Medicinal plants used in the treatment of fungal and bacterial infections in and around Queen Elizabeth Biosphere Reserve, western Uganda

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Abstract

In Uganda, bacterial and fungal infections are prevalent especially, the sexually transmitted diseases including HIV/AIDS. Because of low socio-economic empowerment, traditional beliefs and cultural barriers, the suffering people resort to use of herbal remedies in search of cure especially for rural women who rarely discuss/disclose diseases affecting secretive body parts. The study documented 67 medicinal plants distributed among 27 families and 51 genera used to treat fungal and bacterial infections in and around Queen Elizabeth Biosphere Reserve in western Uganda. The highest numbers of species were from Families Lamiaceae (13) and Asteraceae (11). The most commonly harvested plant parts were leaves (88.1%) and roots (23.9%). The most common growth form harvested were herbs (47.8%) and most of the medicinal plants used were wild species (67.2%). The main methods of herbal drug preparation were by squeezing, boiling and pounding and were mainly orally administered. However, most of the steamed plant species were inserted in the birth canal besides oral administration. Some plants such as *Allium sativum*, *Aloe vera* and *Ocimum gratissimum* are topically applied on the affected body parts. This vital indigenous knowledge about healing secretive and discrete diseases among the marginalized population requires urgent ethnobotanical studies to sustain livelihoods.

Key words: bacterial, fungal, health care, medicinal plants

Introduction

Bacteria have been the worst human disease causing organisms (Ritter *et al.*, 1996). Generally, the most prevalent human pathogens are bacteria, viruses and some fungi, protozoan or parasitic worms (Ritter *et al.*, 1996). This study was limited to bacterial and fungal diseases treated by medicinal plants. Antibiotics, which are chemicals produced synthetically or by microorganisms that inhibit the growth of or destroy certain other microorganisms, have been used since 1940s (Ritter *et al.*, 1996). However, over the past 50 years, many disease-causing bacteria have slowly developed resistance to antibiotics. The treatment of antibiotic resistant bacteria and emerging infectious agents remains a major concern to both biomedical researchers and the public. These resistant forms are appearing not only in humans but also in cattle and poultry (Ritter *et al.*, 1996). World Health Organization (WHO) is concerned about the multidrug resistance of micro-organisms such as tuberculosis (WHO, 2000). Proliferation of emerging parasitic diseases is changing with changes in environment and ecological disturbances because of natural phenomena and human interventions. In feminine health care, vaginal infections are common among women living in tropical rainforests and often result in infertility and abnormal menstrual patterns (Farnsworth, 1994). Thus, new drugs are being planned for and expensive research is being conducted to combat these new strains.

The microbial infections in Africa have not only yielded negative consequences to the general wellbeing of individuals but have also minimized the notion of quality healthcare services delivery in Uganda and general sub-

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Saharan Africa. For instance, the African countries have the highest rates of measurable primary and secondary infertility in the world estimated between 20% and 30% of couples compared to reported rates of 5–10% in developed countries (Okonofua, 1999, 2001). There is somehow conclusive evidence that much of the infertility in Africa is attributable to microbial infections that produce irreversible reproductive tract damage in men and women. Recent findings show that the consumption of mycotoxins produced by fungi such as *Aspergillus* might be linked to infertility in men and are capable of producing deleterious to lethal effects on central nervous system, cardiovascular, pulmonary systems as well as alimentary canal (Sharma, 1998; FAO, 2001; Nduka, Ibeh & Oluwafemi, 2001). The apparent high prevalence of bacterial and fungal-based infections in humans as well as in domestic and wild animals is a threat to humanity. Therefore, some compelling microbial diseases such as coughs and TB that have registered high resistance and new emerging diseases such as HIV/AIDS and its associated fungal and bacterial ailments necessitate that new drugs are discovered and developed. This time round, plants are increasingly being seen as the target in drug discoveries and development. The development of effective herbal remedies will definitely be to the advantage of poor, developing countries in Africa that house these vital medicinal plants. More still, the poor and marginalized segments in society such as women, persons with disability, displaced persons and children in sub-Saharan Africa will receive better services from their own resources. That is why this kind of study, hinging on traditional knowledge (IK) in the documentation of medicinal plants already being used by communities, is useful. The IK may offer solutions in health care delivery in developing nations like Uganda where 80% of the population continues to rely on traditional medicine (Kamatenesi-Mugisha, 2004).

