Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2083
Review Article

Systematic review of the therapeutic potential of the hiccup-nut tree, Combretum bracteosum (Hochst.) Brandis.

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ABSTRACT

Background

Combretum bracteosum (Hochst.) Brandis is a free-standing and many-stemmed shrub or a small tree used in traditional medicine throughout its distributional range. The current study aimed at reviewing the medicinal uses and ethnopharmacological properties of C. bracteosum.

Methods

A systematic review of scientific literature on the therapeutic potential of C. bracteosum was conducted following the Preferred Reporting Items for systematic reviews and meta-analyses (PRISMA). The literature search was conducted using databases PubMed, Web of Science, ScienceDirect, Google Scholar, SpringerLink, Scopus, and SciELO, as well as pre-electronic literature sources such as book chapters, books, and other scientific publications obtained from the university library.

Results

Results from this systematic review revealed that C. bracteosum is used as traditional medicine against backache, convulsions, earache, epilepsy, fever, headache, hiccough, menstrual pains, rheumatism, toothache, and scalp infection in children. The phytochemical assessment of C. bracteosum showed that the species contains proanthocyanidin, gallotannin, anthocyanin, flavonol, flavonoids, phenolics, saponins, steroids, cardiac glycosides, and tannins. The crude extracts of C. bracteosum demonstrated antibacterial, antimycobacterial, antifungal, anti-inflammatory, antioxidant, and GABAA-benzodiazepine receptor binding activities.

Conclusion

This traditional ecological knowledge about C. bracteosum accumulated from the past to the present is extremely important and of great value in the assessment of the therapeutic potential and ethnopharmacological value of the species.

Recommendations

Future research on C. bracteosum should focus on detailed phytochemical, pharmacological, and toxicological evaluations of the crude extracts as well as phytochemical compounds isolated from the species.

Keywords: *Bush willow family, Combretaceae, Combretum bracteosum, materia medica, traditional medicine*
Submitted: *August 15, 2025* ***Accepted:*** *September 17, 2025* ***Published:*** *September 29, 2025*
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Introduction

Combretum bracteosum (Hochst.) Brandis is a free-standing and many-stemmed shrub or a small tree belonging to the Combretaceae family. The plant species is much-branched, growing to a height of 8 metres (Palgrave, 2002) with a tendency to climb or scramble onto other vegetation. Combretum bracteosum belongs to the section Poivrea (Comm. ex DC.) G.Don of the subgenus Combretum Loefling, a taxon of 31 species that have been recorded in Asia, Africa, and Madagascar (Stace, 1980; Maurin et al.,

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2010). Species belonging to this section are characterized by large and showy flowers with protruding stamens (Jordaan et al., 2011). Their petals are externally glabrous or pubescent, oblong-ovate to narrowly elliptic in shape (Wickens, 1973). Plant species belonging to this section often lack epidermal scales, their lateral veins and midrib having gland-tipped hairs and also hairy pockets in the axils of the veins below and translucent gland dots on the leaf blades (Jordaan et al., 2011). Combretum bracteosum differs from all other southern African species of Combretum in having a round and wingless fruit with four to five ridges (Maurin et al., 2010; Jordaan et al., 2011). Palgrave (2002) argued that these morphological characteristics, which differentiate C. bracteosum from other species of the Combretum genus, can be used in the future to place the species in a separate genus. Such a decision cannot be ruled out as accurate taxonomy and nomenclature are considered to be important in medicinal plant research for reproducibility and interpretation of ethnopharmacological research (Bennett and Balick, 2014; Bussmann, 2022; Soejarto et al., 2026). Rivera et al. (2014) argued that accurate scientific nomenclature for medicinal plants is necessary to minimize ambiguities and errors in ethnopharmacological and any other research that requires precise and appropriate use of scientific names for reference purposes. Therefore, a systematic review aimed at critically appraising and synthesizing all available evidence on the therapeutic potential of C. bracteosum was undertaken, as this assessment is important and of great value in ethnopharmacological research of the species.

Materials and Methods

Eligibility Criteria

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 medicinal uses and ethnopharmacological properties of C. bracteosum (Figure 1). The search covered publications from 1962 to 2025, a long period to capture literature on the medicinal uses and ethnopharmacological properties of C. bracteosum.

Information Sources

A comprehensive literature search was conducted using multiple scientific databases, including databases such as PubMed (https://pubmed. ncbi.nlm.nih.gov/), Web of Science (https://www.webofknowledge.com), ScienceDirect (https://www.sciencedirect.com/search), Google Scholar (https://scholar.google.com/), SciELO (https://search.scielo.org/), SpringerLink (https://link.springer.com/) and Scopus (http://www.scopus.com/), as well as pre-electronic literature sources such as book chapters, books and other scientific publications obtained from the university library. The search was conducted from February to July 2025.

Search Strategy

A systematic review of scientific literature on the therapeutic potential of C. bracteosum was conducted following the Preferred Reporting Items for systematic reviews and meta-analyses (PRISMA) guidelines (Page et al., 2021). The search was conducted using the string consisting of the following terms: ("medicinal plant" OR "botanical medicine" OR "phytomedicine" OR "phytochemical", OR "in vitro biological activities" OR "in vivo biological activities" OR "ethnobotany") AND ("knowledge" OR "indigenous" OR "culture" OR "traditional" OR "Combretum bracteosum"). This search string was designed to capture a broad range of literature related to botany, traditional and medicinal uses, traditional ecological knowledge, phytochemical, biological, and pharmacological properties of C. bracteosum.

Selection Process

The selection process was designed to include a wide range of scientific publications focusing on the medicinal uses and ethnopharmacological properties of C. bracteosum. In the selection process, no limitations were applied regarding the year, region, or country of publication, thus allowing for a comprehensive and unrestricted assessment of the scientific articles.

