

Floristic Diversity and Uses of Medicinal Plants Sold by Street Vendors in Gaborone, Botswana

Moffat P. Setshogo^{1*} • Collen M. Mbereki²

¹ Department of Biological Sciences, University of Botswana, Private Bag UB00704, Gaborone, Botswana

² Division of Plant Protection (Crop Production), Ministry of Agriculture, Private Bag 0091, Gaborone, Botswana

Corresponding author: * setshogo@mopipi.ub.bw

ABSTRACT

The sale of herbal medicine, either as concoctions or single plant specimens, has become common in the streets and main shopping centres of major towns and cities in Botswana. A study was undertaken to collect information on the uses of medicinal plants sold by street vendors in Gaborone, Botswana, during June 2008 to December 2008. The indigenous knowledge of the street vendors and the plants used for medicinal purposes were collected through questionnaire and personal interviews during field trips. The survey showed that the street vendors used 47 species of plants distributed in 45 genera belonging to 29 families to treat various diseases and health conditions. The documented medicinal plants were mostly used to cure skin sores, sexually transmitted diseases (STD) and asthma. In this study, the most dominant families are the Asteraceae and Fabaceae, each with 5 species and roots were most frequently used for the treatment of diseases accounting for 62% of the medicines sold. This study showed that many people in Botswana still continue to depend on medicinal plants for primary healthcare.

Keywords: herbal medicine, indigenous knowledge, ethnobotany, remedies, traditional doctors

INTRODUCTION

Traditional herbal medicine is still used by millions of people worldwide and 80% of the developing world (de Silva 1997). In addition modern pharmacopoeia contains 25% drugs derived from plants and there is an increase of interest in green products in industrialised nations (de Silva 1997). In sub-Saharan Africa, it is the main source of medical care for a great proportion of the population. This is especially true as population size outgrows western medical resources and the cost of treatment remains high (Cunningham 1997; Romero-Danza 2001). Even in Botswana where modern medical facilities are relatively available and affordable, herbal medicine still has long standing cultural traditions.

To understand the role of traditional medicine in Botswana, it is important to consider the whole Setswana perspective on health and medicine. In Botswana, medicine applies to both physical and metaphysical symptoms. The duties of a traditional healer range from the treatment of illness to ritual cleansing of widows or widowers, and often symptoms are tied in with ritual meaning (Danley 2006). Indeed Botswana generally believe that illness is caused by such things as witchcraft, breaking of taboos, anger of ancestral gods (*badimo*), or God's will, and that sickness and health or good and bad luck are not chance occurrences. Thus a traditional doctor or *ngaka*, also has a priestly function (Merriweather 1992). Many Botswana still believe that one cannot be cured without consulting a *ngaka*, so it is common for people to use traditional medicine alongside western medicine.

Traditional medicine is the sum total of all the knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental and or social imbalances. Traditional medicine, in contrast to western medicine, can be used to cure unconventional illnesses such as curses, spells and bad lucks. It is here that traditional medicine has found a niche. The relationship between a healer and the patient is often much closer than

that of the health professional and the patient. This may be due to the fact that the healer understands the problems of their patient within a cultural context, speaks the same language and even shares similar views with his patient (Potter and Perry 1999).

Traditional medicine in Botswana is understudied. To date there are a few published articles on herbal medicine. Conducting ethnobotanical surveys of markets is one of the first steps in identifying commonly used plants as species sold in markets are often well known and have been used for generations (Cunningham 2001). However, at the same time as developing countries become modernised and populations continue to grow and move to cities, indigenous uses of plants change and many species become threatened. As many people move to the city, regional and national trade of herbal medicines grows. Trade in such medicines is higher now than at any point in the past due to the combination of high population growths, rapid urbanisation, rural unemployment, and the value placed on traditional medicines (Cunningham 1997). Urbanisation results in cultural change as people are displaced, enter into a cash economy, are exposed to different, and often more Western perspectives (Bodeker 1997). In many cities, medicinal plant use is changing from being a specialist activity concerning doctors to one involving groups of medical plant gatherers who have different motives (Cunningham 1997). Many people wrongly assume that indigenous uses of plants are protected by tradition, but as tradition changes so do old means of protection (Cunningham 2001). For example, Setswana traditional healers consult their ancestors or carry out some ritual before digging out a plant (Kanyenvu 2006). This is done to ensure that the plant is preserved for future use. Likewise traditional doctors will often treat their remedies with a great amount of mystery making them special and inaccessible to the everyday person. In contrast, those who trade in herbal medicines as a major source of income view the resource differently. Thus as tradition changes, commercialisation may threaten some popular species.

