *Combretum molle*.

Pericopsis laxiflora continue to remain as one of the most popular and well-known plants with a long history of use among the Ghanaian population for the treatment of jaundice and body weakness (Imoro *et al.*, 2013). The continuous search for more bioactive compounds from plant sources, has prompted the extraction, isolation and characterization of some nitrogenous bases from *Pericopsis laxiflora*. This review will unify information regarding *P. laxiflora* in terms of its botany, photochemistry, and pharmacological effects in order to facilitate better understanding and provide further support for the ethno-pharmacological use of this important species.

SOURCES OF INFORMATION AND CRITERIA FOR THE REVIEW

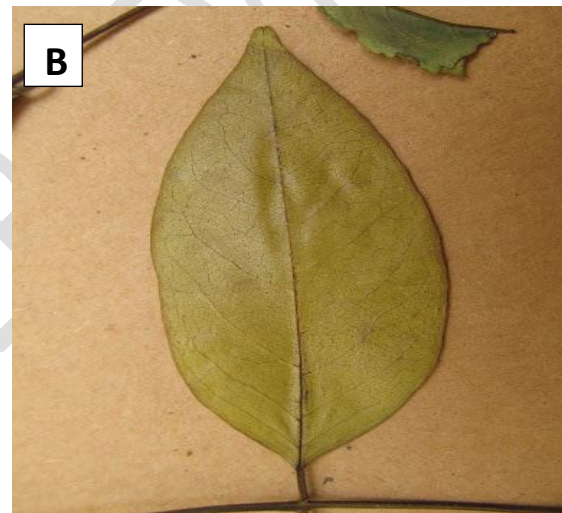
This investigation was carried out by analysing commonly consulted scientific books such as Ghana Herbal Pharmacopoeia and published materials on ethno-medicinal, pharmacological and chemical characterization of *Pericopsis laxiflora*. Peer-reviewed articles were gathered by consulting the databases of Scopus, Medline, Web of Science, PubMed, Science Direct and Google Scholar. The keywords employed to search for the literature of the databases included *Pericopsis laxiflora*, phytochemistry and pharmacological properties. Twenty different articles on *P. laxiflora* were accessed on the basis on ethnobotany, pharmacology and phytochemistry

There were no limitations regarding the language of publication in this search, however, most of the related studies were published in the English language. The criteria followed for the selection of reports in this paper include *Pericopsis laxiflora*: (i) in traditional medicine practice; (ii) phytochemicals; and (iii) pharmacological properties (pre-clinical and clinical).

Pericopsis laxiflora

Pericopsis laxiflora is a savannah, perennial, deciduous shrub or tree belonging to the family Leguminosae. This plant is native to Tropical America, however it is now widely spread in tropical rain forests (Neuwinger, 2000). It is mostly planted in the communities and villages due to its fondly shade capabilities. It is commonly called Satin wood. It has several other names all over the world. In Nigeria, it is referred to as - “Ayan” by the Yoruba people and “Abua-ocha” by the Igbo people.

In Ghana, it is known as “esreso kokrodua” by the Asantes, “kiplig” by the Ewes and “duakobi” by the Fantes. *P. laxiflora* usually grows to a height of 9 - 13 m tall but is occasionally only a shrub up to 2 m. The bole is rarely straight, reaching 25 cm diameter, bearing crooked, drooping branches forming a dishevelled crown; one of the commonest trees of the savanna woodland and fringing forest, and mostly thrive well in loamy soil (Neuwinger, 2000).







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Figure 1. *Pericopsis laxiflora*: (A) Leaves, (B) Dried leaf, (C) Stem, (D) Stem bark, (E) Fruit, enclosing the seeds and (F) Flower)

MEDICINAL USES OF *PERICOPSIS LAXIFLORA* STEM BARK

The genus *Pericopsis* (syn *Afromosia*)-(Papilionaceae) is represented by four species: three in Africa and one in Asia, *P. laxiflora*, *P. elata*, *P. angolensis* and *P. mooniana* (Adeniji and Ariwaodo, 2012). *P. laxiflora* is a common species in dry savannah areas while *P. elata* is found in the forest zone of West Africa (Adeniji and Ariwaodo, 2012). Other species of *Pericopsis* are also commonly used in African traditional medicine (Arbonnier, 2002). *P. laxiflora* bark is often used to treat snake bites, rheumatism, joint pains and teething problems in children (Arbonnier, 2002).

In La Côte d'Ivoire, *P. laxiflora* is used traditionally to treat many health conditions including headache, stomach ulcers, stomach aches, upset stomach, gastritis, enteritis, heart pain,

abdominal pain (Abou *et al.*, 2016) while in Guinea, it is used against shigellosis and colibacillosis (Fadipe *et al.*, 2019). This plant is used for the treatment of malaria, jaundice and ulcer (Asase *et al.*, 2005).

The parts of the tree are usually harvested from the wild for use. Ethno-medicinally, the plant has been reported as remedy for haemorrhoids, abdominal pains, arthritis, sore throat, eye problems, headache, skin diseases and other feverish conditions (Mann *et al.*, 2003). Parts of the plant such as leaves and stem barks are also regarded as medicine for the treatment of syphilis, diarrhoea, dysentery and other bacterial and parasitic agents (Fadipe *et al.*, 2019).

