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Ethnobotanical evaluation of selected medicinal plants used in treatment of diseases around Venda region: A literature review

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The importance of traditional medicine has been recorded throughout the world. It has also been practiced throughout Africa by more than 80 % of rural communities. Traditional medicine has since been imbedded in the culture of many rural communities. People of the world continues to use traditional medicine because of their accessibility and affordability. The use of medicinal plants around the Venda region is vast, yet the published data on the various plants is scanty. The review aims to bring forth the knowledge of the most widely used plants among the *Vhavenda* population. The data was compiled from peer reviewed and non-peer reviewed journals, textbooks, thesis and also by interviews conducted with the traditional healers. The review revealed that there are a number of traditional medicines that are being preferred by traditional healers in their practice, the use of the selected plants in literature has never reported to be used in curing HIV/AIDS and its related illnesses. Most of the plants recorded were found to have active compounds in most of their organs. Plants are great sources for the discovery of new medicines. Natural products and their synthetics can be utilized in the development of highly useful drugs through chemical procedures and isolation followed by analog synthesis through modern medicinal mechanisms. The knowledge and understanding of each utilized medicinal plant is of great importance for it is through the discovery of newer potential drugs that the emerging life threatening infections can be effectively combated. With the increasing rate of people migrating from either rural – urban or vice versa, the natural habitats for such herbal plants is in the process of being completely destroyed without preservation of the naturally important plant species. The fear is of losing such important plant from the local communities thus losing valuable and future vital drugs.

Keywords: Traditional medicine, Rural communities, *Vhavenda* population, Traditional healers, Natural products.
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Since the dawn of human advancement, humans have found alternative cure within their natural territory and have acquired different remedial strategies depending upon climatic, phytogeogeographic, sociocultural, floral, and fauna characteristics. The worldwide significance of traditional medicine (TM) and its benefaction to human healthcare cannot be accentuated. It is estimated that approximately 80 % of people living in the rural parts of Africa are heavily dependent on local medicinal plants for their primary healthcare needs, though it is not fully investigated or documented[1]. The use of such un-refined traditional medicines have long been in practice and continue to be the foundation of many traditional medicines worldwide. In Asia, these remedies there are different types, these includes Japanese Chinese medicine (*Kampo*), traditional Chinese medicine (TCM), *Ayurvedic* medicine (India), and Korean Chinese medicine, *Jamu* (Indonesia). In Europe, phytotherapy and homeopathy have found diverse medicinal uses. In America, the combination of traditional medicine with conventional western medicine is termed ''integrative medicine''[2,3].

The people of Tarai region of Kumaun are reported to use medicinal plants on the trial and error basis, with the great lack of scientific research to confirm effectiveness of various plants they employ in treating illnesses[4]. With the diversity of plant species in jungles worldwide, it is highly recommended to investigate the chemical components and identifying the active compounds thereof before concluding on the tremendous effectiveness of any plant[5]. Although the global society comprise of different cultures and traditional beliefs, there are similarities in certain aspects of medicinal plant uses which can serve as a validation for the effectiveness of certain medicinal

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plants[6]. Despite the traditional importance of use of medicinal plants, there is a great need to understand the folklore practices, document the indigenous knowledge, and preserve the ethno medicinal legends[7,8]. The adaptation of urbanized lifestyles among rural based communities, ethno practices and use of medicinal plants has decreased significantly. A study done in Yangzhou revealed that traditional knowledge on the growing, rearing and preservation of great medicinal plants is not common knowledge since the local communities have lost touch with traditional knowledge[9].

The purpose of this review was to evaluate some of the medicinal plants being utilized in treatment of diseases around Venda region of South Africa. The review focused on desktop literatures complimented by an intensive open ended interview with local traditional healers.