The sale of traditional herbal medicine has become

common in Botswana during the last decade. This is done in both temporary and permanent kiosks at various places in towns and cities. A study was commissioned from June 2008 to December 2008 to document the uses of various plants sold by street vendors in Gaborone, Botswana. A compendium of diseases cured and methods of preparation used were also documented.

MATERIALS AND METHODS

The study area

Gaborone is the capital and largest city of Botswana with a population of 186 007 people (Population and Housing Census 2001). It occurs at coordinates 24°39'29"S 25°54'44"E. It is the center of the national economy. This then results in in-migration from rural areas in search of employment and other livelihood improvement activities. When employment is not readily available, people explore other means of sustenance in the city.

One way of making a living in Gaborone is through market vending. Market stalls are erected at various places throughout the city. All sorts of items and services are sold, from produce, to cloths, crafts, and cell phone repairs. Stalls selling traditional medicine occur mainly at the only railway and bus station in the city.

Survey and interviewing of vendors

The main method of gathering data was through interviewing and observations. Nine interviews comprising seven females and two males were conducted. Each interview lasted at least one hour and many lasted several hours as it was found useful to sit with the vendor and observe as he/she helped customers. The interviews were semi-structured to allow the conversation to flow naturally. Each stall was surveyed by recording all of the plants that were sold. Local names, uses, preparation and any relevant botanical information were also recorded. In cases where vendors were selling too many plants, a focus was on only those that were the most popular.

Data analysis

The data was analysed for consistency of use for various species between vendors. This was much easier to do because of few vendors involved. Where there was ambiguity in use of the various species, the data was not used and there were few instances where this was the case. Generally, the vendors also tried as much as is possible to stock herbal medicines used to treat different ailments.

Species identification

Species were identified, initially, by their common local names given in *Setswana*. The main challenge was that sometimes medicinal plants would have specific names used only by traditional doctors. Confirmation of all samples was done with the help of the University of Botswana Herbarium (UCGB), and voucher specimens deposited with the herbarium.

RESULTS

The results of the survey are presented in **Table 1**. The plants are arranged alphabetically by family, then by genera and finally by species. There are 47 species belonging to 45 genera in 29 families of flowering plants. Species botanical name, family, local name (either *Setswana* or English or both, where known), parts used, methods of preparation, administration of medicine and ailments, diseases or conditions treated are listed for each species. The vendors sell herbal medicine used to cure various diseases including sores, diarrhoea, diabetes, asthma, stomach pains, coughs, aphrodisiacs, malnutrition, sexually transmitted diseases, headaches, boils, menstrual problems, stroke, shingles, rheumatism, heart problems, etc. (**Fig. 1**). Common health problems recorded were skin sores, sexually transmitted diseases (STD) and asthma and the largest number of remedies (sores – 7 remedies; STD and asthma – 4 remedies each) were used to treat these ailments.

