



Traditional plants used for medicinal purposes by local communities around the Northern sector of Kibale National Park, Uganda

Jane Namukobe^{a,*}, John.M. Kasenene^b, Bernard T. Kiremire^a, Robert Byamukama^a, Maud Kamatenesi-Mugisha^b, Sabrina Krief^c, Vincent Dumontet^d, John D. Kabasa^e

^a Department of Chemistry, Makerere University, P.O. Box 7062, Kampala, Uganda

^b Department of Botany, Makerere University, P.O. Box 7062, Kampala, Uganda

^c Eco-Anthropologie et Ethnobiologie, UMR 7206 MNHN 43 rue Buffon 75005 Paris, France

^d Institut de Chimie des Substances Naturelles, CNRS-Avenue de la Terrasse, 91198 Gif-sur-Yvette, France

^e Faculty of Veterinary Medicine P.O. Box 7062, Kampala, Uganda

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ABSTRACT

Ethnopharmacological relevance: The study was done to establish medicinal plants used in the treatment of various diseases by the people in the Northern sector of Kibale National Park in western Uganda. It was also aimed at establishing the plant parts used and the mode of preparation of remedies. These plants create a basis for phytochemical evaluation which can lead to the discovery of biologically active compounds that can be used as starting materials in the development of new drugs targeting selected diseases such as malaria.

Materials and methods: The required information was obtained using open interviews, semi-structured questionnaires, focus group discussions and transect walks.

Results: Different medicinal plants (131 species) distributed over 55 families were observed to be used by the local communities around the Northern sector of Kibale National Park. The plants as reported in this paper are used to treat 43 physical illnesses/diseases. The most used parts of the plants are the leaves. Water is the main medium used for the preparation of the remedies which are mostly administered orally.

Conclusion: The people in the study area have a rich heritage of traditional plants that are used in the health care system to treat diseases. These medicinal plants have contributed significantly to several disease therapies. The most common diseases treated are malaria and cough, which are mostly treated by *Vernonia amygdalina* Del. and *Albizia coriaria* Welw. respectively. The main sources of medicinal plants include bush land, home gardens, grasslands, and the forest.

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1. Introduction

Today, millions of people around the world consume plant-based medicines as part of traditional medicine for a range of medical disorders. The use of traditional medicine in developing countries contributes directly to the socio-economic status and well being of the rural communities (Tabuti et al., 2003a; Chiranjibi et al., 2006). People especially herbalists and traditional healers generate income from medicinal plants. Uganda is one of the developing countries where about 80% of the population largely depend on herbal medicine for treating various diseases (WHO, 1995; Tabuti et al., 2003b). The use of medicinal plants especially in primary health care has become prominent (WHO, 1978; Shrestha

and Dhillon, 2003). This has led to the increasing search for plants with medicinal use. The search for plants with medicinal use has led to some ethnobotanical studies that have documented traditional medicinal plant species, the mode of preparation and uses by local communities in some parts of the country (Oryem-Origa et al., 1997; Kakudidi et al., 2000; Tabuti et al., 2010; Lamorde et al., 2010). In Uganda, most parts of the country remain unsurveyed for medicinal plants despite the rich plant biodiversity that the country has (UNEP-WCMC, 2002). The identification of these plants and in a later stage the investigation of the quality and toxicity is of the utmost importance. Besides, a lot of valuable indigenous information about the use of medicinal plants is being lost from one generation to another and with the increasing rate of habitat destruction, plant resources including medicinal plants are getting depleted or are threatened. For instance, the cultivation of tea and the high population growth around Kibale National Park has led to habitat destruction and over exploitation (Oryem-Origa et al., 1997; Sheldon et al., 1997; Dhillon and Amundsen, 2000; Tabuti

* Corresponding author. Tel.: +256 772 898 346, fax: +256 41 532 061.

E-mail addresses: jnamukobe@chemistry.mak.ac.ug, fjenyn@yahoo.com (J. Namukobe).

et al., 2003b). Kibale National Park is one of the areas that have been encroached by the local communities for commercial timber and tea plantation.

In this paper therefore, we report on the contribution to knowledge of medicinal plants use by residents in the Northern part of Kibale National Park. This work adds value to the wild flora diversity and the findings may serve as a platform for the development of conservation and management interventions of plant resources in the National park and immediate surrounding areas. The work will also provide baseline information for scientific studies leading to isolation of bioactive compounds that can serve as starting materials in the discovery of new plant based drugs or standardised extracts as improved traditional medicines.

