CHAPTER 4

AN EVALUATION OF THE EXTENT AND THREAT OF BARK HARVESTING IN THE VENDA REGION, LIMPOPO PROVINCE, SOUTH AFRICA

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Abstract

The medicinal flora of the Venda region consists of a variety of species, which may potentially provide therapeutic agents to treat different diseases. Bark use for medicinal purposes in southern Africa has been reported for approximately 30% of the woody species (153 species) in the Venda region. However, only 58 medicinal plant species are commonly harvested for the medicinal properties in their bark and found in muthi shops in the region. These 58 species were scored for the possible threat of bark harvesting to the species' survival using 20 ecologically relevant plant or population traits. The most vulnerable species were *Adansonia digitata, Adenia spinosa, Albizia adianthifolia, Albizia versicolor, Brackenridgea zanguebarica, Croton megalobotrys,* and *Warburgia salutaris*. *Brackenridgea zanguebarica and Warburgia salutaris* are amongst ten most traded medicinal plant species in Venda region.

An analysis of the pattern of trade in medicinal plants by local markets in the Venda region, indicated that the growing trade in indigenous medicinal plants in South Africa is posing a threat to the conservation of many plant species. Apart from pharmaceutical companies, trade in medicinal plants has become a way of making a living for some people. Indications are that bark harvesting may threaten the survival of some of the plant species, notably *Brackenridgea zanguebarica,* and *Warburgia salutaris*.

Keywords: Ethnobotanical trade, medicinal plant species, middlemen, traditional healers

4.1 Introduction

Nature is full of undiscovered medicines and valuable chemicals that can potentially be used in healthcare systems and save countless lives (Raskin *et al.* 2002, Gurib-Fakim 2006). Indigenous societies with their wealth of information about medicinal plant species have long understood the importance of a healthy ecosystem for a continued supply of natural resources. As long as people harvest only what they need for treatment, a balanced ecosystem in which populations are viable may be maintained, leading to sustainable harvesting of natural resources (Makoe 1994). However, as a result of growing market demands due to preference of traditional medicine, maintaining the ecosystem balance is currently becoming a problem. Therefore, the unsustainable way of bark harvesting practices for medicinal purposes could make species disappear and their chemical secrets that are probably only known by traditional healers, traders and indigenous societies, would be lost (Buenz 2005).

According to Makoe (1994), Credo Muthwa, who is a well-known traditional healer, believes that muthi shop runners are the ones who heavily exploit animals and plants. He indicated that owners of these outlets hire people who do not understand the traditional ethics of collecting medicines. Muthi is a term for traditional medicine in South Africa. It has been derived from the Zulu word for tree due to the fact that most traditional medicines are derived from trees.

Traditional medicine is regarded as an effective complement to the scientific forms of health care (alternative health care system) and inhabitants of some African countries still rely exclusively on plants as a source of medicine (Hostettmann *et al.* 2000, Lim

2005, Gurib-Fakim 2006, Nyika 2009). The traditional healer takes time to talk to the patient in a holistic way, trying to find out the patient's state of mind and the state of his/her relation with the family. In this way the traditional healer also renders a social service. According to Professor Ralph Kirsch of the Department of Medicine at the University of Cape Town Medical School, traditional healers are caring people, and extraordinarily skilled in psychotherapy and counseling (cited by Kale 1995). They are respected in their community, and regarded as counselors and leaders.

In South Africa most people still make use of traditional medicines for their physical and psychological health needs (Rabe and Van Staden 1997, Dold and Cocks 2002, Keirungi and Fabricius 2005). Especially in areas characterized by high unemployment and insufficient government health services there is a strong adherence to traditional belief systems. The use and reliance on traditional medicines should be acknowledged and accepted, as it cannot be wished away if and when western medicine becomes available. Eighty per cent of the population consulting traditional healers have been found to be firm believers in muthi (Newton 1997, Steenkamp 2003, Fennell *et al.* 2004, Jager 2005). One medical doctor, Dr N. Motlana believed that 99 per cent of patients consulted traditional healers before they would turn to western medicines (Levitz 1992).

To ensure sustainability it has been suggested that collectors of medicinal plant material should be regulated and advised on proper harvesting methods (Lewington 1993, Springfield *et al.* 2005). Furthermore, in order to promote sustainable utilization it is important to know the plant species that are used and harvested for commercialization. Phytochemical screening of medicinal plant parts is recommended

to check the concentration levels of compounds within different parts of the plants. In some instances traders might be selling roots, whereas leaves of the same plant can be used to treat the same disease effectively (Zschocke *et al*. 2007, Shai *et al.* 2009). However, the sustainable harvesting practice that existed for millennia is only becoming a threat as a result of human population growth and its consequencial activities.

Most medicinal plant species from the Venda region are also sold outside Venda. For example, *Brackenridgea zanguebarica*, which in South Africa is confined to the Venda region, has been found to be very popular as a medicine (Netshiungani and Van Wyk, 1980). The bark of *B. zanguebarica* is well sought after beyond the borders of Venda and can be found in the stock of muthi sellers as far away as the Lowveld, Johannesburg, Pretoria or Durban (Williams 1996, Botha *et al.* 2007).

The objectives of the study were to:

i. to compile an inventory of indigenous woody plant species occurring in the Venda region with reported medicinal bark properties;
ii. to provide a list of the plant species most commonly traded for medicinal bark properties in Venda;
iii. to assess the vulnerability of the plant species commonly harvested for their bark in Venda;
iv. to assess the proportion of different plant parts traded within the markets; and
v. to determine the market value of indigenous plant species traded for their bark in the Venda region.

4.2 Study area

The study was conducted in South Africa, Venda region within the Vhembe District Municipality. Venda falls within the Soutpansberg region and is an area that is characterized by its great floristic diversity (Van Wyk and Smith 2001). This is also reflected in the large variety of vegetation types found in the region. According to Mucina and Rutherford (2006), the vegetation of Venda consists of the following vegetation types: Musina Mopane Bushveld, Limpopo Ridge Bushveld, Makhado Sweet Bushveld, Soutpansberg Mountain Bushveld, VhaVenda Miombo, Maluleke Sandy Bushveld, Granite Lowveld and Tzaneen Sour Bushveld.