Data Collection Process

The majority of studies (n = 31; 81.6%) were case studies, while seven were review papers. A variety of sampling techniques were used, which included random and convenience sampling, such as purposive and snowball sampling. Criteria employed to select participants or respondents also varied across the studies. But the participants or respondents included traditional healers, herbalists, local leaders, farmers, hunters, plant gatherers, community members, extension officers, government and non-governmental representatives with interest and

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knowledge about plant resources, particularly C. bracteosum. About three-quarters of the articles relied on qualitative data (n = 29; 76.3%), while (n = 5; 13.2%) studies used quantitative data, and the remainder used both quantitative and qualitative data. Qualitative data were collected through face-to-face interviews, observations made during field work, focus group discussions, data generated through questionnaires, and published data analysis. Other studies were based on field studies, laboratory analysis of field data, and molecular analysis of biological samples. About a quarter of the studies employed thematic analysis, ecological and ethnobotanical indices such as the Jaccard index, informant consensus factor, use value, and relative importance index.

Data Items

This search string was designed to identify articles with the botanical description of C. bracteosum, its origin, and geographical distribution. This review also identified articles that provided medicinal uses of C. bracteosum, plant parts used, mode of administration, dosage, active ingredients, biological activities of crude extracts, and phytochemical compounds isolated from the species.

Study The Risk of Bias Assessment.

No specific tools were used in this study to assess the risk of bias in the included studies. But the risk of bias assessment was evaluated through various aspects, which included assessment of a study's research methodology, selection of research participants or respondents, and evaluation of the research findings. Such an assessment of the risk of bias in this study was aimed at identifying potential systematic errors that could distort the research findings.

Reporting Bias Assessment

One major limitation of this research was over-reliance on studies undertaken in Nigeria (n = 9; 23.7%), that is, Olukoya et al. (1993, Okafor et al. (2009), Erinoso and Aworinde (2012), Ekeke et al. (2013), Aworinde and Erinoso (2015), Ogunleye et al. (2020), Ajao et al. (2022), Ejidike et al. (2023), and Nwigwe and Nwoye (2023). But there are also reports from other countries such as Bangladesh (Uddin and Hassan, 2018; Uddin et al., 2023), Hawaii (Gordon and Gantz, 2008), New Zealand (Wilcox et al., 2004), and Zimbabwe (Maroyi, 2006).

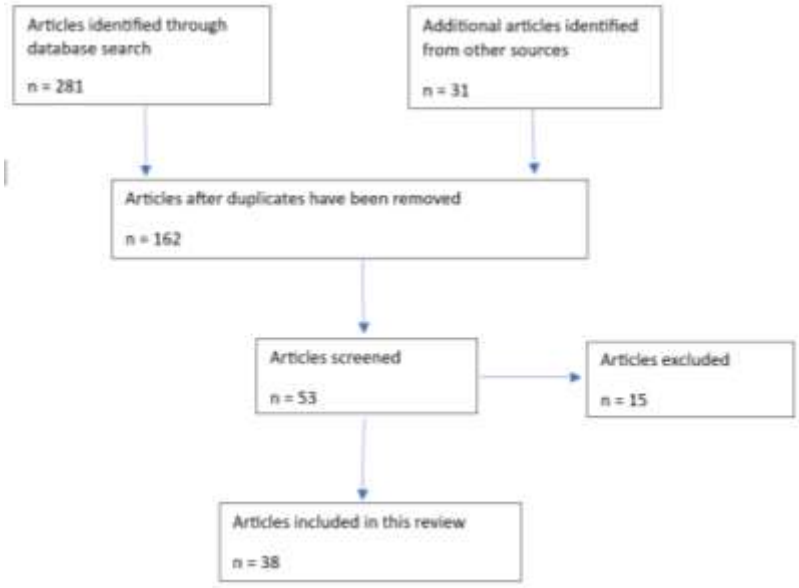

Figure 1: Flow Diagram Showing Identification and Screening of Articles Used in This Review.

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Results and Discussion

Analysis of Reviewed Studies

The present systematic review found a total of 38 publications published from 1962 to 2025 from a total of 412 screened publications, and the results are summarized in Table 1. The majority of the scientific publications are research articles (76.3%), which are followed by books (18.4%). Most studies were conducted in South Africa (60.5%), followed by Nigeria (28.9%) and Bangladesh (5.3%). In Figure 2, the review findings depict an increase in the number of publications on *C. bracteosum*. About three-quarters of the studies (n = 28; 73.7%) presented case studies, while ten articles were review papers (Arnold et al., 2002; Pearce, 2003; Aubrey, 2004; Wilcox et al., 2004; Singh et al., 2012; Patni et al., 2013; Nair, 2017; Ogunleye et al., 2020; Ejidike et al., 2023; Nwigwe and Nwoye, 2023). The article written by Eloff (2001) was excluded because its contents are similar to an earlier publication by the same author (Eloff, 1999). Similarly, Anokwuru et al. (2022) was excluded as the earlier publication (Anokwuru et al., 2021) has a detailed report on antibacterial activities of *C. bracteosum.* Other articles that have been excluded did not address medicinal uses of *C. bracteosum* or its ethnopharmacological properties, and such articles included Smith (1966), Johnson and Johnson (1993), Pooley (1993), Henning and Henning (1997), Joffe (2001), and Manning (2001).

Figure 2: A Detailed List of Publications on Combretum Bracteosum

Table 1: Information About Retrieved Publications on Combretum Bracteosum

Data category	Outcome
Timespan	1962 to 2025
Publication categories	
Number of articles	29 (76.3%)
Number of books	7 (18.4%)
Number of online publications	1 (2.6%)
Number of theses	1 (2.6%)
Geographical focus of the study	
South Africa	23 (60.5%)
Nigeria	11 (28.9%)
Bangladesh	2 (5.3%)
Hawaii	1 (2.6%)
New Zealand	1 (2.6%)
Zimbabwe	1 (2.6%)

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Table 2: List of Studies Used in This Review