2. Materials and methods

2.1. Study area

The study was undertaken in four parishes adjacent to the northern part of Kibale National Park. The parishes were; Hiima (three villages: Nyabusenyi, Kyansimbi, Nyakabingo), Kahangi (Kiburara village), Kaswa (Kabegira village) and Sebitoli (Sebitoli village). All these parishes/villages belong to Hakibale Sub County in Kabarole District (Fig. 1). The villages were used as sampling areas because of their closeness to the forest.

Kibale National Park (0°13' to 0°41'N and 30°19' to 30°32'E) is located South-East of Fortportal in Western Uganda (Fig. 1 inset) near the foothills of the Rwenzori mountains with a general altitude between 1100 and 1500 m. The climate is tropical, warm and rainy with a bimodal rainfall regime. Although the rainfall is heavy and fairly well distributed throughout the year, the months of March–May and September–November are usually wetter than other months. Annual rainfall ranges between 1100 and 1600 mm (Howard, 1991). Temperatures are moderate and do not fluctuate much over the year. The mean maximum temperature is 27 °C and the mean monthly minimum temperature 15 °C, with an annual evaporation rate of about 1500 mm. The park consists of mature, mid-altitude, moist semi-deciduous and evergreen forest, grassland, woodland, lakes, wetlands and plantations of *Eucalyptus* and pines and elements of lowland tropical rainforest (Chapman et al., 1997).

The forest has been exploited as a source of commercial timber since 1950s but medicinal plants have been gathered both inside and outside the forest since time immemorial. The Batoro and Bakiga communities inhabit areas around the tropical moist forest. The Batoro have had a long association with the forest but the Bakiga migrated from the over populated Kigezi in south Western Uganda to this region as early as 1930 and occupied some areas around the forest. The two communities practice subsistence agriculture and depend on forest natural resources for a diversity of livelihoods including traditional medicinal plants. Some families in the study area also practice the growing of medicinal plants around their homesteads and adjacent gardens.

2.2. Study procedures

The survey was done between September 2009 and June 2010. It involved meeting the local council representatives who helped in identifying herbalists and elderly people known to treat patients using herbal medicine. The meetings with local council representatives helped in making priorities when choosing respondents during the survey. Using open interviews, semi-structured questionnaires, homesteads and individual herbalists were visited and asked to provide the following for each of the medicinal plant that they were using to treat diseases: local name, medicinal use,

parts of the plant used, mode of preparation and administration and whether the plant is used singly or with other plants in combination. Focus group discussions were also used to obtain extra information. Transect walks in and around the forest were done to identify some of the plants purported to be used to treat ailments. The villages studied with their number of respondents included; Nyabusenyi (8), Kyansimbi (8), Nyakabingo (7), Kiburara (6), Kabegira (2) and Sebitoli (4). The number of respondents in each village was selected on the basis of knowledgeable members of the community and the size of the village. In total, 35 respondents were interviewed with the help of three field assistants who were conversant in Rutooro/Runyoro, the two dialects commonly used in the area.

3. Results and discussion

3.1. Medicinal plant species

In the study, 131 plant species belonging to 121 genera and 55 families have been established to treat different diseases in the northern part of Kibale National Park (Table 1). The families, genera and species names of the medicinal plants have been determined in comparison with specimen of the Makerere University Herbarium and names given according to the International Plant Names Index (www.ipni.org). Voucher specimens have been deposited at the Makerere University Herbarium. The habitat, diseases treated, parts used, frequency of citation, mode of preparation and administration of each of the medicinal plants have been described (Table 1).

