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Review

Biodiversity, Traditional Uses, and Pharmacological Potential of Medicinal Plants of Mozambique

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Abstract: Mozambique possesses great biological diversity, with approximately 5500 plant species. Around 90% of its population uses natural resources for food and traditional medicine, being miombo forests serving as key providers for rural communities. The trade of medicinal plants also constitutes a significant economic activity for both rural and urban households. This study aims to review ethnobotanical and ethnopharmacological studies on medicinal plants in Mozambique and explore their agricultural and conservation potential. Articles published between 2010 and 2024 were included and identified 472 medicinal plant species, 400 of which were classified to species or genus level, spanning 277 genera and 93 botanical families. The most cited families include Leguminosae (61 species), Euphorbiaceae (20), and Combretaceae (17). Notable species are *Momordica balsamina*, *Sclerocarya birrea*, *Annona senegalensis*, and *Cassia abbreviata*. Sixteen in vitro studies explored medicinal plants' antibacterial, antimycobacterial, antimicrobial, anticancer, and antimalarial properties. Prominent results were shown by *Maerua edulis* (tuberculosis), *Tabernaemontana elegans* (malaria), and *Momordica balsamina* (cancer). This work underscores the critical role of natural resources in Mozambique's primary healthcare system and highlights their agricultural and economic potential. As the first comprehensive compilation of commonly used medicinal plants in the country, it calls for sustainable cultivation practices and further research to enhance their use and benefits.

Keywords: Mozambique; medicinal plants; conservation; ethnobotany; activity

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1. Introduction

For thousands of years, the majority of the world's populations has used medicinal plants. In Africa, a great percentage of people (70–80%) use medicinal plants to satisfy their primary health needs [1,2]. Cultural reasons, the medicinal power of each species, and the accessible and free availability of medicines often explain the use of medicinal plants in rural communities [3]. The practice and knowledge of ethnopharmacology and its holistic and systemic approach, supported by an experiential base, can serve as the instrument for validating the traditional treatment [4].

Mozambique is situated on the eastern coast of southern Africa and covers an area of approximately 800,000 km^2 [5]. The country borders Tanzania in the North; Malawi, Zambia, Zimbabwe, and South Africa in the West; and Eswatini (previously Swaziland) and South Africa in the South.

The country has an extraordinary repository of plant diversity and is home to around 5500 recorded species, 572 of which are endemic or near-endemic [6,7].

The harvesting of non-timber forest products in Mozambique for food, medicine, firewood, and other purposes plays a crucial role in securing livelihoods and alleviating poverty in rural communities throughout the country [8]. Some studies conducted in the

country indicated weak species conservation policies, resulting in heavy deforestation, and finally, the use by healers of decomposed medicinal species due to poor storage [8,9]. In addition to deforestation, the lack of shared knowledge between healers and the illiteracy within society are gaps that often contribute to the misuse of this traditional medicine [10].

Medicinal plants can be defined as those species used in traditional medicine that contain beneficial elements for preventing or healing diseases in humans and/or animals [11]. The use of medicinal plants as a resource for the treatment of various diseases is an ancient practice. However, this knowledge on the use of medicinal plants to cure various diseases has been preserved from generation to generation until today [12]. The massive demand and use of medicinal plants in sub-Saharan Africa is clearly explained by cultural and economic reasons and by the small number of qualified doctors, which makes the ratio of doctors to patients 1: 40,000, compared to a 1:500 ratio for healers and patients [3,12]. Furthermore, 80% of people in developing countries depend on the use of local medicinal plants for primary healthcare satisfaction [11,13–15]. Nowadays, bacterial and fungal infections diseases, such as tuberculosis and candidiasis, are also a major scourge on the health of the rural Mozambican population [16–18]. Due to the high demand for traditional practitioners in primary healthcare, the World Health Organization (WHO) urged African member states to promote and integrate traditional practices that have been validated into their healthcare system [19]. Large parts of underdeveloped countries survive through genetic resources [8,20,21] and most of the pharmaceutical industries have developed based on medicinal plants used by indigenous people [7,21]. Medicinal plant species enjoy a very important cultural and traditional role in countries, and especially in rural areas, where there is a lack of formal hospital facilities for primary healthcare [22]. Although a greater number of the Mozambican population depends on medicinal plants for their primary healthcare, numerous medicinal species have been little studied mainly for their chemical and biological aspects [23]. The curative power found in several plants, which have antimicrobial, anti-inflammatory, antioxidant, antimalarial, antitumor, and other properties, has been justified by the presence of several secondary metabolites such as terpenoids, tannins, alkaloids, and flavonoids in laboratory tests [23–26]. The treatment of various diseases such as malaria, infectious diseases, tuberculosis, cancer, and others using medicinal plants in Mozambique is a daily practice for urban and rural populations [27–36]. It is worth noting that the African continent has a wide biological and cultural diversity due to regional differences in healing practices. It is estimated that the continent has between 40 and 45,000 plant species and only approximately 5000 are currently used for therapeutic purposes [37].

There are many popular misconceptions that the use of medicinal plants does not constitute a danger to the human body. Some plants contain, in their organs, certain active compounds like alkaloids (aconitine and strychnine) and cardiac glycosides, which, when consumed, represent a risk for public health due their toxicity. In addition to the chemical nature of the compound, toxicity also depends on the dosage and administration route. The collection of medicinal plants on rainy days becomes inadvisable, as it reduces the concentration of some active principles (alkaloids). The storage of plants collected for use has been a very serious problem. The collector should know whether the collected part or plant is stored before use and the methods of storage (fresh, buried, dry, etc.).

We live in a globalized world with enormous therapeutic needs in which more and more microbial resistances are appearing and new medicines are needed to combat new diseases or to complement therapeutic strategies to enhance effects or mitigate side effects. We also encounter population groups that cannot access conventional therapies and must resort to the natural remedies traditionally used in their environment. Therefore, it is still of great interest to obtain information on traditional resources that have been used ethnopharmacologically, to ensure their correct, effective, and safe use, and that also serve as medicinal plants or as a starting point for other synthesized medicines. There are currently numerous studies exploring all these options, from general ethnobotanical and ethnopharmacological studies in a geographical area (of particular importance in African

countries) or in selected ethnic groups [38–47] to more specific ones, such as Elmi, A. et al., (2024) on the ethnopharmacological study of plant drugs used traditionally in Djibouti for malaria treatment or Kyana, J. et al., (2024) on antimicrobials and larvicides in the Democratic Republic of the Congo [48,49].

Mozambique compares with other countries on the African continent because of the crucial importance of medicinal plants and its vast reservoir of plant diversity. It is estimated that approximately 90% of the Mozambican population uses natural resources to meet their primary needs (5500 species) and about 15% of these resources are used in traditional medicine [1,6,50,51]. In addition, only 40% of the population has access to the public health system, so the ratio of doctors to patients is 1:50,000 and the ratio of healers to patients is 1: 200 [52,53]. The beginning of the study of medicinal plants in Mozambique took place in the 1970s with the creation of the research office of traditional medicine within the Ministry of Health (MISAU). Later, between 1980 and 1990, the Association of Traditional Doctors of Mozambique (AMETRAMO) was created, followed by the establishment of the Centre for Research and Development in Ethnobotany (CIDE) in 2008. The traditional medicine associations created facilitate the exchange of topics related to the diagnosis, prevention, and treatment of epidemic diseases between traditional and modern doctors [54]. Although traditional medicine is an ancient practice and plays a very important role in Mozambique, little wealth of knowledge is being gained from the same practicing healers for future generations. The largest Mozambican forest is made up of miombo species that are very useful for the rural community because they are the main source of food and medicine [38,55]. To date, the data obtained from ethnobotanical studies are focused on the center of the country, and there are insufficient data on provinces, specifically, Zambézia, in the north of the country [56]. In Mozambique, in recent years, the study of medicinal plants for the treatment of various diseases and research in the area continues to be recognized as a priority for the maintenance and treatment of diseases, especially in rural areas [56,57].

The trade of medicinal plants as a livelihood activity of rural and urban households in various markets across the country has been a well-known practice since the 1980s, despite the lack of information on income, the volumes of plants collected, and trade values [13]. According to Senkoro et al. [20], the common concern regarding the commercialization of medicinal plants is the deforestation of the harvested species due to focusing only on economic returns. The problem of deforestation is also seen within the rural communities due to the use of intense fire during hunting and agriculture activities [58]. Although Mozambique has a long history of using medicinal species, there is still a lack of a general checklist of medicinal plants [56].

The scarce information on ethnobotanical studies on the African continent, in particular, in Mozambique, is explained by the lack of the publication of them, since many were carried out by missionaries, exploiters, and experts in various scientific areas, such as botanists, health doctors, and anthropologists, and are scattered in personal archives, libraries, museums, and herbaria [59].