Article/Publication	Information about *C. bracteosum*	Details of medicinal uses of *C. bracteosum*	Details of the phytochemistry of *C. bracteosum*	Details of the biological activities of *C. bracteosum*
1. Ahmed et al., 2014	Yes	Yes	Yes	Yes
2. Ajao et al., 2022	Yes	Yes	No	No
3. Anokwuru et al., 2021	Yes	No	No	Yes
4. Arnold et al., 2002	Yes	No	No	No
5. Aubrey, 2004	Yes	Yes	No	No
6. Aworinde and Erinoso, 2015	Yes	Yes	No	No
7. Bredenkamp, 2019	Yes	No	No	No
8. Dalling and Van Staden, 1999	Yes	No	No	No
9. Ejidike et al., 2023	Yes	Yes	No	No
10. Ekeke et al., 2013	Yes	No	No	No
11. Eloff, 1999	Yes	No	No	Yes
12. Erinoso and Aworinde, 2012	Yes	Yes	No	No
13. Germishuizen and Meyer, 2003	Yes	No	No	No
14. Gordon and Gantz, 2008	Yes	No	No	No
15. Grimsey et al., 2024	Yes	Yes	Yes	Yes
16. Jäger and Van Staden, 2005	Yes	Yes	No	No
17. Jordaan et al., 2011	Yes	No	No	No
18. Koen, 2001	Yes	Yes	No	No
19. Kok et al., 2025	Yes	No	No	Yes
20. Maroyi, 2006	Yes	No	No	No
21. Masoko et al. 2007	Yes	No	Yes	Yes
22. Mathipa et al., 2022	Yes	No	Yes	Yes
23. McGaw et al., 2001	Yes	Yes	No	Yes
24. Nair, 2017	Yes	No	No	No
25. Nwigwe and Nwoye, 2023	Yes	No	No	No
26. Ogunleye et al., 2020	Yes	No	No	No
27. Okafor et al., 2009	Yes	No	No	No
28. Olukoya et al., 1993	Yes	No	No	Yes
29. Palgrave, 1983	Yes	Yes	No	No
30. Palmer and Pitman, 1972	Yes	Yes	No	No
31. Patni et al., 2013	Yes	No	No	No
32. Pearce, 2003	Yes	Yes	No	No
33. Risa et al., 2004	Yes	Yes	No	Yes
34. Singh et al., 2012	Yes	No	No	No
35. Uddin and Hassan, 2018	Yes	No	No	No
36. Uddin et al., 2023	Yes	No	No	No
37. Watt and Breyer-Brandwijk, 1962	Yes	Yes	No	No
38. Wilcox et al., 2004	Yes	No	No	No

Description and Distribution of Combretum Bracteosum

The genus name "*Combretum*" is associated with the Roman naval and army commander, and also natural philosopher and naturalist, Gaius Plinius Secundus (23 – 79 AD), known in English as Pliny (Palmer and Pitman, 1972; Venter and Venter, 2015; Schmidt et al., 2017). The name "*Combretum*" was adopted by the Swedish botanist Pehr Löfling (31 January 1729 – 22 February 1756) and used in reference to about 276 species belonging to this genus (Stace, 2002,

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2007; Jordaan et al., 2011; Boon et al., 2020). The genus *Combretum* has a pantropical distribution and has been recorded in tropical Africa and Asia, but is absent in the Pacific Islands and most of Australia, with its centre of diversity on the African continent (Gere et al., 2015). The specific name "*bracteosum*" means "having conspicuous or numerous bracts" in reference to the large bracts or leaflike growths at the base of the calyx (Palmer and Pitman, 1972). The synonyms associated with the name *C. bracteosum* include *Codonocroton triphyllum* E.Mey. Ex Engl. & Diels and *Poivrea bracteosa* Hochst. (Palmer and Pitman, 1972). There is confusion regarding the origins of the common names "hiccough creeper", "hiccough nut" or "hiccup nut", with some researchers arguing that eating roasted nuts of *C. bracteosum* result in hiccups (Watt and Breyer-Brandwijk, 1962; Palmer and Pitman, 1972) while others argue that the nuts are used to treat and manage hiccups (Palgrave, 2002). *Combretum bracteosum* is a coppicing shrub or a small tree with a tendency to scramble, growing to 8 metres in height (Palmer and Pitman, 1972; Bredenkamp, 2019). The bark is light brownish grey in colour, smooth, with long, slender vegetative branches that cling onto the surrounding vegetation. The branches of *C. bracteosum* are smooth, usually spineless but sometimes sparingly armed with petiolar spines. The leaves are simple, hairless, opposite, nearly opposite, alternate, or occur in whorls, elliptic to obovate in shape, dull green above in colour and lighter below, sharply pointed or with a short blunt point, the base narrowed or rounded, the margins untoothed and sometimes inrolled below. The lateral and netted veins of the leaves are visible on both sides of the leaves, raised below, the surface smooth except for tiny tufts of hairs in the axils of the veins on the under-surface. The flowers are deep orange to bright red in colour, borne in short, dense, and congested racemes in the axils of the leaves and at the ends of the branches in September to October. *Combretum bracteosum* has petioles that persist as a recurved woody spine or hook. The fruit is oval, round, or egg-shaped and smooth, appearing from December to April (Palmer and Pitman, 1972). *Combretum bracteosum* is endemic to South Africa, recorded on sandy soils near the sea in the coastal forests, dune forest, evergreen forest, forest margins, woodland, river mouths, and stream banks in frost free areas with high annual rainfall at an altitude ranging from sea level to 1220 metres above sea level (Germishuizen and Meyer, 2003; Bredenkamp, 2019). *Combretum bracteosum* has also been introduced as an ornamental tree into other countries such as Bangladesh (Uddin and Hassan, 2018; Uddin et al., 2023), Hawaii (Gordon and Gantz, 2008), New Zealand (Wilcox et al., 2004), Nigeria (Ajao et al., 2022), and Zimbabwe (Maroyi, 2006). The species is now naturalized in Nigeria (Ekeke et al., 2013) and Bangladesh, where it has been recorded as rare in Achalong Reserve Forest, Matiranga, Khagrahhari in Bangladesh (Uddin and Hassan, 2018). *Combretum bracteosum* is cultivated in the Auckland Domain as an ornamental climber (Wilcox et al., 2004). *Combretum bracteosum* is a host plant for the *Coeliades forestan* var. *forestan*, common name "striped policeman" butterfly, which has a very strikingly marked caterpillar, which is yellowish white in colour with dark brown to black stripes and an orange head (Aubrey, 2004).