Herbs (35 species) were found to be the most used plants followed by shrubs (7 species) and trees (5 species). The most dominant families were Asteraceae and Fabaceae

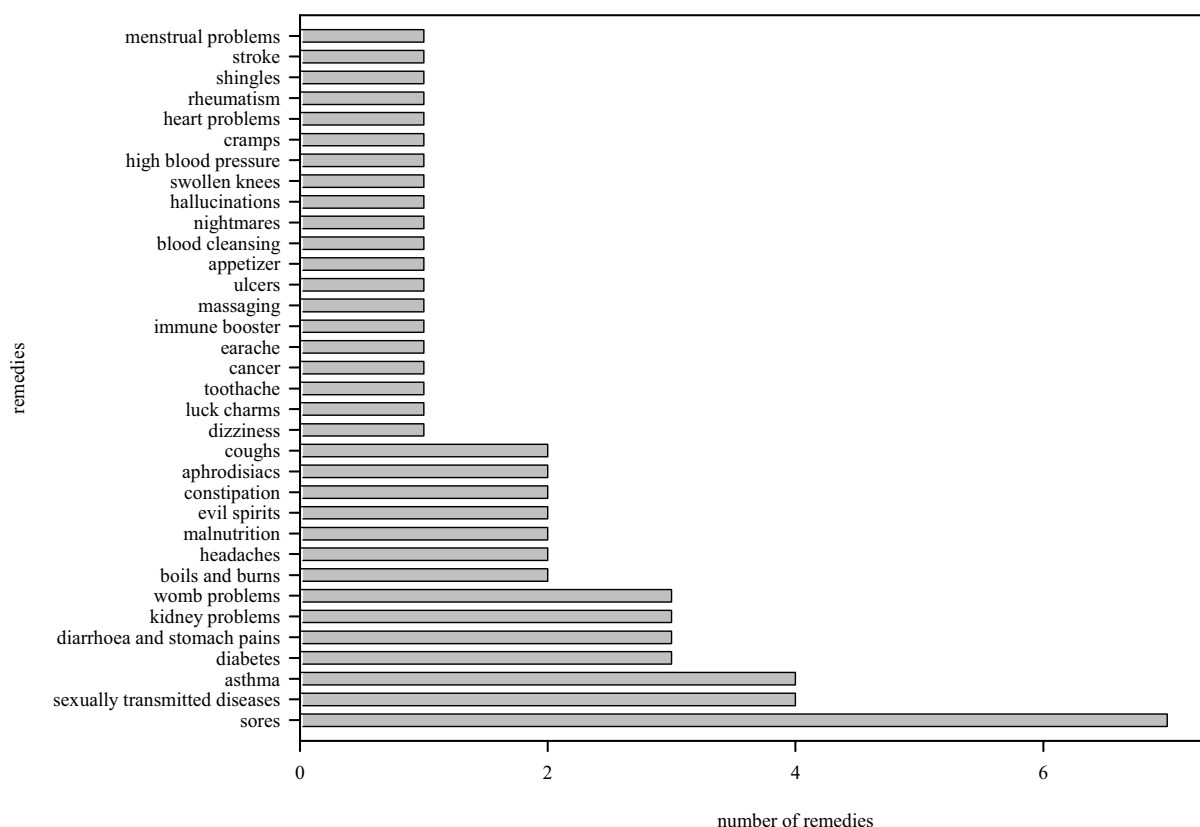


Fig. 1 Number of remedies used for various ailments.

Table 1 Medicinal plants sold by street vendors in Gaborone, Botswana.

Family name	Species name	Local name (Setswana; English)	Medicinal use and method of preparation
Amaryllidaceae	<i>Ammocharis coronica</i> (Ker-Gawl.) Herb.	<i>lesomo, seboka, motu;</i> tumble weed	The bulb is used for curing swollen, painful knees. The bulb is cut into two and half of it boiled in water, then the patient is soothed with it. The other half is fried with nuts of <i>Ximenia americana</i> L. until it turns black. Small incisions are then made on the swollen knees and the medicine applied onto them.
Apiaceae	<i>Scadoxus puniceus</i> (L.) Friis & Nordal. <i>Heteromorpha arborescens</i> (Spreng.) Cham. & Schlecht.	<i>mathubadifhala;</i> blood lily <i>mmuabue, serethe;</i> parsely tree	The tuber is used to cure persistent sores that do not heal up. Very small pieces of the tuber are used to wash the wound periodically. The roots are boiled in milk and fed to malnourished children.
Apocynaceae	<i>Raphionacme velutina</i> Schltr.	<i>thobokwe</i>	The tuber is used as medicine for diarrhoea in babies. The tuber is sliced into two. One half is roasted, cooled and applied on the baby's tummy.
Asparagaceae	<i>Asparagus africanus</i> (Lam.) Oberm. <i>Asparagus exuvialis</i> Burch. forma <i>exuvialis</i>	<i>mhalatsamaru;</i> wild asparagus <i>mosokelatsebeng</i>	The root is boiled in water and the medicine is used to treat genital sores and discomforts. The roots and stems of the plants are used to cure kwashiorkor. The medicine is prepared by boiling pieces of the stem and root in milk. It is then allowed to cool and given to the child to drink.
Asphodelaceae	<i>Aloe zebrina</i> Baker	<i>kgophane;</i> variegated aloe	Used to treat burns and treat diabetes. For the burns, the inner jelly part of the succulent leaves is applied to the burns while for the treatment of diabetes, the leaves are boiled in water and the juice taken orally . Any part of the plant is boiled in water for the treatment of asthma
Asteraceae	<i>Artemisia afra</i> Jacq. ex Willd. <i>Dicoma anomala</i> Sond. <i>Helichrysum paronychioides</i> DC. <i>Hirpicium bechuanense</i> (S.Moore) Rossl. <i>Psiadia paniculata</i> (DC.) Oliv. & Hiern ex Vatke	<i>lengana;</i> African wormwood <i>tlhonya</i> <i>phate-ya-ngaka</i> <i>kgalemela</i> <i>masegomabe</i>	The root is boiled in milk and the medicine is used to treat stomach pains and diarrhoea. The plant is boiled just like tea, milk can be added and or sugar to reduce the bitterness. Then drink it cold or whilst hot. It is used for treating internal sores. For stomach pains and diarrhoea. The root is chewed and only the juices are swallowed. Alternatively the root can be ground to powder and soaked in either hot or cold water. The solution is then drunk. It has a bitter taste. The roots, branches and leaves of this plant are used to cure asthma, sores and incessant coughs. When preparing for kids, boil in milk and add a little bit of sugar to reduce the bitter taste. If it is an adult that has to use the medicine, it is okay to boil in water and give to the patient to drink when the medicine has cooled.
Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	<i>moporota;</i> sausage tree	The fruit is boiled with milk. It is used as an aphrodisiac for men and to treat sexually transmitted diseases.
Capparaceae	<i>Cadaba aphylla</i> (Thunb.) Willd. <i>Capparis tomentosa</i> Lam.	<i>monnamontsho;</i> leafless cadaba <i>motawana;</i> woolly caper bush	The root is glowed and pointed at the area where the wound (boil) is likely to develop. The smoke is supposed to perfuse into the wound every time this procedure is followed. For headache, the root is boiled in water and taken orally. The plant is used to ward off hallucinations, nightmares, evil spirits. It casts away fear and is very strong against witch spells. The roots and stems are soaked in water. For a person suffering from hallucinations, he or she is washed in the solution of the medicine. For those troubled by bad spirits and witches, the medicine solution is sprinkled around the fence of the homestead and houses.
Combretaceae	<i>Combretum erythrophyllum</i> (Burch.) Sond.	<i>mokhukhu;</i> river bushwillow	The root is ground into a powder and mixed with water and is used to cleanse the blood.
Commelinaceae	<i>Commelina diffusa</i> Burm.f.	<i>kgopo</i>	Heals the womb after birth. The root is powdered and mixed with warm or cold water and then drunk.
Convolvulaceae	<i>Turbina oblogata</i> (E. Mey. ex Choisy) A. Meeuse	<i>mokatelo</i>	The bulb is an appetizer i.e., creates the desire to eat, particularly to children. It is pounded and soaked in water. Alternatively one can just put it in the food that one intends giving to the child.
Cucurbitaceae	<i>Cucumis hirsutus</i> Sond. <i>Momordica repens</i> Bremek <i>Zehmeria marlothii</i> (Cogn.) R. & A. Farnandes	<i>mukununu</i> <i>naka-la-tlou</i> <i>phekolola</i>	It is used for ulcers, it helps in breaking them open. The roots are boiled in water and the medicine given to the patient to drink. When the ulcer breaks, it is further treated with the bark of <i>Peltophorum africanum</i> Sond. The root is powdered and mixed with water. The mixture is used to clean the womb after a difficult birth. The tubers are used to chase away evil spirits. They are chopped and placed into cold or hot water. Then the solution is used to sprinkle around the house and home to cast away the evil spirits.
Ebenaceae	<i>Euclea divinorum</i> Heim	<i>motlhakola;</i> diamond-leaved euclea	The root is used as a cure for kidneys. It is boiled in milk and given to the patient to drink.
Euphorbiaceae	<i>Erythrococca trichogyne</i> (Mull.Arg.) Prain var. <i>trichogyne</i> <i>Jatropha erythropoda</i> Pax and K. Hoffm.	<i>mononyane;</i> twin red-berry <i>thotamadi</i>	The root is powdered and mixed with water. The mixture is use for the treatment of diabetes and asthma. It is used to cure constipation. It can either be used alone or in a concoction with other medicines. The tuber is chopped and placed in hot water and then left to cool. Half a cup of the medicine is taken in the morning and another one in the evening until one feels the stomach problem is relieved. It is also said to be used to treat rash associated with sexually transmitted diseases and to cleanse the womb.