The climate of Venda also makes the region a favourable growing place for many South African tree species with 535 woody plant species documented for the Soutpansberg (Hahn undated). In the northern region there are 25 to 30 rainy days per annum with rain mainly falling between December and February (50 mm to 75 mm per month), with less than 10 mm per month falling between May and September. The mean temperature ranges from 28^{o}C in January to 15^{o}C in July. Humidity in the area is $\pm$ 40 percent (Lorton communications undated).

4.3 Materials and methods

4.3.1 Overall assessment of species with potential medicinal bark use in the Venda region

A species list of the woody plant species occurring in the Venda region was compiled from the PRECIS database of the South African Biodiversity Institute (www:/ sibis.sanbi.org) and the tree list of the Soutpansberg (Hahn undated). The literature was consulted to find reports of bark use for medicinal purposes for each species (e.g. Watt and Breyer-Brandwijk 1962, Palgrave 1988, Mabogo 1990, Van Wyk *et al.* 1997, Venter and Venter 1996, Tshisikhawe 2002, Schmidt *et al.* 2002, Van Wyk 2008, Van Wyk and Van Wyk 2009, Mannheimer and Curtis 2009). Plant names used follow the electronic species list in Plants of South Africa version 3.0 (http://posa.sanbi.org).

4.3.2 Evaluation of trade in plant bark in the Venda region

Herbal shops around Thohoyandou and Sibasa were used to compile an inventory of the plant species that were sold and to assess a record of sales (Tshisikhawe 2002). Thohoyandou is regarded as the center of trade in the Venda region mainly due to the presence of government buildings, the University of Venda and businesses. Thohoyandou had five muthi shops in 1998 (Tshisikhawe 2002). Two traders in indigenous medicinal plants, a male and a female, in Thohoyandou (Mr Netshia[2] and Mrs Munyai[1]) were selected for intensive studies and interviews. At Sibasa two muthi shops, a main and a subsidiary were investigated (Mr Tuwani[1]). Data were obtained only from the targeted main shop as this served as a store for the subsidiary one.

The indigenous plant use activities in the region were assessed through visits and

[2] Mr Netshia, Traditional Healer, Thohoyandou, South Africa
Mrs Munyai, Traditional Healer, Thohoyandou, South Africa
Mr Tuwani, Traditional Healer, Sibasa, South Africa.

interviews with traders, traditional healers, and medicinal material gatherers (middlemen). Collection of voucher specimens, which were deposited at the University of Venda herbarium, was done in the company of a traditional healer who indicated their collecting areas and techniques.

4.3.3 Vulnerability of 58 species traded most for their medicinal bark properties in the Venda region

Table 4.1 lists the ecological and biological factors used to score the vulnerability of the 58 species harvested most commonly for their bark in the Venda region. These same factors can also be used to set conservation goals for species according to the method of Burgman *et al.* (2001). In Chapter 7 such an approach is pursued further for one species, *Brackenridgea zanguebarica*.

Each factor had two alternative states: the positive state related to species resilience and the negative one to species vulnerability. Each factor was investigated for a species and if it was possible to answer the question reliably then +1 was given for resilience or -1 for vulnerability. If the available knowledge of the species was insufficient to obtain a reliable answer a value of 0 was given to both resilience and vulnerability. The sum of all positive and negative scores was a measure of the vulnerability of the species. The maximum score for a species would be +20 if it scored positively on all the resilient ecological attributes. The lower the score, the more vulnerable the species would be to population declines with the minimum score -20 if it scored negatively on all the ecological attributes reflecting vulnerability.

Table 4.1: List of ecological factors used to score the vulnerability of the 58 species harvested most commonly for their bark in the Venda region

	Positive criteria	Negative criteria
1	Many large populations	Few small isolated populations
2	Widespread distribution	Restricted distribution
3	Habitat generalist	Habitat specialist
4	Not restricted to a temporal niche	Restricted to a temporal niche
5	Not subject to extreme habitat fluctuations	Subject to extreme habitat fluctuations
6	Vigorous post disturbance regeneration	Weak post disturbance regeneration
7	Rapid vigorous growth	Slow weak growth
8	Quickly achieves site dominance	Poor competitor
9	Short time to set first seed or propagules	Long time to set first seed or propagules
10	Long reproductive lifespan	Short reproductive lifespan
11	Reliable seed production	Unreliable seed production
12	High seed production	Low seed production
13	Long seed or propagule viability	Short seed or propagule viability
14	Good dispersal	Poor dispersal
15	Generally survives fire and and other damage	Generally killed by fire and other damage
16	Adapted to existing grazing, drought, fire-regime	Not adapted to existing grazing, drought, fire-regime
17	Able to coppice and resprout	Unable to coppice and resprout
18	Not exceptionally vulnerable to pathogens, diseases, insects, etc.	Exceptionally vulnerable to pathogens, diseases, insects, etc.
19	Not dependent on vulnerable mutualist	Dependent on vulnerable mutualist
20	Low degree of bark harvest	High degree of bark harvest

4.4 Results and discussion

4.4.1 Overall assessment of species with potential medicinal bark use in the Venda region

Four hundred and ninty eight woody plant species (excluding subspecies) were listed for the Venda region (PRECIS database and Hahn undated combined). Of these species, 30.7% (n = 158) have been reported to have medicinal properties in their bark. However, only 11.7% (n = 58) of these species are actively traded for their bark in muthi shops around Venda. Overall, it is estimated that in South Africa more than 700 plant species are actively traded for their medicinal purposes (Dold and Cocks 2002). Trade of bark for medicinal purposes in Venda therefore contributes 8.2% of total plant species traded for their medicinal purposes in South Africa. Percentage of total plant traded in Venda region is quite high when comparing its land area of 6 807 km^2 and that of the rest of South Africa of 1 219 090 km^2. Trade of medicinal plants in Venda region is therefore relatively high.