The primary objective of this literature review is to systematically collect and analyze existing data on medicinal plants utilized in Mozambique. Specifically, the study aims to explore the rich biodiversity of these plant species, delve into their traditional uses by local communities, and assess their potential applications in modern medicine. By bridging the gap between indigenous knowledge and agricultural opportunities, this research seeks to foster sustainable development within the country.

The justification for our research includes the central axes of public health, because traditional medicine is a predominant practice in Mozambique, and its study can improve healthcare; biodiversity conservation, because researching and validating the use of medicinal plants can contribute to the conservation of biodiversity in the area; and sustainable development, because integrating traditional knowledge with science can promote sustainable development and community empowerment, favoring biodiversity conservation and exchanging obsolete or even harmful agricultural practices for techniques that improve

yields and create possibilities for the economic development of the area through trade in these species.

2. Materials and Methods

This study focused on documenting medicinal plants with curative power used by traditional medicine in Mozambique. The search was performed using a combination of keywords such as "Mozambique, healing plants" and "Mozambique, medicinal plants" in the databases PubMed, Google Scholar, Scopus, and Science Direct during the years 2010 to 2024.

Articles published in Portuguese, Spanish, and English, encompassing theses and multiple peer-reviewed articles, were included. A total of 81 articles were found, of which 50 of them were selected, considering the scope and clarity of the title, the popular knowledge on the subject, and finally, the quality and quantity of endemic plants studied. Of these 50 articles, 16 tested, in vitro, the efficacy of the same plant species against some diseases, such as malaria and tuberculosis.

Data Collection

This study, in addition to reporting ethnobotanical species, also mentions biological assays of some curative species for some diseases. Data referring to plant names, genera and families have all been updated based on The Plant List (http://www.theplantlist.org, accessed on 5 September 2024) and the APG IV system [60]. Data analysis was performed using the Microsoft Excel statistical package.

Finally, IFC(=FIC) were calculated for the 47 species most used medicinally [6]. Their values range from zero to one (0–1), according to the following formula:

$$IFC = (Nur\text{-}Nt)/(Nur\text{-}1);$$

where, ICF = informants consensus factor; Nur = number of use-reports for a particular disease category, and Nut = number of taxa used for a particular disease category by all informants.

3. Results

A total of 50 full-text articles were assessed for eligibility and selected. Sixteen of them were in vitro studies on antibacterial, antimycobacterial, antimicrobial, anticancer, antischistosomicidal, infectious disease, and antimalarial activities. The majority of the studies were from the south zone, represented by Maputo (40), the capital city, compared to the central and northern zones of the country. These results coincide with those of Muchaia and Nanvonamuquitxo [56]. The present review recorded 472 medicinal species. Three hundred and seventy-five (375) were identified up to species level and 25 to genus level. Seventy-two unidentified species were excluded from the subsequent quantitative analyses. The set of 400 species identified belong to 277 genera and 93 families. Leguminosae (with 61 species) was the most comprehensively used family, followed by Euphorbiaceae (20 species), Combretaceae (17 species), Compositae and Rubiaceae (both with 13 species), and finally, Anacardiaceae and Anacardiaceae (both with 11 species). The massive dominant use of the Leguminosae, Euphorbiaceae and Combretaceae families can be attributed to their wide range of bioactive compounds [7]. According to the APGIV system and the plant list (http://www.theplantlist.org/, accessed on 5 September 2024), some results presented outdated families and scientific names. The species *Vernonia colorata* (Willd.) Drake, family Compositae [58], have been updated to *Vernonia coronata* J. Gost. The genera Aloe (Asphodelaceae), Dombeya and Grewia (Sterculiaceae and Tiliaceae), Pseudolachnostylis and Bridelia (Euphorbiaceae), and Flacourtia (Flacourtiaceae), cited by Aparicio et al., Madureira et al. and Bruschi et al. [34,38,52], respectively, have been updated to Xanthorrhoeaceae, Malvaceae, Phyllanthaceae, and Salicaceae. Balanites (Balanitaceae), Sansevieria (Dracaenaceae), Hermannia (Sterculiaceae), and Strychnos (Strychnaceae), cited by Nicosia et al. and Ribeiro et al. [1,7], have been updated to Zygophyllaceae, Asparagaceae, Malvaceae, and Loganiaceae, and finally, the genera Xylotheca (Kiggelariaceae), Sterculia

(Sterculiaceae), and Tacca (Taccaceae), cited by Muchaia et al. and Bruschi et al. [8,56], have been changed to Achariaceae, Malvaceae, and Dioscoreaceae.

Of the 472 species recorded, Table 1 summarizes 325 endemic species with well-clarified uses, providing data on the botanical family, species, therapeutic uses, and references. The most used species were *Momordica balsamina*, *Terminalia sericea*, and *Adansonia digitata*, both with 6, *Sclerocarya birrea*, *Senna petersiana*, and *Tabernaemontana elegans*, both with 5, and finally, *Ozoroa engleri*, *Annona senegalens*, *Kegelia africana*, *Spirostachys africana*, *Cassia abbreviata*, *Trichilia emetica*, *Anselia africana*, *Bridelia cathartica*, and *Pseudolachnostylis maprouneifolia*, all with 4.

Table 1. List of all endemic plants cited.