Traditional Uses of Combretum Bracteosum

The roasted nuts of *C. bracteosum* are edible (Aubrey, 2004), and the species is an important medicinal plant in South Africa (Watt and Breyer-Brandwijk, 1962; Arnold et al., 2002) (Table 3). Literature records show that *C. bracteosum* is important to local communities for several reasons, including as an important source of traditional medicines since at least the 1800s (Palmer and Pitman, 1972; Palgrave, 2002). The leaves and roots of *C. bracteosum* are sold as a source of traditional medicines in informal herbal medicine markets in Lagos, Nigeria (Olukoya et al., 1993). The main medicinal applications of the bark, leaf, and root decoction of *C. bracteosum,* which are supported by at least two references, include the use of the species as traditional medicine against backache, convulsions, earache, epilepsy, fever, headache, hiccough, menstrual pains, rheumatism, toothache, and scalp infection in children (Table 3).

Combretum bracteosum is popular and handsome when in flower and, therefore, the species is planted as an ornamental and shade tree (Aubrey, 2004). Given the visual appeal and aesthetic attractiveness of *C. bracteosum,* stem cutting is a more viable and simpler alternative to seed germination for commercial propagation of the species (Dalling and Van Staden, 1999). These authors also argued that the horticultural potential of the species will be realized if its size is also reduced to a smaller garden or pot plant.

The extracts of *C. bracteosum* leaves appear to inhibit the corrosion of mild steel and, therefore, the extracts of the species can be used in chemical cleaning and pickling processes (Okafor et al., 2009; Singh et al., 2012; Patni et al., 2013; Nair, 2017; Ogunleye et al., 2020). Plants are valuable sources of naturally occurring phytochemical compounds, which are important green corrosion inhibitors

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for metals and alloys under different environments, and such plant extracts are environmentally acceptable, renewable, inexpensive, and readily available (Patni et al., 2013; Ogunleye et al., 2020; Nwigwe and Nwoye, 2023).

Table 3: Medicinal Uses of Combretum Bracteosum

Medicinal use	Parts used	Reference
Backache	Leaf decoction taken orally	McGaw et al., 2001; Jäger and Van Staden, 2005; Ejidike et al., 2023
Bilharzia	Root bark decoction taken orally	Koen, 2001
Colds	Leaves burnt and smoke inhaled, or flower infusion taken orally	Koen, 2001
Cough	Leaves burnt and smoke inhaled, or flower infusion taken orally	Koen, 2001
Diarrhoea	Root decoction taken orally	Koen, 2001
Earache	Leaf decoction applied topically	McGaw et al., 2001; Jäger and Van Staden, 2005; Ejidike et al., 2023
Epilepsy and convulsions	Leaves and roots	Risa et al., 2004; Ahmed et al., 2014
Fever	Leaf decoction taken orally	McGaw et al., 2001; Jäger and Van Staden, 2005; Ejidike et al., 2023
Headache	Leaf decoction taken orally	McGaw et al., 2001; Jäger and Van Staden, 2005; Ejidike et al., 2023
Hiccough, hiccup, or singultus	Seeds taken orally	Watt and Breyer-Brandwijk, 1962; Palmer and Pitman, 1972; Palgrave, 2002; Pearce, 2003; Aubrey, 2004
Menstrual pains	Leaf decoction taken orally	McGaw et al., 2001; Jäger and Van Staden, 2005; Ejidike et al., 2023
Rheumatism	Leaf decoction applied topically	Erinoso and Aworinde, 2012; Ajao et al., 2022
Scalp infection in children	Leaf or root decoction applied topically	Aworinde and Erinoso, 2015; Ajao et al., 2022
Toothache	Leaf decoction applied topically	McGaw et al., 2001; Jäger and Van Staden, 2005; Ejidike et al., 2023

Phytochemistry and Pharmacological Properties of Combretum Bracteosum

Qualitative and quantitative phytochemical analyses of *C. bracteosum* leaves and roots revealed the presence of proanthocyanidin, gallotannin, anthocyanin, flavonol, flavonoids, phenolics, saponins, steroids, cardiac glycosides, and tannins (Ahmed et al., 2014; Mathipa et al., 2022; Grimsey et al., 2024) (Table 4). *Combretum bracteosum* is a good source of proteins, energy, minerals such as calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium, and zinc (Table 4). The protein content of 5.0% to 13.0% exhibited by *C. bracteosum* implies that the browse value of the species is higher than that of other *Combretum* species, such as *C. imberbe*, which have leaves and twigs containing only 4.0% protein (Maroyi, 2025). Although no digestibility value of the leaves, branches, twigs, or fruits of *C. bracteosum* to livestock or game could be found in the literature, the species is a potential forage for ruminants as it is an important source of micro and macro elements, as well as classical nutrients such as proteins and energy (Geng et al., 2020). *Combretum bracteosum* leaves and seeds extracts exhibited antibacterial, antimycobacterial, antifungal, anti-inflammatory, antioxidant, and GABAA-benzodiazepine receptor binding activities, and therefore, support some of its traditional medicinal uses.

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Table 4: Phytochemical, Proximate, Mineral, and Trace Metals Composition of Leaves And Stems of Combretum Bracteosum

Phytochemical/proximate/mineral	Value	Plant part	Reference
Ash (%)	3.0 – 5.0	Leaves and stems	Mathipa et al., 2022
Borneol	-	Leaves	Grimsey et al., 2024
Calcium (mg/mL)	80.0 - 283.0	Leaves and stems	Mathipa et al., 2022
Camphor	-	Leaves	Grimsey et al., 2024
Cineole	-	Leaves	Grimsey et al., 2024
Cobalt (mg/mL)	0.5 - 1.5	Leaves and stems	Mathipa et al., 2022
Copper (ppm)	0.5 - 0.6	Leaves and stems	Mathipa et al., 2022
Energy (kj)	15.0 – 17.0	Leaves and stems	Mathipa et al., 2022
Iron (ppm)	1.5 - 3.2	Leaves and stems	Mathipa et al., 2022
Isomenthol	-	Leaves	Grimsey et al., 2024
Isomyocorene	-	Leaves	Grimsey et al., 2024
Limonene	-	Leaves	Grimsey et al., 2024
Magnesium (g/kg dry matter	11.0 - 28.7	Leaves and stems	Mathipa et al., 2022
Manganese (mg/mL)	0.8 - 1.4	Leaves and stems	Mathipa et al., 2022
Moisture (%)	6.0 - 7.0	Leaves	Mathipa et al., 2022
Nickel (mg/mL)	1.6 – 2.9	Leaves and stems	Mathipa et al., 2022
Potassium (g/kg dry matter	28.0 - 63.4	Leaves and stems	Mathipa et al., 2022
Protein (%)	5.0 – 13.0	Leaves and stems	Mathipa et al., 2022
Sodium (mg/mL)	12.5 - 14.0	Leaves and stems	Mathipa et al., 2022
Terpineol	-	Leaves	Grimsey et al., 2024
Zinc (ppm)	0.5 - 1.0	Leaves and stems	Mathipa et al., 2022