The Fabaceae is the most important family for its medicinal bark. The family constitutes 14.7% to all woody plant species (73 woody species) in Venda, but comprises 22.9% of those species with medicinal bark properties and contributes to 27.6% of the medicinal plant species traded for their bark. In contrast, the Rubiaceae is the second most important woody family in Venda (9.4% of all woody plant species, n = 47) but only 1.2% of the woody species with medicinal bark properties belong to the Rubiaceae.

4.4.2 Evaluation of trade

4.4.2.1 Plant parts and species most commonly traded

The traders interviewed were predominantly traditional healers by profession. They practiced their professions at home and sometimes at their shops. Occasionally, they employed other people like relatives, children, and wives to run the shops. This was in line with the tradition that traditional healers pass their knowledge orally through generations. On the other hand, the chain of knowledge may be broken if none of the family members become interested in the practice.

In Venda the trade of medicinal plant material is centralized in the central business district (CBD) as it is uncommon to find people trading in the rural areas. This might be attributed to the fact that in rural areas people go directly to traditional healers for consultation and muthi dispensation. The introduction and popularity of muthi shops in urban areas is a result of urban people still preferring traditional medicines.

The research information that was collated from three shops (one at Sibasa and two in Thohoyandou) showed that the plant material marketed in Thohoyandou and Sibasa muthi shops ranged from roots, bark, leaves, and fruits, and in some cases, the whole plant (Tshisikhawe 2002). Figure 4.1 summarizes the percentage contribution of different plant parts in the preparation of medicines from the three shops. The plant parts most preferred were roots since 61% of the medicinal plant species were traded in the form of roots. Twenty two percent of plant species were traded in the form of

the whole plant, 15% in the form of stem bark, 1% in the form of fruits and the other 1% in the form of leaves (Tshisikhawe 2002).

In the Venda region roots were therefore the most important parts traded followed by the whole plant and bark. In the Lowveld, Botha *et al.* (2004) similarly reported that the greatest proportions of plant parts were roots, bark or the whole plant, with relatively small proportions of flowers, fruit, seeds and branches. In the Mpumalanga and Limpopo markets roots constituted 59.4% and 60.5% respectively of the stock, with the comparable values for bark being 23.0% in Mpumalanga and 6.2% in Limpopo (Botha *et al.* 2004). In the Witwatersrand muthi markets it was also found that most of the plant species were traded for their roots and bark although the leaves, stems, whole plants and bulbs were also sold (Williams 1996, Williams *et al.* 2000). In the Eastern Cape, trading in medicinal bark was very high and came second to roots (Dold and Cocks 2002). However, in Maputo, Mozambique more than 50% of plant species were traded for their roots and about 6% of medicinal material was traded in the form of bark (Krog *et al.* 2006). In Suriname, South America bark is harvested in a non-destructive manner and only contributes 6% of the material on the market, while roots are minor items that contribute 5% and are mostly aerial roots (Van Andel and Havinga 2008).

Trading of roots for medicinal purposes is not sustainable since it usually results in the destruction of plants. The removal of roots, whole plant or excessive use of fruits and seeds for medicinal purposes has a negative impact on plant population growth which may lead to a decline of maedicinal plants from the wild (Ghimire *et al.* 2008, Rokaya *et al.* 2010).

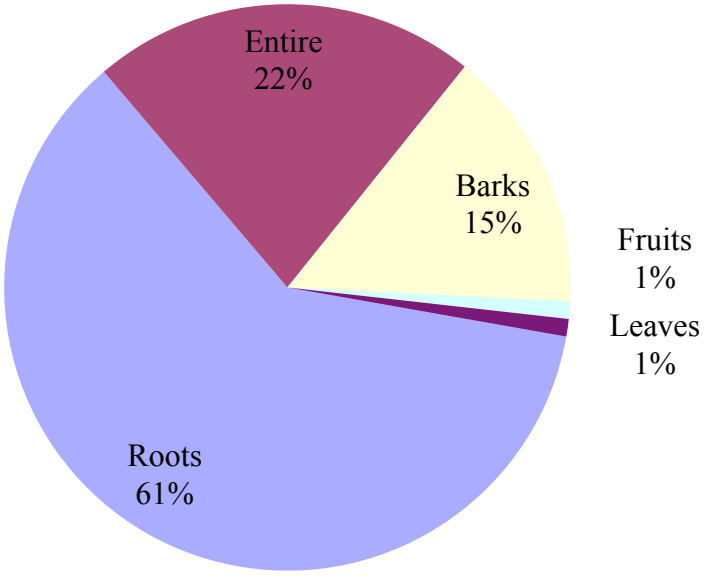

Figure 4.1: Contribution of plant parts to medicinal trade in Venda (adapted from Tshisikhawe 2002).

As indicated in Table 4.2 a total of 58 medicinal plant species are commonly harvested for their medicinal bark in Venda. In total 26 families were listed, with the Fabaceae being the most prominent family, contributing to 27.6% of these species. For 37 (63.8%) of these species only the bark is used, whereas for 17 (29.3%) of the species both the root and bark are used and for four (6.9%) of them the entire plant is used medicinally. In 79.3% of the species the bark has multiple uses and only in 20.7% does the species have only a single use. Most of the species are readily available in the wild (45 species; 77.6%), with 11 (19% of all listed species) of them being moderately available and only two (3.4%) of them, i.e. *Brackenridgea zanguebarica* and *Warburgia salutaris* having a low availability. Additionally, the latter two species also have multiple uses for their bark and are among the ten most traded species in the Venda region.