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Acanthaceae	*Blepharis diversispina* (Nees) C.B. Clarke	Malaria; earache; headache; allergies; fever; mucosal diseases; injuries; hemorrhoids; cough; wounds; and fontanel hardening	[1,6,9]
Achariaceae	*Xylotheca tettensis* (Klotzsch) Gilg	Stomachache and diarrhea	[56]
Alismataceae	*Limnophyton obtusifolium* (L.) Miq	Nausea; earache; ringworm; mucosal diseases; and skin diseases	[1,3,6]
Amaranthaceae	*Celosia* sp.	Furuncle	[13,15]
	Dysphania ambrosioides (L.) Mosyakin and Clemants	Children's fever	[35]
	Hermbstaedtia odorata (Burch.) T. Cooe	Mucosal diseases, menstrual and uterine complaints; and skin diseases	[4,6]
Amaryllidaceae	*Crinum stuhlmannii* Baker	Venereal diseases; swelling; and injuries	[1,7,9]
Anacardiaceae	*Anacardium occidentale* L.	Cough; dysentery; and candidiasis	[15,35,52,56]
	Lannea schimperi (Hochst. ex A.Rich.)	Venereal diseases	[56]
	Lannea schweinfurthii (Engl.) Engl.	Anemia; diarrhea; stomach disorders; malarial anemia; and hemorrhoids	[13,56]
	Mangifera indica L.	Stomachache; malaria; and helminthiasis	[13,52]
	Ozoroa engleri R. Fem and A. Fem	Headache, skin diseases; dysentery, injuries; diarrhea; vomit; stomachache; and wounds	[1,7,13,38]
	Rhus dentata Thunb.	Stomachache; bloody vomit; headache; and muscular pain	[35,51]
	Sclerocarya birrea (A. Rich.) Hochst.	Dysentery; venereal diseases; stomachache; flu; rheumatisms; skin diseases; cough; diarrhea; female infertility; flu; and toothache	[6,38,52,56]
Annonaceae	*Annona senegalensis* Pers	Dysentery; venereal disease; nausea; stomachache; toothache; injuries; poison antidote; worm infections; inflammations; headache; diarrhea; wounds; and cough	[6,13,35,56]
	Artabotrys brachypetalus Benth.	Cough; asthma; and helminthiasis	[13,35]
	Cleistochlamys kirkii (Benth) Oliv.	Wound infections; tuberculosis and rheumatism; and infectious diseases	[14,16,18]
	Monanthotaxis caffra Verdc.	Malaria	[6]
Apiaceae	*Steganotaenia araliacea* Hochst.	Stomachache; constipation; weakness in children; female infertility; headache; and malaria	[6,13,17]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Apocynaceae	*Adenium multiforum* Klotzsch	Dysentery; stomachache; headache; flu; hematomas; injuries; poison antidote; and sexual dysfunctions	[6,15]
	Carissa spinarum L.	Malaria; dysentery; and bone pain	[7,17]
	Cynanchum viminale (L.) L	Venereal diseases; nausea; eye diseases; and skin diseases	[13,17]
	Diplorhynchus condylocarpon (Müll. Arg.) Pichon	Stomachache	[35,52]
	Strophanthus petersianus Klotzsch	Diseases not specified	[14]
	Holarrhena pubescens Wall.	Stomachache	[35]
	Margaretta rosea Oliv.	Milky diarrhea in babies	[38]
	Pergularia daemia (Forssk.) Chiov.	Flu; mucosal disease; injuries; and skin diseases	[7]
	Sarcostemma viminale (L.) R. Br.	Tuberculosis; stomachache; and eye diseases	[1,35,51]
	Secamone parvifolia K. Schum	Dysentery; venereal diseases; stomachache; poison antidote; deworming; rheumatism; epilepsy; stomachache; varicose veins; and diarrhea	[1,6,13]
	Tabernaemontana elegans Stapf	Chest complaints; tuberculosis; stomachache; cough; hernia; candidiasis; diarrhea; wounds; and UTI	[13,15,34,35,56]
Araceae	*Stylochaeton natalensis* Schott	Flu	[7]
Araliaceae	*Cussonia zuluensis* Strey.	Venereal diseases	[35]
Aristolochiaceae	*Aristolochia albida* Duch.	Snake bites	[15]
	Hydnora abyssinica A. Braun	UTI, helminthiasis; and internal wounds	[14,61]
Asclepiadaceae	*Pentarrhinum* sp.	Stomachache; to induce or to the speed up the delivery process; menstrual pain; and snakebites	[52,56]
Asparagaceae	*Asparagus africanus* Lam.	Toothache; hemorrhoids; venereal diseases; throat; eye diseases; prepartum and postpartum care; and stomach disorders	[1,7,12]
	Dracaena hyacinthoides (L.) Mabb	Malaria, hemorrhoids, costiveness, toothache, fever, swelling; and parasites	[4,6]
	Ornithogalum sp.	Baby's belly buttons cure	[4,35]
	Sansevieria hyacinthoides (L.) Druce	Contusions; hemorrhoids; rheumatism; swellings; women's fertility; and epilepsy	[1,3,38]
Asphodelaceae	*Aloe chabaudii* Schonland	Malaria	[6]
	Aloe marlothii A. Berger	Tuberculosis; dysentery; venereal diseases; stomachache; flu; eye diseases; rheumatisms; injuries; prepartum and postpartum care; liver complaints; biliary disorder; malaria; wounds; toothache; liver disorder; eye diseases; liver disorder; diarrhea; cough; and UTI	[1,6,13,52]
	Aloe zebrina Baker	Tuberculosis; stomachache; and malaria	[4,6]
	Aloe sp.	Stomachache and wounds	[35]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Asteraceae	*Acanthospermum hispidium* DC.	Wounds	[13,15]
	Acmella caulirhiza Delile.	Mouth wounds	[38]
	Cyanthillium cinereum (L.) H.Rob.	Stomachache	[38]
	Gymnanthemum coloratum (Willd.) H. Rob. and B. Kahn	Helminthiasis	[14]
	Helichrysopsis septentrionalis (Vatke) Hilliard	Children's anal cleanliness	[14]
	Linzia gerberiformis (Oliv. e Hiern) H. Rob.	Increases virility	[14]
	Sonchus oleraceus L.	Vomit	[56]
	Vernonia amygdalina Delile	Stomachache	[35]
	Vernonia colorata (Willd.) Drake	To induce or to speed up the delivery process; stomachache; constipation; venereal diseases; general weakness; post-partum pain; vertigo; cough; pneumonia; and candidiasis	[15,35,56]
	Vernonia sp.	Venereal diseases	[51]
Begoniaceae	*Begonia oxyloba* Welw. ex Hook.f.	Stomachache	[14]
Bignoniaceae	*Kigelia africana* (Lam.) Benth.	Anal wounds; diarrhea; disinfectant; stomachache; toothache; large wounds; intestinal deworming; and wounds	[11,35,52,56]
	Stereospermum kunthianum Cham.	To induce or to speed up the delivery process and malaria	[4,56]
	Tecoma capensis (Thunb.) Lindl.	Venereal diseases	[35]
Boraginaceae	*Cordia monoica* Roxb	Leprosy; dysentery; costiveness; nausea; eye diseases; and injuries	[6]
Burseraceae	*Commiphora africana* (A. Rich.) Engl.	Malaria; dysentery; stomachache; headache; toothache; fever; swelling; injuries; poison antidote; and skin diseases	[6,7]
	Commiphora neglecta I.Verd.	Skin diseases	[14]
	Commiphora serrata Engl.	Stomachache	[56]
Cactaceae	*Opuntia ficus indica* (L.) Mill.	Cough	[13]
	Opuntia sp.	Cough and bronchitis	[35]
	Rhipsalis baccifera (J. M. Mill.) Stearn.	General weakness	[52]
Canellaceae	*Warburgia salutaris* (Bertol.) Chiov.	Malaria; dysentery; nausea; stomachache; toothache; anti-inflammatory; fever; flu; body pain; injuries; worm infections; sexual dysfunctions; mouth ulcers; and cough	[3,9,14,21]
Capparaceae	*Boscia albitrunca* (Burch.) Gilg and Gilg-Ben	Hemorrhoids; injuries; malaria; diarrhea; and hemorrhoids	[1,6,7]
	Boscia foetida subsp. rehmanniana (Pestal.) Toelken	Diseases not specified and stomach and kidney purification	[1,14]
	Boscia mossambicensis Klotzsch	Diseases not specified	[7]
	Cadaba natalensis Sond.	Tuberculosis; hemorrhoids; swelling; and worm infection	[8,9]
	Capparis tomentosa Lam.	Venereal diseases; headache; eye diseases; poison antidote; cough; chest pain; and tuberculosis	[6,35]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
	Capparis viminea Hook.f. e Thomson ex Oliv. var. viminea	Snakebites and headache	[14]
	Cladostemon kirkii (Oliv.) Pax e Gilg	Diseases not specified; dysentery; nausea; toothache; injuries; skin diseases	[6,14]
	Maerua edulis (Gilg and Gilg Ben) DeWolf	Venereal diseases; nausea; allergies; flu; eye diseases; swelling; rheumatisms; cough; tuberculosis; women fertility; and stomachache	[3,13,35]
	Maerua juncea Pax	Cough and helminthiasis	[9,35]
	Maerua parvifolia Pax	Stomachache; throat; diarrhea; and purification	[1,7]
	Maerua triphylla var. pubescens (Klotzsch) DeWolf	Headache	[14]
	Thilachium africanum Lour	Swelling and poison antidote	[9]
Caricaceae	*Carica papaya* L.	Toothache; stomachache; and diarrhea	[35,56]
Celastraceae	*Elaeodendron schlechterianum* (Loes.) Loes	Dysentery; costiveness; stomachache; convulsion; injuries; parasites; and sexual dysfunctions	[1,7]
	Gymnosporia arenicola Jordaan	Infectious and inflammatory diseases	[3,7,13]
	Gymnosporia buxifolia (Lam.) Loes	Dysentery; toothache; flu; injuries; and poison antidote	[6]
	Gymnosporia heterophylla (Eckl. and Zeyh.) Loes.	Stomachache; mouth internal wounds; swellings; stabbing heart pain; and cough	[1,13,35]
	Gymnosporia senegalensis (Lam.) Loes.	Dysentery amoebic; dysentery; venereal diseases; toothache; anti-bacterial; fever; eye diseases; rheumatisms; injuries; poison antidote; and worm infection	[7,13,15]
	Loeseneriella crenata (Klotzsch) R. Wilczek	Stomachache; epilepsy; and allergy	[1,7]
Chrysobalanaceae	*Parinari curatellifolia* Planch. ex Benth.	Cough	[52]
Cleomaceae	*Cleome angustifolia* subsp. petersiana (Klotzsch) Kers	Diarrhea	[13]
Clusiaceae	*Garcinia livingstonei* T. Anderson	Dysentery; nausea; stomachache; eye diseases; ringworm; injuries; anal wounds; diarrhea; malaria; helminthiasis; diarrhea; cough; and dysentery	[6,13,51]
Combretaceae	*Combretum adenogonium* A.Rich.	Wounds	[38]
	Combretum apiculatum Sond	Malaria; leprosy; dysentery; venereal disease; hernia; and poison antidote	[7]
	Combretum collinum Fresen.	Toothache	[14]
	Combretum goetzei Engl. et Diels	Aphrodisiac	[51]
	Combretum imberbe Wawra	Leprosy; dysentery; stomachache; flu; injuries; sexual dysfunctions; and toothache	[1,7]
	Combretum hereroense Schinz	Stomachache and malaria	[52]