Antibacterial Activities

Olukoya et al. (1993) evaluated the antibacterial activities of ethanol and water extracts of *C. bracteosum* leaves against *Klebsiella pneumoniae, Corynebacterium diphtheriae,* and *Bacteroides fragilis* using the agar diffusion method. The extracts demonstrated weak activities against the tested pathogens, exhibiting 5.0 mm to 9.0 mm diameter zone of inhibition (Olukoya et al., 1993). Eloff (1999) evaluated the antibacterial activities of acetone extracts of *C. bracteosum* leaves against *Escherichia coli, Staphylococcus aureus, Enterococcus faecalis*, and *Pseudomonas aeruginosa* using the twofold serial dilution with gentamycin as a positive control. The extracts demonstrated activities against the tested pathogens, exhibiting the minimum inhibitory concentration (MIC) values ranging from 0.8 mg/ml to 3.0 mg/ml (Eloff, 1999). Ahmed et al. (2014) evaluated the antibacterial activities of water, dichloromethane, butanol, and ethyl acetate extracts of *C. bracteosum* leaves against *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa*, and *Enterococcus faecalis* using the microdilution method with gentamicin as a positive control. The extracts demonstrated activities against the tested pathogens exhibiting MIC values ranging from 39.0 µg/ml to 625.0 µg/ml (Ahmed et al., 2014). Anokwuru et al. (2021) evaluated the antibacterial activities of the methanol extract of *C. bracteosum* leaves against *Staphylococcus aureus, Staphylococcus epidermidis, Bacillus cereus, Klebsiella pneumoniae, Enterococcus faecalis, Pseudomonas aeruginosa, Escherichia coli, Salmonella typhimurium*, and *Shigella sonnei* using the microdilution assay with ciprofloxacin as a positive control. The extracts demonstrated activities against the tested pathogens, exhibiting MIC values ranging from 0.5 mg/ml to 3.0 mg/ml (Anokwuru et al., 2021). Grimsey et al. (2024) evaluated the antibacterial activities of the methanol extract of *C. bracteosum* leaves against *Staphylococcus aureus, Klebsiella pneumoniae*, and *Escherichia coli* using the broth microdilution assay with ciprofloxacin, ampicillin, gentamycin, oxacillin, and methicillin as positive controls. The extracts demonstrated activities against the tested pathogens, exhibiting MIC values ranging from 500.0 µg/ml to 2000.0 µg/ml (Grimsey et al., 2024).

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https://doi.org/10.51168/sjhrafrica.v6i9.2083
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Antimycobacterial Activities

Kok et al. (2025) evaluated the antimycobacterial activities of ethanol extracts of *C. bracteosum* seeds against Mycobacterium tuberculosis using the microdilution method with isoniazid as a positive control. The extract demonstrated activities against the tested pathogen, exhibiting an MIC value of 1000.0 µg/ml (Kok et al., 2025)

Antifungal Activities

Masoko et al. (2007) evaluated the antifungal activities of hexane, acetone, methanol, and dichloromethane extracts of *C. bracteosum* leaves against *Candida albicans, Aspergillus fumigatus, Cryptococcus neoformans, Sporothrix schenckii*, and *Microsporum canis* using the microdilution assay with amphotericin B as a positive control. The extracts demonstrated activities against the tested pathogens exhibiting MIC values ranging from 0.02 mg/ml to 2.5 mg/ml (Masoko et al. 2007). Ahmed et al. (2014) evaluated the antifungal activities of water, dichloromethane, butanol, and ethyl acetate extracts of *C. bracteosum* leaves against *Candida albicans, Aspergillus fumigatus*, and *Cryptococcus neoformans* using the microdilution method with amphotericin B as a positive control. The extracts demonstrated activities against the tested pathogens exhibiting MIC values ranging from 19.0 µg/ml to 1250.0 µg/ml (Ahmed et al., 2014).

Anti-Inflammatory Activities

McGaw et al. (2001) evaluated the anti-inflammatory activities of acetone, water, and ethyl acetate extracts of *C. bracteosum* leaves in an *in vitro* assay for cyclooxygenase inhibitors with indomethacin as a positive control. The extracts demonstrated activities by showing inhibition ranging from 53.0% to 100.0% (McGaw et al., 2001). Ahmed et al. (2014) evaluated the anti-inflammatory activities of the crude extracts of *C. bracteosum* leaves by determining the inhibition of 15-lipoxygenase (15-LOX) using soybean lipoxygenase type 1-B. The extract demonstrated lipoxygenase inhibitory capacity by exhibiting a median lethal concentration (LC50) value of 24.5 µg/ml (Ahmed et al., 2014).

Antioxidant Activities

Ahmed et al. (2014) evaluated the antioxidant activities of water, dichloromethane, butanol, and ethyl acetate extracts of *C. bracteosum* leaves using the ferric reducing antioxidant power (FRAP), 2,2'-azino-bis (3-ethylbenzothiazoline)-6-sulphonic acid (ABTS), and 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging methods with trolox and ascorbic acid as positive controls. The extracts demonstrated ferric reducing antioxidant power activities and exhibited half maximal effective concentration (EC50) values which ranged from 5.7 µg/ml to 85.0 µg/ml for ABTS and DPPH (Ahmed et al., 2014). Mathipa et al. (2022) evaluated the antioxidant activities of a 70% acetone extract of *C. bracteosum* leaves using the DPPH free radical scavenging assay with ascorbic acid as a positive control. The extract exhibited dose-dependent activities with scavenging activities ranging from 60.0% to 85.0% (Mathipa et al., 2022). Kok et al. (2025) evaluated the antioxidant activities of ethanol extracts of *C. bracteosum* seeds using the DPPH free radical scavenging assay with ascorbic acid as a positive control. The extract demonstrated activities exhibiting a half-maximal inhibitory concentration (IC50) value of 245.2 µg/ml (Kok et al., 2025).