Table 1 (Cont.)

Family name	Species name	Local name (Setswana; English)	Medicinal use and method of preparation
Euphorbiaceae	<i>Jatropha zeyheri</i> Sond.	<i>seswagadi</i>	The root is soaked in water and the medicine is used to cleanse kidneys, and intestines.
Fabaceae	<i>Tragia okanyua</i> Pax	<i>sebabetsane</i> ; stinging nettle	The root is powdered, mixed with water and drunk to cure sexually transmitted diseases.
	<i>Cassia abbreviata</i> Oliv. subsp <i>beareana</i> (Holmes) Brenan.	<i>monepenepe</i> ; long-tail cassia	The root is ground into a powder, mixed with water and used to wash "dirty" blood. "Dirty" blood refers to a situation like during miscarriages. A person that has miscarried is said to have dirty blood and so ought to be cleaned hence the use of this medicine. It is also used to treat diabetes.
	<i>Elephantorrhiza burkei</i> Benth.	<i>ntolane</i> ; sumach bean	The root is powdered and used for massaging muscles. Pregnant women are massaged with it before giving birth.
	<i>Indigofera flavicans</i> Bak.	<i>tshikadithata</i>	The root is boiled in water and the mixture taken orally to boost the human immune system especially of those people whose immune system is compromised by the effects of HIV.
	<i>Otoptera burchellii</i> DC.	<i>mosiha-wa-poo</i> , <i>mpingambize</i>	All parts of the plant are used as medicine for earaches. The plant parts are boiled in water and then oil drops are added to the solution. A few drops are then administered to the ear.
Hyacinthaceae	<i>Peltophorum africanum</i> Sond.	<i>mosetlha</i> ; weeping wattle	The bark is ground into powder and mixed with ground bark of <i>Sclerocarya birrea</i> (A.Rich.) Hochst. subsp. <i>caffra</i> (Sond.) Kokwaro for the treatment of early cancer. It is crushed on its own and mixed with hot water for the treatment of asthma.
	<i>Urginea sanguinea</i> Schinz	<i>sekaname</i>	The bulb is chopped into pieces. The pieces are then added to the water that the widow or widower has to bath with. Some of the pieces are then taken along to every place that the widower visits for the first time and added into the food that he/she shall be eating for the first time. This practice shall continue for a period lasting the whole year.
Hydnoraceae	<i>Hydnora johannis</i> Becc. var. <i>johannis</i>	<i>letlhole</i>	The bulb is boiled either whole or in powdered form in water and used to cleanse the body in general, but most commonly helps with menstrual problems.
Hypoxidaceae	<i>Hypoxis hemerocallidea</i> Fisch. Mey & Ave-Lall.	<i>tshuku-ya-poo</i> ; African potato	The tuber is chopped and put into hot water. It is then left to soak and allowed to cool overnight. The debris is then sieved off and the liquid given to the patient to drink. This medicine is used for curing sexually transmitted diseases and kidney problems. It is also said to be an aphrodisiac.
Lamiaceae	<i>Acrotome inflata</i> Benth.	<i>leatla</i> , <i>seromo</i> ; tumbleweed	The root is used to relieve uterus pains. It is boiled or soaked in water and taken orally.
	<i>Clerodendrum ternatum</i> Schinz var. <i>ternatum</i>	<i>sedupapula</i> ; cat's claw	The roots are use to relieve constipated patients. They are boiled in water and then allowed to cool. The solution is then given to the patient to drink in the morning, afternoon and in the evening, using a coffee mug quantity.
Myrothamnaceae	<i>Myrothamnus flabellifolius</i> (Sond.) Welw.	<i>moswaarula</i> ; resurrection plant	Used to cure stroke and shingles. Any part of the shoot is ground into a powder and prepared just like tea.
Pedaliaceae	<i>Harpagophytum procumbens</i> (Burch.) DC.	<i>sengaparile</i> ; devils claw	Tubers are sliced and put in hot water. The mixture is then allowed to settle overnight. The debris is then sieved using a very fine sieve or cloth and the solution is used as medicine. The medicine is used to treat high blood pressure, cramps and rheumatism.
	<i>Pterodiscus ngamicus</i> N.E.Br. ex Stapf	<i>pelo-ya-khutsana</i>	The bulb is boiled in water and the medicine is used to treat heart problems.
Pittosporaceae	<i>Pittosporium viridiflorum</i> Sims.	<i>moranganga</i> ; cheesewood	The bark of the plant is used to cure sexually transmitted diseases and internal itches. It works as a concoction with other plants such as <i>Hypoxis hemerocallidea</i> Fisch. Mey. & Ave-Lall. and <i>Hirpicium bechuanense</i> (S.Moore) Ross. The bark is soaked in water and taken periodically. It has a bitter taste.
Plumbaginaceae	<i>Plumbago zeylanica</i> L.	<i>masigomabe</i> ; white plumbago	The roots are soaked in water to prepare the medicine. It is a cure for sores. It is also used to cure coughs in kids.
Poaceae	<i>Vossia cuspidata</i> (Roxb.) Griff.	<i>mojakubu</i> ; hippo grass	The grass is either boiled and mixture applied to the body like a lotion or is burnt like a candle. In either case it is thought to bring luck, especially to business.
Rhamnaceae	<i>Ziziphus mucronata</i> Willd. subsp. <i>mucronata</i>	<i>mokgalo</i> ; buffalo thorn	The bark is boiled in water and the mixture is used for gargling and washing mouth for the treatment of toothache.
Rubiaceae	<i>Rubia horrida</i> (Thunb.) Puff	<i>madi-a-phalane</i>	The leaves are ground into a powder and mixed with water and taken orally to treat dizziness.
Rutaceae	<i>Thamnosma rhodesica</i> (Baker f.) Mendoca	<i>moralala</i>	The twigs are pounded to powder, mixed with water and the patient washed with the solution. It is used for washing water-filled sores.
Solanaceae	<i>Solanum incanum</i> L.	<i>tholwana-e-tona</i> ; bitter apple	The root is cooked with milk and sipped periodically. This is medicine for infants. It cures problems such as terrible headaches, and a condition where by nerves net the head showing signs of abnormality.
Tiliaceae	<i>Grewia flavescens</i> Juss.	<i>motsotsojane</i> ; rough-leaved raisin	The root is boiled in milk and used to treat big sores under the chin.