	Combretum microphyllum Klotzsch	Dysentery; injuries; and postpartum and prepartum care	[6]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
	Combretum molle R. Br. Ex G. Don	Leprosy; dysentery; nausea; stomachache; headache; fever; swelling; injuries; poison antidote; postpartum and prepartum care; diarrhea; dysentery; helminthiasis; UTI; and wounds	[6,13,56]
	Combretum mossambicense (Klotzsch) Engl	Dysentery; costiveness; toothache; fever; eye diseases; swelling; bone pain; and parasites	[7,8]
	Combretum paniculatum Vent	Fever and worm infection	[7]
	Combretum zeyheri Sond	Dysentery; nausea; toothache; flu; poison antidote; and cough	[7,35]
	Pteleopsis myrtifolia (M.A. Lawson) Engl. and Diels	Tuberculosis; malaria; stomachache; and diarrhea	[5,35,56]
	Terminalia brachystemma Welw. Hiern	Stomachache	[35]
	Terminalia mollis M. A. Lawson	Asthma	[51]
	Terminalia myrtifolia (M. A. Lawson) Gere and Boatwr	Dysentery; venereal diseases; injuries, menstrual and uterine complaints; sexual dysfunctions; and postpartum and prepartum care	[7]
	Terminalia sericea Burch. ex DC.	Diarrhea; menstrual cycle troubles; menstrual pain; venereal diseases; female infertility; injuries; anal wounds; stomachache; malaria; burns; wounds; dysentery; helminthiasis; and hemorrhoids	[1,4,6,13,51,52]
Connaraceae	*Rourea orientalis* Baill.	Diarrhea; bloody vomit; menstrual cycle troubles; venereal diseases; to induce or to speed up the delivery process; and malaria	[5,56]
Convolvulaceae	*Bonamia mossambicensis* (Klotzsch) Hallier f.	Diseases not specified	[14]
	Ipomoea consimilis Schulze-Menz	Stomachache and children's constipation	[52]
	Ipomoea pileata Roxb.	Stomachache	[38]
Cucurbitaceae	*Coccinia* sp.	Venereal diseases	[38]
	Cucumis africanus L. f.	Helminthiasis and schistosomiasis	[13]
	Cucumis hirsutus Sond.	Leprosy and wounds	[13]
	Cucumis metuliferus E. Mey ex Naudin	Stomachache; appendicitis; dysentery; and laxative	[1,7]
	Cucumis zeyheri Sond	Dysentery; stomachache; and injuries	[7]
	Diplocyclos tenuis (Klotzsch) C.Jeffrey	Toothache	[14]
	Kedrostis sp.	Diarrhea; helminthiasis; and wounds	[13]
	Momordica balsamina L.	Malaria; liver cleaner; and schistosome	[7,20–24,27]
	Momordica foetida Schumach.	Gonorrhea	[38]
	Oreosyce africana Hook. f.	Stomachache and venereal diseases	[35]
Dilleniaceae	*Tetracera boiviniana* Baill	Malaria	[6]
Dioscoreaceae	*Dioscorea cochleari-apiculata* De Wild.	Stomachache	[52]
	Tacca leontopetaloides (L.) Kuntze	Menstrual cycle troubles; snake bites; and toothache	[51]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Dracaenaceae	*Sansevieria hyacinthoides* (L.) Druce	Stomachache in children; weakness in children; venereal diseases; and snake bite	[51,52]
Ebenaceae	*Diospyros loureiroana* G.Don	Teeth care/cleaning	[38]
	Diospyrus mespiliformis Hochst. ex A. DC	Dysentery; venereal diseases; stomachache; headache; toothache; fever; and skin diseases	[6]
	Diospyros verrucosa Hiern	Malaria	[4]
	Diospyros villosa (L.) De Winter var. villosa	Oral hygiene	[55]
	Euclea divinorum Hiern	Dysentery; intestinal ulcer; venereal diseases; headache; toothache; anemia; convulsion; fever; injuries; poison antidote; and cancer	[7]
	Euclea natalensis subsp. acutifolia F.White	Childbirth and postpartum	[14]
	Euclea racemosa Murr	Headache; toothache; and mucosal diseases; caries; and wounds	[6,13]
Ehretiaceae	*Ehretia amoena* Klotzsch	Malaria	[4]
Erythroxylaceae	*Erythroxylum emarginatum* Thonn.	Diarrhea	[56]
Euphorbiaceae	*Acalypha indica* L.	Hemorrhoids; costiveness; eye diseases; and intestinal lavage	[1,6,13]
	Croton megalobotrys Müll. Arg.	Intestinal pain	[14]
	Croton pseudopulchellus Pax	Malaria	[4]
	Croton sp.	Epilepsy	[13]
	Euphorbia cupularis Boiss	Stomachache; allergies; mucosal diseases; injuries; and menstrual and uterine complaints	[7,9]
	Euphorbia graniticola L.C.Leach	Furuncle	[14]
	Euphorbia hirta L.	Cataracts	[38]
	Jatropha zeyheri Sond	Urinary complaints; headache; flu; body pain; injuries; and menstrual and uterine complaints	[7,13]
	Manihot esculenta Crantz.	Stomachache and anemia	[56]
	Ricinus communis L.	Bruises; inflammation; and venereal diseases	[38,56]
	Spirostachys africana Sond.	Stomachache; constipation; female infertility; menstrual cycle troubles; miscarriage; hemorrhoids; skin diseases; debility (HIV-AIDS); diarrhea; epilepsy; and dysentery	[1,7,15,52]
	Tragia okanyua Pax	Headache	[56]
Fabaceae	*Abrus precatorius* agg	Stomachache and helminthiasis	[14,56]
	Acacia polyacantha Willd	Malaria and headache	[4,56]
	Acacia sayal Delile	Venereal diseases	[56]
	Acacia senegal (L.) Willd.	Hernia and venereal diseases	[56]
	Acacia sp.	Cough	[56]
	Albizia adianthifolia (Schumach.) W. Wight	Anal wounds; diarrhea; stomachache; and wounds	[52]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
	Albizia versicolor Welw. ex Oliv	Anal wounds; cough; tuberculosis	[52]
	Afzelia quanzensis Welw.	Vaginal toning and stomachache	[38,56]
	Bauhinia galpinii N.E.Br.	Malaria	[4]
	Bauhinia thonningii Schum.	Stomachache; malaria; inflammation; stomachache; and joint pain	[4,35,56]
	Bobgunnia madagascariensis (Desv.) J. H. Kirkbr. and	Headache	[38]
	Brachystegia boehmii Taub.	Intestinal deworming	[56]
	Brachystegia spiciformis Benth.	Hernia	[56]
	Burkea africana Hook.	Diarrhea	[56]
	Cassia abbreviata Oliv.	Wounds; malaria; venereal diseases; stomachache; fever; swelling; menstrual and uterine complaints; postpartum and prepartum care; and diarrhea	[1,6,14,54]
	Cassia afrofistula Brenan.	Sexual vitality and stomachache	[62]
	Cassia occidentalis L.	Candidiasis	[15]
	Colophospermum mopane (J. Kirk ex Benth.) J. Léonard	Malaria; stomachache; and bone pain	[1,6]
	Cynometra carvalhoi Harms	Hernia	[55]
	Dalbergia melanoxylon Guill. and Perr	Venereal diseases; nausea; swelling; injuries; toothache; and skeletal disorders	[7,52,59]
	Desmodium velutinum (Willd.) DC.	Stomachache	[38]
	Dialium schlechteri Harms	Burnings; rheumatism; and wounds	[52]
	Dichrostachys cinerea (L.) Wight and Arn.	Stomachache and wounds	[13,38]
	Elephantorrhiza elephantina (Burch.) Skeels	Dysentery; stomachache; fever; injuries; menstrual and uterine complaints; skin diseases; anemia; helminthiasis; diarrhea; cough; tuberculosis; dysentery; and hemorrhoids	[1,7,13]
	Erythrina abyssinica DC.	Malaria; stomachache; and toothache	[4,9,52]
	Erythrina lysistemon Hutch.	Fever	[14]
	Guibourtia conjugata (Bolle) J. Léonard	Stomachache; flu; stomach disorders; and cough	[1,7]
	Hymenaea verrucosa Gaertn.	Malaria	[6]
	Indigofera antunesiana Harms	General weakness	[52]
	Julbernardia globiflora (Benth.) Troupin	Malaria and stomachache	[4,56]
	Millettia stuhlmannii Taub.	Soap/wounds treatment; malaria; and venereal diseases	[4,38,56]
	Mucuna coriacea Baker	Helminthiases and internal wounds	[13]
	Newtonia buchananii (Baker f.) G.C.C.Gilbert e Boutique	Aphrodisiac	[13]
	Ormocarpum kirkii S. Moore	Malaria	[4,6]
	Peltophorum africanum Sond	Dysentery; intestinal infections; nausea; stomachache; toothache; purifying blood; eye diseases; and injuries	[5,7]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
	Pericopsis angolensis (Baker) Meeuwen	Stomachache and toothache	[38,56]
	Philenoptera violacea (Klotzsch) Schrire	Earache	[51]
	Piliostigma thonningii (Schumach.) Milne-Redh.	Bloody vomit; cough; bilharzia; fever; venereal diseases; and backache	[51,52]
	Pseudarthria sp.	Stomachache	[35]
	Pisum sativum L.	Dysentery and diarrhea	[56]
	Pterocarpus angolensis DC	Malaria; tuberculosis; dysentery; venereal diseases; stomachache; headache; injuries; poison antidote; menstrual and uterine complaints; postpartum and prepartum care; and ringworm (Tinea corporis)	[4,7,38]
	Pterocarpus rotundifolius (Sond.) Druce	Fontanelle syndrome	[52]
	Rhynchosia sublobata (Schumach.) Meikle	Dysentery; stomachache; and backache	[52]
	Schotia brachypetala Sond.	Clean stomach and intestines	[14]
	Senegalia nigrescens (Oliv.) P. J. H. Hurter	Convulsion and injuries	[7]
	Senna abbreviata Oliv.	Malaria	[15]
	Senna occidentalis Linn	Malaria	[15]
	Senna petersiana (Bolle) Lock	Malaria; cholera; flu; injuries, diarrhea; sore throat; helminthiasis; and epilepsy	[6,7,13,38,56]
	Senna siamea Lam.	Stomachache	[55]
	Senna sp.	Diarrhea; stomachache; to close fontanelle; female infertility; tuberculosis; and asthma	[13,52,59]
	Striga gesnerioides (Willd.) Vatke ex Engl.	Bloody vomit	[52]
	Tamarindus indica L.	Stomachache and tuberculosis	[52]
	Xeroderris stuhlmannii (Taub.) Mendonc¸a et E.C. Sousa	Intestinal worms in children; tuberculosis; menstrual cycle troubles; malaria; stomachache; and venereal diseases	[6,52,56]
Hypoxidaceae	*Hypoxis hemerocallidea* Fish., C. A. Mey and Avé Lall	Flu; injuries; diabetes; helminthiasis, diarrhea; dysentery; wounds; UTI; and hemorrhoids	[7,13,38]
Iridaceae	*Gladiolus* sp.	Diarrhea; dysentery; helminthiasis; and schistosomiasis	[13]
Lamiaceae	*Clerodendrum glabrum* E. Mey.	Cough; fever; tuberculosis; and bronchitis	[35]
	Hoslundia opposita Vahl	Appetite stimulant	[24,38]
	Ocimum americanum L.	Malaria and constipation	[38]
	Ocimum gratissimum L. var. *gratissimum*	Dysentery	[14]
	Pycnostachys urticifolia Hook.	Malaria and headache	[15,52]
	Vitex payos (Lour.) Merr.	General weakness; burns; and toothache	[52]