Table 4.2: Indigenous plant species most commonly traded around Venda for medicinal bark properties

Botanical names	**Common names** **E – English, V – Venda**	**Plant parts**	**Single/ multiple use**	**Availability**	**Remarks***
Adansonia digitata L.	Boabab (E), Muvhuyu (V)	Bark	Multiple	High	Bark contains phenolic compounds and is a use source of the new hypoglycemic compounds
Adenia spinosa Burtt Davy	Tshivhuyudumbu (V)	Bark	Multiple	Moderate	Contains cyanogenic compounds
Afzelia quanzensis Welw.	Pod mahogany (E), Mutokota (V)	Bark	Multiple	High	Bark contains compounds with therapeutic potential
Albizia adianthifolia (Shumach.) W. Wight	Flat-crown (E), Muelela (V)	Bark	Single	High	Bark contains large amounts of histamine and related imidazole compounds
Albizia versicolor Welw. *ex* Oliv.	Large-leaved false-thorn (E), Mutamba-pfunda (V)	Bark	Multiple	High	Bark contains 4.8% tannin
Annona senegalensis Pers.	Wild custard-apple (E), Muembe (V)	Root/Bark	Multiple	High	Contains four bioactive ent-kaurenoids (1-4).
Berchemia discolor (Klotsch) Hemsl.	Brown ivory (E), Munie (V)	Bark	Single	High	Bark contains prenylated flavonoids
Bolusanthus speciosus (Bolus) Harms	Tree wistaria (E), Mukambana (V)	Root/Bark	Multiple	High	Bark contains eight known isoflavonoids

Brackenridgea zanguebarica Oliv.	Mutavhatsindi (V)	Root/Bark	Multiple	Low	Bark contains phenolic compounds and differer flavanoids
Burkea africana Hook.	Wild seringa (E), Mufhulu (V)	Bark	Multiple	High	Bark contains tannin
Combretum molle R. Br. *ex* G. Don	Velvet bushwillow (E), Mugwiti (V)	Root/Bark	Multiple	High	Saponins, sericoside and tannins extracted
Commiphora marlothii Engl.	Paperbark corkwood (E), Mukarakara (V)	Bark	Single	Moderate	Bark contains three labile C22 octanordammare triterpenes compounds
Commiphora viminea Burtt Davy	Zebra-bark corkwood (E)	Root/Bark	Multiple	High	Pentacyclic triterpene extracted, strong antimicrobial activity
Croton gratissimus Burch. var. *gratissimus*	Lavender fever-berry (E), Mufholoro (V)	Bark	Multiple	High	Bark contains four cembranolides
Croton megalobotrys Muell. Arg.	Large fever-berry (E), Muruthu (V)	Bark	Multiple	High	Bark contains aristolochic acid I (1)
Cussonia spicata Thunb.	Common cabbage tree (E), Musenzhe (V)	Root/Bark	Multiple	High	Bark contains tannins
Dalbergia melanoxylon Guill. & Perr.	Zebrawood (E), Muuluri (V)	Bark	Single	Moderate	Contains antidiarrhetic compounds

Dichrostachys cinerea (L.) Wight & Arn. subsp. *africana* Brenan & Brummitt	Sickle bush (E), Murenzhe (V)	Root/Bark	Multiple	High	Epicatechin isolated
Diospyros mespiliformis Hochst. *ex* A. DC.	Jackal berry (E), Musuma (V)	Root/Bark	Single	High	Bark contains tannins
Dombeya rotundifolia (Hochst.) Planch. var. *rotundifolia*	Common wild pear (E), Tshiluvhari (V)	Bark	Multiple	High	Bark contains lupeol and β-sitosterol
Ekebergia capensis Sparrm.	Cape ash (E), Mutovuma (V)	Bark	Multiple	Moderate	Bark contains 7.23% tannin and used in treatme of heartburn and chest complaints
Elaeodendron transvaalense (Burtt Davy) R.H. Archer	Bushveld saffron (E), Mulumanamana (V)	Root/ bark	Multiple	Moderate	Used in treatment of venereal diseases and contains 13.4% catechol tannin
Elephantorrhiza elephantine (Burch.) Skeels	Dwarf Elephant-root (E), Gumululo (V)	Bark	Multiple	Moderate	Demonstrate anti-ehrlichial activity
Erythrina lysistemon Hutch.	Common coral tree (E), Muvhale (V)	Bark	Single	High	Antibacterial compound wighteone isolated fro bark
Euphorbia ingens E. Mey. *ex* Boiss.	Common tree euphorbia (E), Mukonde (V)	Root/Bark	Multiple	High	Contains poisonous latex with ichthyocidal properties

Faidherbia albida (Delile) A. Chev.	Ana tree (E)	Bark	Multiple	High	Contains compounds with anti-malarial activitie
Ficus ingens (Miq.) Miq.	Red-leaved rock fig (E), Tshikululu (V)	Bark	Multiple	High	Bark contains analgesic compounds
Ficus sansibarica Warb. subsp. *sansibarica*	Knobbly fig (E), Mutamvu (V)	Bark	Multiple	High	Contains phenolic compounds
Maerua angolensis DC. subsp. *angolensis*	Bead bean tree (E), Mutamba-na-mme (V)	Bark	Multiple	High	Contains compounds with hypoglycemic effect
Maerua cafra (DC.) Pax	Bush-cherry (E)	Root/Bark	Multiple	Moderate	Contains natural compounds similar to nicotine
Mundulea sericea (Willd.) A. Chev.	Cork-bush (E), Mukunda-ndou (V)	Bark	Single	High	Contains rotenone, deguelin, tephrosin, munduserone, and mundulone compounds
Ozoroa engleri R. Fern. & A. Fern.	White resin tree (E), Tshinungmafhi (V)	Bark	Multiple	High	Bark contains compounds with antimalarial properties
Parinari curatellifolia Planch. *ex* Benth.	Mobola plum (E), Muvhula (V)	Bark	Multiple	High	Bark contains silica crystals
Peltophorum africanum Sond.	Weeping wattle (E), Musese (V)	Bark	Multiple	High	Contains bergenin and norbergenin
Piliostigma thonningii (Schumach.) Milne-Redh.	Camel's foot (E), Mukolokota (V)	Root/Bark	Multiple	High	Bark rich in tannin

