Evaluation of medicinal uses, phytochemistry and pharmacological properties of *Bersama lucens* (Hochst.) Szyszyl.

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**ABSTRACT**

*Bersama lucens* (Hocht.) Szyszyl is a shrub or small tree with its different parts used traditionally to treat various diseases. *Bersama lucens* has been recorded in Eswatini, Mozambique and South Africa. The main aim of this review is to provide an overview and critical analysis of the medicinal uses, phytochemistry and biological activities of *B. lucens*. The information presented in this study was gathered using various databases such as PubMed, Taylor and Francis imprints, Springer, NCBI, Google scholar and Science direct, and review of books, journal articles and other scientific publications kept in the University library. The bark and root infusion or decoction of *B. lucens* are mainly used as a blood purifier, lice repellent and protective charm, and traditional medicine for stomach problems, leprosy, stroke, sexually transmitted infections, headache, infertility, nervous disorders, impotence and menstrual pain. The biological activities exhibited by *B. lucens* extracts include antibacterial, antifungal and anti-inflammatory activities. Documentation of the medicinal uses, phytochemistry and pharmacological properties of *B. lucens* is vital as this information provides baseline data required for future research and development of health-promoting and pharmaceutical products. Future research should focus on detailed phytochemical, pharmacological and toxicological screening, *in vivo* studies and clinical trials involving the crude extracts and phytochemical compounds isolated from the species.

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**INTRODUCTION**

*Bersama lucens* (Hocht.) Szyszyl is a shrub to medium-sized tree belonging to the Francoaceae family. Under the Angiosperm Phylogeny Group iv classification system, the Melianthaceae family is included within the Francoaceae family ([Group, 2016]). The Francoaceae family consists of six genera, namely *Balbisia* Cav., *Bersama* Fresen., *Francoa* Cav., *Greyia* Hook. & Harv., *Melianthus* L. and *Viviana* Cav. The genus *Bersama* Fresen consists of shrubs and small trees recorded in the Afromontane vegetation, tropical lowland habitats and margins of evergreen forests in sub-Saharan Africa but conspicuously absent in the Congo basin ([Decraene et al., 2001; Linder and Melianthaceae, 2007]). The recognized species include *B. abyssinica* Fresen., *B. lucens*, *B. palustris* L. Touss., *B. swinnyi* E. Phillips, *B. swynnertonii* Baker f., *B. tysoniana* Oliv, and *B. yangambiensis* L., Touss. *Bersama lucens* has been recorded in Eswatini, Mozambique and South Africa. The genus name *Bersama* refers to the Ethiopian name for this genus. The species name “*lucens*” is a Latin word meaning “shiny” or “polished” about the “glossy and shiny” leaves which are characteristic of the species. The synonyms of *B. lucens* include *B.
The English common names of B. lucens include "glossy Bersama", "glossy white ash" and "shiny-leaf Bersama". Bersama lucens is a shrub or small tree with dense leaf clusters at the tips of the branchlets which grows to a height of 3 to 10 metres (Palgrave and Keith, 2002). The branchlets of B. lucens are grey to pale brown in colour, brittle, wrinkled bark with intrapetiolar stipules. The leaves are alternate, imparipinnate with hairless leaflets that are ovate to elliptic in shape, leathery, glossy bright green above with midrib and lateral veins that are yellowish and conspicuous on both surfaces. The leaflet tips are rounded or bluntly pointed with a tapering to rounded base, and the leaflet margins are thickened and usually waxy. The flowers are whitish or yellowish and occur on slender and erect racemes. The fruit is a wrinkled sub-globose capsule with short hairs which is dull green when mature and splitting into four valves. The seeds are bright scarlet and partly enveloped in a green-yellowish, cup-shaped aril. Bersama lucens has been recorded in forest areas, riverine thickets, forest margins, bushveld, often in rocky places or on coastal dunes at an altitude ranging from 5 m to 1525 m above sea level.

The bark and roots of B. lucens and two other closely related species, B. swinnyi and tysoniana are regarded as significant sources of traditional medicines against headache, impotence, infertility, menstrual pain, nervous disorders, stroke and venereal diseases in South Africa (Hutchings et al., 1996; Wyk and Gericke, 2018). Based on their popularity as medicinal plants, these three species are included in the book "medicinal plants of South Africa," a monographic guide to the popular medicinal plants in the country, including their taxonomy, botanical description, primary medicinal uses, preparation and dosage, active phytochemical compounds and pharmacological effects (Wyk et al., 2013). Moreover, the bark and roots of B. lucens are traded as herbal medicines in informal herbal medicine markets in about two-thirds of South African provinces, that is, Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga, Northern Cape and Western Cape provinces (Williams et al., 2001; Dold and Cocks, 2002). Therefore, this review aims to provide an overview of the medicinal uses, phytochemistry and pharmacological properties of B. lucens, and a critical review of the therapeutic potential of the species.