GABAA-Benzodiazepine Receptor Binding Activities

Risa et al. (2004) evaluated the GABAA-benzodiazepine receptor binding activities of water and ethanol extracts of *C. bracteosum* leaves and roots using the GABAA-benzodiazepine receptor binding assay. The extracts demonstrated dose-dependent activities (Risa et al., 2004).

Conclusion

Assessment of the literature has illustrated the medicinal value, phytochemical, and biological activities of *C. bracteosum*. While the species has a long history of human association and use, it has not received wide acknowledgment for its various medicinal uses. *Combretum bracteosum* has great potential as a medicinal plant characterized by several ethnomedicinal applications and ethnopharmacological properties. To realize the full potential of *C. bracteosum*, future studies should explore additional active phytochemical compounds using various *in vitro* and *in vivo* models.

Limitations

Identification and access to relevant literature focusing on the botany, medicinal uses, and ethnopharmacological properties of *C. bracteosum* were a major challenge. This is partly due to the restricted geographical distribution of the species. Literature assessed in this investigation was that published solely in English, without considering other

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2083
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scientific articles written in other internationally recognized languages.

Recommendation

The current study provides a summary of the medicinal uses and ethnopharmacological properties of *C. bracteosum.* However, there is a need for detailed studies focusing on phytochemical and pharmacological properties, toxicity and safety, mechanisms of action *in vivo*, and clinical research of the species aimed at corroborating the ethnomedicinal applications of *C. bracteosum.*

Acknowledgments

The author would like to thank the Reviewers for their helpful comments and feedback.

Source Of Funding

University of Fort Hare

Author Contributions

I am solely responsible for the conception and design of the research work, data collection, analysis, interpretation of the data, and writing of the manuscript.

Registration and Protocol

The review was not registered, and a protocol was not prepared.

Competing Interests

The author declares no competing interests

List Of Abbreviations

15-LOX = 15-lipoxygenase
ABTS = 2,2'-azino-bis (3-ethylbenzothiazoline)-6-sulphonic acid
DPPH = 2,2-diphenyl-1-picrylhydrazyl
EC50 = half maximal effective concentration
FRAP = ferric reducing antioxidant power
IC50 = half maximal inhibitory concentration
LC50 = median lethal concentration
MIC - minimum inhibition concentration
PRISMA = preferred reporting items for systematic reviews and meta-analyses

Availability of Data, Code, and Other Materials

All data generated or analyzed during this study are included in this article.

Author Biography

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References

1. Ahmed, A.S., McGaw, L.J., Elgorashi, E.E., Naidoo, V., and Eloff, J.N. (2014). Polarity of extracts and fractions of four *Combretum* (Combretaceae) species used to treat infections and gastrointestinal disorders in southern African traditional medicine has a major effect on different relevant *in vitro* activities. Journal of Ethnopharmacology,154, 339–350. http://dx.doi.org/10.1016/j.jep.2014.03.030
2. Ajao, A.A.-N., Mukaila, Y.O. and, Sabiu, S. (2022). Wandering through southwestern Nigeria: An inventory of Yoruba useful angiosperm plants. Heliyon, 8, e08668. https://doi.org/10.1016/j.heliyon.2021.e08668
3. Anokwuru, C.P., Sandasi, M., Chen, W., Van Vuuren, S., Elisha, I.L., Combrinck, S. and, Viljoen, A.M. (2021). Investigating antimicrobial compounds in South African Combretaceae species using a biochemometric approach. Journal of Ethnopharmacology, 269, 113681. https://doi.org/10.1016/j.jep.2020.113681
4. Anokwuru, C.P., Chen, W., Van Vuuren, S., Combrinck, S. and, Viljoen, A.M. (2022). Bioautography-guided HPTLC–MS as a rapid hyphenated technique for the identification of antimicrobial compounds from selected South African Combretaceae species. Phytochemical Analysis, 33(8):1177-1189. https://doi.org/10.1002/pca.3167
5. Arnold, T.H., Prentice, C.A., Hawker, L.C., Snyman, E.E., Tomalin, M., Crouch, N.R., and Pottas-Bircher, C. (2002). Medicinal and magical plants of southern Africa: An annotated checklist. National Botanical Institute, Strelitzia 13, Pretoria.