Linaceae	*Hugonia orientalis* Engl.	Malaria; wounds; diarrhea; and wounds	[6,13,56]
Loganiaceae	*Strychnos decussata* Gilg	Helminthiasis	[13]
	Strychnos henningsii Gilg	Menstrual cramps; abdominal pain; and diarrhea	[13,17]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
	Strychnos innocua Delile	To induce or to speed up the delivery process; to facilitate placenta expulsion; and mental illness	[13,16]
	Strychnos madagascariensis Lam	Tuberculosis, stomachache; and fever	[1,7]
	Strychnos spinosa Lam	Venereal diseases; hernia; to induce or to speed up the delivery process; snake bites; earache; intestinal infections; stomachache; headache; dropsy, flu; poison antidote; skin diseases; and helminthiasis	[7,13,52,55]
Loranthaceae	*Erianthemum dregei* (Eckl. e Zeyl.) Tiegh.	Fever	[14]
Malpighiaceae	*Acridocarpus natalitius* A. Juss.	Tuberculosis; flu; bone pain; mucosal diseases; diarrhea; and hemorrhoids	[7,13]
Malvaceae	*Adansonia digitata* L.	Venereal diseases; stomachache; headache; fever; body pain; bones fortification; injuries; tuberculosis; persistent cough; bronchitis; pneumonia; chest pain; sexual vitality; malaria; debility; diarrhea; and cough	[1,6,7,35,38,56]
	Dombeya rotundifolia (Hochst.) Planch	Dysentery; intestinal ulcer; hemorrhoids; nausea; stomachache; fever; and sexual dysfunction	[7,9]
	Gossypium herbaceum L.	Vomit control	[1]
	Grewia hexamita Burret	Infectious diseases	[25]
	Grewia sp.	Malaria	[6]
	Hermannia micropetala Harv	Toothache; body pain; laxative; and fontanel hardening	[1,7]
	Hibiscus meyeri Harv	Diuretic/urinary complaints; anti-bacterial and anti-inflammatory; flu; poison antidote; skin diseases; and stabbing heart pain	[1,7]
	Hibiscus surattensis L.	Cough	[38]
	Khaya anthotheca (Welw.) C. DC.	Stomachache	[38]
	Sterculia quinqueloba (Garcke) K. Schum.	Sexual virility and vitality and bilharzia	[38,56]
	Sterculia appendiculata K. Schum.	Malaria	[56]
	Thespesia populnea	Fever	[14]
	Triumfetta welwitschii Mast. var. welwitschii	Leprosy	[14]
	Trichilia dregeana Sond.	Stomachache	[52]
	Trichilia emetica Vahl	Anal wounds; diarrhea; disinfectant; menstrual ache; stomachache; malaria; mucosal diseases; injuries; contraceptive; and candidiasis	[1,7,17,51]
	Turraea nilotica Kotschy et Peyr.	Diarrhea; dysentery; venereal diseases; and bilharzia	[53]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Menispermaceae	*Cissampelos hirta* Klotzsch	Stomachache	[38]
	Tinospora caffra (Miers) Troupin	Venereal diseases; stomachache; toothache; convulsions; body pain; bone pain; injuries; paralysis; children's diseases; and epilepsy	[1,7]
	Tiliacora funifera (Miers) Oliv.	Helminthiasis and diarrhea	[13]
Moraceae	*Ficus lutea* Vahl	Malaria	[7]
	Ficus sur Forssk	Dysentery and malaria	[6,7]
	Ficus sycomorus L.	Stomachache; toothache; and flu	[1,7]
	Maclura africana (Bureau) Corner	Ringworm; cough; and helminthiasis	[7,13,14]
	Morus alba L.	Venereal diseases	[38]
Moringaceae	*Moringa oleífera* Lam.	Stomachache, malaria; and toothache	[56]
Musaceae	*Musa* sp.	Stomachache and headache	[56]
Myrtaceae	*Eucalyptus* sp.	Cough and malaria	[56]
	Psidium guajava L.	Cough; malaria; stomachache; and dysentery	[6,38,56]
	Syzygium cumini (L) Skeels	Malaria	[56]
	Syzygium guineense (Willd.) DC. subsp. guineense	Leprosy	[14]
Nyctaginaceae	*Boerhavia diffusa* L.	Hand wounds	[38]
Ochnaceae	*Brackenridgea zanguebarica* Oliv.	Injuries	[7,14]
	Ochna kirkii Oliv.	Malaria	[6]
	Ochna natalitia (Meisn.) Walp.	Helminthiases and tuberculosis	[13]
Olacaceae	*Olax dissitifora* Oliv	Nausea; stomachache; malaria; and wounds	[1,6,7]
	Ximenia americana L.	Swelling; worm infection; anti-abortifacient; HIV-AIDS; menstrual cycle; stabbing heart pain; stomachache' and women's fertility	[1,7]
	Ximenia caffra Sond.	Intestinal worms in children; constipation; weakness in children; female infertility; menstrual cycle troubles; venereal diseases; tuberculosis, cough; leprosy; propitiatory; malaria; dysentery; nausea; stomachache; fever; throat pain; eye diseases; ringworm; injuries; parasite; worm infection; menstrual and uterine complaints; and sexual dysfunctions	[6,52]
Oleaceae	*Schrebera trichoclada* Welw.	Female infertility	[52]
Opiliaceae	*Opilia amentacea* Roxb.	Helminthiases	[13]
Orchidaceae	*Ansellia africana* Lindl.	Tuberculosis; dysentery; stomachache; headache; body pain; hematomas; hernia; asthma; cough; and rheumatism	[1,7,13,35]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Orobanchaceae	*Cycnium adonense* E.Mey. ex Benth. subsp. adonense	Leprosy	[14]
Passifloraceae	*Adenia gummifera* (Harv.) Harms	Internal wounds; helminthiasis; and tuberculosis	[13]
	Passiflora sp.	Malaria	[6]
Pedaliaceae	*Dicerocaryum eriocarpum* (Decne.) Abels	Dysentery; stomachache; anti-bacterial and anti-inflammatory; ringworm; and mucosal diseases	[7]
Phyllanthaceae	*Antidesma venosum* E.Mey. Tul.	Stomachache	[35]
	Bridelia cathartica G.Bertol. subsp. cathartica	Purgative; malaria; infectious and inflammatory diseases; helminthiasis; UTI; and candidiasis	[13–15,26]
	Bridelia ferruginea Benth.	Malaria	[13]
	Cleistanthus schlechteri (Pax) Hutch	Malaria	[6]
	Flueggea virosa (Roxb. ex Willd.) Royle	Dysentery and abscesses	[3]
	Hymenocardia acida Tul.	Wounds and milky diarrhea	[14,38]
	Margaritaria discoidea (Baill.) G.L. Webster	UTI; tuberculosis; and cough	[13]
	Phyllanthus reticulatus Poir.	Toothache; wounds; and diarrhea	[13,14]
	Phyllanthus sp.	Cough and bloody vomit	[52]
	Pseudolachnostylis maprouneifolia Pax.	Dysentery; costiveness; venereal disease; earache; stomachache; headache; anemia; fever; flu; injuries; sexual dysfunctions; epilepsy; and cough	[1,7,52,56]
	Uapaca sansibarica Pax	Diseases not specified	[14]
Piperaceae	*Piper capense* L.f.	Stomachache	[14]
Poaceae	*Cynodon dactylon* (L.) Pers	Swelling; injuries; liver complaints; and anti-abortifacient	[52]
	Zea mays L.	Aphrodisiac	[1,7]
Polygalaceae	*Securidaca longepedunculata* Fresen.	Stomachache; constipation; stomachache in children; intestinal worms in children; venereal diseases; wounds; increases virility; cough; chest complaints; and tuberculosis	[14,35,50]
Portulacaceae	*Portulaca quadrifida* L.	Venereal diseases	[14]
Ranunculaceae	*Clematis brachiata* Thunb.	Headache	[14]
	Clematis viridiflora Bertol.	Headache	[52]
	Ranunculus multifidus Forssk.	Blennorrhagias	[14]
Rhamnaceae	*Helinus integrifolius* (Lam.) Kuntze	Stomachache in children	[14]
	Ziziphus mucronata Willd.	Stomachache; constipation; muscular pain; poison antidote; and skin diseases	[7,52]
Rosaceae	*Hagenia albyssinica* J.F. Gmel.	Stomachache; diarrhea; and hernia	[56]
Rubiaceae	*Breonadia salicina* (Vahl) Hepper and J.R.I.Wood	Malaria	[6]
	Catunaregam swynnertonii (S.Moore) Bridson	Aphrodisiac; tuberculosis; and helminthiasis	[13,14,38]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
	Crossopteryx febrifuga (Afzel. ex G. Don) Benth.	Malaria; stomachache; and joint pain	[15,38,56]
	Gardenia ternifolia Schumach. e Thonn. subsp. jovis-tonantis (Welw.) Verdc. var. goetzei (Stapf e Hutch.) Verdc.	Stomachache	[1,14]
	Gardenia volkensii K.Schum. subsp. volkensii var. volkensii	Dysentery; headache; swelling; body pain; and stomachache	[7,14,38]
	Heinsia crinita (Afzel.) G. Taylor	Helminthiasis	[13]
	Pavetta sp.	Malaria	[6]
	Tricalysia sp.	Stomachache; constipation; and earache	[52]
	Vangueria infausta Burch.	To induce or to speed up the delivery process; stomachache; cough; skin blisters; malaria; dysentery; earache; toothache; allergies; ringworm; injuries; and skin diseases	[6,36,51,55]
	Xeromphis obovata (Hochst.) Keay	Stomachache	[56]
Rutaceae	*Ptaeroxylon obliquum* Radlk	Stomachache	[1,7]
	Vepris reflexa I. Verd.	Aphrodisiac	[1,52]
	Zanthoxylum capense (Thunb.) Harv.	Violent chronic coughing; tuberculosis; bronchitis; UTI; and helminthiasis	[13,35]
	Zanthoxylum humile (E.A.Bruce) P.G.Waterman	Toothache; dysentery; diabetes; heart problems; anesthetic; swelling; injuries; burns; oral anesthetic; toothache; wounds and burns; and painkiller	[7,14]
	Zanthoxylum rhetsa DC.	Stomachache; diarrhea; and hernia	[56]
Salicaceae	*Flacourtia indica* (Burm.f.) Merr.	Diarrhea; malaria; and stomachache	[6,14,56]
	Oncoba spinosa Forssk.	Antivenereal and anti-ophidic	[14]
Salvadoraceae	*Salvadora persica* L. var. persica	Colds; nausea; stomachache; headache; flu; and injuries	[7,14]
Santalaceae	*Viscum triflorum* DC.	Diseases not specified	[14]
Sapindaceae	*Cardiospermum halicacabum* L.	Toothache	[38]
	Pappea capensis Eckl. and Zeyh	Dysentery; stomachache; eye diseases; and ringworm,	[7]
	Zanha africana Exell	Headache	[38]
	Zanha golungensis Hiern	Stomachache; constipation; wounds; sprains; muscular pain; headache; toothache; malaria; and general weakness	[52]
Sapotaceae	*Manilkara discolor* (Sond.) J. H. Hemsl.	Toothache	[51]
	Manilkara mochisia (Baker) Dubard	Toothache	[1,7]
Solanaceae	*Solanum aculeatissimum* Jacq.	Headache	[14]
	Solanum lichtensteinii Willd	Stomachache; fever; throat; flu; ringworm; and injuries	[7]
	Solanum panduriforme E. Mey.	Stomachache; toothache; and snakebites	[52]
	Solanum sp.	To chase away evil spirits and wounds	[38,52]
Thymelaeaceae	*Synaptolepsis kirkii* Oliv.	Skin blisters and constipation	[52]

