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Ethnobotany, phytochemistry and pharmacology of *Pseudarthria hookeri*: A narrative review

Author:
Alfred Maroyi[1]

Affiliation:
[1]Department of Botany, Faculty of Science and Agriculture, University of Fort Hare, Alice, South Africa

Corresponding author:
Alfred Maroyi,
amaroyi@ufh.ac.za

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Background: *Pseudarthria hookeri* Wight & Arn. is a well-known and widely used medicinal plant in tropical Africa.

Aim: The current study was aimed at documenting the ethnomedicinal uses, and botanical, phytochemical and pharmacological properties of *P. hookeri.*

Setting: This review provides an overview of the traditional and medicinal uses of *P. hookeri*, as well as its botanical, chemical and pharmacological properties.

Method: The literature search on existing information on ethnomedicinal uses, botanical, phytochemical and pharmacological properties of *P. hookeri* was conducted using online databases such as PubMed®, Web of Science, SciELO, Google Scholar, ScienceDirect®, SpringerLink® and Scopus® and also pre-electronic literature obtained from the university library.

Results: *Pseudarthria hookeri* is used as aphrodisiac and ethnoveterinary medicine, and as traditional medicine for female reproductive problems, malaria, gastro-intestinal problems, respiratory infections, liver and skin problems. Chemical compounds identified from *P. hookeri* include flavonoids, acetate, anthraquinones, coumaronochromones, ether, oligothiophene, phenolic acid, alkaloids, catechic tannins, polyphenols, polyterpenes, quinones, saponosides and sterols. *Pseudarthria hookeri* crude extracts and some chemical compounds isolated from the species demonstrated anti-anaemic, antibacterial, antifungal, antidiabetic, antioxidant, antiplasmodial, antiproliferative, antischistosomal, oestrogenic and larvicidal activities.

Conclusion: This review highlights the need for detailed ethnopharmacological assessments of *P. hookeri* focussing on its phytochemical, biological and toxicological properties, *in vivo* and clinical studies.

Contribution: *Pseudarthria hookeri* is an important medicinal plant and has potential as a source of health and pharmaceutical products.

Keywords: Fabaceae; materia medica; *Pseudarthria hookeri*; traditional medicine; tropical Africa.

Introduction

Many cultures in tropical Africa use both vascular and non-vascular plants as sources of traditional medicines. For example, research by Van Wyk, Oudshoorn and Gericke (2013) revealed that the rich cultural diversity in South Africa is reflected in the formal and informal traditional pharmacopoeia practised in different parts of that country. Similarly, literature has shown that medicinal plants from ancient times to the present day have been incorporated into the traditional *materia medica* in the African traditional medicine (Chaitanya et al. 2021; Che et al. 2024), Ayurveda (Anand et al. 2022; Kaushik et al. 2023; Kumar, Dobos & Rampp 2016), Medieval Islamic medicine (Irannejad 2023; Saad 2024; Schulz 2023), and American (Alonso-Castro et al. 2015; Lucía et al. 2021; Mamedov, Mehdiyeva & Craker 2015), European (Knoess & Wiesner 2019; Leonti & Verpoorte 2017; Lobbens et al. 2017) and Chinese (Gao et al. 2019; Shan et al. 2022; Zhang et al. 2022) traditional medicine systems. The World Health Organization (WHO) defined traditional medicine as:

> [*T*]he sum total of the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health, as well as in the prevention, diagnosis, improvement or treatment of physical and mental illnesses. (WHO 2019)

Therefore, the medicinal uses of plants in any given culture or society are based on socio-culturally specific indigenous or traditional knowledge about the plant species. Hence, the need to document such knowledge, principles, healthcare practices and products, particularly in

developing countries where valuable medicinal plants are threatened with extinction or severe genetic loss while detailed indigenous or traditional knowledge about the species is lacking (Hedberg & Staugård 1989; Kaur, Kaur & Saggoo 2022; Mir et al. 2021).