Pleurostylia capensis (Turcz.) Loes.	Coffee-pear (E), Murumelela (V)	Root/Bark	Multiple	High	Contains psychoactive compounds
Podocarpus latifolius (Thunb.) R.Br. *ex* Mirb.	Broad-leaf yellowwood (E), Muhovho-hovho (V)	Entire	Single	High	Contains 3-6% tannin
Pseudolachnostylis maprouneifolia Pax	Kudu berry (E), Mutondowa (V)	Bark	Multiple	High	Contains inhibitory effects of suramin
Pterocarpus angolensis DC.	Wild teak (E), Mutondo (V)	Bark	Multiple	High	Contains a high percentage tannin
Rapanea melanophloeos (L.) Mez.	Cape-beech (E), Tshikonwa (V)	Bark	Multiple	Moderate	Contains 12-15% tannin
Rauvolfia caffra Sond.	Quinine tree (E), Munadzi (V)	Bark	Multiple	High	Contains the alkaloid reserpine
Schotia brachypetala Sond.	Weeping boer-bean (E), Mulubi (V)	Bark	Multiple	High	Antibacterial fatty acids isolated
Sclerocarya birrea (A. Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	Marula (E), Mufula (V)	Bark	Multiple	High	Bark contains 3.5-20.5% tannin
Searsia leptodictya (Diels) T.S. Yi, A.J. Mill & J. Wen.	Mountain karee (E), Mushakaladza (V)	Root/Bark	Single	High	Contains anti-cancer and anti-inflammatory compounds

Securidaca longepedunculata Fresen.	Violet tree (E), Mupesu (V)	Entire	Multiple	Moderate	Roots contain high percentage of methyl salicyl
Senegalia karroo Hayne	Sweet thorn (E), Muunga (V)	Bark	Multiple	High	Bark contains 19% tannin
Senegalia tortilis (Forssk.) Hayne subsp. *heteracantha* (Burch.) Brenan	Umbrella thorn (E), Muswu (V)	Bark	Single	High	Bark has a small amount of condensed tannins
Spirostachys africana Sond.	Tamboti (E), Muonze (V)	Bark	Multiple	High	Lipophilic compounds extracted
Strychnos madagascariensis Poir.	Black monkey orange (E), Mukwakwa (V)	Bark	Single	High	Contains tannins and other secondary compoun
Synadenium cupulare (Boiss.) L.C. Wheeler *ex* A.C. White, R.A. Dyer & B. Sloane	Dead-mans tree (E), Muswoswo (V)	Entire	Single	Moderate	Contains high amount of cyclooxygenase inhibitors
Syzygium cordatum Hochst. *ex* C. Krauss	Water berry (E), Mutu (V)	Root/Bark	Multiple	High	Leucodelphinidin and leucocyanidin detected ir bark
Syzygium guineense (Willd.) DC.	Water pear (E), Mutu-madi (V)	Bark	Multiple	High	Bark extract contains polyphenols, tannins and triterpens
Terminalia sericea Burch. *ex* DC.	Silver cluster-leaf (E), Mususu (V)	Entire	Multiple	High	Bark contains several pentacyclic triterpenoids

Trichilia dregeana Sond.	Forest Natal mahogany (E), Mutuhu (V)	Bark	Multiple	Moderate	Contains limonoids
Trichilia emetica Vahl subsp. *emetica*	Natal mahogany (E), Mutshikili (V)	Root/bark	Multiple	High	Contains limonoids
Warburgia salutaris (G. Bertol.) Chiov.	Pepper-bark tree (E), Mulanga (V)	Bark	Multiple	Low	Bark contains tannin, mannitol and muzigadial compounds
Wrightia natalensis Stapf	Saddle pod (E), Musunzi (V)	Root/bark	Multiple	High	Contains tyrosinase inhibitory potency compou
Zanthoxylum davyi (I. Verd.) P.G. Waterman	Knobwood (E), Mununguu (V)	Bark	Multiple	High	Contain alkaloids pellitorine, hesperidin, lupeol and chelerythrine acetonate

*Sources: Von Breitenbach 1981, Palgrave 1988, Mabogo 1990, Hutchings 1996, Van Wyk *et al.* 1997, Venter and Venter 1996, Schmidt *et al.* 2002, Tshisikhawe 2002, Seigler 2003, Geyid *et al.* 2005, van Wyk 2008, Paraskeva 2008, van Wyk and van Wyk 2009, Mulaudzi *et al.* 2011.

Table 4.3 lists ten of the most commonly traded plant species in Venda. Five of these species are traded for their bark and/or roots, i.e. *Brackenridgea zanguebarica, Elaeodendron transvaalense, Pleurostylia capensis, Securidaca longepedunculata* and *Warburgia salutaris*. From Table 4.3 it is evident that species such as *Elaeodendron transvaalense* and *Pleurostylia capensis* are readily available to traders. The availability of these species in the wild is high irrespective of the fact that they are among the most sought after and noted medicinal plants.

Of all the medicinal plants recorded, it is only *Brackenridgea zanguebarica*, which is collected at the same place by all traders interviewed. The fact that commonly traded plant species in Table 4.3, with the exception of *Brackenridgea zanguebarica,* are collected at different localities indicates a low level of collection pressure. The spread of the collection area is a good sign in terms of species conservation, preservation and sustainability because it allows these plants enough time to regenerate between collection periods resulting in the removal of stress on such plants. Collection of medicinal plant materials is usually done in winter when people are free from farming activities (Mabogo 1990).

Table 4.3: Comparison in terms of availability and collection locality of ten medicinal plant species commonly traded in the three shops in Thohoyandou (adapted from Tshisikhawe, 2002)

BOTANICAL NAMES	**Mr Netshia**		**Mrs Munyai**		**Mr Tuwani**	
	***Origin**	**Av.**	**Origin**	**Av.**	**Origin**	**Av.**
Albizia anthelmintica	Shakadza, Makuya	Moderate	Makuya	Moderate	Ha-Mutele	Low
Brackenridgea zanguebarica	Thengwe	Very low	Thengwe	Very low	Thengwe	Very low
Elaeodendron transvaalense	Thengwe	Very high	Makuya	High	Makuya	Moderate
Maerua edulis	Shakadza	Moderate	Makuya	Moderate	Ha-Mutele	Low
Osyris lanceolata	Thononda, Thengwe	Low	Thengwe	Low	Makonde	Low
Pleurostylia capensis	Shakadza	High	Dzimauli	High	Makonde, Sambandou	Moderate
Salacia rehmannii	Thengwe, Linia	Moderate	Thengwe	Low	Gundani	Low
Securidaca longepedunculata	Matavhela	Low	Makuya	Moderate	Makonde	Low
Warburgia salutaris	Mudimeli, KNP	Low	Songozwi	Very low	KNP	Very low
Wrightia natalensis	Thengwe	Low	Makuya	High	Makuya	High

Av. = Availability KNP = Kruger National Park

* Origin - refers to places where the plant species are collected. The places differ from one collector to another although there might be some few overlapping in terms of their collection areas.

Collection by various collectors at the same locality, as is the case with *B. zanguebarica* results in pressure on the species. In addition, it indicates that this species is restricted to one area.

Price / quantity relationship can be used to estimate the value of the plant material since the relationship also indicates its importance and popularity as a medicine. Medicinal plant material was mostly traded in portions ranging from 4 to 850 g although some were sold in powdered form. It was clear that powdered plant material was the most expensive, but that not all traders offered powdered plant material (Table 4.4). For example, powdered *Elaeodendron transvaalense* material at Mr Netshia's shop was 22 times more expensive than the non-powdered form at Mrs Munyai's shop (Tshisikhawe 2002). The high cost of prepared materials is attributed to the time and energy spent during the collection, and grinding processes (Van Andel and Havinga 2008).

Of note was the large difference in price per mass at the different shops and that the ranking was not always consistent among the traders. The same trend was reported by Botha *et al.* (2007) for the Lowveld region of Limpopo and Mpumalanga. Availability also influences the price of medicinal plant material (Netshiluvhi 1999, Letsela *et al*. 2002) although Botha *et al*. (2007) found that there was no relationship between prices and perceptions of species availability. Some plant species are hard to find, because of scarcity or distance factors, which render them more expensive than those readily available. As indicated in Table 4.4 some plant species, in particular *Brackenridgea zanguebarica* and *Warburgia salutaris*, were found to be out of stock, because of their popularity, diverse uses and scarcity (Tshisikhawe 2002).

Table 4.4: Comparison of species price and frequency of use of the most commonly traded species around Thohoyandou and Sibasa (adapted from Tshisikhawe 2002)

Botanical names	**Price/mass (rand/gram) Mr Netshia**	**Price/mass (rand/gram) Mrs Munyai**	**Price/mass (rand/gram) Mr Tuwani**	**Total use frequency (demand/ supply)**
Albizia anthelmintica	1.76*	0.13	0.02	7
Brackenridgea zanguebarica	0.39	Out of stock	0.04	5
Elaeodendron transvaalense	2.88*	0.13	0.04	3
Maerua edulis	2.04*	Out of stock	0.02	3
Osyris lanceolata	0.11	0.41	0.04	6
Pleurostylia capensis	0.14	0.59	0.19	5
Salacia rehmannii	0.28	0.35	0.07	2
Securidaca longepedunculata	0.08	0.34	0.03	5
Warburgia salutaris	Out of stock	0.23	Out of stock	4
Wrightia natalensis	0.60	Out of stock	Out of stock	2

* = Powdered medicinal plant material

Price/mass index were calculated in rand per gram unit in all the three shops

Total use frequency was used to determine the supply and demand of the muthi market.

The scarcity of medicinal plants such as *Warburgia salutaris* and *Brackenridgea zanguebarica* as revealed in Table 4.3 is partly compensated for by the fact that they are not leading the list of plant species with the highest use frequency, although they are still among the most traded species. Total use frequency was obtained by

consolidating reported medicinal use from all the traders. During consolidation similar uses on one species were recorded ones in order to produce use frequency ranking. Plants with the highest use frequencies are *Albizia anthelmintica* and *Osyris lanceolata*. *Brackenridgea zanguebarica* is ranked third together with *Pleurostylia capensis* and *Securidaca longepedunculata,* while *Warburgia salutaris* is ranked fourth.

An interesting aspect, which was evident in the muthi shops, was the interest in hemiparasites and epiphytes, for example *Viscum* species (nzunzu) amongst the traditional healers. The trade of hemiparasites and epiphytes is a new trend, and has also been noted by other researchers (Botha *et al*. 2001, 2004, 2007, Williams *et al*. 2010). During collection of medicinal material traditional healers showed great excitement when they find a hemiparasite or epiphyte rather than the plant species on which it grows. They believe that hemiparasites/epiphytes are very strong medicinally, compared to the plants on which they grow (Netshia pers comm.[3]).

Rituals observed during the collection include the spitting of saliva on the epiphytes before collecting. Performances of rituals are accompanied by invocations and praises to the ancestors. Interest in epiphytes may alleviate stress on affected plants that might be faced with extinction thereby giving them time to establish themselves again (Netshia pers. comm.[4]). However, the trade in parasitic species also has its dangers if rare parasitic species are overcollected e.g. *Hydnora africana*. It is clear that the trade of epiphytes and hemiparasites/parasites will increase due to their considered healing powers by the traditional healers.

[3] Mr Netshia, Traditional Healer, Thohoyandou, South Africa, Communication 1998

[4] Mr Netshia, Traditional Healer, Thohoyandou, South Africa. Communication 1998.

4.4.2.2 Collectors of medicinal plants

Mr Netshia (pers. comm.) and Mr Tuwani[5] (pers. comm.) collect medicinal plant material themselves, whereas Mrs Munyai[6] (pers. comm.) depends on the middlemen in most cases. Traditional healers usually train their middlemen in terms of collecting rituals in order for them to get good quality medicinal plant material. In fact these middlemen end up helping people in their areas with minor problems.

According to Mrs Munyai, middlemen are only used in places difficult to access such as steep mountains in cases where the traditional healer may be a woman or an old person. However, middlemen have been found to have an effect on the price of material collected by them. From Table 4.4, it is clear that on average the price of unprepared medicinal material is high at Mrs Munyai's shop as she gets most of her material through the middlemen. Middlemen come at a cost and this cost is included in the cost of the medicine.

It should be noted that collection of medicinal material comes at a cost irrespective of middlemen involvement. The cost of collection is influenced by one or all of the following factors:

(i) Transport – The area of collection of medicinal material varies according to availability as well as the practitioner's knowledge of such species and habitat. To a practitioner with extensive knowledge on species distribution, the collecting distance increases with species depletion from one area. The

[5] Mr Tuwani, Traditional Healer, Sibasa, South Africa.
[6] Mrs Munyai, Traditional Healer, Thohoyandou, South Africa

increase in distance of collection brings about more transport cost, which is absorbed by the clients.

(ii) Consultation fee - Traditional healers believe that when they are away on collection trips a lot of clients are turned away. Therefore, thousands of rands are lost in consultation fee because of their absence. The longer the time they spend in the field looking for a particular medicine, the more expensive the medicine will be.

(iii) Middlemen fee - They collect medicinal material for traditional healers at a price. The price of middlemen is fair as they are needed only in conditions unfavourable to the traditional healer, for example when a female traditional healer needs a plant species which is found on top of a mountain, a young man is preferred as a middleman.

The effect of the middleman in the whole medicinal plant trading process should not be ignored. Their level of knowledge on rituals and their roles in the functioning of medicinal plants should be investigated. Usually middlemen start as assistants to traditional healers during collecting. It is only after understanding the collecting procedures that they qualify as collectors. Depending on the level of knowledge and understanding, the middlemen may be as good as traditional healers in collecting medicinal plant materials.

4.4.2.3 Exportation from the region

Some accounts of collectors from outside the Venda region were obtained from the Thengwe Territorial Council where *Brackenridgea zanguebarica* is collected through

an interview with the headman (Nemafukani pers. comm.[7]). The account serves to establish the extent of trade and destinations to which plants are exported.

Medicinal plant materials are extensively exported from the Venda region. Although there are no proper official records of medicinal plant material collection at Thengwe Territorial Council on *Brackenridgea zanguebarica*, it was estimated that about a hundred traditional healers visit the area for collecting annually (Nemafukani pers. comm.). The headman reported that some collectors come from as far as KwaZulu-Natal, Gauteng and Mpumalanga Provinces which is about 1100, 500 and 400 km respectively from Venda region. According to the headman control measures for *Brackenridgea zanguebarica* collection have now been put in place. The observation by headman Nemafukani on the extent of exportation from Venda region is supported by Netshiungani and van Wyk (1980) and Williams (1996), who noted that *Brackenridgea zanguebarica* was even found in stocks of muthi sellers trading in Johannesburg and Pretoria.

4.4.2.4 Conservation and sustainability methods

Traditional healers still observe traditional rituals when collecting medicinal plant material. The cultural beliefs of the Vhavenda people towards *Brackenridgea zanguebarica* are the main factor in its conservation, and preservation (Netshiungani and van Wyk 1980).

Amongst some of the traditional rituals, traditional healers always make sure that they

[7] Mr Nemafukani, Headman Thengwe Territorial Council. Communication 1999.

leave behind a plant or population of plants that can regenerate and sustain it (Netshia pers comm.[8]). The success of their harvesting strategy is confirmed during their second visit to collecting areas. An indication that traditional healers always have conservation in mind when collecting can be seen from the confidence with which they show their collection sites. They are always sure that visiting their collecting areas can reveal the success of their conservation strategies and methods. For example, when collecting the roots they harvest only a few lateral roots from one plant and then go to the next. The area from where the roots had been collected is immediately covered again so that the plant should not die.

It is only with herbs that healers uproot the whole plant leaving some plants behind so that the population is sustained. The whole plant is preferably used as medicine in cases where herbaceous species are used. This avoids collection of a large number of plants and there is therefore, no waste/danger in uprooting the whole plant. Collection of leafy parts involves the collection of a few small branches from the plant. Rituals like spitting of saliva on the branches before being collected are often performed as is the case with hemiparasites/epiphytes. They believe that if such an act is not performed the medicine may not work effectively (Netshia pers comm.[9]).

Collection of bark involves removal of a few strips preferably from the stem. Traditional healers will never ring-bark the stem because they believe that for the medicine to be effective in healing, the plant it is removed from should not die. Traditional healer Credo Muthwa (cited in Makoe 1994) also confirmed the conservation of medicinal plants by traditional healers through collection rituals.

[8]Mr Netshia, Traditional Healer, Thohoyandou, South Africa. Communication 1998.
[9] Mr Netshia, Traditional Healer, Thohoyandou, South Africa. Communication 1998.

Muthwa believes that if you take all the roots and leave the tree rootless, then you are also killing the very patient you purport to help. According to Muthwa traditional healers from Botswana, Lebowa and Zimbabwe also confirm this traditional practice. In fact, to Credo Muthwa: "it is an insult to claim, or even suggest, that traditional healers play a role, active or sluggish, in the extinction of plants and animals".

In Venda, these traditional practices of saving the plant were noticed during voucher specimen collection field trips. According to Mabogo (1990), Venda traditional healers stress the need to avoid killing the plants from which the medicines are obtained. They believe that if a person kills the plant as a result of collecting the medicine from it, the medicine will kill the patient instead of healing such a patient. Leaving the roots exposed is therefore strictly forbidden. However, the increase in trade of medicinal plants which often include people who are not traditional healers has brought about harvesting techniques that do not conform to the rituals of traditional healers that promoted sustainable harvesting.

Conservation measures for *Brackenridgea zanguebarica,* since it is regarded as threatened, have been put in place by making a reserve around the population of this species. The conservation authorities and the headman make sure that collection of medicinal plant material from the reserve is done by a dedicated person from the tribal council under the supervision of reserve staff. Collection of medicinal plant material is only done outside the reserve and even this has been suspended since 1997 so that the trees are given time to recover. According to Nemafukani (pers. comm.), seedlings of this plant, which have established themselves in great numbers, will also have enough time to grow into mature plants. This will ensure a continuous and

sustainable supply of medicinal material from the area if they can vegetatively develop and reach flowering stage. The territorial council arrests people found collecting medicinal material during the recovery period. Because of the fact that headmen from the areas where *Brackenridgea zanguebarica* is found are given a share in the cash generated, civic people in such areas also play a conservationist role by policing the area. This system of managing natural resources by involving traditional leaders and the community was found to be successful.