CHEMICAL COMPOSITION OF *PERICOPSIS LAXIFLORA*

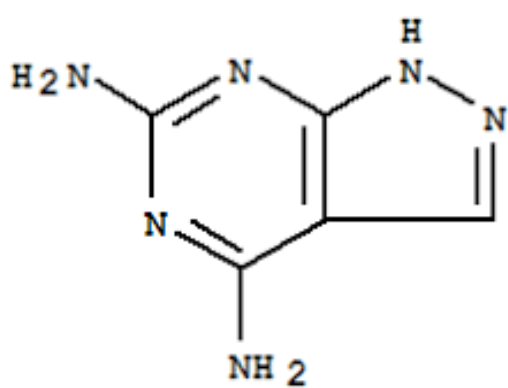
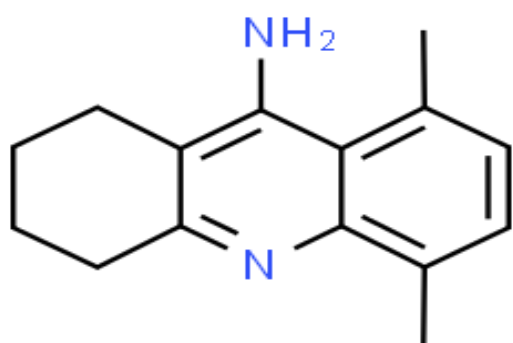
In nature, man is surrounded by plants that are natural chest of medicines. Although many drugs have been derived from herbal medicines, several medicinal plants are still yet to be exploited or fully investigated. *Pericopsis laxiflora* is one of such plants. It is our considered opinion that spirited efforts be made by all and sundry to unravel through regulated and concerted research efforts, the healing potentials of this herb.

This is being advocated because there is a paucity of data on the phytochemistry and pharmacological properties of this herb. Phytochemicals reported to be present in the leaves and stem bark of ethanolic crude extracts of *P. laxiflora* are tannis, alkaloids, flavonoids, terpenoids, saponins and phenols. Cardiac glycosides were present in the leaves but absent from the stem bark (Okanlawon *et al.*, 2015).

Ethyl acetate, methanol and aqueous crude extracts of *P. laxiflora* were all reported to contain tannins, flavonoids, steroids and terpenoids, cardiac glycosides, saponins, phenolic compounds, alkaloid and reducing compounds in different proportions (Abou *et al.*, 2016).

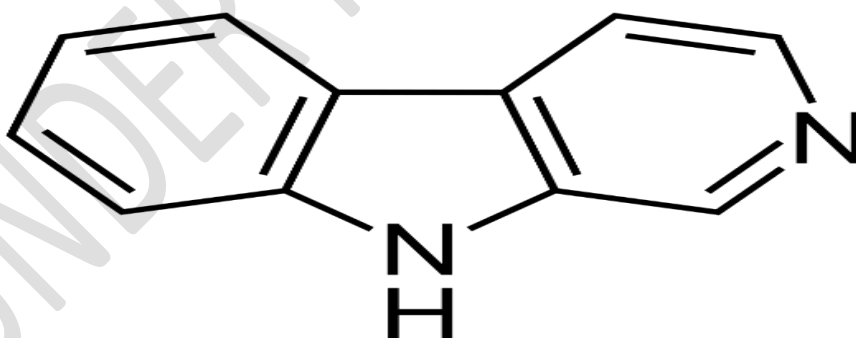
Extraction and purification of some of the nitrogenous bases present in the bark of *Pericopsis laxiflora* by Fadipe *et al.*, (2019) led to the isolation and characterization of three alkaloids: 5,8-Dimethyl-1,2,3,4-tetrahydro-9-acridinamine, 1H-Pyrazolo[3,4-d] pyrimidine and 1,2,3,4,5,6- hexahydro-1,5-methano-8H-pyrido[1,2-a]diazocin-8-one (Fadipe *et al.*, 2019).

In another study, qualitative and quantitative screening of 70% ethanol leaf extract of the *P. laxiflora* revealed a strong presence of alkaloids (Fadipe *et al.*, 2019), which were extracted and separated out as crude alkaloids. Fractionation of the crude alkaloids using various chromatographic techniques led to the isolation and purification of two indole alkaloids whose structures were elucidated based on physical, chemical and spectral data in comparison with literature data (Figure 2). They were identified as β -carboline derivative and tryptamine derivative and also reported to have antibacterial potentials (Fadipe *et al.*, 2019).