Table 1. *Cont.*

Botanical Family	Botanical Species (or Genus)	Therapeutic Uses	References
Tiliaceae	*Grewia flavescens* Juss. var. flavescens	Stomach disorders	[52]
	Grewia hexamita Burret	Menstrual cycle; women fertility; and post-delivery cleaning	[14,25]
	Grewia monticola Sond.	Diarrhea; wounds; and swelling	[14]
	Grewia pachycalyx K. Schum.	Tuberculosis	[52]
	Grewia sulcata Mast.	Wounds	[13]
Turneraceae	*Tricliceras longipedunculatum* N (Mast.) R. Fern	Snakebites	[52]
Verbenaceae	*Lippia javanica* (Burm f.) Spreng.	Serious hemorrhages	[24,38]
Vitaceae	*Ampelocissus obtusata* subsp. kirkiana (Planch.) Wild e R.B.Drumm.	Leprosy	[14]
	Cissus bathyrhakodes Werd.	To facilitate placenta expulsion	[52]
	Cissus cornifolia (Baker) Planch.	Puerperal fever; dysentery; burns; and wounds	[1,7,14]
	Cissus quadrangularis L.	Cattle's wounds; flu, swelling, injuries, menstrual and uterine complaints; cough; and wounds	[1,7,14]
	Cyphostemma buchananii Wild and R.B. Drumm.	Toothache and teeth abscesses	[38]
	Cyphostemma gigantophyllum (Gilg e M.Brandt) Desc. Ex Wild e R.B.Drumm.	Leprosy and wounds	[14]
	Cyphostemma junceum (Webb) Wild e R.B.Drumm.	Leprosy	[14]
	Rhoicissus revoilii Planch.	Diarrhea; stomachache; bloody vomit; cough; tuberculosis; fever; general weakness; and sexual vitality	[38,52]
	Rhoicissus tomentosa (Lam.) Willd. et Drummond	Miscarriage	[52]
Zygophyllaceae	*Balanites maughamii* Sprague	Tuberculosis; stomachache; and malaria	[1,7]

According to Bruschi et al. [52], the species *Anacardium occidentale* (used in the treatment of hernia); *Diplorhynchus condylocarpon* (vertigo); *Boscia albitrunca* (muscle pain); *Vernonia colorata* (vertigo); *Dalbergia melanoxylon* (general weakness); *Millettia stuhlmannii* (venereal diseases); *Brackenridgea zanguebarica* (venereal diseases), and *Zanthoxylum humile* (mouth anesthetic; toothache, wounds, burns, and pain killer) provided new data for Africa.

A total of 20 species were studied against Plasmodium falciparum, Mycobacterium tuberculosis, Candida albicans, Schistosoma mansoni, Staphylococcus aureus, Pseudomonas aeruginosa, and others, which cause diseases such as tuberculosis, malaria, infectious diseases, intestinal worms, etc. [17]. These species belong to 13 families and Capparaceae was the most used with three species. Other botanical families were Anacardiaceae, Apocynaceae, Compositae, Leguminosae, Malvaceae, and Phyllanthaceae (each with two species) and Combretaceae, Cucurbitaceae, Meliaceae, Polygalaceae, Rubiaceae, Salvadoraceae, and Xanthorrhoeaceae (each with one species). Tuberculosis was the most analyzed disease, followed by malaria.