Common fungal infections for instance, *Candida albicans* are widespread and cause vaginal thrush/vaginal pruritus, leucorrhoea, lower abdominal pain, skin infections of penis, oral thrush in malnourished children and adults as well as in HIV/AIDS and other immuno-compromised ailments (Martin & Jullo, 1978; Pandey *et al.*, 1981; Hawker & Linton, 1988; Oliver *et al.*, 1999). The common types of candidiasis of humans are the skin candidiasis, broncho-candidiasis, oral candidiasis, pulmonary and vulvovaginal candidiasis (Emmons *et al.*, 1977). The fungal infections caused by *Aspergillus niger*, *Aspergillus flavus* and *Aspergillus terreus* show symptoms of Aspergillosis (lung diseases and nasal sinuses), a disease affecting the respiratory system that resembles tuberculosis in humans (Alexopoulos & Mims, 1979; Hawker & Linton, 1988; Sharma, 1998). The fungi producing aflatoxins cause cancers (FAO, 2001) and further reduce immunity and worsen the immune system in HIV/AIDS patients.

The bacterial based infections are widespread especially in the tropics where the climate promotes their proliferation. For instance, *Staphylococcus aureus* causes infections such as furunuculosis, carbunculosis and osteomyelitis infections in the eye, skin, hair follicle and sweat glands, (Todar, 2002). In addition, gram negative bacteria such as *Pseudomonas aeruginosa* are the epitome of opportunistic pathogens in humans and cause a variety of systemic infections, particularly in patients with severe burns, patients with cancer and patients with AIDS (Todar, 2002). *Pseudomonas aeruginosa* species are notorious for high resistance to antibiotics and cause dreaded infections such as *Pseudomonas septicaemia*, urinary tract, ear, gastrointestinal, endocarditis, dermatitis, osteochondritis and central nervous system infections (Todar, 2002). *Escherichia coli* inhabits the intestines of humans and animals and causes enteritis in young infants and adults leading to diarrhoea and fatal dehydration and is the common infectant of the urinary tract and bladder in man and plays a big role in public health concerns in Uganda, and developing countries in general.

In rural parts of Uganda, some of the bacterial and fungal infections mentioned above are treated using herbal drugs and yet these drugs are not properly documented and validated for efficacy. This study was purposely carried out to document the indigenous knowledge from the ethnobotanical and ethnomedical points of scrutiny. We therefore documented several commonly used medicinal plants traditionally used in the treatment of antimicrobial organisms. The methods of herbal medicines preparation and administration were also documented and the conservation status of the plants was ascertained.

Materials and methods

This study was undertaken between January 2000 and September 2003 to document medicinal plants used to treat fungal and bacterial infections in health care in and around Queen Elizabeth Biosphere Reserve in Bushenyi and Kasese districts in western Uganda. Ethnobotanical data collection methods used in this study included visiting traditional healers to document the IK, regarding medici-

nal plants used, gender and socio-cultural aspects. Informal and formal conversations, discussions and interviews with them, market surveys, health surveys and field visits were conducted. Voucher specimens of medicinal plants used were collected, documented and identified in the Makerere University Herbarium.