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2083
Review Article

6. Aubrey, A. (2004). *Combretum bracteosum* (Hochst.) Brandis. Walter Sisulu National Botanical Garden. Available from: https://pza.sanbi.org/combretum-bracteosum, accessed on 12 April 2025
7. Aworinde, D.O. and Erinoso, S.M. (2015). Ethnobotanical investigation of indigenous plants used in the management of some infant illnesses in Ibadan, southwestern Nigeria. African Journal of Traditional Complementary and Alternative Medicine, 12(1), 9–16. http://dx.doi.org/10.4314/ajtcam.v12i1.2
8. Bennett, B.C. and Balick, M.J. (2014). Does the name really matter? The importance of botanical nomenclature and plant taxonomy in biomedical research. Journal of Ethnopharmacology, 152, 387–392. http://dx.doi.org/10.1016/j.jep.2013.11.042
9. Boon, R.G.C., Jordaan, M. and, Van Wyk, A.E. (2020). A new species of *Combretum* sect. Ciliatipetala (Combretaceae) from South Africa. Phytotaxa, 434(1), 1-12. https://doi.org/10.11646/phytotaxa.434.1.1
10. Bredenkamp, C.L. (2019). A flora of the Eastern Cape province, volume 1. Strelitzia 41, South African National Biodiversity Institute, Pretoria
11. Bussmann, R.W. (2022). Taxonomy: An irreplaceable tool for validation of herbal medicine revisited. In: Mukherjee, P.K. (Editor.), Evidence-based validation of herbal medicine. Elsevier, Amsterdam, pp. 149–183
12. Dalling, K.J. and, Van Staden, J. (1999). Germination requirements of *Combretum bracteosum* seeds. South African Journal of Botany, 65, 83-85. https://doi.org/10.1016/S0254-6299(15)30943-1
13. Ejidike, I.P., Mtunzi, F.M., Ledwaba, I., Phele, M.J., Ejidike, O.M., Ogunleye, O., Ata, A., and Eze, M.O. (2023). *Combretum* species around Africa as alternative medicine: Ethnopharmacological and ethnobotanical importance. Journal of Applied Pharmaceutical Science,13(8), 12-29. https://doi.org/10.7324/JAPS.2023.20644
14. Ekeke, C., Agbagwa, I.O. and, Okoli, B.E. (2013). Mitotic studies on *Combretum* Loefl. from Nigeria. American Journal of Plant Sciences, 4, 508-511. http://dx.doi.org/10.4236/ajps.2013.43064
15. Eloff, J.N. (1999). The antibacterial activity of 27 Southern African members of the Combretaceae. South African Journal of Science, 95, 148–152
16. Eloff, J.N., Jäger, A.K., and Van Staden, J. (2001). The stability and relationship between anti-inflammatory activity and antibacterial properties of southern African *Combretum* species. South African Journal of Science 97, 291–293.
17. Erinoso, S.M. and Aworinde, D.O. (2012). Ethnobotanical survey of some medicinal plants used in traditional health care in Abeokuta areas of Ogun State, Nigeria. African Journal of Pharmacy and Pharmacology, 6(18), 1352–1362. http://dx.doi.org/10.5897/AJPP12.127
18. Geng, Y., Ranjitkar, S., Yan, Q., He, Z., Su, B., Gao, S., Niu, J., Bu, D., and Xu, J. (2020). Nutrient value of wild fodder species and the implications for improving the diet of mithun (*Bos frontalis*) in Dulongjiang area, Yunnan province, China. Plant Diversity, 2020, 42(6), 455-63. https://doi.org/10.1016/j.pld.2020.09.007
19. Gere, J., Yessoufou, K., Daru, B.H., Maurin, O., and Van Der Bank, M. (2015). The African continent is a likely origin of the family Combretaceae (Myrtales). A biogeographical view. Annual Research and Review in Biology, 8, 1–20. https://doi.org/10.9734/ARRB/2015/17476
20. Germishuizen, G. and, Meyer, N.L. (2003). Plants of southern Africa: An annotated checklist. Strelitzia 14, National Botanical Institute, Pretoria
21. Gordon, D.R. and Gantz, C.A. (2008). Potential impacts on the horticultural industry of screening new plants for invasiveness. Conservation Letters, 1, 227-235
22. Grimsey, L., Van Vuuren, S.F., Wright, M.H., and Cock, I.E. (2024). Selected South African *Combretum* spp. Extracts inhibit methicillin-resistant *Staphylococcus aureus* and ESBL strains of *Escherichia coli* and *Klebsiella pneumoniae*. South African Journal of Botany,

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2083
Review Article

165, 49-58. https://doi.org/10.1016/j.sajb.2023.12.018

23. Henning, G.A. and Henning, S.F. (1997). Living butterflies of southern Africa. Umdaus Press, Pretoria.
24. Jäger, A. and, Van Staden, J. (2005). Cyclooxygenase inhibitory activity of South African plants used against inflammation. Phytochemistry Reviews, 4, 39–46. https://doi.org/10.1007/s11101-004-5570-7
25. Joffe, P. (2001). Creative gardening with indigenous plants: A South African guide. Briza Publications, Pretoria.
26. Johnson, D. and Johnson, S. (1993). Gardening with indigenous trees and shrubs. Southern Books, Halfway House, Johannesburg.
27. Jordaan, M., Van Wyk, A.E. and, Maurin, O. (2011). A conspectus of *Combretum* (Combretaceae) in southern Africa, with taxonomic and nomenclatural notes on species and sections. Bothalia, 41(1), 135–160. https://doi.org/10.4102/abc.v41i1.36
28. Koen, K.J. (2001). Cultivation of *Combretum bracteosum* (Hochst.) Brandis. PhD Thesis, University of Natal, Pietermaritzburg
29. Kok, A.-M., Meyer, D., and Lall, N. (2025). Adjuvant properties of selected medicinal plants for tuberculosis treatment. South African Journal of Botany, 177, 555-560. https://doi.org/10.1016/j.sajb.2024.12.028
30. Manning, J., Batten, A., and Bokelmann, H. (2001). Eastern Cape South African wild flower guide 11. The Botanical Society of South Africa, Cape Town.
31. Maroyi, A. (2006). A preliminary checklist of naturalized and introduced plants in Zimbabwe. Kirkia, 18, 177-247
32. Maroyi, A. (2025). The leadwood tree (*Combretum imberbe* Wawra, family Combretaceae): Medicinal uses and ethnopharmacological properties. Ethnobotany Research and Applications, 30, 50. http://dx.doi.org/10.32859/era.30.50.1-14
33. Masoko, P., Picard, J., and Eloff, J.N. (2007). The antifungal activity of twenty-four southern African *Combretum* species (Combretaceae). South African Journal of Botany, 73, 173–183. https://doi.org/10.1016/j.sajb.2006.09.010
34. Mathipa, M.M., Mphosi, M.S., and Masoko, P. (2022). Phytochemical profile, antioxidant potential, proximate and trace elements composition of leaves, stems, and ashes from 12 *Combretum* spp. Used as food additives. International Journal of Plant Biology, 13, 561–578. https://doi.org/ 10.3390/ijpb13040045
35. Maurin, O., Chase, M.W., Jordaan, M. and, Van Der Bank, M. (2010). Phylogenetic relationships of Combretaceae inferred from nuclear and plastid DNA sequence data: Implications for generic classification. Botanical Journal of the Linnean Society, 162, 453-476. https://doi.org/10.1111/j.1095-8339.2010.01027.x
36. McGaw, L.J., Rabe, T., Sparg, S.G., Jäger, A.K., Eloff, J.N., and Van Staden, J. (2001). An investigation into the biological activity of *Combretum* species. Journal of Ethnopharmacology, 75, 45–50. https://doi.org/10.1016/S0378-8741(00)00405-0
37. Nair, R.N. (2017). Green corrosion inhibitors for mild steel in acidic medium. International Journal of Modern Trends in Engineering and Research, 4(12), 2016-2021. https://doi.org/10.21884/IJMTER.2017.4405.OQRS0
38. Nwigwe, U.S., and Nwoye, C.I. (2023). The efficacy of plant inhibitors as used against structural mild steel corrosion: A review. Portugaliae Electrochimica Acta, 40, 381-395. https://doi.org/10.4152/pea.2023410505
39. Ogunleye, O.O., Arinkoola, A.O., Alagbe, S.O., Agbede, O.O., Omodele, A.E., Morakinyo, A.F., and Osho, Y.A. (2020). Synthesis of green corrosion inhibitor for mild steel in an acidic environment. Indian Chemical Engineer, 62(1), 52-66. https://doi.org/10.1080/00194506.2019.1625815
40. Okafor, P.C., Uwah, I.E., Ekerenam, O.O. and, Ekpe, U.J. (2009). *Combretum bracteosum* extracts as an eco-friendly corrosion inhibitor for mild steel in acidic medium. Pigment and Resin Technology, 38(4), 236–241. http://dx.doi.org/10.1108/03699420910973323