Medicinal plants such as *Pseudarthria hookeri* Wight and Arn (Figure 1) as well as their bioactive compounds are becoming increasingly popular all over the world as natural alternatives to synthetic chemicals (Dharani & Yenesew 2019; Jamshidi-Kia, Lorigooini & Amini-Khoei 2018; Van Wyk & Wink 2012). This is not surprising as medicinal plants and plant-derived medicines have always played an important role within traditional primary healthcare systems in several countries. Moreover, *P. hookeri* is listed in the Traditional Herbal Pharmacopoeia of South Africa (Arnold et al. 2002), Uganda (Lye et al. 2008) and Zimbabwe (Gelfand et al. 1985). The species has also other medicinal applications or traditional uses. For example, in Zimbabwe, a ring of *P. hookeri* branches is placed round a sleeping person to catch bedbugs (*Cimex lectularius* Linnaeus) and the next morning the branches with the bedbugs are disposed of (Wild, Mavi & Biegel 1972). In Benin, *P. hookeri* is collected from the wild and used as fodder for livestock (Ouachinou et al. 2018). Leaves and roots of *P. hookeri* are sold as sources of traditional medicines in informal herbal medicine markets, stalls of herbalists and traditional healers in Ivory Coast (Bolou et al. 2022). It is therefore within this context that the current review was undertaken to evaluate the ethnobotanical uses, phytochemical and pharmacological properties of *P. hookeri*.

Methods

The literature search for botanical characteristics, ethnomedicinal uses, phytochemistry and biological activities of *P. hookeri* was conducted from November 2023 to March 2024 using electronic search for peer-reviewed scientific publications, published books and book chapters. Online search databases used included Web of Science (https://www.webofknowledge.com), Scopus® (http://www.scopus.com/), SpringerLink® (https://link.springer.com/), Google Scholar (https://scholar.google.com/), SciELO (https://search.scielo.org/), PubMed® (https://pubmed.ncbi.nlm.nih.gov/) and ScienceDirect® (https://www.sciencedirect.com/search).

Pre-electronic sources which included books, book chapters, journal articles, dissertations and theses were obtained from the university library. The keywords used in the search included '*Pseudarthria hookeri*', the synonyms of the species '*P. hookeri* Wight & Arn'. and English common names 'bug-catcher', 'pink velvet bean' and 'velvet bean'. Additional search was also conducted using keywords such as 'biological activities of *Pseudarthria hookeri*', 'pharmacological properties of *Pseudarthria hookeri*', 'ethnobotany of *Pseudarthria hookeri*', 'medicinal uses of *Pseudarthria hookeri*', 'phytochemistry of *Pseudarthria hookeri*' and 'traditional uses of *Pseudarthria hookeri*'. Literature sources included in this review are those that assessed the ethnobotany, taxonomy, medicinal uses, phytochemical and pharmacological properties of *P. hookeri* (Figure 2). Literature sources excluded from this review are those articles that are partially accessed, that is, accessed as abstracts only, and also published or unpublished ethnopharmacological surveys lacking information on botany, taxonomy, medicinal uses, phytochemical and pharmacological properties of *P. hookeri.*

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects. No ethical clearance is required as this research used secondary data and literature reviews or published data.



Source: Photographs taken by: (a) S. Louw (02 May 2017); and (b) H. Magdastlucia (06 April 2014)

FIGURE 1: *Pseudarthria hookeri*: (a) Showing plant habit and (b) A branch with leaves and flowers.