RESULTS AND DISCUSSION

Medicinal uses of Bersama lucens

The bark and root infusion or decoction of B. lucens are mainly used as a blood purifier, lice repellent and protective charm, and traditional medicine for stomach problems, leprosy, stroke, sexually transmitted infections (including venereal diseases), headache, infertility, nervous disorders, impotence and menstrual pain (Table 1; Figure 1). Other minor medicinal uses of B. lucens supported by at least one literature report include the use of the bark and root infusion or decoction to boost immunity (Monakisi, 2007), and traditional medicine for hiccough (Simon and Lamla, 1991), meningitis (Monakisi, 2007),

MATERIALS AND METHODS

An extensive survey of literature related to the medicinal uses, phytochemistry and pharmacological properties of B. lucens was conducted using Science Direct, Pubmed, Google Scholar, Springer, Elsevier, NCBI, Taylor and Francis imprints, and review of books, journal articles and other scientific publications kept in the University library. The literature search was conducted using the following keywords: “Bersama lucens”, “medicinal uses of Bersama lucens”, “phytochemicals of Bersama lucens”, “biological activities of Bersama lucens”, “ethnobotany of Bersama lucens”, and various common names and synonyms of the species were also used as keywords to get additional information about the species.
Table 1: Medicinal uses of Bersama lucens

<table>
<thead>
<tr>
<th>Medicinal use</th>
<th>Parts used</th>
<th>Country</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood purifier</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(Cocks and Dold, 2006; Nzue, 2009)</td>
</tr>
<tr>
<td>Boost immunity</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(Monakisi, 2007)</td>
</tr>
<tr>
<td>Headache</td>
<td>Bark or root decoctions or tinctures taken orally</td>
<td>South Africa</td>
<td>(Pujol, 1990; Philander, 2011)</td>
</tr>
<tr>
<td>Hiccough</td>
<td>Bark infusion taken orally</td>
<td>South Africa</td>
<td>(Simon and Lamla, 1991)</td>
</tr>
<tr>
<td>Impotency</td>
<td>Bark infusion taken orally</td>
<td>Eswatini and South Africa</td>
<td>(Watt and Breyer-Brandwijk, 1962; Long, 2005)</td>
</tr>
<tr>
<td>Infertility</td>
<td>Bark infusion taken orally</td>
<td>South Africa</td>
<td>(Simon and Lamla, 1991; Dweck, 2007)</td>
</tr>
<tr>
<td>Leprosy</td>
<td>Bark infusion applied topically</td>
<td>South Africa</td>
<td>(Hutchings et al., 1996; Grace et al., 2003)</td>
</tr>
<tr>
<td>Lice repellant</td>
<td>Stem bark infusion applied topically</td>
<td>South Africa</td>
<td>(Buwa and van Staden, 2006; Bosch and Fresen, 2008)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(Monakisi, 2007)</td>
</tr>
<tr>
<td>Menstrual pain</td>
<td>Bark or root decoctions or tinctures taken orally</td>
<td>Eswatini and South Africa</td>
<td>(Hutchings and van Staden, 1994; Wyk and Gericke, 2018)</td>
</tr>
<tr>
<td>Nervous disorders</td>
<td>Bark or root decoctions or tinctures taken orally</td>
<td>Eswatini and South Africa</td>
<td>(Manana, 1968; Bosch and Fresen, 2008)</td>
</tr>
<tr>
<td>Pain</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(McGaw et al., 1997)</td>
</tr>
<tr>
<td>Protective charm</td>
<td>Bark</td>
<td>South Africa</td>
<td>(Philander, 2011; Schmidt et al., 2017)</td>
</tr>
<tr>
<td>Protective charm</td>
<td>Stem bark infusion taken orally</td>
<td>South Africa</td>
<td>(Bhat, 2013)</td>
</tr>
<tr>
<td>Skin problems</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(Bhat, 2013; Khumalo, 2018)</td>
</tr>
<tr>
<td>Stomach problems</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(Philander, 2011; Wyk et al, 2013)</td>
</tr>
<tr>
<td>Stroke</td>
<td>Bark or root decoctions or tinctures taken orally</td>
<td>South Africa</td>
<td>(Monakisi, 2007)</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Bark decoctions taken orally</td>
<td>South Africa</td>
<td>(Buwa and van Staden, 2006; Bosch and Fresen, 2008)</td>
</tr>
<tr>
<td>Sexually transmitted infections (including venereal diseases)</td>
<td>Stem bark infusion taken orally</td>
<td>South Africa</td>
<td>(Buwa and van Staden, 2006; Bosch and Fresen, 2008)</td>
</tr>
</tbody>
</table>
pain (McGaw et al., 1997), skin problems (Bhat, 2013) and tuberculosis (Monakisi, 2007).