The most commonly used plant species are *Vernonia amygdalina*, *Bidens pilosa* and *Albizia coriaria*, being cited 21, 11 and 8 times respectively (Table 1). These plants are some of the culturally important species as their citation is above average. The high frequency of citation of *Vernonia amygdalina*, *Albizia coriaria* and *Bidens pilosa* is an indication that these plants could be effective and therefore of great cultural significance (Heinrich et al., 2009). The frequency of citation of use for *Vernonia amygdalina* in the treatment of malaria, a common disease in Uganda, was 13 out of the total 21 citations. The potential of *Vernonia amygdalina* in the treatment of malaria has been supported by in vitro studies where the petroleum ether and the acetone–water leaf extract showed antiplasmodial activity, with IC₅₀ of 2.5 µg/ml (Tona et al., 2004) and 25.5 µg/ml (Masaba, 2000) respectively. *Vernonia amygdalina* contains steroid glycosides and sesquiterpene lactones which are active against *Plasmodium falciparum* (Ohigashi et al., 1994; Koshimizu et al., 1994). This plant has also been found to be clinically effective for the treatment of malaria in adult patients (Challand and Willcox, 2009). The treatment of fresh wounds by *Bidens pilosa* was cited by informants, 7 times out of the 11 citations. This plant has been found to have antimicrobial, anti-inflammatory properties and compounds that help in the wound healing process (Li-Ping et al., 2008; Tobinaga et al., 2009; Ashafa and Afolayan, 2009). Several isolated constituents of *Bidens pilosa* which have anti-inflammatory, antibacterial and antifungal properties have been studied (Geissberger and Sequin, 1991; Fabiana et al., 2011). The treatment of cough using *Albizia coriaria* was cited 8 times and thus significant. The potential for its use in cough is not well studied though abroad spectrum antibacterial activity was found in the methanol leaf extract (Olila et al., 2007).

From Table 1, some of the plants had few citations or were cited only once. Such plants like *Clematis hirsuta* Guill. & Perr. and *Mangifera indica* L. were cited only three times. Medicinal plants which were cited once included *Asparagus africanus* Lam. and *Acemella caulirhiza* Delile among others. The few citations could indicate that these plants are rare or have fallen into disuse because of cultural adaptations or they are ineffective and therefore not

Table 1
List of the medicinal plants used by local communities around the Northern part of Kibale National Park; their habitat, diseases treated, parts used, frequency of citation, mode of preparation and administration.