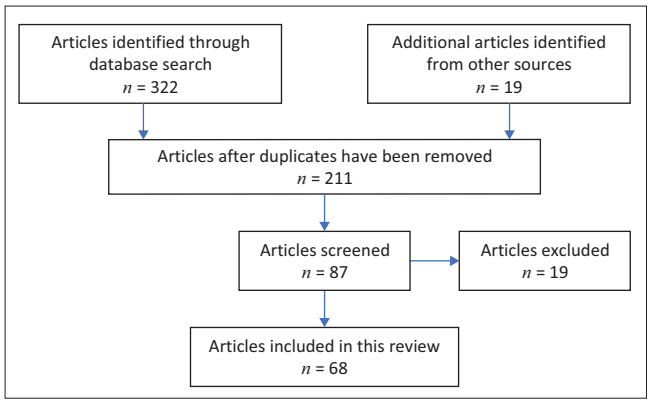


FIGURE 2: Flow diagram showing identification and screening of articles used in this review.

Review findings

Taxonomy and morphological description of *Pseudarthria hookeri*

Pseudarthria hookeri Wight & Arn. is a member of the Fabaceae, Leguminosae or legume, bean or pea family. The genus *Pseudarthria* Wight & Arn. consists of perennial, erect to suberect, woody herbs, shrubs or subshrubs arising from a thick rhizomatous and woody rootstock (Leistner 2000). The genus has been recorded in Asia, tropical Africa, Réunion island, Mauritius and Madagascar with about six species (Leistner 2000; Schrire 1988; Verdcourt 1971, 2000; Zhang, Yi1 & Pan 2018). The genus name '*Pseudarthria*' is derived from two Greek words '*pseudes*' which means 'false' and '*arthria*' which means 'joint', in reference to the imperfectly segmented fruits (Manning 2009). The species name '*hookeri*' is in honour of Sir William Jackson Hooker (1785–1865), an English botanist and botanical illustrator who was the first director of the Royal Botanical Gardens at Kew in the United Kingdom (Schmidt, Lotter & McCleland 2017). The synonyms associated with the botanical name *P. hookeri* Wight & Arn. include *Anarthrosyne densiflora* Klotzsch, *Anarthrosyne robusta* E. Mey., *Desmodium kerstenii* O. Hoffm., *D. robustum* E. Mey., *Pseudarthria alba* A. Chev., *P. densiflora* (Klotzsch.) B. D. Jacks and *P. robusta* (E. Mey.) Schltr. (Schrire 1988; Verdcourt 1971, 2000; Zhang et al. 2018). Accepted infraspecific taxa within *P. hookeri* are *P. hookeri* var. *argyrophylla* Verdc. and *P. hookeri* var. *hookeri* (Schrire 1988; Verdcourt 1971, 2000). The English common names of *P. hookeri* include 'bug-catcher', 'pink velvet bean' and 'velvet bean' (Gumede 2021; Manning 2009, 2012).

Pseudarthria hookeri is an erect, slender or arching deciduous shrub growing from a thick rhizome, with short-lived, erect-ascending velvety, angular and hairy stems, which branch from about halfway up, with grooved or strongly ribbed branches, growing up to 3 m in height (Manning 2012). The leaves of *P. hookeri* are alternate, petiolate, trifoliolate, terminal leaflet the largest, widely ovate to obovate elliptic, tips tapering, margins finely toothed, rough and green above and pale and velvety beneath. The curved, velvety hairs on leaves and stems act like velcro, sticking to other surfaces (Manning 2012). The flowers occur in copious terminal panicles or branched racemes, bright pink in colour, and calyx is velvety-brown or mauve in colour (Figure 1). The pods are oblong in shape, woody, straight, jointed but not breaking into segments, brown in colour, finely hairy, slightly constricted between the seeds. *Pseudarthria hookeri* has been recorded in Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, the Democratic Republic of Congo (DRC), Eswatini, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Nigeria, Rwanda, Senegal, Siera Leone, South Africa, South Sudan, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe (Burrows & Willis 2005; Burrows et al. 2018; Figueiredo & Smith 2008; Fischer et al. 2010; Germishuizen & Meyer 2003; Gosline et al. 2023; Loffler & Loffler 2005; Schrire 1988) (Figure 3). The species has been recorded in open woodland, savanna, often in rocky places, scrub, bushveld, upland and lowland grassland, bushed and wooded grassland on sandy soils at an altitude ranging from sea level to 2000 m above sea level (Burrows & Willis 2005; Loffler & Loffler 2005; Manning 2012; Schrire 1988; Wild et al. 1972). Ecological assessments, however, showed that *P. hookeri* is also a common weed or ruderal, particularly in old cultivation, abandoned agricultural fields, forest margins, disturbed areas, along rivers and streambanks, swampy areas and vleis (Manning 2012; Schrire 1988; Wild et al. 1972). In the field, *P. hookeri* is easily confused with *Flemingia grahamiana* Wight & Arn. (family Fabaceae), but *F. grahamiana* lacks the prominent striated stems and short stalk of the terminal leaflet (Schmidt et al. 2017).