A set of 10 species were tested against Mycobacterium tuberculosis, namely, *Anacardium occidental*, *Sarcostemma viminale*, *Tabernaemontana elegans*, *Capparis tomentosa*, *Maerua edulis*, *Maerua juncea*, *Combretum zeyheri*, *Vernonia colorata*, *Adansonia digitata* and *Securidaca* [35,51]. According to

the same authors, six species showed negative results, namely, *Anacardium occidental*, *Sarcostemma viminale*, *Maerua juncea*, *Combretum zeyheri*, *Vernonia colorata* and *Adansonia digitata*.

Results relating to testing the anti-TB activity of plant extracts have been observed in Uganda, Turkey, and Indonesia [36]. Many plants were used and tested positive against *Mycobacterium tuberculosis* H37Rv, for example, *Helichrysum melanacme*, water extract (MIC = 1 mg/m); *Arctium lappa*, methanol extract (MIC = 62.5 µg/mL), and *Vetiveria zizanioides*, ethanolic extract of roots (MIC = 500 µg/mL).

The species *Momordica balsamina* was the most-used to study *Plasmodium falciparum*, with more than two studies analyzed [24,27–29]. Identical studies were also found in Ethiopia and Cameroon, testing various plants against *Plasmodium falciparum* 3D7 and *Plasmodium berghei* [30,32]. Promising results were found in some plants such as *Echinops kebericho*, *Phyllanthus muellerianus*, and *Anogeissus leiocarpus*.

EtOAc extract of *Tabernaemontana elegans* roots (MIC 15 µg/mL) and CH_2Cl_2 extract of *Zanthoxylum capense* roots (MIC 62 µg/mL) showed greater antimycobacterial activity. Another and no less important result showed the inhibitory effects of acetone extracts of *Cassia abbreviata* and *Pseudolachnostylis maprouneifolia barks* and acetone extract of *Aloe marlothii* leaves against α-glucucosidase and β-glucuronidase (MIC 200 µg/mL), confirming the presence of anti-HIV activity [35].

Many studies were tested by the broth microdilution method and methanol, ethanol, water, n-Hexane, and ethyl acetate were the most used solvents for plant extract preparation.

Table 2 summarizes the ICF values for the different diseases categories. The calculation of this factor indicates whether a certain category of disease is usually treated using medicinal plants by the local community. A total of 19 different disease categories were treated with the medicinal plants from Mozambican areas. The categories were classified into systems; digestive, circulatory, respiratory, nervous, auditory, visual, sexual-reproductive, lymphatic, immune, muscular, endocrine, children's diseases, skin diseases, tooth diseases, blood and nutritional problems, microbial infections, urogenital and gynecological troubles, antidote, and others.

Table 2. Ailments categories and their ICF values.

Diseases Categories	Diseases	Nur	Nut	ICF
Digestive system	Stomachache, diarrhea, dysentery, bellyache, throat pain, mouth ulcer, bloody vomit, rectal prolapse, nausea, and cholera	156	144	0.08
Circulatory system	Hemorrhoids and heart problems	7	6	0.17
Respiratory system	Asthma, cough, tuberculosis, bronchitis, constipation, and flu	67	59	0.12
Nervous system	Epilepsy, headache, and convulsions	32	32	0
Auditory system	Earache	8	7	0.14
Visual system	Conjunctivitis and eye ache	7	7	0
Sexual-reproductive system	Bilharzia, VIH-SIDA and general weakness, venereal diseases, gonorrhea, hernia, sexual dysfunction, and testicle inflammation	52	51	0.14
Lymphatic system	Appendicitis	1	1	0
Immune system	Cancer, fever, and allergies	11	10	0.1
Muscular system	Rheumatism, back pain, chest pain, articular problems, muscle pain, and pain in bones	10	10	0
Endocrine system	Biliary disorders, stomach disorders, and liver disorder	33	33	0
Children diseases	Fontanelle syndrome, paralysis and childhood diseases, and intestinal worms in children	8	8	0
Skin diseases	Abscess, boil, swelling, burn, leprosy, ringworm, and skin diseases	35	35	0
Tooth diseases	Sore tooth	18	18	0

Table 2. *Cont.*

Diseases Categories	Diseases	Nur	Nut	ICF
Blood and nutritional problems	Anemia and diabetes	7	6	0.16
Microbial infections	Helminthiasis, intestinal worms, and schistosomiasis	24	24	0
Urogenital and gynecological troubles	Miscarriage, speeding up labor, menstruation pains, female infertility, pregnancy pains, and post-partum pain	33	33	0
Antidote	Snake bite	10	10	0
Others	Aphrodisiac, wounds, malaria, injuries, and satyriasis	102	97	0.05

ICF: the informant consensus factor; Nur: the number of use-reports for particular disease category; Nut: the number of taxa used for a disease category by all informants.

FIC was excluded from data analysis because it proved to be incompatible with the number of use reports for a particular disease category and the number of taxa used for a disease category by all informants.

The Nur of various disease categories ranged from 1 to 156. The highest Nur (156) corresponds to the digestive system category, followed by the other (102), respiratory (67), and sexual-reproductive (52) categories. This category included illnesses such as stomachache, diarrhea, dysentery, bellyache, vomit, throat pain, mouth ulcer, bloody vomit, rectal prolapse, nausea, and cholera. Stomachache was the most frequently mentioned illness (65), followed by diarrhea (51) and dysentery (20). A total of 60 species have been cited for the treatment of stomachache, diarrhea (46), and dysentery (17). Stomachache, diarrhea, dysentery, and malaria are the most common causes of illness and one of the main lethal causes in children in Africa.

Maroyi et al. and Eddouks et al. [37,50] also reported the cure of stomachache and diarrhea using medicinal plants, and the high number of plants mentioned in the treatment of these diseases, revealing their popularity. In the remaining categories, diseases such as cough, tuberculosis, venereal diseases, helminthiasis, wounds, and malaria were also frequently mentioned. In this set, malaria was the most mentioned (55 times), followed by cough (35 times), wounds (33 times) and venereal diseases (32 times). Cough was often considered as one of the symptoms related to tuberculosis.

Figure 1 describes the frequency of plant organs used during the drug preparation process. Roots lead, with 235, followed by leaf (135), stem (76), and finally, bark (48). These records contradict those consulted that show the leaf as the most used organ due to its anatomical position, it being responsible for carrying out the photosynthetic process, and the unsustainability that the stem and bark have in the development and discovery of traditional medicines [37,50]. Maceration in water and oral mode were the most used methods in the preparation of medicines and their administration.

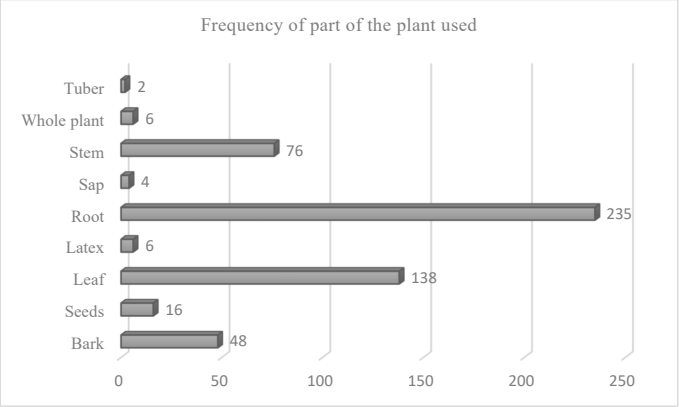

Figure 1. Frequency of part of the plant used.

4. Discussion

In this present bibliography review, 472 medicinal species were registered. Three hundred and seventy-five (375) were identified up to species level and 25 to genus level. Seventy-two unidentified were excluded from the subsequent quantitative analyses. The highest percentage of ethnobotanical and ethnopharmacological studies still take place in the south compared to the center and north of Mozambique. A large number of ethnobotanical studies have focused only on evaluating the efficacy of medicinal species through data collection and not on confirming them through the follow-up of medicated patients and phytochemical laboratory tests [62–64].

In Mozambique, considerable efforts are being made to improve access to public health resources for the population, especially for rural communities. It is, therefore, important to utilize all available health resources, including the use of medicinal plants, particularly those known and used in geographical areas closest to these populations [65–67].

However, this use must respect the necessary hygienic conditions for proper conservation and utilization, without destroying the natural sources that provide these plants in the wild. Additionally, it is crucial to control and prevent the development of pests that affect crops and public health.