4.3.3 Vulnerability of 58 species traded most for their medicinal bark properties in the Venda region

Vulnerability is a descriptor of long term *in situ* effects on populations or ecosystems. It is considered a function of exposure to a stressor, effect and recovery potential (De Lange *et al.* 2010). A vulnerability/resilience score gives insight on those species that might be at risk since it assesses each species on a number of sensitive criteria.

In Table 4.5 the lower the vulnerability/resilience score, the more at risk such a species would be from overutilization. From Table 4.5 it can be seen that species such as *Adansonia digitata (8), Adenia spinosa (4), Albizia adianthifolia (9), Albizia versicolor (5), Brackenridgea zanguebarica (6), Croton megalobotrys (6),* and *Warburgia salutaris (8)* may be considered to be species at risk because of their low scores which are below 10. The three vulnerable species that stand out are *Albizia adianthifolia, Brackenridgea zanguebarica* and *Warburgia salutaris* which are also among the ten most traded species in Venda. On the other hand, the rest of the most traded species *Elaeodendron transvaalense (15), Pleurostylia capensis (18),*

Securidaca longepedunculata (18) and *Wrightia natalensis* (19) all had high scores. *Osyris lanceolata, Maerua edulis* and *Salacia rehmannii* were not scored because they are not harvested for their bark.

It is important to note that vulnerability/resilience scores look at the totality of all the criteria and as such a species may have high degree of bark harvest thereby scoring negatively but be away from risk due to positive scores on other criteria. *Elaeodendron transvaalense (15), Peltophorum africanum (19), Pterocarpus angolensis (19), and Sclerocarya birrea* subsp. *caffra (18)* are some of those species with a high degree of bark harvesting but score positively on other criteria. Therefore bark harvesting alone cannot be used as a criterion of suggesting that the species is at risk.

Planning should be done in order to reduce or minimize holistic human-induced threats to biodiversity (Midgley and Thuiller 2007, De Lange *et al.* 2010, Gauthier *et al.* 2010). One way in which the threat of bark harvesting on the wild plant populations could be minimized would be by establishing medicinal plant gardens or botanic gardens. The medicinal plant garden staff must also develop comprehensive programs of environmental education to the public, which will help in stressing the need for plant conservation. The need for a time of recovery after a harvest and the capacity of some species to regenerate their bark, could be stressed by such environmental education initiatives.

Table 4.5: Vulnerability score for 58 plant species harvested for their bark in the Venda region

Botanical names	**Vulnerability score**
Senegalia karroo	17
Senegalia tortilis subsp. *heteracantha*	16
Adansonia digitata	8
Adenia spinosa	4
Afzelia quanzensis	15
Albizia adianthifolia	9
Albizia versicolor	5
Annona senegalensis	20
Berchemia discolor	20
Bolusanthus speciosus	11
Brackenridgea zanguebarica	6
Burkea africana	18
Combretum molle	18
Commiphora marlothii	20
Commiphora merkeri	20
Croton gratissimus var. *gratissimus*	11
Croton megalobotrys	6
Cussonia spicata	16
Dalbergia melanoxylon	17
Dichrostachys cinerea subsp. *africana*	20
Diospyros mespiliformis	16
Dombeya rotundifolia var. *rotundifolia*	17
Ekebergia capensis	16
Elaeodendron transvaalense	15
Elephantorrhiza elephantina	18
Erythrina lysistemon	19
Euphorbia ingens	18
Faidherbia albida	18

Ficus ingens	16
Ficus sansibarica subsp. *sansibarica*	16
Maerua angolensis subsp. *angolensis*	20
Maerua caffra	19
Mundulea sericea	19
Ozoroa engleri	19
Parinari curatellifolia	18
Peltophorum africanum	19
Piliostigma thonningii	18
Pleurostylia capensis	18
Podocarpus latifolius	20
Pseudolachnostylis maprouneifolia	20
Pterocarpus angolensis	19
Rapanea melanophloeos	20
Rauvolfia caffra	20
Schotia brachypetala	19
Sclerocarya birrea subsp. *caffra*	18
Searsia leptodictya	20
Securidaca longepedunculata	18
Spirostachys africana	19
Strychnos madagascariensis	18
Synadenium cupulare	18
Syzygium cordatum	19
Syzygium guineense	18
Terminalia sericea	20
Trichilia dregeana	18
Trichilia emetica subsp. *emetica*	18
Warburgia salutaris	8
Wrightia natalensis	19
Zanthoxylum davyi	20

Derivation of scores is provided in Appendix B

4.5 Conclusions

Although only a proportion of the potential plant species with medicinal properties were found in the muthi shops investigated, bark harvesting constitutes a very important component of the trade in medicinal plant species. Five out of the ten most traded species were used for their bark and among these five species the two scarcest species were counted, while one of them was only moderately available.

This study furthermore reported on the pattern of trade in medicinal plant species by local markets in the Venda region, Limpopo Province, South Africa. Venda in general and Thohoyandou and Sibasa in particular have few muthi trading shops. This is because the people trading in medicinal plant material are at the same time traditional healers who are able to collect medicinal plant material using their practicing certificates as their licenses.

It is recommended that initiatives such as the formation of the Brackenridgea Nature Reserve aimed at protection of *Brackenridgea zanguebarica* species be supported and expanded to include other threatened species. These reserves around communities of threatened medicinal plants must be supplemented by a propagation program of threatened species in medicinal plant gardens or botanic gardens. The medicinal plant garden staff must also develop comprehensive programs of environmental education to the public, which will help in stressing the need for plant conservation.

Bark harvesting is very prominent in certain species that are in demand such as *Brackenridgea zanguebarica* and *Elaeodendron transvaalense*. However, recovery

from bark harvesting between the two species differ with *B. zanguebarica* showing a good healing strategy.

Trade in medicinal plants might be rife in Venda but it is important to note that most of the species whose bark is being traded are able to recover from the harvesting and their populations are able to sustain themselves. Trading with bark can be detrimental when the species involved has a small population with a restricted distribution because if the population is large and widely distributed the species has the potential of avoiding harvesting over the entire range. The good thing about species traded for their bark in Venda is that although negatively reported, overall the species involved in trade are able to recover from harvesting due to their large populations that are widely distributed.

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