Medicinal uses of *Pseudarthria hookeri*

Pseudarthria hookeri is used as a source of traditional medicines in Burundi, Cameroon, Eswatini, Ethiopia, Ivory Coast, Kenya, Nigeria, South Africa, Uganda and Zimbabwe, representing 29.4% of the countries where the species is indigenous (Table 1). Traditional medicines prepared from the fruits, leaves, roots and stems of *P. hookeri* are used to treat and/or manage 35 human and animal diseases and ailments (Table 1). The main diseases and ailments treated by *P. hookeri* extracts include reproductive problems, malaria, gastro-intestinal problems, respiratory infections, liver and skin problems (Table 1). In Zimbabwe, the root decoctions of *P. hookeri* are taken orally mixed with *Arachis hypogea* L. (family Fabaceae) as remedy for diarrhoea (Gelfand et al. 1985). Similarly, in Uganda, the leaf decoctions of *P. hookeri* are taken orally mixed with *Cajanus cajan* (L.) Huth (family Fabaceae) as remedy for diarrhoea (Namukobe et al. 2011). Similar observations have been made by Van Vuuren, Motlhatlego and Netshia (2022) who argued that combining of medicinal plants is common in the African herbal pharmacopoeia but very little research has been conducted aimed at scientifically validating the different types of herbal medicine combinations being used in the continent.



Note: Map drawn using mapchart.net.

FIGURE 3: Distribution of *Pseudarthria hookeri* in tropical Africa.

Phytochemical composition and pharmacological properties of *Pseudarthria hookeri*

Leaves and other parts of *P. hookeri* are characterised by several classes of flavonoids such as flavanones, flavones and isoflavones (Table 2). Some of the chemical compounds isolated from *P. hookeri* whole plants include acetate, anthraquinone, coumaronochromones, ether, oligothiophene and phenolic acid (Dzoyem et al. 2018; Tchamgoue et al. 2016). In addition to flavonoids, Yaya et al. (2023) isolated alkaloids, including catechic tannins, polyphenols, polyterpenes, quinones, saponosides and sterols from *P. hookeri* leaves. *Pseudarthria hookeri* crude extracts and some flavonoids isolated from the species demonstrated pharmacological activities such as anti-anaemic, antibacterial, antifungal, antidiabetic, antioxidant, antiplasmodial, antiproliferative, antischistosomal, oestrogenic and larvicidal properties.

Anti-anaemic activity of *Pseudarthria hookeri*

Yaya et al. (2023) evaluated the anti-anaemic activities of aqueous extract of *P. hookeri* leaves against phenylhydrazine-induced anaemic rats at doses of 50.0 mg/kg bw, 200.0 mg/kg bw, 1000.0 mg/kg bw and 2000 mg/kg bw with ranferon® as a positive control. The extract exhibited activities by causing increase in haemoglobin, red blood cell and haematocrit

TABLE 1: Ethnomedicinal uses of *Pseudarthria hookeri*.