Several researchers report a vast diversity of medicinal plants used in Mozambique [1,13,38,55,65]. These plants address a wide range of health problems, including malaria, tuberculosis, bacterial infections, parasitic diseases, and various other ailments. Ribeiro, A. et al., Bruschi, P. et al., and Sitoe, E., and Van Wyk, B. E. documented several plants with potential new medicinal uses, some unreported before in Africa [1,8,52,68]. Luo, X. et al. and Manuel, L. et al. specifically investigated plants used for treating tuberculosis and malaria, respectively: Luo, X. et al. identified promising anti-tuberculosis activity in extracts from *Maerua edulis*, *Securidaca longepedunculata*, *Zanthoxylum capense*, and *Tabernaemontana elegans* and identified potential active compounds in the promising anti-tuberculosis extracts, including fatty acids, phenolic compounds, and indole alkaloids; Manuel, L. et al. documented various plants used by traditional healers for malaria treatment in northern Mozambique [6,35].

It is interesting to see whether there could be evidence of knowledge exchanged between population groups of different origins or social strata living together in Mozambique, as is the case elsewhere [68]. In this case, it should be noted that there is not always an adequate transfer of knowledge, as in some cases, the results showed that there was only a small percentage of medicinal plants shared by two or more groups. This may be due to several factors, such as a power imbalance between different social classes or ethnic groups, the suppression of indigenous medical knowledge and practices by those using more conventional therapies, language barriers, and the reduced availability of medicinal herbs in traditional areas due to new agricultural practices. Additionally, there is the issue of whether the shared uses of medicinal plants between Mozambique and other southern African countries, such as South Africa, are empirically confirmed, pointing to a common, as yet unnamed, medicinal system between the Bantu-speaking cultures of southern and eastern Africa [69].

Despite many ethnobotanical studies carried out in the country, there is still a lack of scientific validation of the medicinal power of the species used.

Practices of trading medicinal plants by inexperienced people in the informal market are recurrent [11,20,69]. Increasing commercialization attracts people with limited knowledge of traditional management systems and harvesting techniques, which may have severe consequences for the wild plant population. Also, the practice of traditional medicine in Mozambique still faces problems in the appropriate method of collecting medicinal species, conservation, and the correct use of prepared medicines. In a developing country endemic for Aspergillus, efforts have been made to combat aflatoxin contamination, which affects both public health and the country's economy. Aflatoxin levels and prevalence vary according to time, geographical location, and different commodities. Efforts should be directed towards reducing contamination both at the crop level and in product

conservation. The proper storage and handling of harvested crops is crucial to prevent contamination during the post-harvest phase [69–71]. According to Freitas, L. O., and Resende, A. [71], the inadequate method of preparing the herbal medicine and its lack of supervision contributes to its subsequent contamination, in many cases by fecal coliforms (*Escherichia coli* and *Staphylococcus aureus*). And after compiling the results of different analyses, it was observed that 35% of the medicinal plants analyzed were in inadequate sanitary quality conditions for human consumption, according to the established standards, indicating unsatisfactory hygienic conditions for storage and commercialization.

In the case of the sustainable development and biodiversity conservation points, there are different experiences in Mozambique. Several studies [72–75] examine the adoption, performance, and impact of conservation agriculture (CA) practices among smallholder farmers in Mozambique. CA, characterized by minimal soil disturbance, crop residue retention, and crop rotation, is a sustainable land management system aimed at addressing challenges such as soil degradation, fertility decline, and the adverse effects of climate change. The research highlights the factors influencing the adoption of CA, its effectiveness under different conditions, and its potential to improve crop productivity and livelihoods. These studies revealed a positive impact of CA on smallholder farmers' livelihoods in Mozambique. CA adoption correlated directly with higher productivity and yields and indirectly with improved household incomes and food security. The integration of CA into Mozambique's rural development policies could systematically enhance farmer livelihoods while promoting sustainable agricultural practices.

Results from some of them indicate that almost half of the farmers adopted one or more CA practices, and that family size, animal ownership, means of communication, and group membership positively influenced adoption. Interestingly, female-headed households were more likely to adopt CA, and the awareness of deteriorating soil health proved to be a significant factor. However, adoption patterns were site-specific, underscoring the need for localized strategies rather than a blanket approach.

Other evaluations conducted between 2008 and 2011 in 17 communities compared the performance of CA practices with conventional tillage systems in corn crops. The results showed that maize yields were consistently higher with intensive tillage systems in both low and medium tillage areas. These results underscore the importance of taking into account site-specific risks and farmer preferences when promoting CA practices.

Despite the variability observed across sites, CA consistently improved maize and legume yields, offering a sustainable alternative to conventional agriculture as population pressures and land constraints increase.

In conclusion, CA holds significant promise as a tool for sustainable intensification, but its success depends on careful targeting and adaptation to specific farmer and agro-ecological contexts.

Agricultural research addresses various global challenges, from food security to climate change. Medicinal plants play a crucial role in the economic, social, cultural, and ecological spheres of local communities worldwide. Their primary applications are found not only in the pharmaceutical field, but also in the perfumery, cosmetics, toothpaste, soap, beverage, and food industries. These natural resources represent a significant source of income, particularly in rural areas. There are several examples of the interesting application of medicinal and aromatic plants and how their exploitation has an impact on public health and the economy of a country [76–83]. Moreover, medicinal plants are posited as excellent viable alternatives for sustainable agriculture, offering potential for the food, pharmaceutical, and cosmetic industries, as found in plants rich in anthocyanins (*Cornus mas* L.) or those of the genus *Rubus*. These plants provide significant nutritional and health benefits, although more research is needed on wild and lesser-known species [80,81]. Worldwide, medicinal and aromatic plants are gaining interest as resilient alternative crops, with saffron and rosemary showing the best economic yields in Italy [82]. The search for species with economic, nutritional, or medicinal utility is a promising avenue for developing sustainable crops, such as *Vigna subterranea*, which emerges as a promising crop for Africa [83].

However, the cultivation of these plants faces challenges, such as the need for sustainable agricultural practices. Unfortunately, there have been hardly any studies on the sustainable breeding and cultivation of medicinal plants in Mozambique, but the above-mentioned results encourage thinking that this biodiversity conservation and sustainable development would also be possible through these methods. To address these challenges, studies have been conducted on the short-term effects of different tillage systems combined with cropping patterns on soil physical properties at four experimental sites in Mozambique. The results showed that CA practices could be a sustainable option that could help improve crop production and reduce contamination risks. Thus, conservation agriculture (CA) is promoted as an alternative to conventional tillage (CT) to reduce soil degradation and achieve the more sustainable production of medicinal plants [84]. Additionally, climate change significantly affects crop prices, which show a general trend towards increasing due to declining yields. Crop management and technique improvement can favor sustainable practices with added value, enabling a more responsible and adequate use of wild natural resources to prevent their disappearance [80,82,84–86].

Zambézia has a rich flora of the miombo type, which is in an advanced state of degradation, due to an unrestrained exploitation of species, such as those of economic as well as medicinal value [5,8,22,51]. The main motive and use of medicinal plants at the commercial level is the deforestation of the species collected due to the focus only on economic benefits. Conservation and development could potentially benefit from value-addition activities, new management systems (like agroforestry), or population protection and restoration [87]. A viable alternative to the devastation caused by uncontrolled exploitation could be the implementation of sustainable cultivation and selective breeding programs for plant species that have demonstrated significant economic and medicinal value. This approach could serve as a substitute or complement for traditional agricultural practices.

5. Conclusions

In this present bibliography review, 472 medicinal species were registered. Three hundred and seventy-five (375) were identified up to species level and 25 to genus level. Seventy-two unidentified were excluded from the subsequent quantitative analyses. The highest percentage of ethnobotanical and ethnopharmacological studies still take place in the south compared to the center and north of Mozambique. A large number of ethnobotanical studies have focused only on evaluating the efficacy of medicinal species through data collection and not on confirming them through the follow-up of medicated patients and phytochemical laboratory tests.

Our study highlights the importance of natural resources in Mozambique, and especially of medicinal plants in primary healthcare. The most-used plant species for medicinal purposes have been compiled and identified for the first time, highlighting the need for continued research on these species and their uses. This paper also highlights the importance of sustainable harvesting practices that are crucial for conserving these valuable medicinal plant resources. It is essential to regulate plant collection practices and establish priorities for the conservation of these species traditionally used in communities, in order to guarantee the sustainable management of forests. The introduction of improvements in cultivation techniques already in use in Mozambique is a good starting point to ensure conservation and the coverage of demand by the populations that use them.

The results indicate the potential for the sustainable cultivation and improvement of plant species with established or promising economic and medicinal importance as an agricultural alternative.

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