Botanical description of traditional medicine

Within the African continent, traditional medicine has grown to be a part of the people's culture regardless of the fact that this form of medicine is not as well studied nor understood. People who practice the use of traditional medicine range from herbalists, *sangomas*, psychiatrists and so forth. *Muthi* as it is known among the *Zulu* people is an important part of the culture and traditions of African people. Today, majority of the population in urban South Africa, as well as rural communities depends on herbal medicines for their healthcare needs. Apart from their cultural importance, this could be attributed to the fact that these medicines are generally more accessible and affordable[10]. As a consequence, there is a great inclination, worldwide, to consolidate traditional medicine with western medicine.TM have been the focus for a broader reportage of primary healthcare delivery in Africa and the rest of the world[11]. It is deeply embedded in a specific sociocultural context which varies from one community to another. The remedial uses of medicinal plant in Africa dates back to the ancient times as it is confirmed by the ancient Egyptian writings. The medicinal practices put forward in the Ebers and other Egyptian texts formed the intellectual foundation of African medicine[12]. Knowledgeable footing on the use of TM is still scantly documented in South Africa. This is becoming a critical issue, based on the delicacy of oral-tradition knowledge and the swift stride of urbanization and cultural modifications in this country. It is further pointed that the informal traditional medical systems of the *Khoi-San* dates back to over 300 years; the *Nguni*, *Sotho*, *Venda* and *Tsonga* speaking peoples' practices is not yet systemized[13].

A large part of the common daily utilized medicines in South Africa are still obtained from plants and abundant volumes of plants or their extracts are sold in informal and commercial sectors of the economy. In South Africa, approximately 20 000 tons of plant material, are harvested and sold yearly as traditional medicine[14]. Medicinal plants in *Kwa-Zulu* Natal alone support traditional health services with a value of more than $30 million annually[15]. More than 500 plant species are traded as medicinal plants on the Witwatersrand alone. These are mostly bark and roots, although other parts (stems, leaves, whole plants, bulbs)[13]. Unsustainable harvesting of bark and roots can lead to depletion of our natural sources. The active compounds in leaves, roots or bark can often differ considerably in nature and concentration, with one plant part harmless and another toxic. The use of traditional medicines (treatment of bacterial, fungal and viral infections) as well as their trade have also been recorded in Venda region[16]. Most of the medicinal plants are harvested for their roots which can be unsustainable if not well monitored[17,18]. The *in vitro* activities of some of the medicinal plants from Venda have been investigated and profiled[19,20].

Active compounds in certain medicinal plant

Plant compounds are classified as primary or secondary metabolites. Primary metabolites are broadly scattered in nature. Plants are known to produce plenty secondary metabolites which are synthesized from various primary metabolites and comprise a predominant source of biocidal compounds, pesticides and many therapeutic drugs. For centuries, medicinal plants or their secondary metabolites have been directly or indirectly playing a significant role in the human society to take action thereby reducing burden of disease[21]. In contrast to primary metabolites, secondary metabolites are produced in specialized cell types and at discrete developmental stages, making their extraction and purification a bit of a challenge. A few of the common plant compounds (saponins, flavonoids, phenols, glycosides, alkaloids) are detailed below:

Saponins

Saponins are prevalent in a number of higher plants and mostly found in roots, tubers, leaves, seeds.

Based on the carbon skeletons, saponins are usually categorized into triterpenes and steroids. Their glycone parts are mainly oligosaccharides, arranged either in a sequential manner or branched fashion, adhered to it is a to hydroxyl group through an acetal linkage[22]. These compounds dissolve in water to form an evenly suspended suspension that foam upon shaking. Saponins are in great demand in the pharmaceutical industry because some form the basis for the artificially manufactured drugs. Many have pharmacological effects and are used in phytotherapy and the cosmetic industry. They are believed to form the main components of a number of plant drugs and herbal remedies, and are considered responsible for many pharmacological effects[23].

Flavonoids

Flavonoids are primarily benzo-Á-pyrone (phenylchromone) derivatives, consisting of a massive group of polyphenolic compounds[24,25]. These natural antioxidants comprise over 4,000 chemically unique and discrete moieties and are found everywhere. The extremely large group predominantly comprises distinct classes such as flavonols, flavans, flavanones and others. Flavonoids are hydroxylated phenolic substances and are known to be synthesized by plants as a defense mechanism in response to microbial infection. Their activities are determined by the structure whereas the chemical identity of flavonoids depends on their structural class, degree of hydroxylation, other substitutions and combinations and degree of polymerization[26]. Several studies have highlighted defensive effects of flavonoids against various infections and chronic diseases such as cardiovascular diseases and other age-related diseases[25,27].