Medicinal use	Plant part used	Country	Reference
Allergy	Not specified	Uganda	Auerbach et al. 2012
Angina	Leaf and root decoction taken orally	Ivory Coast	Bolou et al. 2022
Aphrodisiac	Not specified	Kenya and South Africa	Gumede 2021; Lye et al. 2008
Backache	Root decoction taken orally	Uganda	Lye et al. 2008; Tabuti, Lye and Dhillion 2003
Bilharzia	Leaf and root decoction taken orally	Zimbabwe	Gelfand et al. 1985
Breast cancer	Leaf, root and stem decoction taken orally or applied topically	Uganda	Kudamba et al. 2023
Diabetes	Leaf decoction taken orally	Ivory Coast	Kahou et al. 2016
Diarrhoea	Root decoction taken orally mixed with *Arachis hypogea* L. (family Fabaceae)	Zimbabwe	Gelfand et al. 1985
Diarrhoea	Leaf decoction taken orally mixed with *Cajanus cajan* (L.) Huth (family Fabaceae)	Uganda	Namukobe et al. 2011
Epilepsy	Root decoction taken orally	Eswatini	Loffler and Loffler 2005
Female reproductive problems (infertility, menstrual problems, prolapsed uterus, promote labour and retained placenta)	Fruit, leaf and root decoction taken orally	Uganda	Kamatenesi-Mugisha, Oryem-Origa and Olwa-Odyek 2007; Lye et al. 2008; Tabuti et al. 2003
Fever	Leaf decoction taken orally	Uganda	Auerbach et al. 2012; Lye et al. 2008
Gastro-intestinal problems (abdominal pains and diarrhoea)	Leaf or root decoction taken orally	Kenya, South Africa, Uganda and Zimbabwe	Asiimwe et al. 2013; Gelfand et al. 1985; Gumisiriza et al. 2019; Gumede 2021; Kamatenesi-Mugisha et al. 2014; Kigen et al. 2016; Lye et al. 2008
Jaundice	Leaf decoction taken orally	Uganda	Auerbach et al. 2012; Lye et al. 2008
Liver problems	Root decoction taken orally	Ethiopia and Uganda	Auerbach et al. 2012; Teka et al. 2020
Malaria	Leaf decoction taken orally	Uganda	Anywar et al. 2016; Katuura et al. 2007; Lye et al. 2008; Ssegawa and Kasenene 2007a; Stangeland et al. 2011
Respiratory infections (cough, pneumonia and tuberculosis)	Leaf decoction taken orally	Ivory Coast, South Africa and Uganda	Asiimwe et al. 2013; Auerbach et al. 2012; Gumede 2021; Koné et al. 2004, 2005, 2007; Namukobe et al. 2011
Skin problems (purulent rashes, ringworm and scabies)	Leaf or root decoction applied topically	Burundi and Uganda	Lye et al. 2008; Ngezahayo et al. 2015; Tabuti et al. 2003
Snakebite	Root decoction taken orally	Uganda	Lye et al. 2008; Tabuti et al. 2003
Sore eyes	Washed with leaf decoction	Uganda	Ssegawa and Kasenene 2007b
Swelling	Leaf decoction applied topically	Cameroon	Yemele et al. 2015
Syphilis	Leaf decoction taken orally	Uganda	Ssegawa and Kasenene 2007b
Yellow fever	Leaf decoction taken orally	Uganda	Namukobe et al. 2011
Wounds	Not specified	Uganda	Auerbach et al. 2012
Ethnoveterinary medicine (constipation and helminthiasis)	Leaves	Nigeria and Uganda	Isaac et al. 2022; Matovu et al. 2020

Note: Please see the full reference list of the article, Maroyi, A., 2024, 'Ethnobotany, phytochemistry and pharmacology of Pseudarthria hookeri: A narrative review', *Journal of Medicinal Plants for Economic Development* 8(1), a271. https://doi.org/10.4102/jomped.v8i1.271, for more information.

levels, and the effects were similar to those exhibited by the positive control, ranferon®, a pharmaceutical drug used for the treatment of anaemia (Yaya et al. 2023).