Traditional healers, midwives, young women and old people (men and women) were the main respondents in the study. The research methods used were mainly those that promoted free sharing of information between the researcher, the herbalists and other people. Therefore, informal conversations and semi-structured interviews and discussions were used to generate the ethnobotanical data (Martin, 1995). To reach the traditional medical practitioners and traditional birth attendants (TBAs), the local authorities (Local Councils), herbalist associations in villages and chairpersons of wildlife clubs were consulted. When going to the forests, game reserves or other areas where they collect plant specimens, prior arrangements were made with the community leaders and park staff partly because of the insecurity in the reserve. The ethnomedical data regarding the diseases treated, medicinal plants used, plant parts used, methods of preparation and administration were collected and analysed.

The informal conversations were held with the specialist resource users and other knowledgeable people on particular ailments. The meeting places were the gardens, women group meetings, at their homes, and any other place convenient to them. Through conversations, the sources of knowledge of the healers on medicinal plants, the medicinal plants used and changes in the availability of medicinal plants were established. Those who were more knowledgeable were later followed up and interviewed further especially the TBAs. Focused group discussions were held with them later for formal recording. Young mothers were visited because the young children are the ones who fall sick more often and are treated using herbal remedies. This was done to verify the information gathered and the spread of the indigenous knowledge (IK) in health care delivery among the different reproductive age groups.

The semi-structured interviews and discussions were held with the specialist resource users and other knowledgeable people on particular ailments by use of interview schedules for each respondent. Interviewed people were mainly the herbalists (both men and women) and TBAs. The time and place of interviews were arranged according to the schedules of the respondent. Meetings with them were, for example, at the places of work such as the farms, where they treat the patients, etc. Depending on where the interviews and discussions were held, recording was done immediately or afterwards or appointments were made for more details at a more convenient place arranged with the respondent. Key informants were identified and later interviewed separately and even followed up for further details. Some of the key questions asked included, the name of the respondents, the village or parish or sub-county he or she was coming from, diseases treated, plant local names used, parts harvested, methods of preparation and administration.

The field visits and excursions were arranged with the healers for places far from their homesteads or took place concurrently with the interviews and discussions. This was done with individuals or groups depending on where the herbs were collected. In the shared areas such as the fishing villages, or the multiple use areas, group excursions were conducted. The data collected were to supplement the information on plant names, plant parts used, collection of the herbarium voucher specimens and conservation status of these medicinal plants. The medicinal plants collected were given the voucher numbers and later identified in the Botany Department Herbarium of Makerere University.

Results

The ailments under STDs include fungal and bacterial infections and HIV/AIDS – herpes zoster. The treatment and management of STDs using local herbs are presented in Tables 1 and 2.

Medicinal plants used in the treatment of fungal and bacterial infections

The documentation compiled 67 medicinal plant species distributed among 27 families and 51 genera for use in antimicrobial treatment (bacterial and fungal infections) (Table 1). The highest number of species were from family Lamiaceae (13) followed by Asteraceae (11) Mimosaceae (5), Papilionaceae and Myrtaceae had four species each. The rest of the families had three or fewer number of species used as antimicrobes.

Leaves (88.1%) were the most commonly harvested plant parts, followed by roots (23.9%), barks (10.5%), fruits (9.0%), stems (7.5%) in that order. Seeds, aerial roots and whole plants (1.5 %) each were harvested. From *Bidens pilosa*, *Warburgia ugandensis*, *Momordica foetida*, *Dracaena steudneri* and *Ricinus communis*, three different plant parts were harvested for use in the treatment of

Table 1 Medicinal plants used in treatment of antimicrobes (bacterial and fungal infections)