Phytochemistry and pharmacological properties of Bersama lucens

The ethnomedical data about B. lucens is centred around its utilization as herbal medicine. However, there is very little information available concerning the phytochemistry and pharmacological properties of the crude extracts or compounds isolated from the species. (Pollard and Amuti, 1981) identified small amounts of fructose oligosaccharides from the stems of B. lucens. Research by (Cunningham, 2001) revealed that the bark of B. lucens contains high amounts of calcium oxalate crystals. (Koorbanally et al., 2008) identified triterpenoid compounds lup-30-al-3b-ol and lup-20-(30)-en-3,29-diol-7-one from the bark of B. lucens. (Wyk et al., 2013) argued that B. lucens should be used caution as herbal medicine as related species such as B. abyssinica are known to contain poisonous heart glycosides such as melianthugenin. Some of these phytochemical compounds may be responsible for the pharmacological properties of the species.

(Buwa, 2006; Buwa and van Staden, 2006) evaluated the antibacterial activities of water, ethyl acetate and ethanol extracts of B. lucens bark against Klebsiella pneumoniae ATCC 13883, Bacillus subtilis ATCC 6051, Staphylococcus aureus ATCC 12600 and Escherichia coli ATCC 11775 using the microplate method with neomycin as a positive control. The water and ethanol extracts exhibited activities against tested pathogens with minimum inhibitory concentration (MIC) values ranging from 3.1 mg/ml to >12.5 mg/ml (Buwa, 2006; Buwa and van Staden, 2006). (Khumalo, 2018) evaluated the antibacterial activities of dichloromethane and methanol extracts of B. lucens bark against Bacillus cereus ATCC 11175, Enterococcus faeacalis ATCC 29121, Escherichia coli ATCC 8739, Salmonella typhimurium ATCC 14028 and Shigella sonnei ATCC 9290 using the microtitre plate technique with ciprofloxacin as a positive control. The extracts exhibited activities against tested pathogens with MIC values ranging from 0.3 mg/ml to 2.0 mg/ml in comparison to MIC values of 0.02 μg/ml to 0.07 μg/ml exhibited by the positive control (Khumalo, 2018).

(Buwa, 2006; Buwa and van Staden, 2006) evaluated the antifungal activities of water, ethyl acetate and ethanol extracts of B. lucens bark against Candida albicans ATCC 10231 using the microplate method with neomycin as a positive control. The extracts exhibited activities against the tested pathogen with MIC values ranging from 0.78 mg/ml to 12.5 mg/ml (Buwa, 2006; Buwa and van Staden, 2006). (McGaw et al., 1997) evaluated the anti-inflammatory activities of the aqueous and ethanol leaf extracts of B. lucens by assessing the inhibition of prostaglandin biosynthesis using the cyclooxygenase assay with indomethacin (0.5 μg) as a positive control. The extracts exhibited suitable activities with percentage inhibition ranging from 71.0% to 80.0%, which were higher than 75.0% exhibited by the positive control (McGaw et al., 1997).

CONCLUSIONS

Since toxic heart glycosides such as melianthugenin have been isolated from closely related B. abyssinica, there is, therefore, need for detailed clinical and toxicological evaluations of crude extracts and compounds isolated from B. lucens. Therefore, the widespread use of B. lucens as herbal medicine in southern Africa suggest that the species is not taken at toxic dosages. Therefore, the use of B. lucens for the treatment of human diseases and ailments should be treated with caution and rigorous toxicological and clinical studies of different plant parts used as traditional medicine are necessary.

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Conflict Of Interest

The authors declare that they have no conflict of interest for this study.

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