Antibacterial activity of *Pseudarthria hookeri*

Asiimwe (2015) evaluated the antibacterial activities of ethanol extract of *P. hookeri* leaves against *Staphylococcus aureus* (ATCC 25923) and *Streptococcus pneumoniae* (ATCC 49619) using agar diffusion assay with ciprofloxacin as a positive control. The extract exhibited activities against the tested pathogens with zone of inhibition of 12.0 mm (Asiimwe 2015). Similarly, Dzoyem et al. (2018) evaluated the antibacterial activities of the flavonoids pseudarflavone A, 6,7-(2″,2″-dimethylchromano) flavanone, 6-prenylpinocembrin and desmoxyphyllin A isolated from the whole plants of *P. hookeri* against *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus faecalis* and *Staphylococcus aureus* using broth microdilution assay with ciprofloxacin as a positive control. The flavonoids exhibited activities against the tested pathogens with minimum inhibitory concentration (MIC) values ranging from 4.0 µg/mL to 64.0 µg/mL (Dzoyem et al. 2018). These antibacterial properties exhibited by the crude extracts of *P. hookeri* and flavonoids isolated from the species support the traditional uses of the species against gastro-intestinal problems (Asiimwe et al. 2013; Gelfand et al. 1985; Gumede 2021; Gumisiriza et al. 2019; Kamatenesi-Mugisha et al. 2014; Kigen et al. 2016; Lye et al. 2008), respiratory problems (Asiimwe et al. 2013; Auerbach et al. 2012; Gumede 2021; Koné et al. 2004, 2005, 2007; Namukobe et al. 2011), syphilis (Ssegawa & Kasenene 2007b) and wounds (Auerbach et al. 2012).

Antifungal activity of *Pseudarthria hookeri*

Asiimwe (2015) evaluated the antifungal activities of ethanol extract of *P. hookeri* leaves against *Candida albicans* (ATCC 10231) using agar diffusion assay with nystatin as a positive control. The extract exhibited activities against the tested pathogen with zone of inhibition of 8.0 mm (Asiimwe 2015). These preliminary ethnopharmacological findings corroborate the traditional use of leaf or root decoctions of *P. hookeri* against skin problems such as purulent rashes (Ngezahayo et al. 2015), ringworm (Lye et al. 2008; Ngezahayo et al. 2015; Tabuti et al. 2003) and scabies (Lye et al. 2008).

Antidiabetic activity of *Pseudarthria hookeri*

Kahou et al. (2016) evaluated the antidiabetic activities of aqueous extract of *P. hookeri* leaves on haemoglobin glycation in diabetic Wistar rats. The extract administered orally at doses of 1000.0 mg/kg bw and 1200.0 mg/kg bw for 28 days