Species name, family, local name, ethnic language	Growth habit	Habitat	Conservation Status	Disease treated	Part used	Mode of preparation and administration	Frequency of citation
<i>Acacia hockii</i> De Wild. (Leguminosae) Engando (Ru)	T	Gr	W/A	Athletes foot	FL	Squeeze & apply to the affected area	1
<i>Acmella caulirhiza</i> Delile (Asteraceae) Ensoimya (Ru)	H	Ho	W/A	Eye infection	FR	Squeeze & apply to the affected area	1
<i>Aframomum angustifolium</i> K.Schum (Zingiberaceae) Amatehe (Ru)	H	Sw/Bu	W/A	Measles	FFr	Squeeze add banana brew & drink	1
<i>Ageratum conyzoides</i> L. (Asteraceae) Omunywaniwenkanda (Ru)	H	Bu	W/A	Wound	FL	Squeeze & wrap on fresh wound	3
<i>Albizia coriaria</i> Welw. (Leguminosae) Omusisa (Ru)	T	Bu	W/A	Cough	FSB	Decoction drunk. 500 ml given three times a day for adults & 250 ml given once for children until recovery	8
<i>Allium sativum</i> L. (Alliaceae) Tungulucumu (Ru)	H	Ga	Cu/A	Cough	Bu	Pound with ginger, add water & drink	2
<i>Aloe vera</i> (L.) Burm.f. (Aloaceae) Enkokorutanga (Ru)	H	Ga	Cu/A	Malaria, yellow fever	FL	Decoction drunk. 500 ml & 250 ml given three times a day for adults & children respectively for three days.	7
<i>Asparagus africanus</i> Lam. (Asparagaceae) Akakwatango (Ru)	H	Gr	W/A	Muscle pains Measles	FL	Squeeze & smear on the skin	1
<i>Basella alba</i> L. (Basellaceae) Enderema (Ru)	C	Bu	W/A	Measles	FL	Decoction drunk. 500 ml given three times a day for adults & 250 ml to children for three days or apply on the body	4
<i>Bidens pilosa</i> L. (Asteraceae) Nyabarasana (Ru)	H	Bu	W/A	Eye infection, nose bleeding Yellow fever, diarrhoea, fresh wounds, ulcers	FL	Squeeze & drop in the eyes/nose	11
<i>Blighia unijugata</i> Bak. (Sapindaceae) Omwataibale (Ru)	T	Bu	W/R	Headache, malaria	FSB	Decoction drunk. 500 ml given once a day until recovery	2
<i>Brachiaria decumbens</i> Stapf. (Poaceae) Ejubwa (Ru)	G	Gr	W/A	Heart disease, diarrhoea, yellow fever, malaria	FL	Chew or decoction drunk. Give 500 ml once a day	6
<i>Bridelia micrantha</i> Baill. (Euphorbiaceae) Omubaragaza (Ru)	T	Bu	W/A	Hernia, malaria	DSB	Decoction drunk	1
<i>Cajanus cajan</i> (L.) Millsp. (Leguminosae) Orutendigwa (Ru)	H	Bu	W/A	Quicken placenta removal, diarrhoea, relieve menstrual pains, stomach ache measles	FL	Squeeze, add water & drink.	5
<i>Callistemon citrinus</i> (Curtis) Skeels. (Myrtaceae) Bottle brush (Eng)	T	Ho	Cu/A	Cough	FL	Decoction bathed Decoction drunk. 500 ml given once a day for adults & one tea spoonful for children	2
<i>Camellia sinensis</i> (L.) Kuntze (Theaceae) Amajani (Ru)	T	Pl	Cu/A	Yellow fever, stomach ache	FL	Chew or decoction with <i>Bidens pilosa</i> + <i>Myrica salicifolia</i> & drunk	3
<i>Canna indica</i> L. (Cannaceae) Amaranga (Ru)	H	Ho	Cu/A	Infertility in men Pneumonia	FR	Decoction drunk Decoction drunk	1
<i>Cassia didymobotrya</i> Fresen. (Caesalpiniaceae) Omuchora (Ru)	S	Bu	W/A	Constipation, fever, ring worm	FSB, FL	Decoction drunk. Give 500 ml once	3
<i>Cassia mimosoides</i> Linn. (Caesalpiniaceae) Mukuru ataitabye (Ru)	H	Gr	W/A	Paediatric cough	FL	Squeeze & smear Decoction drunk. Give 500 ml twice a day	1
<i>Cassia occidentalis</i> L. (Leguminosae) Omwitanjoka (Ru)	H	Bu	W/A	Snake bite, tape worms	FL	Decoction drunk. Give 500 ml three times a day	5
<i>Catha edulis</i> Forssk. (Celastraceae) Amairungi	S	Ho	Cu/A	Cough	FL	Chew & swallow liquid	1
<i>Centella asiatica</i> (L.) Urb. (Apiaceae) Embutami (Ru)	Cr	Gr	W/A	Stomach ache	FL	Infusion drunk	2
<i>Cestrum nocturnum</i> Lam. (Solanaceae) Bamulyekiro (Rg)	S	Ho	Cu/A	Ring worm	FL	Squeeze & smear on affected area	1
<i>Citropsis articulata</i> Swingle & Kellerman (Rutaceae) Katimboro (Ru)	S	Fo	W/A	Infertility in men	FR	Chew fresh roots for three days	1

Table 1 (Continued)