Family	Scientific name	Parts used	Growth form	Conservation
Acanthaceae	*Justicia* sp.*	L	H	W
Alliaceae	*Allium cepa* L.[b],*,†	RT	H	C
	Allium sativum L. [b],*,†	RT	H	C
Aloeaceae	*Aloe vera* (L.) Webb.*,†	L	H	C/W
Amaranthaceae	*Cyathula uncinulata* (Schrad.) Schinz.*	L	H	W
Anacardiaceae	*Mangifera indica* L.	L	T	C/W
Asteraceae	*Bidens pilosa* L.*	L, FR, R	H	W
	Conyza floribunda H.B & K.*	L	H	W
	Crassocephalum bojeri (D.C.) Robyns *	L	H	W
	Crassocephalum vitellinum (Benth.) S.Moore*,†	L, ST	H	W
	Emilia coccinea (Sims) G. Don[a,]*	B, L	S	W
	Erlangea tomentosa S. Moore*	L	H	W
	Erlargea marginata (Oliv. & Hiern) S. Moore	L	H	W
	Microglossa pyrifolia (Lam.) O. Kuntze*	L, R	H	W
	Pluchea ovalis DC.*	L	H	W
	Tithonia diversifolia (Hemsl.) Gray	L	S	W
	Vernonia amygdalina Del.*	L, R	S	W
Bignoniaceae	*Spathodea campanulata* P. Beauv.[c]	B	T	W
Caesalpinaceae	*Senna didymobotrya* Fresen.[c]*	L, R	S	W
Canellaceae	*Warburgia ugandensis* Sprague	B, L, R	T	W
Capparaceae	*Capparis tomentosa* Lam.*	L, R	H	W
	Cleome rutidosperma DC.*	L	H	W
Convolvulaceae	*Ipomoea cairica* L. *,†	L, ST	H-CL	W
Crassulaceae	*Kalanchoe lateritia* Engl.[a,]*	L	H	C/W
Cucurbitaceae	*Luffa cylindrica* (L.) M.J Roem.	L, R	H-CL	C
	Momordica foetida Schumach	L, ST, R	H-CL	W
	Zehneria scabra (L.f.) Sond.†	L, ST	H-CL	W
Dracaenaceae	*Dracaena steudneri* Engl.	B, L, FR	T	W
Euphorbiaceae	*Euphorbia hirta* L.	WP	H	W
	Flueggera virosa (Willd.) Voight	L, R	S	W
	Ricinus communis L.[c]	R, L, FR	T	C/W
Lamiaceae	*Geniosporum rotundifolium* Briq.	L	H	W
	Hoslundia opposita Vahl. [a],*,†	L, R	S	W
	Leonotis nepetifolia (L.) Ait.f.†	L	H	W
	Ocimum basilicum L.[a],*,†	L	H	C/W
	Ocimum gratissimum L.[a],*,†	L	H	C/W
	Ocimum kilimandscharicum Guerke [a],*,†	L, FR	H	W
	Ocimum lamiifolium Benth. [a],*,†	L, FR	S	C/W
	Ocimum sp.[a,]*	L	H	W
	Plectranthus prostratus Guerke [a],*,†	L	H	C
	Plectranthus sp.[a,]*	L	H	C
	Solenostemon latifolius (Benth.) J.K. Morton [a],*,†	L	H	C
	Solenostemon sp.[a,]*	L	H	W
	Tetradenia riparia (Hochst.) L. E. Codd. [a],[c],†	L	S	C
Malvaceae	*Hibiscus aponeurus* Sprague & Hutch.*	L	S	W
	Hibiscus fuscus Garcke*	L	S	W
Mimosaceae	*Acacia mearnsii* De Wild.[a,]*	L, B	T	C/W
	Acacia rubica Benth.	L, FL	S	W
	Albizia adianthifolia (Schumach.) W.F. Wright	L	T	W
	Albizia coriaria Oliv.[c]	L, B	T	W

Table 1 (Continued)