TABLE 2: Phytochemical composition of *Pseudarthria hookeri.*

Chemical compound	Plant part	Reference
Flavanones		
6-prenylpinocembrin	Leaves and whole plant	Dzoyem et al. 2018; Faraz et al. 2019; Tchamgoue et al. 2016, 2022
6-prenyl-3'-methoxyeriodictyol	Leaves and whole plant	Dzoyem et al. 2018; Faraz et al. 2019; Tchamgoue et al. 2016, 2022
6-prenylpinocembrin acetate	Leaves and whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2022
6,7-(2",2"-dimethylchromano) flavanone	Whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2016
6,8-diprenyleriodictyol	Leaves and whole plant	Tchamgoue et al. 2016, 2022
7-O-benzyl-6-prenylpinocembrin	Leaves and whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2022
Dorsmanin I	Leaves and whole plant	Faraz et al. 2019; Tchamgoue et al. 2016, 2022
Hiravanone	Whole plant	Dzoyem et al. 2018; Faraz et al. 2019; Tchamgoue et al. 2016
Flavones		
Luteolin	Leaves	Tchamgoue et al. 2022
Pseudarflavone A	Leaves and whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2016, 2022
Pseudarflavone B	Whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2016
Isoflavones		
Genistein	Leaves	Tchamgoue et al. 2022
Orobol	Leaves and whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2016, 2022
Flavonoids		
Dorsamin F	Whole plant	Tchamgoue et al. 2016
Gancaonin P	Whole plant	Tchamgoue et al. 2016
Quercetin	Leaves	Faraz et al. 2019; Tchamgoue et al. 2022
Other chemical compounds		
Acetate		
Acetate	Whole plant	Tchamgoue et al. 2016
Anthraquinone		
Emodin	Whole plant	Tchamgoue et al. 2016
Coumaronochromones		
Boeravinone L	Whole plant	Dzoyem et al. 2018; Tchamgoue et al. 2016
Desmoxyphyllin A	Whole plant	Dzoyem et al. 2018
Oblonginol	Whole plant	Tchamgoue et al. 2016
Ether		
Benzylether	Whole plant	Tchamgoue et al. 2016
Oligothiophene		
α-terthienyl	Whole plant	Tchamgoue et al. 2016
Phenolic acid		
Protocatechuic acid	Whole plant	Tchamgoue et al. 2016

Note: Please see the full reference list of the article, Maroyi, A., 2024, 'Ethnobotany, phytochemistry and pharmacology of Pseudarthria hookeri: A narrative review', *Journal of Medicinal Plants for Economic Development* 8(1), a271. https://doi.org/10.4102/jomped.v8i1.271, for more information.

caused a decrease in blood glucose, triglycerides and serum total cholesterol levels in diabetic rats (Kahou et al. 2016). Similarly, Tchamgoue et al. (2016) evaluated the insulin secretory activities of the flavonoids pseudarflavones A, 6,7-(2",2"-dimethylchromano) flavanone, gancaonin P, boeravinone L, dorsamin F, dorsmanin I, 6-prenyl-30 -methoxyeriodictyol and orobol isolated from *P. hookeri* whole plants on isolated *in vitro* mice islets. The flavonoids exhibited mild to moderate insulin secretory activities (Tchamgoue et al. 2016). The antidiabetic and insulin secretory activities exhibited by the *P. hookeri* crude extracts and flavonoids isolated from the species support the traditional use of leaf decoctions as remedies for diabetes (Kahou et al. 2016).

Antioxidant activity of *Pseudarthria hookeri*

Asiimwe (2015) evaluated the antioxidant activities of ethanol extract of *P. hookeri* leaves against 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay. The extract exhibited weak antioxidant activities of 43.7% (Asiimwe 2015). A species exhibiting antioxidant activities has the capacity to protect human body cells from harmful damage caused by free radicals.

Antiplasmodial activity of *Pseudarthria hookeri*

Clarkson et al. (2004) evaluated the antiplasmodial activities of dichloromethane and methanol (1:1) extracts of *P. hookeri* leaves against chloroquine-sensitive strain (D10) of *Plasmodium falciparum* using the parasite lactate dehydrogenase (pLDH) assay with chloroquine diphosphate as a positive control. The extract exhibited activities with half maximal inhibitory concentration (IC_{50}) value of 100.0 µg/mL (Clarkson et al. 2004). Tchamgoue et al. (2022) evaluated the *in vivo* antiplasmodial activities of ethanol extract of *P. hookeri* leaves and the flavonoids quercetin, 7-O-benzyl-6-prenylpinocembrin and 6,8-diprenyleriodictyol isolated from the species against male Swiss albino mice infected with *Plasmodium berghei.* The ethanol extract exhibited activities causing 32.5% suppression at 500.0 mg/kg bw and prolonged the survival period of infected mice while similar activities were also exhibited by the flavonoids quercetin, 7-O-benzyl-6-prenylpinocembrin and 6,8-diprenyleriodictyol (Tchamgoue et al. 2022). *Pseudarthria hookeri* leaves are widely used as herbal medicines for malaria in Uganda (Anywar et al. 2016; Katuura et al. 2007; Lye et al. 2008; Ssegawa & Kasenene 2007a; Stangeland et al. 2011) and the documented antiplasmodial activities exhibited by both the crude extracts and flavonoids isolated from the species would contribute to the search for phytochemical compounds that could be used in the development of antimalarial drugs.