Phenols

One of the most predominant groups of these metabolites is phenolic compounds. They are distinguished by at least one aromatic ring with one or more hydroxyl groups. They are predominantly synthesized from cinnamic acid, which is influenced by the action of L-phenyloalanine ammonia-lyase PAL (EC 4.3.1.5). Phenols are classified into several groups, with constitutive number of carbon atoms in combination with the structure of the basic phenolic skeleton[28-30]. Phenolics have various functions in plants. Antidiabetic effects of flavonoids and phenolic acids have been described by several studies. Literature reviews have highlighted the effects on the increases of bile secretion to reduce cholesterol and lipid levels, antimicrobial activity of the compound against bacterial species. Phenolics have been demonstrated to possess multiple biological activities examples being the treatment of ulcers, reducing inflammation, inhibits oxidation, inhibits formation of tumorous growth, fights against malaria and also reduces depression symptoms[31-33].

Glycosides

Glycosides are compounds that produce one or more sugars when hydrolyzed. Glycosides are formed from a simple sugar and another compound by replacing the hydroxyl group within the water molecule[34]. Thus the glycoside comprise of two parts: the sugar moiety and the aglycone which may be any natural product (terpenes, flavonoid).

Alkaloids

Alkaloids are a group of extremely diverse compounds with contain a ring structure and a nitrogen atom. The nitrogen atom is located within the heterocyclic ring structure[35]. Alkaloids are widely distributed in the plant kingdom and exist in plants of relatively complex or advanced characteristics[35]. Furthermore, several alkaloids show important biological activities, such as the reduction of asthma symptoms, pain relieving effects, and the anticancer effects[35]. Alkaloids are amongst the most significant active constituents in natural herbs, and some of these compounds have already been developed into commercial drugs, such as camptothecin (CPT) a topoisomerase I inhibitor[36].

Botanical description and common uses of selected medicinal plants

Eight medicinal plants were commonly reported by 15 traditional healers who were 5 males and 10 females. Indigenous medicinal plants commonly reported by traditional healers in treatment of diseases in Venda region are indicated in Table 1. The samples and voucher specimens of the medicinal plants were collected and deposited at the University of Venda herbarium for identification. International Plant Names Index (IPNI) database was used to validate the botanical names of the voucher specimens.

Lannea edulis (Sond.) Engl.; Family: Anacardiaceae

Lannea edulis is a small shrublet with short branches arising from the underground tubers. The leaves are divided into 2-4 pairs of leaflets. The

Table 1—Medicinal plants used for treating various ailments in Venda, Limpopo

Scientific names, Family, Local Venda names and Voucher number	Common names	Availability	Crude methodology
Lannea edulis Engl.; Anacardiaceae; *Mutshutshungu* (V); MPT00120	Wild grape	Moderate	Half a cup of dried root decoction taken daily.
Elaeodendron transvaalense (Burtt Davvy) R.H.Archer; Celastraceae; *Mukuvhazwivhi* (V); MPT00041	Bushveld saffron	Moderate	Half a cup of dried bark decoction taken daily.
Coccinia rehmannii Cogn.; Cucurbitaceae; *Galange;* MPT00116	Wild cucumber	Moderate	Half a cup of dried roots decoction taken daily.
Jatropha zeyheri Sond.; Euphorbiaceae; *Thundamali* (V); MPT00115	Verfbol	Moderate	Half a cup of dried roots decoction taken daily.
Cassia abbreviata Oliv. ; Fabaceae; *Mumboma* (V); MPT00122	Sjambok tree	High	Half a cup of dried bark decoction taken daily.
Elephantorrhiza elephantina (Burch.) Skeels; Fabaceae; *Gumululo* (V); MPT00117	Elephant-root	Moderate	Half a cup of dried roots decoction taken daily.
Pterocarpus angolensis DC.*;* Fabaceae; Mutondo (V) ; MPT00118	Bleed wood tree	High	Half a cup of dried bark decoction taken daily.
Ornithogalum ornithogaloides (Kunth) Oberm.; Liliaceae; *Tshiganame* (V); MPT00121	Vlei chinkerinchee	Low	Half a cup of dried roots decoction taken daily.
Ochna holstii Engl. ; Ochnaceae ; *Tshipfure* (V); MPT00119	Red Ironwood	Moderate	Half a cup of dried roots decoction taken daily.
Ziziphus mucronata Willd.; Rhamnaceae; *Mukhalu* (V); MPT00123	Buffalo thorn	High	Half a cup of dried bark decoction taken daily.

yellow small flowers are borne in erect clumps followed by purplish berries. It is known as *Mutshutshungwi* in Tshivenda and is used in treating ailments such as diarrhea[37-39]. Within some communities, leaf infusions of this plant are applied topically on sore eyes and boils[40]. A root decoction is taken in soft porridge to treat sterility and also to cleanse the blood of any foreign organisms (interviews comments). Several uses have been recorded in Zimbabwe, including the treatment of convulsions, whooping cough, female sterility and bloody diarrhea. The active ingredients within the bark of *Lannea edulis* are alkylphenols (cardonol 7 and cardonol 13) as well as 3 dihydroalkylhexenones[41].

Jatropha zeyheri Sond.; Family: Euphorbiaceae

It is a climbing herb, rooted rhizome, slightly branched leafy stems. It is mainly found in grasslands and in sandy soil, known by the locals as *Thundamali*. The genus comprise of approximately 172 species, all with significance with regards to healing various ailments[42]. Decoction of the tuber is known to be used in the treatment of inconsistent periods, period pain and to ensure a healthy and strong foetus before birth[43]. It may also be used topically in wound treatment[44].

Cassia abbreviata Oliv.; Family: Fabaceae

Cassia abbreviata (Long-tail *Cassia* or *Sjambok* tree) loses its leaves in winter season and is easily identified through its' unusually long tail like seedpods which appears brownish in colour. The Afrikaans common name for this plant is *Sambokpeul*, and *VhaVenda* people call it *Mulumanama/ Mumboma. Cassia abbreviata* is an average sized tree, the trunk is generally uniform and the bark is deeply and regularly cracked. The veins on the leaves are parallel and dark green in color. Flowering season lasts only 4 – 6 weeks and it happens as new leaves sprout. The seed pods or fruits of *C. abbreviata* are long, thin and cylindrically shaped and they ripen a year after the flowers. The whiplike shape of the pods led to its common name (*Sjambok* tree), being a short whip which is used quite often as disciplinary measure in South Africa (observation). Traditional healers harvest both the root and the bark of *Cassia abbreviata* for the treatment of bilharzia and black water fever. Other ailments which have been proven to be treated with this tree extract include backache, costiveness, diarrhea, skin infections, and headache[13]. With the interviews conducted in this study, it has been discovered that *Cassia* is also used to alleviate HIV/AIDS and related co-infections. Some of the anti-infectivity effects it possess includes; diarrhea and gonorrhea medicine[45], antimicrobial properties[46-48].

Elephantorrhiza elephantina (Burch.) Skeels**;** Family: Fabaceae

Elephantorrhiza elephantina is commonly known as *Gumululo* among the *Vhavenda* people, it has several unbranched, annual stems growing from an enormous underground rhizome. The leaves have couple small, narrow leaflets, also have clumps of cream flowers. This plant is used as a traditional cure for a variety of ailments, including diarrhea and dysentery, stomach disorders, haemorrhiods and peptic ulcers[49]. The activity of the medicine is not clear, however tannins are known antidiarrhoeals and antiseptics, effective in the treatment of infectious diarrhoeas[49]. As antibacterials and antifungals, they are useful to treat dermatitis and also known to enhance tissue regeneration by forming a protective barrier on the skin and mucosa[50].

Pterocarpus angolensis DC.; Family: Fabaceae

Pterocarpus angolensis is a sweetly-scented tree, also known by the name bleed wood tree because of the red sap that oozes when the bark is cut. Its flowers blossom in spring, while in autumn the long dangling leaves adopts a dark yellow colour[51,52]. It is commonly known as *Mutondo* in Tshivenda, it has flattened crown consisting of large leaves and separated in a feathery fashion. The stem has good quality wood, with varying colour from light brown to red or coppery-brown and is fissured[51]. The seed pods of *Mutondo* are circular in shape surrounded by brownish wing which are borne in hanging clusters[51]. The red sticky sap from the tree, is used in the manufacturing of dyes and has also several medicinal properties[53]. This distinguished tree has many uses and is of great value in the African continent at large. Its timber used for furniture, implements, curios and canoes designs[52,54]. The red sap is mixed with animal fat to beautify women faces and bodies. It is also believed to have supernatural properties for curing of blood problems. Several ailments have been proven to be treated by decoction of *Mutondo* like fungal infections, eye problems, fever and stomach cramps (interviews).

Ornithogalum flexuosum (Thunb.) U.Müll.-Doblies & D.Müll.-Doblies syn. *Ornithogalum ornithogaloides* (Kunth) Oberm.; Family: Liliaceae

Ornithogalum ornithogaloides also known as the *Vlei chinkerinchee* and *Tshiganame* (Tshivenda) is a bulbous plant of only about 40 cm high. The bulb is small at about 2 cm in diameter, white and enclosed in thin, membranous bulb-scales. Each bulb usually produces two inflorescences consecutively during the season. The flowers produced are small, pure white and star shaped. The fruit is 3-chambered, with 1 -3 seeds in each chamber. There are approximately over a hundred of *O. ornithogaloides* species in Southern Africa and a large proportion of these have been found to be poisonous to grazing animals. The symptoms are severe, sometimes bloody diarrhea. Cattle are often blinded; even if they recover from the poisoning they remain blind for life[55]. No research has been published on *O. ornithogaloides* being utilized for treatment of any human ailments, for the first time in literature this review reports the use of *Tshiganame* as one of the concoctions in the eradication of HIV/AIDS burden

Ochna holstii Engl.; Family: Ochnaceae

It is a bushy to average sized tree with rough stems, small branches with grey-brown stems and branchlets with tossed elevated dots. *O. holistii* is commonly known as *Tshipfure* in Tshivenda, the leaves are alternate with mid vein and branched veins eminent from above and indented margins. Its flowers are yellow and densely clustered on side shoots. The flowering season is between September–November and the fruiting time is between November and January. The fruits of *Tshipfure* are pink to purple coloured. It is used mostly in treating wounds topically especially on domestic animals of the local people around the Vhembe district[56]. The local traditional healers make use of this extract also as part of a concoction in hindering replication of HIV and boosting the immune system (interviews).

Ziziphus mucronata Willd.; Family: Rhamnaceae

Ziziphus mucronata is a widely used medicinal plant, commonly known as *Mukhalu* in Tshivenda. It is an average sized tree and branchlets are spread widely. The bark is rough, and brown and bears sharp thorns on its twigs. Its leaves have an intensely green color and are shiny with a characteristic yellowish-green colour borne in clusters. *Z. mucronata* fruits are small, rounded berries which become reddish-brown when matured. Warm bark decoction are used in the treatment of cough and chest problems and root decoctions are used in treatment of diarrhea and dysentery[37,57]. A combination of root and leaves decoction can be applied topically to treat boils, sores and glandular swellings[37,57]. The decoction is also taken orally to alleviate swelling pain.

Traditional significance of study to society/ researchers

This review study will contribute significantly to the body of traditional knowledge within the society. It highlights the important of these species in traditional medicinal practices and hence the eminent protection of the species. Protection of important medicinal plant species will go a long way towards addressing respect, preservation and maintenance of traditional knowledge relevant for conservation and sustainable utilization as envisaged by United Nations Conference on Environment and Development[58]. It is important to note that raising awareness of important medicinal plants enhances the knowledge profile of ethnomedicine amongst the societies. It has also been noted that knowledge of ethnomedicine amongst the societies is of importance since they may need it not only for treatment of different diseases but also prevention thereof[59]. Promoting the continuous availability of these important medicinal plants within the societies may assist in availing them for potential drug development experiments. It has been asserted that trial and error experiments on materials based on traditional knowledge could guide the search for new drugs[60].

Conclusion

South Africa has an abundantly rich cultural practice of plant usage, diverse range of climate changes, diverse plant species of which have been utilized for centuries in traditional practices yet scientifically some of the applications are not well documented. The therapeutic potentials of such medicinal plants are massive yet the thorough understanding of their biological properties is not broadly investigated. As highlighted in this review, plants are great natural source for the uncovering of newer potential medicines or remedies. The compounds within each plant can be chemically processed and later used in the development of useful drugs that will aid in decreasing if not completely eliminating the burden of disease. The 8 listed plant species are in abundant usage for treatment of serious diseases like HIV among the local communities in Venda. The use thus, South African based medicinal plants have long been appreciated for treating illness, and continue to be one of the best and most effective sources used to develop new plant-derived compounds as clinical candidates for new world-class medicines.

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