Fig. 2 Photographs of some of the herbal medicines: *Hirpicium bechuanense* (A), *Cassia abbreviata* subsp *beareana* (B), *Cadaba aphylla* (C), *Capparis tomentosa* (D), *Helichrysum paronychioides* (E), *Jatropha erythropoda* (F), *Myrothamnus flabellifolius* (G), *Urginea sanguinea* (H), *Dicoma anomala* (I).

(5 species), Euphorbiaceae (4 species), and Curcubitaceae (3 species). Other families with low numbers are listed below: Amaryllidaceae, Aspragaceae, Capparaceae, Lamiaceae and Pedaliaceae (2 species), Apiaceae, Apocynaceae, Asphodelaceae, Bignoniaceae, Combretaceae, Commelinaceae, Convolvulaceae, Ebenaceae, Hyacinthaceae, Hydrocharitaceae, Hypoxidaceae, Myrothamnaceae, Pittosporaceae, Plumbaginaceae, Poaceae, Rhamnaceae, Rubiaceae, Rutaceae, Solanaceae, and Tiliaceae (1 species). A photo sample of the herbal medicines is shown in **Fig. 2**.

There were plants that were used to treat more than one disease. These were *Aloe zebrina*, *Psiadia punctulata*, *Kigelia africana*, *Cadaba aphylla*, *Erythrococca trichogyne*, *Jatropha zeyheri*, *Peltophorum africanum*, *Hypoxis hemericalleidea*, *Myrothamnus flabellifolius*, *Harpagophytum procumbens*, *Pittosporum viridiflorum* and *Plumbago zeylanica*. Preference for their use might be due to their availability.

Different parts of medicinal plants were used as medicine. Among the different plant parts, roots were most frequently used for the treatment of diseases (62%) followed by whole plant and stem (11% each), bark (6%), leaf and shoot (4%), and fruit (2%). The methods of preparation fall into five categories, viz: water extraction (47%), powder (29%), milk extraction (16%), roast (4%) and fresh specimens (4%). It should be noted that even in cases where the specimens were powdered, they were still eventually mixed with water to make the medicine. Most of the medicines were for internal consumption.

Most of the remedies consisted of a single plant part, prepared through one or more methods of preparation. In the instance where this is the case, medicines prepared

through the different methods would be used to treat differing ailments also. For example, leaves of *Aloe zebrina* were used fresh to treat burns but were boiled in water to prepare a juice that is taken orally for the treatment of diabetes. It was also observed that medicine could be prepared by different methods but still treating the same ailment. For example, the roots of *Hirpicium bechuanense* could either be chewed and the juices swallowed or soaked in cold or hot water and taken orally, for the treatment of stomach pains and diarrhoea. It was further noted that still some medicines could be used for more than one condition. For example, the water extract of the tuber of *Hypoxis hemericalleidea* could be used to treat sexually transmitted diseases, kidney problems and be an aphrodisiac at the same time!

DISCUSSION

Indigenous knowledge systems are engrained in all cultures and societies. The general populace is conscientiously aware of certain individuals within their societies who are endowed with the knowledge of medicines of plant origin that are useful for providing mental and physical relief from illness, trauma and other disturbances. With such people in the community, health services are easily available and accessible. These practitioners of herbal medicines have somewhat been relegated to the background due to the advent of western, scientific-based medicines.

Most governments throughout the world recognise the importance of traditional herbal medicine and the potential role it could play in primary health care. The extent to which herbal preparations are prescribed within conven-

tional medicine varies greatly between countries, for instance being much higher in Germany than in the UK or USA (Hamilton 2003). Most countries, Botswana included, still take the cautious route of not incorporating herbal medicine in their health systems. This approach, however, might prove detrimental to the knowledge held by practitioners and the conservation of the plants involved.

Medicinal plants have special meanings to people in the sense that they contribute to many people's lives in terms of health support, financial income, cultural identity and livelihood security (Hamilton 2003). What is at danger is the methods of exploiting these medicinal resources and the way it is practised by those who purport to have the knowledge and skills. Before the advent of commercialisation of traditional herbal medicine, it was a speciality activity practised by traditional doctors. It has, however, become an activity involving groups of people who more often ignore the practices employed in the past to ensure sustainability of the trade. This venture then becomes a threat to conservation and sustainable use of the plants and might prove to be self-destructive in the long term.

There is currently lack of knowledge on the number of medicinal plant species in Botswana. Coupled with this is also the lack of information on biomass and primary production of indigenous medicinal plants. This therefore means that detailed assessment of sustainable off-take from natural populations is not possible. Even if these data were available, their value would be questionable due to the intensive management inputs required for managing sustainable use of vulnerable species in cases where demand exceeds supply (Cunningham 1997). What can be done at best is to identify the categories of medicinal plant species that are most vulnerable to over-exploitation by combining insights of herbal medicine sellers with our knowledge of plant biology and distribution (Cunningham 1990).

The majority of plant medicines sold in Gaborone are of root origin accounting for 62% of herbal medicines recorded. This is worrisome particularly if the harvesting is done unsustainably. The harvesting and need-based usage of medicinal plants was traditionally regulated in such a way that sustainability was inherently ensured (Ahmad 2003). Harvesting often requires the performance of certain rituals, which limit resource off take and protect the resource (Medius 1998). The vital traditions of sustainability have been ingrained into societies through their emphasis in rituals and their mention in ancient scriptures (Ahmad 2003). For example in Charaksamhita, one of the most important Ayurvedic texts of India, it has been mentioned that the branches and leaves of medicinal plants should be collected in rainy and spring seasons, roots in summer or late winter when the leaves have fallen down or fully matured, barks, tubers and latex in autumn, heartwood in early winter and flowers and fruits according to their season (Sharma 1994). Sustainable harvesting techniques are very simple and only require harvesters to take certain precautions. For instance, the tuber system of the grapple plant, *Harpagophytum procumbens*, is structured such that there is a parent (main) tuber and secondary tubers coming out of the parent tuber. Sustainable harvesting of this particular species requires that only the secondary tubers are harvested and the parent tuber left to re-grow the following season. Harvested populations also need to be left fallow for at least two years to recover. These vital traditions of sustainability are therefore threatened by emphasis on profitability. Traditional herbal medicine is now demand-based as opposed to need-based. Those who trade in herbal medicine are often poor people whose main aim is earning money, and not resource management.

There is a realisation that the ways of exploiting medicinal plants is changing. Most street vendors interviewed revealed that the medicinal resources were increasingly becoming rare and it was increasingly becoming expensive to do collections from the wild. There therefore has to be a concerted effort to augment traditional practices of conser-

vation of medicinal plants with modern ones. There is probably a need to take the route to cultivation of medicinal plants. Some traditional herbalists now have backyard gardens where they cultivate some of the material they sell. Large-scale cultivation is still limited by a lack of institutional support for production and dissemination of key species for cultivation, and the low prices paid for traditional medicinal plants by herbal medicine traders and urban herbalists (Cunningham 1997). If cultivation is to succeed in providing an alternative supply source, plants have to be produced cheaply and in large quantities. Material from cultivation would have to compete with that harvested from the wild by commercial gatherers who have incurred no input costs. There would also be a need for a change in attitudes towards cultivated material. In Botswana, traditional medical practitioners believe that cultivated material is unacceptable, as cultivated plants did not have the power of material cultivated from the wild (Cunningham 1997).

In conclusion, though street vending of herbal medicines is a potential source of income for the impoverished, it is faced with a number of challenges. The first one is that of sustainability of the trade because of unknown off-take rates from the wild sources. Secondly alternate means of making material adequate and available for the trade, such as cultivation, are faced with competition from the wild sources which often are at low prices. Finally, there will need to be a change in attitude of traditional medical practitioners and their patients towards cultivated material which is thought of as less potent than wild material.

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