Antiproliferative activity of *Pseudarthria hookeri*

Dzoyem et al. (2018) evaluated the antiproliferative activities of the flavonoids pseudarflavone A, 6,7-(2",2"-dimethylchromano) flavanone, 6-prenylpinocembrin, boeravinone L, desmoxyphyllin A and 7-benzyloxy-6-prenylpinocembrin isolated from the whole plants of *P. hookeri* against the human T-Cell leukaemia cells Jurkat cancer cells using (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) colorimetric assay with doxorubicin as a positive control. The flavonoids showed activities exhibiting IC_{50} values ranging from 3.6 µg/mL to 10.0 µg/mL (Dzoyem et al. 2018). The antiproliferative activities exhibited by the flavonoids isolated from *P. hookeri* corroborate the traditional uses of the species as remedy for breast cancer (Kudamba et al. 2023).

Antischistosomal activity of *Pseudarthria hookeri*

Sparg, Van Staden and Jäger (2000) assessed the antischistosomal activities of aqueous extracts of *P. hookeri*

leaves against the schistosomula of *Schistosoma haematobium* with praziquantel as a positive control. The extract exhibited activities by killing 67.7% of the schistosomula worms at a concentration of 50.0 mg/mL after 12 to 24 h of exposure (Sparg et al. 2000). These results support the traditional uses of leaf and root decoctions of *P. hookeri* as remedy for bilharzia in Zimbabwe (Gelfand et al. 1985).

Oestrogenic activity of *Pseudarthria hookeri*

Vollmer and Njamen (2007) and Njamen et al. (2008) evaluated *in vitro* and *in vivo* oestrogenic activities of methanol extracts of *P. hookeri* roots. The *in vitro* and *in vivo* oestrogenic activities were screened using the yeast estrogen receptor assay, ovariectomised Wistar rats and alkaline phosphatase induction assay on Ishikawa cells. The extracts exhibited oestrogenic activities showing stimulating effects (Njamen et al. 2008; Vollmer & Njamen 2007). These preliminary results can be used as baseline data for further oestrogenic studies considering the fact that *P. hookeri* is used against female reproductive problems such as infertility (Lye et al. 2008), menstrual problems (Kamatenesi-Mugisha et al. 2007; Lye et al. 2008), prolapsed uterus (Kamatenesi-Mugisha et al. 2007; Lye et al. 2008), inducing labour (Lye et al. 2008; Tabuti et al. 2003) and retained placenta (Lye et al. 2008; Tabuti et al. 2003).

Larvicidal activity of *Pseudarthria hookeri*

Koné et al. (2005) evaluated the larvicidal activities of ethanol extracts of *P. hookeri* leaves and roots against *Haemonchus contortus* using fenbendazole and ivermectin as positive controls. Both extracts showed activities exhibiting an absolute lethal concentration (LC_{100}) value of 0.8 mg/mL (Koné et al. 2005). Therefore, this species has potential to be used in the treatment of intestinal helminthosis.

Conclusion

The present review provides a summary of the botany, medicinal uses, phytochemical and pharmacological properties of *P. hookeri*. Because the species is used as traditional medicine in 29.4% of the countries where it is indigenous, there is need for detailed ethnopharmacological research focussing on assessing safety, mechanisms of action *in vivo* and clinical research aimed at corroborating the traditional medical applications of the species. As the active ingredients of *P. hookeri* vary depending on the plant parts and origin of the specimen, phytochemical profiling protocols of the species should be standardised. Based on ethnopharmacological research done so far on *P. hookeri*, it seems the species has potential as a source of health and pharmaceutical products.

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