Family	Scientific name	Parts used	Growth form	Conservation
	Albizia gummifera (J.F. Gmel) C.A. Sm.[c]	L	T	W
Moraceae	*Ficus natalensis* Hochst.[c]	L, AR	T	W
Myrtaceae	*Eucalyptus cirtiodora* Hook.[c]	L, FR	T	C
	Eucalyptus globulus Labill.[c]	L	T	C
	Eucalyptus grandis Maiden	L	T	C
	Psidium guajava L.[c]	L, R	T	C/W
Papilionaceae	*Arachis hypogea* L.[b]	SE	H	C
	Eriosema psoraleoides (Lam.) G. Don.[c]	L	S	W
	Indigofera arrecta A. Rich. [c],†	L, R	S	W
	Indigofera spicata Forsk.	L	H	W
Polygonaceae	*Rumex abyssinicus* Jacq. [b],[c],†	L, ST	H	C/W
Rubiaceae	*Pavetta subcana* Brem. (P. *albertina* S. Moore)[c]	L	S	W
Rutaceae	*Zanthoxylum gillettii* (De Wild.) Waterm.[c]	B, R	T	W
Tiliaceae	*Grewia arabica* K. Schum.[c]	L	S	W
Tropaeolanaceae	*Tropaeolum peltophorum* Benth.[c]	R	H	W
Vitaceae	*Cyphostemma adenocaule* (A. Rich.) Wild & Drum.[c],†	L, R	H-CL	W
Zingiberaceae	*Zingiber officinale* Roscoe[c],†	RT	H	C

L, leaves; R, roots; B, bark; ST, stems; RT, root tuber; FR, fruits; SE, seeds; AR, aerial roots; WP, whole plant; H, herbs; H-CL, climbing herbs; S, shrubs; T, trees; C, cultivated; W, wild.
Method of preparation: [a]steaming; [b]chewing; [c]pounding.
Method of administration: *insert in the birth canal; †smearing

Table 2 Medicinal plants used in treatment of HIV/AIDS (herpes zoster)

Family	Scientific name	Parts used	Growth form	Conservation
Alliaceae	*Allium cepa* L.*	BU	H	C
Alliaceae	*Allium sativum* L.*	BU	H	C
Aloeaceae	*Aloe vera* (L.) Webb. *	L	H	C/W
Canellaceae	*Warburgia ugandensis* Sprague	L, B, R	T	W
Caricaceae	*Carica papaya* L.*	L, R, FR	T	C/W
Lamiaceae	*Tetradenia riparia* (Hochst.) L. E. Codd.*	L	S	C
Lauraceae	*Cinnamomum verum* J. Persl	L, B	T	C
Solanaceae	*Capsicum frutescens* L.*	L, FR, SE	H	C
Sterculiaceae	*Cola acuminata*	SE	T	W

L, leaves; R, roots; B, bark; BU, bulbs; FR, fruits; SE, seeds; H, herbs; H-CL, climbing herbs; S, shrubs; T, trees; C, cultivated; W, wild.
Method of administration: *smearing on the affected area.

fungal and bacterial infections. In the case of *Euphorbia hirta*, the whole plant was used.

Herbs (47.8%) were the most common growth form harvested followed by shrubs and trees (22.4% each), and climbing herbs (7.5%) in that order. Most of the medicinal plants used for treatment of fungal and bacterial infections were wild species (67.2%), followed by cultivated plants (17.9%) and lastly, the partially domesticated and wild species constituted 14.9%.

The main methods of herbal drug preparation were by squeezing, boiling and pounding. Some plants such as *Spathodea campanulata* and *Zanthoxylum gilletti* are first pounded before squeezing or boiling. A few plants such as *Rumex abyssinicus* are chewed. All the species of Lamiaceae are steamed.

The herbal medicines for treating microbes were orally administered. The steamed Lamiaceae species are inserted in the birth canal besides oral administration. The species

used for bathing include *Cyphostemma adenocaule*, *Tithonia diversifolia*, *W. ugandensis* and *Tertadenia riparia*. The other plants such as *Allium sativum*, *Aloe vera* and *Ocimum gratissimum* were smeared (topical application) on the affected parts of the body by mixing them with vaseline, cow-ghee or butter.