Species name, family, local name, ethnic language	Growth habit	Habitat	Conservation Status	Disease treated	Part used	Mode of preparation and administration	Frequency of citation
<i>Citrus limonum</i> Risso. (Rutaceae) Endimo (Ru)	T	Ho	Cu/A	Malaria	FL	Decoction drunk	1
<i>Chenopodium opulifolium</i> DC. (Chenopodiaceae) Omwetango (Ru)	H	Ho	Cu/A	Malaria	FL	Squeeze, add water & drink	1
<i>Chenopodium procerum</i> Hochst.ex Moq. (Chenopodiaceae) Omujumbajumba (Ru)	H	Bu	W/R	Muscle pains, headache	FL, FSe	Squeeze & smear	3
<i>Clematis hirsuta</i> Guill. & Perr. (Ranunculaceae) Akanyankamba (Ru)	H	Bu	W/A	Flu, pneumonia, cough	FL, FFI	Squeeze in 500 ml of water given three times a day for two days Squeeze and sniff	3
<i>Cleome gynandra</i> L. (Capparaceae) Eyobyo (Ru)	H	Ga	Cu/A	Snake bite	FL	Decoction with black salt drunk Infusion drunk	1
<i>Coffea canephora</i> Pierre ex A. froehner (Rubiaceae) Omwani (Ru)	T	Ga	Cu/A	Diarrhoea, cough	FL	Pound, add water & drink. 500 ml given once	8
<i>Crassocephalum mannii</i> (Hook.f.) Milne-Redh. (Asteraceae) Ekigango (Ru)	H	Bu	W/A	Fever	FL	Decoction mixed with leaves of <i>Vernonia amygdalina</i> , <i>S. oleraci</i> bathed	1
<i>Crassocephalum montuosum</i> (S. Moore) Milne-Redh. (Asteraceae) Ekiinami (Ru)	H	Bu	W/A	Diarrhoea	FL	Infusion drunk, 500 ml given once Infusion with passion fruit, <i>Coffea canephora</i> & <i>Brachiaria decumbens</i> drunk	1
<i>Crassocephalum vitellinum</i> S. Moore. (Asteraceae) Embiribiri (Ru)	H	Bu	W/A	Eye infection, boils anemia, poisoning, diarrhoea, fresh wounds	FL	Squeeze and drop in eyes	10
<i>Combretum paniculatum</i> Vent. (Combretaceae) Akakoigo akataito (Ru)	Sc	Bu	W/A	Diarrhoea	FL	Boil & drink 500 ml Squeeze & apply Infusion drunk. 500 ml given two times a day for adults for five days	1
<i>Conyza floribunda</i> Kunth. (Asteraceae) Ekinyansambu (Ru)	H	Bu	W/A	Tonsillitis, ringworm	FL	Chew	2
<i>Cordia millenii</i> Bak. (Boraginaceae) Omutumba (Ru)	T	Fo	W/A	Diarrhoea	FSB	Squeeze & smear Decoction drunk	1
<i>Crepis</i> sp. (Asteraceae) Omuribata (Ru)	H		W/A	Cough	FL	Roast leaves & squeeze juice in mouth	2
<i>Cucurbita maxima</i> Duch. (Cucurbitaceae) Ekisunsa (Ru)	C	Ho	Cu/A	Cough	FL	Decoction drunk	1
<i>Cymbopogon citratus</i> Stapf (Poaceae) Kalifuha	G	Ho	Cu/A	Yellow fever	FL	Boil with <i>Bidens pilosa</i> & <i>Melanthera scandens</i> & drink	3
<i>Cymbopogon nardus</i> (L.) Rendle. (Poaceae) Etete (Ru)	G	Gr	W/A	Infertility in men	FL	Boil with <i>Albizia coriaria</i> bark in local brew & drink	1
<i>Cyphomandra betacea</i> Cav. (Solanaceae) Ekidodoima (Ru)	S	Ho	Cu/A	Ulcers	FL	Decoction mixed with <i>Crassocephalum vitellium</i> & drunk	1
<i>Cyphostemma adenocaula</i> (Steud.) Desc. (Vitaceae) Ekibombo (Ru)	C	Bu	W/A	Hook worms, tape worms	FL, FTu	Boil leaves & bath or infusion mixed with local brew drunk	6
<i>Desmodium repandum</i> (Vahl) Leguminosae) Omunyampata (Ru)	H	Bu	W/A	Diarrhoea	FL	Squeeze & drink	1
<i>Desmodium uncinatum</i> (Jacq.) DC. (Leguminosae) Otansigahanu (Ru)	H	Bu	W/A	Worms, yellow fever, diarrhoea, toothache	DL, DFI	Decoction bathed or smear,	4
<i>Dicliptera laxata</i> C.B. Clarke (Acanthaceae) Omufoka (Ru)	H	Bu/Fo	W/R	Skin infections	FL	Boil & bath the baby/drink	3
<i>Dichrocephala integrifolia</i> Kuntze (Asteraceae) Omubuza (Ru)	H	Bu	W/R	Boils Cough	FL	Squeeze & apply Decoction drunk	1
<i>Diospyros abyssinica</i> (Hiern) F. (Ebenaceae) Omuhoko (Ru)	S	Wo	W/R	Fresh wounds, fungal infection on the foot	FL, Se	Squeeze & apply and apply on affected area	3
<i>Digitaria abyssinica</i> Stapf. (Poaceae) Orumbo (Ru)	G	Bu	W/A	Malaria yellow fever, stop bleeding	DL	Decoction drunk & bathed pound & apply on fresh wound	6
<i>Dracaena fragrans</i> Ker.Gawl. (Dracaenaceae) Akaramura (Ru)	H	Ho	Cu/A	Ear infection	L	Squeeze & drop the extract in the ear	1

Table 1 (Continued)

Species name, family, local name, ethnic language	Growth habit	Habitat	Conservation Status	Disease treated	Part used	Mode of preparation and administration	Frequency of citation
<i>Drymaria cordata</i> Willd ex Schult. (Caryophyllaceae) Bunjune (Ru)	H	Bu	W/A	Induction of labour	FL	Infusion drunk. 500 ml given once	1
<i>Drypetes battiscombei</i> Hutch (Euphorbiaceae) Akakamyia (Ru)	H	Bu	W/A	Diarrhoea	FL	Infusion drunk.	6
<i>Eriobotrya japonica</i> (Thumb) Lindl. (Rosaceae) Ensaali (Ru)	S	Ga	Cu/A	cough	FL	Decoction drunk	1
<i>Erlangea cordifolia</i> S. Moore (Asteraceae) Entooma (Ru)	H	Bu	W/A	Stomach upsets in newly borns	FL	Squeeze & give two tea spoonfuls	1
<i>Erlangea tomentosa</i> S. Moore. (Asteraceae) Ekitokotoko (Ru)	H	Bu	W/A	Cough	FL	Roast & chew	3
<i>Erythrina tomentosa</i> Buch. Ham. (Leguminosae) Omuko (Ru)	T	Bu	W/A	Tonsillitis, malaria	L, R	Decoction drunk	1
<i>Eucalyptus grandis</i> W.Hill (Myrtaceae) Kalitunsi (Ru)	T	Ho	Cu/A	Cough	FL	Decoction drunk. 250 ml taken twice	3
<i>Euphorbia tirucalli</i> L. (Euphorbiaceae) Enkoni (Ru)	H	Gz	Cu/A	Snake bite	FL	Roast, squeeze & drunk	1
<i>Ficus natalensis</i> Hochst. (Moraceae) Omutoma (Ru)	T	Ho	W/A	Heart disease, stomach ache, throat infection	FL	Decoction drunk Mix stem bark with black salt & chew	5
<i>Galinsoga parviflora</i> Cav. (Asteraceae) Karandaranda (Ru) Empunika (Rg)	H	Bu	W/A	Memory enhancement	FL	Decoction drunk	1
<i>Guizotia scabra</i> Chiov. (Asteraceae) Ekiterankuba (Ru)	H	Bu	W/A	Yellow fever	FL	Decoction drunk	1
<i>Hibiscus fuscus</i> Garcke (Malvaceae) Ensingasinga (Ru)	H	Bu	W/A	Muscle Pull	FL	Squeeze with ghee & apply	1
<i>Hibiscus subdariffa</i> Rottl. (Malvaceae) Musayi (Ru)	H	Ho	Cu/A	Anemia	FL	Decoction drunk. 500 ml given once.	2
<i>Hoslundia opposita</i> Vahl. (Lamiaceae) Orutotoimya (Ru)	H	Bu	W/A	Worms, diarrhoea, yellow fever & skin blisters	FL, FFI	Decoction or fresh liquid drunk & bathed	3
<i>Imperata cylindrica</i> (L.) P. Beauv. (Poaceae) Ensojo (Ru)	G	Bu	W/A	Worms	FL	Chew and drink 250 ml three times a day.	1
<i>Indigofera erecta</i> Thunb. (Leguminosae) Omusororo (Ru)	H	Gr	W/A	Skin diseases, malaria	FL	Squeeze & apply on skin or drink	1
<i>Ipomoea batatas</i> (L.) Lam. (Convolvulaceae) Enkoora (Ru)	Vine	Ga	Cu/A	Diarrhoea	DL	Pound with <i>Passiflora edulis</i> , & bathed	2
<i>Justicia betonica</i> Linn. (Acanthaceae) Kwinini entoro (Ru), Endurwa (Rg)	H	Ho	Cu/A	Malaria	FL	<i>Coffea canephora</i> add water Decoction drunk. 500 ml given three times a day.	6
<i>Kalanchoe pinnata</i> (Lam.) Pers. (Crassulaceae) Enyondo (Ru)	H	Ga	Cu/A	Cough	FL	Roast, squeeze & drink. 2 table spoons three times a day for children. 250 ml given three times a day.	6
<i>Kosteletzkya adoensis</i> Mast. (Malvaceae) Omuzigambogo (Ru)	H	Bu	W/A	Diarrhoea	FL	Squeeze & drink	1
<i>Laggera alata</i> (DC.) Oliv. (Asteraceae) Irema (Ru)	H	Bu	W/A	Cough	FL	Decoction drunk	1
<i>Lantana trifolia</i> L. (Verbanaceae) Omusekera (Ru)	S	Bu	W/A	Malaria, yellow fever, diarrhoea, cough	FL	Decoction drunk. 500 ml given three times a day Mix with black salt & chew	3
<i>Leonotis nepetifolia</i> (L.) R. Br. (Lamiaceae) Macumu (Rg) Ekicumucumu (Ru)	H	Bu	W/A	Fresh wound	FL	Squeeze & apply on the affected area	1
<i>Leucas martinicensis</i> (Jacq.) R.Br. (Lamiaceae) Omucunda (Ru)	H	Bu	W/A	Burns, boils	FL	Squeeze & apply on the affected area	1
<i>Lycopersicon esculentum</i> Mill. (Solanaceae) Enyanya (Ru)	H	Ga	Cu/A	Skin problems in babies	FL	Boil with <i>Physalis peruviana</i> , <i>Solanum melongena</i> & bath	1
<i>Maesa lanceolata</i> Forssk. (Myrsinaceae) Omuhangabagenzi (Ru)	T	Bu	W/A	Ulcers	DSe	Dry, pound & take in tea	1
<i>Manihot esculenta</i> Crantz. (Euphorbiaceae) Muhogo (Ru)	S	Ga	Cu/A	Fever	BL	Boil & bath or mix with <i>Elymus repens</i> (L.) Gould, <i>Sonchus oleraceus</i> boil & steam the body	2
<i>Mangifera indica</i> L. (Anacardiaceae) Omuyembe (Ru)	T	Ho	Cu/R	Malaria, cough	FL FSB	Decoction drunk	3
<i>Markhamia lutea</i> K.Schum. (Bignoniaceae) Omusambya (Ru)	T	Ho	W/A	Diarrhoea, gonorrhoea	DL	Pound add water & drink	2