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2083
Review Article

41. Olukoya, D.K., Idika, N., and Odugbemi, T. (1993). Antibacterial activity of some medicinal plants from Nigeria. Journal of Ethnopharmacology, 39, 69–72. https://doi.org/10.1016/0378-8741(93)90051-6
42. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T., Mulrow, C., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L.A., Stewart, L.A., Thomas, J., Tricco, A.C., Welch, V.A., Whiting. P. and Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. British Medical Journal, 372, 71. https://doi.org/10.1136/bmj.n71
43. Palgrave, C.K. (2002). Coates Palgrave trees of southern Africa. C Struik Publishers, Cape Town
44. Palmer, E. and Pitman, N. (1972). Trees of southern Africa: Covering all known indigenous species in the Republic of South Africa, South-West Africa, Botswana, Lesotho, and Swaziland. Balkema, Cape Town.
45. Patni, N., Agarwal, S., and Shah, P. (2013). Greener approach towards corrosion inhibition. Chinese Journal of Engineering, Volume 2013, Article ID 784186. http://dx.doi.org/10.1155/2013/784186
46. Pearce, J.M.S. (2003). A note on hiccups. Journal of Neurology, Neurosurgery and Psychiatry, 74, 1070. https://doi.org/10.1136/jnnp.74.8.1070
47. Pooley, E. (1993). The complete field guide to trees of Natal, Zululand and Transkei. Natal Flora Publications Trust, Durban.
48. Rivera, D., Allkin, R., Obón, C., Alcaraz, F., Verpoorte, R. y Heinrich, M. (2014). What is in a name? The need for accurate scientific nomenclature for plants. Journal of Ethnopharmacology, 152, 393–402. http://dx.doi.org/10.1016/j.jep.2013.12.022
49. Risa, J., Risa, A., Adersen, A., Gauguin, B., Stafford, G.I., Van Staden, J. and Jäger, A.K. (2004). Screening of plants used in South Africa for epilepsy and convulsions in the GABAA-benzodiazepine receptor assay. Journal of Ethnopharmacology, 93, 177–182. http://dx.doi.org/10.1016/j.jep.2004.01.021
50. Schmidt, E., Lotter, M., and McCleland, W. (2017). Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg.
51. Singh, A., Ebenso, E.E., and Quraishi, M.A. (2012). Corrosion inhibition of carbon steel in HCl solution by some plant extracts. International Journal of Corrosion, Volume 2012, Article ID 897430. http://dx.doi.org/10.1155/2012/897430
52. Smith, C.A. (1966). Common names of South African plants. Memoirs of the Botanical Survey of South Africa No. 35. Botanical Research Institute, Pretoria.
53. Soejarto, D.D., Addo, E.M., and Kinghorn, A.D. (2026). The continuing need for taxonomic input in phytochemical research. Journal of Ethnopharmacology, 354, 120474. https://doi.org/10.1016/j.jep.2025.120474
54. Stace, C.A. (1980). The significance of the leaf epidermis in the taxonomy of the Combretaceae: Conclusions. Botanical Journal of the Linnean Society, 81, 327-339. https://doi.org/10.1111/j.1095-8339.1980.tb01682.x
55. Stace, C.A. (2002). Proposal to conserve *Terminalia nom. cons.* (Combretaceae) against an additional name, *Bucida*. Taxon, 51, 193-194. https://doi.org/10.2307/1554985
56. Stace, C.A. (2007). Combretaceae. In: Kubitzki, K. (editor). The Families and Genera of Vascular Plants Volume 9. Springer, Berlin, pp. 67–82. https://doi.org/10.1007/978-3-540-32219-1_11
57. Uddin, S.N. and, Hassan, M.A. (2018). Vascular flora of Chittagong and the Chittagong Hill Tracts, volume 2. Bangladesh National Herbarium, Dhaka
58. Uddin, M.S., Mazumder, A. and, Uddin, S.B. (2023). Addition of one hundred and forty-seven new vascular taxa to the flora of Bangladesh. Species, 24, e13s1013. https://doi.org/10.54905/disssi/v24i73/e13s1013

Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol.6 No. 9 (2025): September 2025 Issue
https://doi.org/10.51168/sjhrafrica.v6i9.2083
Review Article

59. Venter, F. and Venter, J.-A. (2015). Making the most of indigenous trees. Briza Publications, Pretoria
60. Watt, J.M. and Breyer-Brandwijk, M.G. (1962). The medicinal and poisonous plants of southern and eastern Africa: being an account of their medicinal and other uses, chemical composition, pharmacological effects, and toxicology in man and animal. E & S. Livingstone Ltd., Edinburgh.
61. Wickens, G.E. (1973). Combretaceae. In: Polhill, R.M. (editors). Flora of tropical East Africa: Combretaceae. Royal Botanic Gardens, Kew, London, pp. 1-209
62. Wilcox, M., Bradshaw, C., and Cameron, E. (2004). Woody plants of the Auckland Domain. Auckland Botanical Society Journal, 59, 44–56

PUBLISHER DETAILS:

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa