

Full Length Research Paper

Use, conservation and present availability status of ethnomedicinal plants of Matebele-Village in the Limpopo Province, South Africa

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Ethnobotanical surveys were carried out between January 2011 and April 2012 to compile an inventory of plants used medicinally by people of the Matebele village. A semi-structured questionnaire was used to collect data on the species used by the villagers. The results show that 65 species (86.1% indigenous and 13.8% exotics) from 36 families, mostly the Asteraceae (13.8%) and Fabaceae (10.7%), are being used to treat 28 ailments or conditions. To the best of our knowledge, 24.4% of the species were recorded for the first time as medicinal. The most widely used species were *Terminalia sericea* (43.3%), followed by *Acacia senegal*, *Eucomis pallidiflora* (36.6% each), *Drimys elata* (26.6%), *Warburgia salutaris* (19.9%) and *Artemisia afra* (16.6%). Roots (39.1%), leaves (21.6%) and stem bark (10.8%) were the most frequently used parts. The heavy dependence on wild medicinal plants and utilization of threatened (*E. pallidiflora*, *D. elata* and *W. salutaris*) and protected (*Sclerocarya birrea*) species by inhabitants of Matebele village calls for urgent conservation intrusion.

Key words: Ethnomedicinal plants, Limpopo Province, Matebele Village, conservation, present availability status, South Africa, use.

INTRODUCTION

Plants play a key role in the primary healthcare systems in many developing countries, principally in Africa, where modern drugs are not affordable (De Souza et al., 2011). Globally, about 85% of the traditional medicines used for primary healthcare are derived from plants (Kumar and Nair, 2004). It has been estimated that 80% of people in Africa rely on traditional medicine for their primarily

healthcare (Hostettmann and Marston, 2002). South Africa is no exception, and studies by Dykman (1908), Kling (1923), Hutchings et al. (1996), Van Wyk et al. (1997), Amusan et al. (2007), Appidi et al. (2008) and De Wet et al. (2010, 2012) demonstrate this.

In the Limpopo Province of South Africa, a number of ethnobotanical surveys (Arnold and Gulumian, 1984;

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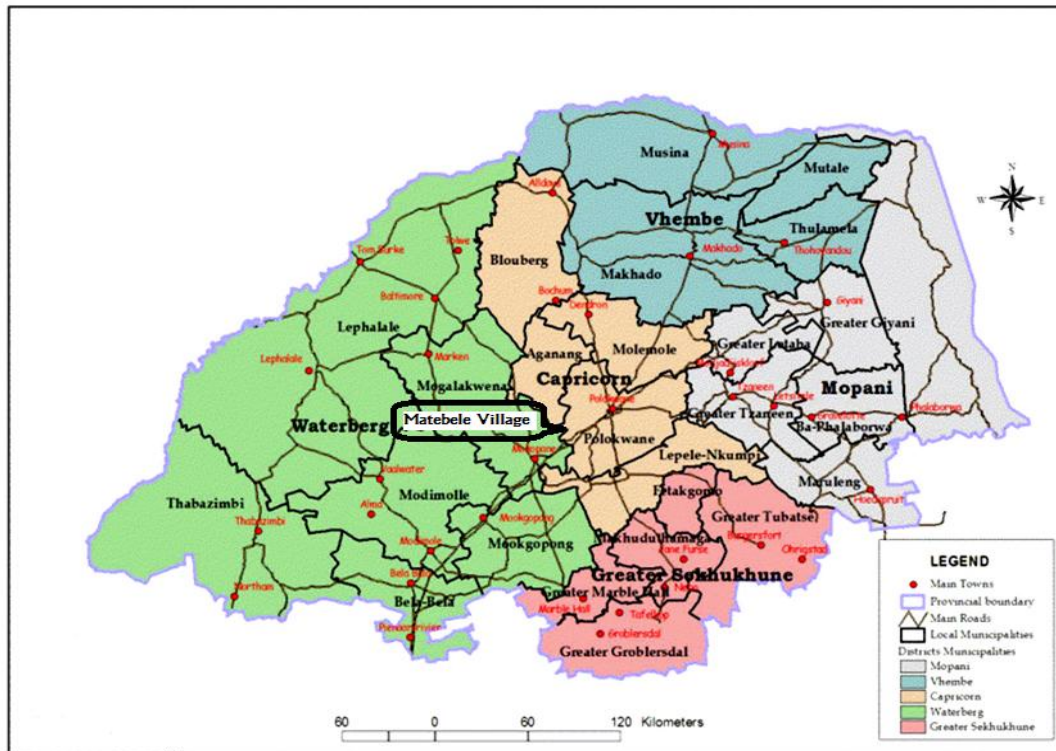


Figure 1. Map of the Limpopo Province indicating the location of Matebele Village.

Mabogo, 1990; Brandt and Muller, 1995; Madzibane and Potgieter, 1999; Mashabane et al., 2001; Samie et al., 2005; Tshikalange et al., 2005; Mulaudzi et al., 2011) highlighted that rural people in different districts depend heavily on traditional medicine to treat common ailments.

The broad use of traditional medicine is mainly attributable to its accessibility and affordability (Steenkamp, 2003). Other reasons include, amongst others, a lack of access to modern medical facilities, clinging to traditional approaches and unbearable queues in modern health care centres such as hospitals (Hossan et al., 2010). According to Yirga (2010), some rural people prefer traditional medicine for cultural reasons or traditions.

The utilization of medicinal plant species by rural people has significantly contributed to the development of different traditional medical systems (Jachak and Saklani, 2007), as well as assisted in the exploration of different species to find a scientific basis of their traditional uses. Therefore, natural product drug discovery from plants remains a significant hope in the improvement of the poor livelihoods of rural communities.

However, a review of the literature revealed that many rural areas in the Waterberg district of the Limpopo Province are either under explored or unexplored with regards to their vegetational use in treating common ailments. Apart from Semenya (2012), Semenya and Potgieter (2012) and Semenya et al. (2012), there is no

ethnobotanical study which was conducted in this district. It is unfortunate that the above-mentioned studies did not cover Matebele; one of few villages in the Limpopo Province where herbal medicine is the only means of medical treatment for poor villagers. Therefore, a need was felt to gather in-depth information on the plant species used by community members within this village, which may be under threat due to changes in lifestyle, increasing population and a high frequency of use of certain species. It is also feared that ethnobotanical knowledge might become considerably limited or even disappear in the foreseeable future because traditional knowledge is still mostly taught orally without written records. Therefore, the aims of the present study were to document indigenous knowledge on the use of ethnomedicinal plants by the villagers of Matebele and to assess the conservation status of each species.

MATERIALS AND METHODS

Study area and study population

The study was conducted in the Matebele Village (also known as Viennen), Waterberg District, Limpopo Province of South Africa (Figure 1). People's livelihood depends mostly on subsistence farming and plant resources. The community has poor access to water resources, communications, and have an obsolete energy system. There are no secondary health services.

The closest health centre is located in the towns of Mokopane (17 km) and Polokwane (45 km). The great majority of people in this poor village belong to the Bapedi ethnic group (51.6%) and Matebele (36.6%), followed by Va-Tsonga (11.6%). Because of these diverse cultures, which are associated with various belief systems, there is a high expectation of significant traditional knowledge and use of medicinal plant species by the people within the village.

Ethnobotanical information

A dual-purpose reconnaissance survey was first carried out to: (i) obtain permission to conduct this study within the area of jurisdiction, and (ii) to meet with the community members to request them to participate in the study. Information on the use of ethnomedicinal plants by community members to treat different human ailments was collected from January 2011 to April 2012. A total of 10 people, equal in gender representation, from each ethnic group were randomly selected. Semi-structured interviews, observation and guided field surveys were employed to obtain ethnobotanical data. The objective of the study was explained in Setshebe, Sepedi, and Xitsonga, the local dialects. Interviews were designed to gather data on the plants used to treat human ailments, sources of plant material, methods of herbal preparation, part(s) used, dosage and lastly administration of medicine.

Collection of plant materials

Medicinal plant materials were collected by the researchers from both home gardens and natural communal areas during organized tours, while accompanied by a participant. The species were initially identified by their local names. Based on ethnobotanical information provided by the participants, specimens were collected, numbered, pressed and dried for taxonomic identification at the University of Limpopo's Larry Leach Herbarium. Collection numbers of plants are presented in Table 1.

Conservation status of species

In determining the conservation status of indigenous ethnomedicinal plants used by Matebele villagers, the information collected was compared with the National Red Data List of South Africa's Plants (SANBI, 2013). Each species was assessed according to version 3.1 of the IUCN categories and criteria (SANBI, 2013).

Data analysis

Data associated with the identified medicinal species were stored in Microsoft Excel 2007 programme and was later analysed for descriptive statistical patterns. Descriptive statistics, such as percentages and frequencies were used to analyse the data obtained from the questionnaires. Information obtained from the International Plant Index (IPNI) (International Plant Index, 2012) was used to validate the documented species and to establish their families.

RESULTS AND DISCUSSION

Diversity of ethnomedicinal plants

Sixty five species from 36 botanical families were identified to have ethnomedicinal value (Table 1). Of

these species, 86.1% are indigenous and 13.8% exotics; they are used to treat 28 human ailments or difficulties. This indicates that Matebele Village has a very high diversity of medicinal plant species. Furthermore, the large number of species employed to treat a single ailment or difficulty clearly reflects the diversity of treatment protocols used by the villagers. In the treatment of more prominent ailments or difficulties, a number of alternative species can be employed, which in itself will ensure that treatment options will always be available.

The Asteraceae had the highest number of medicinal species, namely nine species or 13.8% of the total number of species used, followed by the Fabaceae (7 species, 10.7%). Their high frequency of use came as no surprise as they are consistently documented as most used in different ethnomedicinal inventories of the Limpopo (Semenya, 2012; Semanya et al., 2012) and other provinces of South Africa (De Beer and Van Wyk, 2011; Erasto et al., 2005). This could possibly be attributed to their wide distribution and abundance, and rich bioactive contents.

Plant habit

Three growth forms: herbs, shrubs and trees were medicinally used by the different ethnic groups of Matebele village. However, trees and herbs (43%, for each) were mostly preferred. Shrubs constituted only 13.8% of used growth forms. This finding concurs with the general pattern observed in most medicinal plant inventories (Kamatenesi-Mugisha and Oryem-Origa, 2005; Uprety et al., 2010; Ribeiro et al., 2010; Semanya, 2012). The distinct preference for trees and herbs in the current study might be attributed to the proximity of the Matebele Mountain, which is dominated by woody and herbaceous species.

Source of plant

Of the 65 species documented, 89.2% was obtained from communal land, notably in the mountains. The remaining 10.8% of species were harvested from home gardens, and were mostly exotics (*Arctotis stoechadifolia*, *Citrullus lanatus*, *Citrus lemon*, *Medicago sativa*, *Punica granatum* and *Zea mays*), probably due to their easiness to domesticate, and their other uses such as foods and ornamentals. This high dependence on wild resources rather than on home garden plants is a common practice in the Limpopo Province; a phenomenon also noted by other investigations (Tshisikhawe, 2002; Magoro, 2009; Moeng, 2010; Semanya, 2012). This stems from the traditional belief that cultivated medicinal plants have less healing power than wild growing ones. However, their preference for wild plant species might have a serious consequence in the future in terms of the species availability, thus ultimately threatening the future ability to

Table 1. List of medicinal plants use by indigenous people of Matebele Village of to treat their ailments.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
<i>Acacia senegal</i> Britton. var. <i>Kerensis</i>	Fabaceae	SS102	Tree	Seed	Pounded and 5 to 10 teaspoons taken orally with a tin cup of warm water. Thrice a day	Nose bleeding	33.3	Least concern
				Seed/stem bark	Burnt in a hut. Smoke inhaled. Thrice a day		3.3	
<i>Acanthus montanus</i> * L.	Acanthaceae	SS 76	Herb	Root	Boiled for 20 min. One tin cup (300 ml) of extract is taken orally. Thrice a day	Stomach complains	3.3	Exotic
<i>Aloe falcata</i> Baker	Asphodelaceae	SS 330	Shrub	Leaf	Boiled for 7 min. One tin cup of extract is taken orally. Five times a day	Hypertension	3.3	Least concern
<i>Aloe angolensis</i> Baker	Asphodelaceae	SS 42	Shrub	Leaf	Boiled for 25 min. One tin cup of extract is taken orally prior meal	Appetite	3.3	Not listed
<i>Aloe marlothii</i> A. Berger subsp. <i>marlothii</i>	Asphodelaceae	SS 80	Shrub	Leaf	Boiled for 10 min. One tin cup of extract is taken orally. Thrice a day	Gonorrhoea	3.3	Least concern
<i>Arctotis stoechadifolia</i> P.J. Bergius	Asteraceae	SS 14	Herb	Whole plant	Pounded and 4 teaspoons are taken orally with cup of warm water. Thrice a day	Clean kidneys	3.3	Exotic
<i>Artemisia afra</i> Jacq. ex Willd. var. <i>afra</i>	Asteraceae	SS 223	Herb	Leaf	Crushed and smoked with a newspaper. Twice a day	Tuberculosis	16.6	Least concern
<i>Asparagus falcatus</i> L.	Asparagaceae	SS 332	Shrub	Root	Boiled for 5 min. One tin cup of the extract is taken orally. Thrice a day	Blood clotting	3.3	Least concern
<i>Burkea africana</i> Hook.	Fabaceae	SS 60	Tree	Leaf	Pounded and 3 teaspoons applied topically after bathing	Circumcision wounds	3.3	Least concern
<i>Callilepis salicifolia</i> Oliv.	Asteraceae	SS 62	Herb	Tuber	Boiled for 5 to 20 min. One tin cup of extract is taken orally. Thrice or four times a day	Leukaemia	6.6	Least concern
<i>Carissa bispinosa</i> (L.) Desf. ex Brenan	Apocynaceae	SS 104	Tree	Thorn	Boiled for 20 min. Steam is inhaled. Thrice a day	Body pains	13.3	Least concern
<i>Carpobrotus edulis</i> (L.) L. Bolus subsp. <i>edulis</i>	Mesembryanthemaceae	SS 98	Herb	Leaf	Squeezed juice. One tin cup of juice is taken orally. Thrice a day	Goitre	3.3	Least concern
<i>Cassia abbreviate</i> Oliv. subsp. <i>abbreviata</i>	Fabaceae	SS 67	Tree	Root	Boiled for 5 to 20 min and undisclosed volume of the extract is used to bath the body	Measles	6.6	Least concern

Table 1. Contd.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
<i>Centella asiatica</i> (L.) Urb.	Apiaceae	SS 91	Herb	Root	Boiled for 7 min. One tin cup of extract is taken orally. Thrice a day	Tonsils	3.3	Least concern
<i>Conyza scabrida</i> DC.	Asteraceae	SS 10	Shrub	Root	Boiled for 5 min and one tin cup of extract is taken orally. Thrice a day	Depression	3.3	Least concern
<i>Chironia baccifera</i> L.	Gentianaceae	SS 22	Shrub	Root	Boiled for 20 min. One tin cup of extract is taken orally. Thrice a day	Blood clotting	3.3	Least concern
<i>Citrullus lanatus</i> (Thunb.) Matsum. Aand Nakai	Cucurbitaceae	SS 09	Herb	Seed	Fried and taken orally prior meal	Appetite	3.3	Least concern
					Juice is squeezed and fermented for two days. One tin cup of the extract is taken thrice a day	Hypertension	3.3	
<i>Citrus lemon*</i> (L.) Burm. f.	Rutaceae	SS 480	Tree	Root	Boiled for 20 min. Undisclosed volume of the extract is used to bath the body. Thrice a day	Malaria	3.3	Exotic
<i>Combretum molle</i> R. Br. ex G. Don	Combretaceae	SS 219	Tree	Root	Pounded and mixed with 2 teaspoons of salt. Applied topically after bathing	Wounds	3.3	Least concern
<i>Commiphora marlothii</i> Engl.	Burseraceae	SS 403	Tree	Stem bark	Burned thrice a day. Smoke is inhaled	Epilepsy	3.3	Least concern
<i>Croton pseudopulchellus</i> Pax	Euphorbiaceae	SS 51	Tree	Leaf	Boiled (undisclosed time). One tin cup of the extract is taken orally. Thrice a day.	Heart attack	3.3	Least concern
						Asthma	3.3	
<i>Cussonia paniculata</i> Eckl. And Zeyh. subsp. <i>paniculata</i>	Araliaceae	SS 50	Tree	Root	Boiled for 5 min and 3 teaspoons of vinegar is added to the extract. One tin cup of the mixture is taken orally. Thrice a day	Stomach complains	3.3	Least concern
<i>Cussonia spicata</i> Thunb.	Araliaceae	SS 75	Tree	Root	Boiled for 5 to 10 min. One tin cup of the extract is taken orally. Thrice a day	Appetite	3.3	Least concern
<i>Dicoma anomala</i> subsp. Sond. <i>Anomala</i>	Asteraceae	SS 407	Herb	Tuber	Boiled for 5 to 25 min. One tin cup of the extract is taken orally. Thrice a day	Measles Dirty blood (STIs)	3.3 3.3	Least concern

Table 1. Contd.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
<i>Dicoma anomala</i> subsp. Sond. <i>Anomala</i>	Asteraceae	SS 407	Herb	Tuber	Pounded and 3 teaspoons are applied on incision made with a razor blade. Thrice a day	Swelled legs	10	Least concern
<i>Dolichos falciformis</i> E. Mey.	Fabaceae	SS 36	Herb	Root	Macerated in warm water for 24 h. One tin cup decoction is taken orally. Twice a week	Blood purifier	3.3	Least concern
<i>Drimia elata</i> Jacq.	Hyacinthaceae	SS 18	Herb	Bulb	Boiled for 5 to 20 min. One tin cup of the extract is taken orally. Thrice a day	Blood purifier	26.6	Deficient data
<i>Elephantorrhiza elephantina</i> (Burch.) Skeels	Fabaceae	SS 100	Shrub	Root	Boiled for 8 to 25 min. One tin cup of the extract is taken orally. Thrice a day	Blood clotting Blood purifier	3.3 6.6	Least concern
<i>Equisetum ramosissimum</i> Def, subsp. <i>Ramosissimum</i> L.	Equisetaceae	SS 49	Herb	Root	Crushed and smoked with a newspaper. Thrice a day	Asthma	6.6	Least concern
<i>Eucomis pallidiflora</i> Baker subsp. <i>pole-evansii</i>	Hyacinthaceae	SS 355	Herb	Bulb	Boiled for 5 to 8 min. One tin cup of extract is taken orally. Thrice a day	Tuberculosis	3.3	Near threatened
					Boiled for 5 to 25 min. One tin cup of extract is taken orally. Thrice a day	Blood clotting Cough	3.3 30	
<i>Ficus sycomorus</i> L. subsp. <i>gnaphalocarpa</i> (Mig.) C.C Berg	Moraceae	SS 56	Tree	Root/ stem bark	Boiled for 6 min. One tin cup of the extract is taken orally. Thrice a day	Goitre	3.3	Least concern
<i>Geigeria aspera</i> Harv. var. <i>aspera</i>	Asteraceae	SS 310	Herb	Whole plant	Burned in a hut. Smoke is inhaled. Thrice a day	Nose bleeding	3.3	Least concern
<i>Grewia bicolour</i> Juss. var. <i>bicolor</i>	Malvaceae	SS 16	Tree	Root	Boiled for 5 to 15 min. One tin cup of the extract is taken orally. Thrice a day	Diarrhoea	10	Least concern
<i>Gymnosporia senegalensis</i> (Lam.) Loes.	Celastraceae	SS 79	Tree	Root/ leaf	Boiled for 5 to 20 min. One tin cup of the extract is taken orally. Thrice a day.	Blood clotting	6.6	Least concern
<i>Gymnosporia tenuispina</i> (Sond.) Szyszyl.	Celastraceae	SS 333	Tree	Root	Boiled for 20 min and drops of the cool extract is applied via a finger on the eyes. Ten times a day	Blindness	3.3	Least concern

Table 1. Contd.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
					Boiled for 20 min and one tin cup of the extract is taken orally. Thrice a day	Heart attack	3.3	
<i>Helichrysum herbaceum</i> (Andrews) Sweet	Asteraceae	SS 207	Herb	Root	Boiled for three minutes. One tin cup of the extract is taken orally. Thrice a day	Stomach complains	3.3	Least concern
<i>Justicia petiolaris</i> E. Mey. subsp. Bowiei	Acanthaceae	SS 06	Herb	Root				Least concern
<i>Kirkia wilmsii</i> Engl.	Kirkiaceae	SS 94	Tree	Tuber				Least concern
					Five to ten piled tubers is eaten raw after every meal. Thrice a day	Hypertension	10	
<i>Kleinia longiflora</i> DC.	Asteraceae	SS 217	Herb	Whole plant	Boiled for 20 min. One tin cup of the extract is taken orally by patient. Twice or six times a day	Sepsis	6.6	Least concern
<i>Leonotis leonurus</i> (L.) R. Br.	Lamiaceae	SS 334	Herb	Leaf / stem bark	Boiled for 10 min. One tin cup of the extract is taken orally. Thrice a day	Severe headache	3.3	Least concern
<i>Lippia javanica</i> Spreng.	Verbenaceae	SS 180	Herb	Leaf	Boiled for 5 min. One tin cup of the extract is taken orally. Thrice a day	TB	3.3	Least concern
						Chest complains	3.3	
					Burned in a hut. Smoke inhaled. Thrice a day	Nose bleeding	3.3	
<i>Lolium multiflorum</i> * Lam.	Poaceae	SS 15	Herb	Whole plant	Boiled for 20 min. One tin cup of the extract is taken orally. Thrice a day	Kidney problem	3.3	Exotic
<i>Medicago sativa</i> * L.	Fabaceae	SS 320	Herb	Whole plant	Boiled for 20 min. One tin cup of the extract is taken orally. Thrice a day	Heart attack	3.3	Exotic
<i>Myrothamnus flabellifolius</i> Welw	Myrothamnaceae	SS 111	Herb	Whole plant	Boiled for 20 min. One tin cup of the extract is taken orally. Thrice a day	Nose bleeding	3.3	Deficient data
					Burned in hut twice a day. Smoke is inhaled			
<i>Olea europea</i> L. subsp. <i>africana</i>	Oleaceae	SS 335	Tree	Bark	Boiled for 15 min. Ten drops of the extract are applied to the ear via a bird's feather. Seven times a day	Deafness	3.3	Least concern
						Diarrhoea	3.3	
<i>Opuntia ficus-indica</i> *Mill.	Cactaceae	SS 90	Tree	Root	Boiled for 20 min. One tin cup is taken orally. Thrice a day	Gonorrhoea	6.6	Exotic

Table 1. Contd.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
					Boiled for 5 to 20 min. One tin cup of the extract is taken orally. Thrice a day	Measles	3.6	
<i>Ozoroa sphaerocarpa</i> R. Fern. & R. Fern.	Anacardiaceae	SS 30	Tree	Stem bark/root	Boiled for 5 to 20 min. One tin cup of the extract is taken orally. Thrice a day	Heart attack	3.3	Least concern
<i>Plectranthus ciliatus</i> E. Mey. ex. Benth.	Lamiaceae	SS 322	Herb	Root	Boiled for 5 to 20 min. One tin cup of the extract is taken orally. Thrice a day			Least concern
<i>Polygala hottentotta</i> C. Presl	Polygalaceae	SS 17	Shrub	Whole plant	Boiled for 10 min and nine tin cups of the extract is taken orally. Once a day	Constipation	3.3	Least concern
<i>Punica granatum</i> *L.	Punicaceae	SS 73	Tree	Root	Boiled for 10 to 20 min. One tin cup of the extract is taken orally. Thrice a day	Diarrhoea	6.6	Exotic
<i>Ricinus communis</i> *L.var. <i>communis</i>	Euphorbiaceae	SS 38	Shrub	Whole plant	Boiled for 5 to 30 min. One 1 to 3 cups of warm extract is used to massage legs	Swelled legs	3.3	Exotic
<i>Sarcostemma viminale</i> (L.)R.Br. subsp. <i>orangeanum</i>	Apocynaceae	SS 106	Tree	Root/ stem bark	Burnt in a hut. Smoke is inhaled. Thrice a day	Epilepsy	3.3	Least concern
<i>Sclerocarya birrea</i> Hochst. subsp. <i>birrea</i>	Anacardiaceae	SS 01	Tree	Stem bark	Boiled for 10 min. One tin cup of the extract is taken orally. Thrice or five times a day	Stoke	3.3	Least concern (NFA)
						Leukaemia	3.3	
					Boiled for 20 to 25 min. One tin cup of the extract is taken orally. Thrice a day	Sepsis	3.3	
<i>Senecio barbertonicus</i> Klatt	Asteraceae	SS 113	Tree	Leaf	Boiled for 10 min. One tin cup of the extract taken orally. Thrice a day	Flue	3.3	Least concern
<i>Senna didymobotrya</i> *(Fresen.) H.S. Irwin & Barneby	Fabaceae	SS 105	Tree	Leaf	Boiled for 10 min and extracts is used for bathing or one tin cup of extract is taken orally. Thrice a day	Measles	3.3	Exotic
<i>Sidacordifolia</i> L. subsp. <i>cordifolia</i>	Malvaceae	SS 326	Herb	Root				Least concern
<i>Siphonochilus aethiopicus</i> (Schweif.) B.L. Burt	Zingiberaceae	SS 202	Herb	Tuber	Boiled for 5 min. Steam is inhaled. Five times a day	Asthma	3.3	Critically endangered

Table 1. Contd.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
<i>Solanum mauritianum</i> * Scop. <i>Solanum panduriforme</i> E. Mey. <i>Syzygium cordatum</i> Hochst. ex C. Kranss subsp. <i>cordatum</i>	Solanaceae	SS 116	Herb	Fruit	Macerated in the water for 24 h and one tin cup of decoction is taken orally. Thrice a day	Clean kidneys	3.3	Exotic Least concern Least concern
	Solanaceae	SS 85	Herb	Fruit	Burnt in a hut. Smoke is inhaled. Thrice a day	Toothache	6.6	
	Myrtaceae	SS 225	Tree	Root/ leaf	Boiled for 20 min and one tin cup of the extract is taken orally. Every time before and after meals	Ulcer	3.3	
<i>Terminalia sericea</i> Burch. ex DC	Combretaceae	SS 112	Tree	Leaf	Boiled for 5 to 26 min. One tin cup of the extract is taken orally. Thrice a day	Measles	40	Least concern
<i>Warburgia salutaris</i> (G. Bertol.) Choir.	Canellaceae	SS 81	Tree	Leaf	Pounded and mixed with either olive oil, or vaseline and used as a lotion after bathing	Measles	3.3	Endangered
						Measles	13.3	
<i>Ximenia americana</i> L.var. <i>americana</i>	Olacaceae	SS 460	Tree	Root	Boiled for 5 to 10 min. One tin cup of the extract is taken orally. Thrice a day	Colds and flue	6.6	Least concern
						Dirty blood (STIs)	3.3	
					Pounded and mixed with oil and used as a lotion after bathing	Malaria	3.3	
						Erectile dysfunction	6.6	
					Pounded and mixed with a king corn flavour and fermented for a week. One tin cup of the extract is taken orally. Thrice a day			

Table 1. Contd.

Scientific name	Family	Collection number	Habit	Part(s) used	Mode of preparation, dosage and administration	Ailment/s treated	Number cited (%)	Conservation status
<i>Ziziphus mucronata</i> Willd.	Rhamnaceae	SS 12	Tree	Leaf	Green leaves are crushed and applied topically. Thrice a day	Sore	6.6	Least concern

Least concern: A species is least concern when it has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant species are included in this category. Near threatened: A species is near threatened when it has been evaluated against the criteria but does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. Critically endangered: A taxon is critically endangered when the best available evidence indicates that it meets any of the five IUCN criteria for Critically Endangered, and is therefore facing an extremely high risk of extinction in the wild. Endangered: A taxon is endangered when the best available evidence indicates that it meets any of the five IUCN criteria for endangered, and is therefore facing a very high risk of extinction in the wild. * (Asterisk): A taxon is known or believed to be exotic in South Africa. Data deficient: A species is data deficient when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. NFA: A species protected by National Forest Act No. 84 of 1998. Not listed: Indigenous species which is not listed in the South African National Red Data List of plants.

treat even the most common ailments and conditions. Therefore, the conducting of a public awareness program is necessary to conserve frequently used plant species. Their cultivation, for sustainable utilization is highly recommended.

Conservation status of indigenous plant

Almost all (98.1%) of the indigenous plant species documented in this study appeared in the South African National Red Data List of Plants (SANBI, 2013). 90% of them appeared as least concern, 3.7% as data deficient or insufficient information, and 1.8% as near threatened, endangered or critically endangered. Multi-used *S. birrea* (for leukemia and stroke) which is listed in the South African National Red Data List of Plants as least concern, is also protected by the National Forest Act No. 84 of 1998. The utilization of threatened and protected species is a common practice in Limpopo Province, as reported by Tshisikhawe (2002), Moeng (2010) and Semanya (2012). These species are collected because

users believe that they are effective in treating ailments, and due to the absence of alternative species, and probably because of a lack of knowledge regarding their conservation status. Therefore, initiatives to educate the rural people of the Limpopo Province concerning threatened and protected species are urgently needed as they seem to be unaware which ones are threatened or protected by law. Hesitation to act might cause their extinction in the wild.

Use of species per ethnic group

The majority of species were recorded from Pedi speaking people (81.5%) and Tsonga speaking people (64.6%). Matebele speaking people provided the least amount of information regarding medicinally used species (46.1%). This is surprising as it was expected that Matebele speaking people would have featured amongst the cultures with the most mentioned species, as they are one of the dominant cultures in the study area. A reason for this is currently unknown, and

warrants further investigation.

Inventory of selected species

The most widely used species were *Terminalia sericea* (43.3%) *Acacia senegal*, *Eucomis pallidiflora* (36.6% for each), *Drimia elata* (26.6%), *Warburgia salutaris* (19.9%) and *Artemisea afra* (16.6%). *T. sericea* was used exclusively to treat measles. The use of this species for measles was also noted by Gowela et al. (2005) in Malawi. However, its extensive use came as no surprise as it has a wide range of uses as a traditional medicine.

For instance, it is commonly used as a remedy for eye infections (Drummond and Coates-Palgrave, 1973), bilharzia (Kokwaro, 1976) and gonorrhoea (Hedberg et al., 1982), diarrhoea (Neuwinger, 1996), respiratory infections (York et al., 2011), wounds and stomach ache (Ribeiro et al., 2010) and sexually transmitted infections (STIs) (Arnold and Gulumiam, 1984; Mabogo,

1990; De Wet et al., 2012). The fact that people of Matebele village exclusively prefer it for measles might be an indication of its effectiveness against this infection, or the lack of alternative species for this ailment.

Likewise, *A. senegal* is extensively used to treat nose bleeds. Though there are no ethnobotanical studies to support its use for the treatment of nose bleeding, related species such as *Acacia arabica* (Ahmad et al., 2009), *Acacia catechu* (Kumari et al., 2011), *Acacia nilotica* (Rajvaidhya et al., 2012) are extensively used to stop nose bleeding. Thus, the possibility exists that *A. senegal* might be helpful in treating nose bleeding.

W. salutaris was one of the other widely used species in the study area and is used in the treatment of measles (13.3%) as well as colds and flu (6.6%). Its use as a remedy for measles (Kokwaro, 1976; Akinnifesi et al., 2008), colds and flu (Bryant, 1966; Hutchings et al., 1996; Rabe and van Staden, 1997; Jäger, 2003) is supported by different ethnobotanical surveys with its utilization as an expectorant to treat colds and flu scientifically authenticated by Jansen and De Groot (1991). However, its extensive use might result in its local extinction, especially with high demand and low population yield.

The same is true for *E. pallidiflora*, which is multi-used for cough (30%), fever, tuberculosis (TB) and blood clotting (3.3% each). Its use in the treatment of fever is in line with the finding of Du Toit et al. (2007). It should however be noted that the multi-utilization of a single species has disadvantages from a conservation point of view as it amplifies harvesting pressure, thereby posing an even greater threat to its populations' sustainability and integrity.

It is interesting to note that the medicinal use of *Drimia elata* (Cocks and Dold, 2006) and *A. afra* (Van Wyk et al., 1997) by inhabitants of Matebele Village corresponds well with findings from other ethnobotanical studies conducted in South Africa. This according to Van Wyk and Wink (2004), is a cultural indication of efficacy of remedy, due to its long history of traditional use for treating an ailment. In fact, a number of species documented in this study have been culturally validated via their extensive use by different cultures. These include, amongst others, *Solanum panduriforme* (Watt and Breyer-Brandwijk, 1962; Mabogo, 1990; Hutchings et al., 1996), *Ziziphus mucronata* (Van Wyk et al., 1997), *Olea europea* (Balick, 1990; Al-Quran, 2008), *Combretum molle* (Drummond and Coates-Palgrave, 1973), *Dolichos falciformis* and *Elephantorrhiza elephantina* (blood purifier) (Cocks and Dold, 2006), *Aloe marlothii*, *Opuntia ficus-indica* (Semenya, 2012), *Grewia bicolor* (Jaspers et al., 1986) and *Punica granatum* (Lansky and Newman, 2007). Hossan et al. (2010) noted that if a species has been reported in different surveys for the treatment of a common ailment then that species may be a new source of medication for such an ailment in the future.

However, as seen in the literature, some (24.4%) of the

plants used by various cultures of Matebele Village are recorded for the first time as remedies for the documented ailment(s). This include *A. senegal* (nose bleeding), *Asparagus falcatus* (blood clotting), *Burkea africana* (circumcision wounds), *Carissa bispinosa* (body pains), *Carpobrotus edulis* (goitre), *Chironia baccifera* (blood clotting), *C. lanatus* (appetite and hypertension), *Conyza scabrada* (depression), *Croton pseudopulchellus* (heart attack), *Medicago sativa* (heart attack), *Plectranthus ciliatus* (heart attack), *Polygala hottentotta* (constipation), *Senecio barbertonicus* (sepsis), *Sida cordifolia* (measles), *Syzygium cordatum* (ulcer) and *Zea mays* (erectile dysfunction).

Some of the above mentioned species are commonly used as medicine to treat different human ailments in South Africa and elsewhere. For instance, thorns and leaves of *A. senegal* is used together with leaves of *Diospyros mespiliformis* to treat toothache in Burkina Faso (Tapsoba and Deschamps, 2006). Squeezed leaves of *Carissa edulis* are used by both Zulu traditional healers (Puranwasi, 2006) and "coloured" (racially-mixed) people (Thring and Weitz, 2006) to treat mouth and throat infections. The Mapuche community in North-western Patagonia use unspecified parts of *Zea mays* to treat urinary infections (Estomba et al., 2006). In Tubah, in the northwest region of Cameroon, *Z. mays* is used extensively as a cough remedy (Focho et al., 2009). Unspecified parts of *Senna didymobotrya*, an exotic species in South Africa, are multi-used (for malaria, skin, fever, typhoid, STI's) in Kenya (Okello et al., 2010). Bapedi traditional healers in the Limpopo Province use *C. Lanatus* in the treatment of the human immune virus (Semenya, 2012). *C. baccifera* is used and highly appreciated by South Africans for treating a large number of ailments, ranging from boils and hemorrhoids (Smith, 1966) to blood purifier, acne, sores, diarrhoea (Watt and Breyer-Brandwijk, 1962) and leprosy (Van Wyk et al., 1997). Leaves or stem bark of *S. cordatum* is used by inhabitants of Kwa-Zulu Natal Province, South Africa in combination with *Sclerocarya birrea* to treat gonorrhoea (De Wet et al., 2012). Furthermore, people of Mutirikwi Communal land in Zimbabwe use its bark to treat TB (Chigora et al., 2007). In central Africa, *S. cordatum* is known as a remedy for stomach ache and diarrhoea (Van Wyk et al., 1997). New utilizations of these species by people of Matebele village provides valuable contributions to the ethnobotanical records of South Africa and elsewhere. Furthermore, the fact that these species are extensively being used medicinally to treat various ailments by different cultures in South Africa and elsewhere is an indication that they might be medicinally safe.

Plant parts used for herbal preparation

Different plant parts such as bulb, fruit, leaf, tuber, seed,

stem bark, thorn and whole plant were used in the preparations of remedy (Table 1). However, plant parts most frequently used included roots (39.1%), followed by leaves (21.6%) and stem bark (10.8%). The use of these plant parts in the preparation of remedies is also common elsewhere (Runyoro et al., 2006; Saikia et al., 2006; Thring and Weitz, 2006; Appidi et al., 2008; De Wet et al., 2011), probably due to their high concentration of active healing properties and local availability. However, from a conservation point of view the practice of extensive exploitation of perennial plant parts, such as root and stem bark is not sustainable (Semenya, 2012). Their harvesting from relatively slow growing woody species such as *B. africana*, *Z. Mucronata* and *S. cordatum* can result in a decline in both their size and distributions of populations, and ultimately result in local extinctions. Therefore, people of Matebele Village need to be encouraged to harvest plant parts such as leaves, seeds or fruits for herbal preparations, which would be less destructive.

Methods of herbal preparation, administration and dosage

Participants in the current study prepared herbal remedies exclusively using a single species. This finding is contrary to those commonly reported in the Limpopo Province (Arnold and Gulumian, 1984; Mabogo, 1990; Semanya, 2012) and other areas of South Africa (Bisi-Johnson et al., 2010; De Wet et al., 2011; De Beer and Van Wyk, 2011), where herbal medicine is prepared using both single and multi-species. However, preference of a single species by people of Matebele village might be linked to their local availability or effectiveness.

Various preparation methods such as boiling, burning, crushing, pounding and maceration were prepared. These methods are common in South Africa (Mabogo, 1990; Coopoosamy and Naidoo, 2012) and elsewhere (Kisangau et al., 2007; Njoroge and Bussmann, 2009; Deka and Sama, 2011). However, boiling is the method of choice by people of Matebele Village, perhaps due to its simplicity of preparation (Table 1). It was observed that burning and crushing of medicinal materials is used exclusively for TB. This seems to be a traditional standard preparation method of medicine for TB in the Limpopo Province, as it was also noted by Mabogo (1990) for the Vha-Venda. The use of pounding and maceration methods by people of Matebele Village may have an advantage as many active ingredients are extracted with almost no alteration of their chemical structure, thus preserving almost all their properties, thereby heightening their effectiveness.

The mode of herbal administration and dosage are very important; in the current study, oral, topical and nasal were used to administer medicines (Table 1). However, there was a distinct preference of oral administration of

extracts, taken with a tin cup (300 ml). The preference of this method might be due to the fact that medication in liquid form is already dissolved, so it can readily be absorbed by the human body (Semenya, 2012).

Conclusion

This study reveals a momentous contribution of ethnomedicinal plants knowledge to the health security of poor rural community of Matebele Village. This knowledge offers a basis for prioritizing further phytochemical and pharmacological studies of ethnomedicinal plants of this village. However, a high percentage of these plant species are harvested from the wild, but with little consideration for domestication, hence threatening their existence. Therefore, there is an urgent need to educate people of this community regarding the plant conservation to ensure their sustainability.

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REFERENCES

- Al-Quran S (2008). Taxonomical and Pharmacological Survey of Therapeutic Plants in Jordan. *J. Nat. Prod.* 1:10-26.
- Ahmad SS, Mahmood F, Dogar ZH, Khan ZI, Ahmad K, Sher M, Mustafa I, Valeem EE (2009). Prioritization of medicinal plants of Margala Hills National Park, Islamabad on the basis of available information. *Pak. J. Bot.* 41:2105-2114.
- Akinnifesi FK, Sileshi G, Ajayi OC, Chirwa PW, Kwesiga FR, Harawa R (2008). Contributions of agro forestry, research and development to livelihood of smallholder farmers in South Africa: 2. Fruit, medicinal, fuelwood and fodder tree systems. *Agric. J.* 3:76-88.
- Amusan OOG, Sukati NA, Dlamini PS, Sibandze FG (2007). Some Swazi phytomedicines and their constituents. *Afr. J. Biotechnol* 6:267-272.
- Appidi JR, Grierson DS, Afolayan AJ (2008). Ethnobotanical study of plants used for the treatment of diarrhoea in the Eastern Cape, South Africa. *Pak J. Biol. Sci.* 11:1961-1963.
- Arnold HJ, Gulumian M (1984). *Pharmacopoeia of traditional medicine in Venda.* *J. Ethnopharmacol* 12:35-74.
- Balick MJ (1990). Ethnobotany and the Identification of Therapeutic Agents from the Rainforest. In: *Bioactive Compounds from Plants.* Chadwick DJ, Marsh J (Eds), J. Wiley and Sons, Chichester. Pp. 22-39.
- Bisi-Johnson MA, Obi CL, Kambizi L, Nkomo M (2010). A survey of indigenous herbal diarrhoeal remedies of O.R. Tambo district, Eastern Cape Province, South Africa. *Afr. J. Biotechnol.* 9:1245.1254.
- Brandt HD, Muller GJ (1995). Traditional medicines and acute poisoning. *CME* 13: 1053-1060.
- Bryant AY (1996). *Zulu Medicine and Medicine Men.* Struik Publishers, Cape Town.
- Chigora P, Masocha R, Mutenheri F (2007). The role of indigenous medicinal knowledge (IMK) in the treatment of ailments in rural Zimbabwe: The case of Mutirikwi Communal Lands. *J. Sust. Dev. Afr.* 9:1509-1520.

- Cocks ML, Dold AP (2006). Cultural significance of biodiversity: the role of medicinal plants in urban African cultural practices in the eastern cape, South Africa. *J. Ethnobiol.* 26:60-81.
- Coopoosamy RM, Naidoo KK (2012). An ethnobotanical study of medicinal plants used by traditional healers in Durban, South Africa. *Afr. J. Pharm. Pharmacol.* 6:818-823.
- De Beer JJJ, Van Wyk B-E (2011). An ethnobotanical survey of the Agter-Hantam, Northern Cape Province, South Africa. *South Afr. J. Bot.* 77:741-754.
- De Souza C, Ameyapoh A, Karou SD, Anani KT, Kpodar ML, Gbeassor M (2011). Assessing Market-Sold Remedies in Lom'e (Togo) for Hygienic Quality. SAGE-Hindawi Access to Research doi:10.4061/2011/572521.
- De Wet H, Nkwananya MN, Van Vuuren SF (2010). Medicinal plants used for the treatment of diarrhoea in northern Maputaland, KwaZulu-Natal Province, South Africa. *J. Ethnopharmacol* 130:284-289.
- De Wet H, Nzama VN, Van Vuuren SF (2012). Medicinal plants used for the treatment of sexually transmitted infections by lay people in northern Maputaland, KwaZulu-Natal Province, South Africa. *South Afr. J. Bot.* 78:12-20.
- Deka M, Sarma GC (2011). Traditional use of fertility inducing plants used by the herbal practitioners in some parts of the state Assam, N E India, a survey report. *Int. J. Sci. Adv. Technol.* 1 (6):133.
- Drummond RB, Coates-Palgrave K (1973). *Common Trees of the Highveld*. Longman, Rhodesia.
- Du Toit K, Elgorashi EE, Malan SF, Mulholland DA, Drewes SE, Van Staden J (2007). Antibacterial activity and QSAR of homoisoflavanones isolated from six Hyacinthaceae species. *South Afr. J. Bot.* 73:236-241.
- Dykman EJ (1908). *De Suid-Afrikaanse Kook-, Koek-en-Resepte Boek*, 14th improved impression. Paarl Printers Ltd., Paarl (Cape Colony), South Africa.
- Erasto P, Adebola PO, Grierson DS, Afolayan AJ (2005). An ethnobotanical study 349 of plants used for the treatment of diabetes in the Eastern Cape Province, South Africa. *Afr. J. Biotechnol.* 4:1458-1460.
- Estomba D, Ladio, A, Lozada M (2006). Medicinal wild plant knowledge and gathering patterns in a Mapuche community from North-western Patagonia. *J. Ethnopharmacol.* 103:109-119.
- Focho DA, Nkeng EA, Fonge PBA, Fongod AN (2009). Diversity of plants used to treat respiratory diseases in Tubah, northwest region, Cameroon. *Afr. J. Pharm. Pharmacol.* 3:573-580.
- Gowla JP, Kwapata MB, Masangano C, Chikuni AC, Akinifesi FK (2005). The status of medicinal trees used in child healthcare in ten villages surrounding Dzalanyama forest reserve in Malawi. *J. Agric. Environ. Sci. Technol* 3:39-48.
- Hedberg I, Hedberg O, Madati P, Mshigeni KE, Mshiu EN (1982). Inventory of plants used in traditional medicine in Tanzania. I. Plants of the families Acanthaceae-Cucurbitaceae. *J. Ethnopharmacol.* 6:29-60.
- Hossain MS, Agarwala B, Sarwar S, Karim M, Jahan R, Rahmatullah M (2010). Traditional use of medicinal plants in Bangladesh to treat urinary tract infections and sexually transmitted diseases. *Ethnobot. Res. Appl.* 8:61-74.
- Hostettmann K, Marston A (2002). "Twenty years of research into medicinal plants: results and perspectives". *Phytochem. Rev.* 1:275-285.
- Hutchings A, Scott AH, Lewis G, Cunningham AB (1996). *Zulu medicinal plants: An inventory*. University of Natal Press, Pietermaritzburg, Natal, South Africa.
- International Plant Index: www.ipni.org 2012 (Site accessed 23/01/2012)
- Jachak SM, Saklani A (2007). Challenges and opportunities in drug discovery from plants. *Current Sci.* 92:1251-1257.
- Jager AK (2003). Evaluation of antibacterial activity if traditionally prepared South African remedies for infections. *South Afr. J. Bot.* 69:595-598.
- Jansen BMJ, De Groot A (1991). The occurrence and biological activity of drimane sesquiterpenoids. *Natural Products Reports* 8:309-318.
- Jaspers MWJM, Bashir AK, Zwaving JH, Malingre THM (1986). Investigation of *Grewia bicolor* Juss. *J. Ethnopharmacol.* 17:205-211.
- Kamatenesi-Mugisha M, Oryem-Origa H (2005). Traditional herbal remedies used in the management of sexual impotence and erectile dysfunction in western Uganda. *Afr. Health Sci.* 5:40-49.
- Kisangau DP, Lyaruu HVM, Hosea KM, Joseph CC (2007). Use of traditional medicines in the management of HIV/AIDS opportunistic infections in Tanzania: A case in the Bukoba rural district. *Journal of Ethnobiology and Ethnomedicine* 2007, 3:29 doi:10.1186/1746-4269-3-29.
- Kling H (1923). *Die Sieketrooster*. Van de Sandt de Villiers, Cape Town.
- Kokwaro O (1976). *Medicinal Plants of East Africa*. East African Literature, Nairobi.
- Kumar BM, Nair PKR (2004). The enigma of tropical home gardens. *Agroforestry System* 61:135-152.
- Kumari P, Joshi GC, Tewari LM (2011). Diversity and status of ethno-medicinal plants of Almora district in Uttarakhand, India. *Int. J. Biodiversity Conserv.* 3:298-326.
- Lansky EP, Newman RA (2007). *Punicagranatum* (pomegranate) and its potential for prevention and treatment of inflammation and cancer. *J. Ethnopharmacol.* 109:177-206.
- Mabogo DEN (1990). The ethnobotany of the Vha-Venda. M.Sc dissertation, University of Pretoria, Pretoria.
- Madzibane J, Potgieter MJ (1999). Uses of *Colophospermum mopane* (Leguminosae: Caesalpinioideae) by the Vha-Venda. *South Afr. J. Bot.* 65:440-443.
- Magoro, MD (2008). Traditional Health practitioner's practice and the sustainability of extinction-prone traditional medicinal plants. M.Sc dissertation. University of South Africa, Pretoria.
- Mashabane LG, Wessels DCJ, Potgieter MJ (2001). The utilization of *Colophospermum mopane* by the Va-Tsonga in the Gazankulu region (eastern Northern Province, South Africa). *South Afr. J. Bot.* 67:199-205.
- Moeng ET (2010). Analysis of *Muthi* shops and street vendors on medicinal plants of the Limpopo Province. M.Sc. Dissertation. University of Limpopo, Mankweng.
- Mulaudzi RB, Ndhala AR, Kulkarni MG, Finnie JF, Van Staden J (2011). Antimicrobial properties and phenolic contents of medicinal plants used by the Venda people for conditions related to venereal diseases. *J. Ethnopharmacol.* 135:330-337.
- Neuwing HD (1996). *African Ethnobotany Poisons and Drugs Chemistry* (Germany). Chapman and Hall GmbH, Germany.
- Njoroge GN, Bussmann RW (2009). Ethnotherapeutic management of sexually transmitted diseases (STDs) and reproductive health conditions in Central Province of Kenya. *Indian J. Trad. Knowl.* 8:255-261.
- Okello SV, Nyunja RO, Netondo GW, Onyango JC (2010). Ethnobotanical study of medicinal plants used by Sabaots of Mt. Elgon Kenya. *Afr. J. Trad. Comp. Altern. Med.* 7:1-10.
- Puranswai R (2006). The role of traditional healers in oral health care in KwaZulu-Natal. M.Sc. Dissertation. University of the Western Cape, Cape Town.
- Rabe T, van Staden J (1997). Antibacterial activity of South African plants used for medicinal purposes. *J. Ethnopharmacol.* 56:81-87.
- Rajvaidhya S, Nagori BP, Singh GK, Dubey BK, Desai P, Jain J (2012). A review on *Senegalia arabica* - An Indian medicinal plant. *Int. J. Pharma. Sci. Res.* 3(7):1995-2005.
- Ribeiro A, Romeiras MM, Tavares J, Faria TM (2010). Ethnobotanical survey in Canhane village, district of Massingir, Mozambique: medicinal plants and traditional knowledge. *J. Ethnobiol. Ethnomed.* 6:33 doi:10.1186/1746-4269-6-33.
- Runyoro DKB, Ngassapa OD, Matee MIN, Joseph CC, Moshi MJ (2006). Medicinal plants used by Tanzanian traditional healers in the management of *Candida* infections. *J. Ethnopharmacol.* 106:158-165.
- Saikia AP, Ryakala VK, Sharma P, Goswami P, Bora U (2006). Ethnobotany of medicinal plants used by Assamese people for various skin ailments and cosmetics. *J. Ethnopharmacol.* 106:149-157.
- Samie A, Obi CL, Bessong PO, Lall N (2005). Activity of fourteen selected medicinal plants from rural Venda communities in South Africa against fifteen clinical bacterial species. *Afr. J. Biotechnol.* 4:1443-1451.
- Semenya SS (2012). Bapedi phytomedicine and the treatment sexually

- transmitted diseases in the Limpopo Province, South Africa. M.Sc. Dissertation, University of Limpopo, Mankweng.
- Semenya SS, Potgieter MJ (2012). Ethnobotanical survey of medicinal plants used by Bapedi traditional healers to treat erectile dysfunction in the Limpopo Province, South Africa. *J. Med. Plant Res.* DOI: 10.5897/JMPR12.499.
- Semenya S, Potgieter M, Erasmus L (2012). Ethnobotanical survey of medicinal plants used by Bapedi healers to treat diabetes mellitus in the Limpopo Province, South Africa. *J. Ethnopharmacol.* 141:440-445.
- Smith CA (1966). *Common Names of South African Plants*. The Government Printer, Pretoria.
- South Africa National Biodiversity Institute (SANBI). 2013. *The IUCN Categories and Criteria version 3.1*. SANBI, Pretoria.
- Steenkamp V (2003). Traditional herbal remedies used by South African women for gynaecological complaints. *J. Ethnopharmacol.* 86:97-108.
- Tapsoba H, Deschamps JP (2006). Use of medicinal plants for the treatment of oral diseases in Burkina Faso. *J. Ethnopharmacol.* 104:68-78.
- Thring TSA, Weitz FM (2006). Medicinal plant use in the Bredasdorp/Elim region of the Southern Overberg in the Western Cape Province of South Africa. *J. Ethnopharmacol.* 103:261-275.
- Tshikalange TE, Meyer JJM, Hussein AA (2005). Antimicrobial activity, toxicity and the isolation of a bioactive compound from plants used to treat sexually transmitted diseases. *J. Ethnopharmacol.* 96:515-519.
- Tshisikhawe MP (2002). Trade of indigenous medicinal plants in the Northern Province, Venda Region: Their ethnobotanical importance and sustainable use. M.Sc. Dissertation. University of Venda, Thohoyandou.
- Uprety Y, Asselin H, Boon EK, Yadav S, Shrestha KK (2010). Indigenous use and bio-efficacy of medicinal plants in the Rasuwa District, Central Nepal. *Ethnobiol. Ethnomed.* 6:3.
- Van Wyk BE, Van Oudtshoorn B, Gericke N (1997). *Medicinal plants of South Africa*. Briza Publications, Pretoria.
- Van Wyk BE, Wink M (2004). *Medicinal Plants of the World: An Illustrated Scientific Guide to Important Medicinal Plants and their Uses*. Timber Press, Portland.
- Watt JM, Breyer-Brandwijk MG (1962). *The and Poisonous Plants of Southern and Eastern Africa*, 2nd edition. E. and S Livingstone Ltd, Edinburgh.
- Yirga G (2010). Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. *Afr. J. Plant Sci.* 4:6-11.
- York T, De Wet H, Van Vuuren SF (2011). Plants used for treating respiratory infections in rural Maputaland, KwaZulu-Natal, South Africa. *J. Ethnopharmacol.* 135:696-710.