(a)

(b)



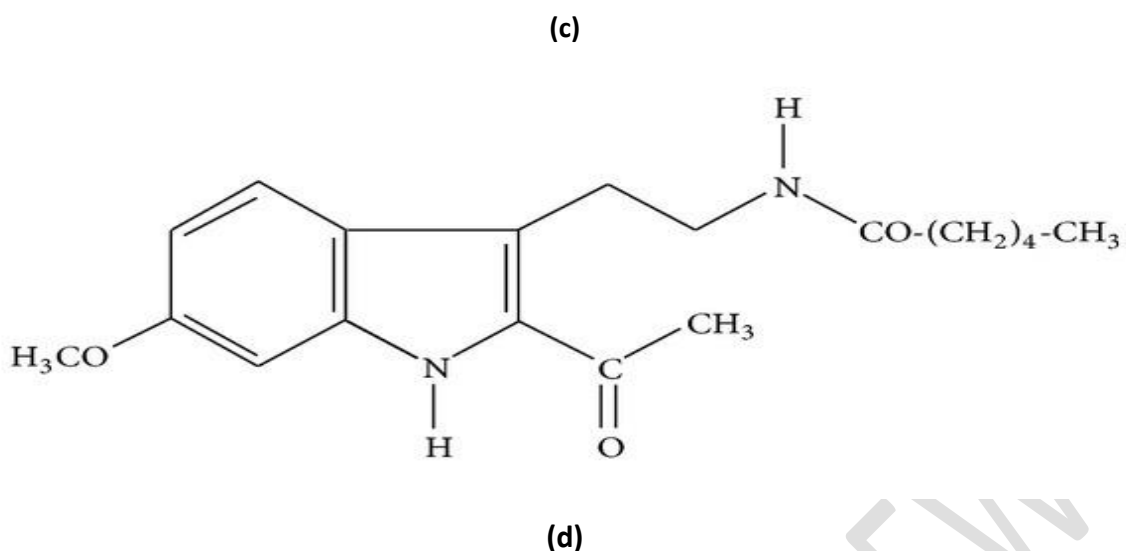


Figure 2. Bioactive compounds present in *Pericopsis laxiflora*: (a) 5, 8-Dimethyl-1, 2, 3, 4-tetrahydro-9-acridinamine, (b) 1H-Pyrazolo [3, 4-d] pyrimidine, (c) β -carboline derivative and (d) tryptamine derivative

ANTIMICROBIAL ACTIVITY OF *PERICOPSIS LAXIFLORA*

Antimicrobial activity of the stem bark and leaves of the species were confirmed using the agar diffusion method and the minimum inhibitory concentration test (MIC) against four standard organism viz: *Shigella dysenteriae*, *Staphylococcus aureus*, *Candida valida* and *Penicillium atrovenetum*. It was concluded that *P. laxiflora* ethanolic crude extract of leaves and stem bark possess antimicrobial properties that were possibly due to the presence of phytochemicals such as total phenol, alkaloid, flavonoid and saponins (Okanlawon *et al.*, 2015).

In-vitro antibacterial assessment of isolated compounds from *P. laxiflora* stem bark using the agar dilution method displayed broader a spectrum of potentials against the bacterial strains, although they were less potent when compared with Ciprofloxacin standard (Fadipe *et al.*, 2019).

Abou *et al.*, (2013) also evaluated the antibacterial properties of various extracts from the bark of *P. laxiflora* against *Escherichia coli* and *Klebsiella pneumoniae*, two strains of beta-lactamase producing extended spectrum (ESBL). In their investigation, 70% ethanolic, methanolic and acetic acid extracts showed bactericidal activities. However, acetic acid extract was more active on *E. coli* ESBL and *K. pneumoniae* ESBL compared to other extracts tested. It was concluded that the sensitivity of the bacteria tested justifies the use of the plant in traditional medicine to combat diseases in which the tested germs were involved including urinary tract infections and gastroenteritis (Abou *et al.*, 2013).

Another study by Abou *et al.*, (2016) reported that various extracts of *P. laxiflora* stem bark (aqueous, methanol, ethanol and ethyl acetate) possess antibacterial activity against *Staphylococcus aureus* and *Shigella* species.

The study confirms the effectiveness of the use of *P. laxiflora* in traditional medicine for treatment of some infectious diseases. Umar *et al.*, (2014) examined both the anti-trypanosomal and antioxidant properties of aqueous extracts of *P. laxiflora* stem bark. They found that the extract possesses anti-trypanosomal effect. Although the mechanism by which *P. laxiflora* produced these effects have not yet been elucidated. They speculated that *P. laxiflora* contains antioxidants which were able to modulate complete cessation of motility in both *Trypanosoma evansi* and *Trypanosoma congolense* (Umar *et al.*, 2014).

Conclusions

Pericopsis laxiflora has been recorded for the management of jaundice in African, however its hepatoprotective effects as well as its underlying mechanism has have not yet been reported (Asase *et al.*, 2005).

The scientific research on *P. laxiflora* indicates that this plant has received increasing attention in recent years and has been reported to have beneficial pharmaceutical uses as an anti-parasitic, antimicrobial, anti-trypanosomal, antioxidant, and antibacterial agent. Phytochemical and pharmacological studies have validated the traditional uses of *P. laxiflora*. However, there is a need to investigate the bioactive components that are responsible for observed pharmacological properties. The principle bioactive metabolites have to be examined for their bioactivities and their mechanism of action needs to be determined, in conjunction with analysing the anti-fibrotic and hepatoprotective pathways of specific compounds in *P. laxiflora*. These may help to strengthen our understanding of this highly therapeutic plant for commercial exploitation.

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