Medicinal plants used in HIV/AIDS-herpes zoster management

Nine medicinal plant species distributed among eight families were used for management and treatment of HIV/AIDS and herpes zoster (Table 2). Family Alliaceae had two species while the rest of the families had one species each used in management and treatment of HIV/AIDS and herpes zoster.

Leaves (66.7%) were the most commonly harvested plant parts, followed by roots, barks, bulbs, seeds and fruits (22.2%) each. From *W. ugandensis*, *Carica papaya* and *Capsicum frutescens*, three different plant parts were harvested for use in the management of HIV/AIDS and herpes zoster and the rest of the species one or two different plant parts were used.

Herbs and trees (44.4%) were the most commonly harvested and shrubs (11.1%) were the least harvested. Most of the medicinal plants used for treatment of herpes zoster were cultivated (55.6%), followed by wild plants and the partially domesticated and wild species (22.2%) each. The main methods of herbal drug preparation were by squeezing and pounding. The *Allium* species and *Cinnamomum verum* are also cooked in food. All the herbal medicines used for the treatment of HIV/AIDS-herpes zoster were orally administered. Besides oral administration, the herbal drugs were smeared on the affected body parts.

Discussion

The prevalence of STDs among Ugandan women is high. The common STDs include gonorrhoea, syphilis, candidiasis and several others sexually transmitted infections including HIV/AIDS, according to the respondents. As the respondents during the interview were not able to distinguish clearly the signs and symptoms of these ailments, especially the ones related to feminine health care apart from herpes zoster, we grouped these STDS as fungal and bacterial infections (antimicrobial). In addition, based on the IK provided, these infections were not screened to ascertain if they are only caused by bacterial and fungal microorganisms. The most common symptoms advanced by the respondents included the unpleasant vaginal discharge, vulval itching, scratching, urinating pus, lower abdominal pains, backache, bleeding from the vagina and severe wounds in the reproductive organs. All these symptoms were reported to cause discomfort and pain during urination and coitus. It is noted that herpes zoster is caused by a virus; however, as it is linked to HIV/AIDS, the local people translate it as part of the STDs. More so, once the patient suffers from herpes zoster, the incurred/resultant wounds in most cases are infected with the bacterial and fungal infections that are treated using herbal remedies.

Plants that have astringent, antiseptic and anti-inflammatory properties are of great value in treating some STDs. Some of these plants are able to relieve pain and treat opportunistic infections in immuno-compromised persons like HIV/AIDS-herpes zoster. There are several diseases affecting the female genital organs, which, when not treated properly, can cause infertility (Pamplona-Roger, 2000; Nduka *et al.*, 2001; Kamatenesi-Mugisha & Oryem-Origa, 2005) . Most rural women around QEBR complain of their partners not being concerned about attending to such diseases and usually end up reporting late in health centres. Thus, use of certain herbs is common among women in western Uganda. The HIV/AIDS symptomatic management using plants like *Allium cepa*, *A. sativum*, *Cinnamomum verum* and *Cola acuminata* is worthwhile. The research findings show that *A. sativum* is fungicidal to oral candidiasis, a common manifestation in HIV/AIDS patients (Bii, Ouko & Kumon, 2003). Besides HIV/AIDS, some of these plants have got antifungal and antibacterial properties. Although the cost of modern drugs used in the management of HIV/AIDS in developing countries has reduced, they are still expensive for a majority of the population. Many herbal remedies as immune boosters and cures of some HIV/AIDS symptoms are on high demand. Thus, the documentation of the present knowledge in medicinal plants that treat challenging diseases like HIV/AIDS may be a stepping stone in finding ways of linking and integrating technologies and innovations for the treatment of crippling diseases that have no cure yet.

On the other hand, the small list of herbal remedies may imply lack of cure or solutions to some ailments prevalent in the communities such as HIV/AIDS-herpes zoster. It could as well be because of lack of effective natural remedies and cures like in the case of HIV/AIDS-herpes zoster.

In the administration of herbal remedies, the method of insertion in the birth canal (vagina) was noted to be prevalent among women. Over 50% of the medicinal plants used are inserted in the vagina besides oral administration and smearing on the affected areas. The insertion method of administration is indicative that the prevalence of fungal and bacterial infections is common in women and plants are really employed in the treatment such ailments. Most of the medicinal plants from family Lamiaceae are steamed and inserted into the birth canal and they include *Hoslundia opposita*, *Ocimum basilicum*, *Ocimum gratissimum*, *Ocimum kilimandscharicum*, *Ocimum lamiifolium* and *Plectranthus prostrates.* Some plants such as *A. sativum, A. vera* and *O. gratissimum* are topically applied on the affected parts of the body by mixing them with vaseline, cow-ghee or butter. The insertion of medicinal plants into the birth canal has double effect by being in direct contact with the diseases micro-organisms targeted to be destroyed. In addition, they improve odour (reduce the bad smell) as most of Lamiaceae and especially *Ocimum* species have a pleasant aroma and are as well widely used as natural cosmetics (Kamatenesi-Mugisha, 2004, 2005).

The medicinal plants used for the treatment of fungal and bacterial infections are harvested from wild/natural ecosystems (67.2%), whereas those for treating herpes zoster are from cultivated areas (55.6%). The domesticated medicinal plants for treating herpes zoster are mainly food crops and on high demand as nutritional supplements such as *Cinnamomum verum*, *C. frutescens*, *A. sativa*, *A. vera* and *C. papaya*.

The most commonly harvested plant parts are leaves (88.1%) followed by roots (23.9%) and barks (10.5%). The harvesting of roots and barks is more critical as the harvesting of roots involve uprooting the whole plant and debarking the stem to obtain the barks. The example for key species where the roots and barks are harvested include *Acacia mearnsii*, *Albizia coriaria*, *W. ugandensis*, *Zanthoxylum gilletti* and *Spathodea campanulata* and all these species are harvested from wild ecosystems. The most common growth forms harvested are herbs (47.8%), which are mainly growing in their plantations. The harvesting of shrubs and trees (22.4%) is also relatively high. The homegrown herbs in farmlands are part of biodiversity outside the protected areas and need to be protected.

The competency of harvesters to employ environmentally friendly practices on nontimber forest products from wild ecosystems presents technical challenges for the managers and conservationists (Guillen, Pierce & Donovan, 2002). The harvesting of roots and barks may kill the plant and threaten the survival of the species (Kamatenesi-Mugisha, 1997;Kamatenesi-Mugisha, HÖft & Bukenya-Ziraba, 2000; Kamatenesi-Mugisha & Bukenya-Ziraba, 2002). The serious *ex situ* conservation strategies need to target the 'flagship' medicinal plant resources like *W. ugandensis* and *Cola acuminata.* The fact that these herbs are found on sale in local markets at very high prices reveals their hidden demand and possibly their therapeutic values at local and national levels. Medicinal herbs such as *W. ugandensis* from the park that are harvested illegally are being sold in the markets in Uganda.

The conservation, development and commercialization of potent herbal remedies are Africa's dream, which is in line with WHO Traditional Medicine Strategy of 2002–2005 (WHO, 2000) and African Traditional Medicine Agenda of 31st August 2005. This vital indigenous knowledge about healing serious, secretive and discrete diseases in marginalized people requires urgent ethnobotanical, ethno-anthropological and scientific validation studies to sustain life and integrate it into modern healthcare delivery. This IK will also go along to contribute to the meeting of the millennium development goals (MGDs) such as poverty eradication (MGD1), women empowerment (MGD3), sustainable environmental management (MGD7), improvement in maternal health and combating HIV/AIDS and other diseases (MGD6) as well as development of global collaborations and partnerships (MGD8) in Uganda, in other developing countries in Africa and globally.

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