Table 1 (Continued)

Species name, family, local name, ethnic language	Growth habit	Habitat	Conservation Status	Disease treated	Part used	Mode of preparation and administration	Frequency of citation
<i>Melanthera scandens</i> Schumach. & Thonn. (Asteraceae) Enkarwakarwa (Ru)	H	Bu	W/A	Malaria, yellow fever	FL	Decoction drunk. 500 ml given three times a day.	2
<i>Mentha aquatica</i> L. (Lamiaceae) Ehohwa (Ru)	H	Sw	W/R	High blood pressure	DL	Take in tea	3
<i>Momordica foetida</i> Schum. & Thon. (Cucurbitaceae) Omwihura (Ru)	C	Bu	W/A	Flue, cough, worms	FL	Roast and chew leaves decoction drunk	6
<i>Mondia whitei</i> Skeels (Asclepiadaceae) Emirondwa (Ru)	Sc	Bu	W/R	Aphrodisiac	FR	Chew	1
<i>Moringa oleifera</i> Lam. (Moringaceae) Moringa (Sci.)	T	Ga	Cu/A	Tape worms	FL	Squeeze, add, water drink	1
<i>Murdannia simplex</i> Vahl. (Commelinaceae) Muhinduka (Ru)	H	Gr	W/A	Snake bite	FL	Squeeze & drink	1
<i>Musa sp</i> (Musaceae) Bitooke (Ru)	T	Ga	Cu/A	High blood pressure, yellow fever	FFr, FL	Decoction drunk	1
<i>Musa paradisiaca</i> L. (Musaceae) Gonja (Ru)	H	Ga	Cu/A	Quick delivery	FR	Chew	1
<i>Myrica salicifolia</i> Hochst. (Myricaceae) Omujeje (Ru)	T	Sw	W/A	Yellow fever, cough,	FL	Mix with leaves of <i>Musa sp</i> + tea leaves boil & drink. Boil leaves & drink	5
<i>Neoboutonia macrocalyx</i> Pax. (Euphorbiaceae) Ekiora (Ru)	T	Fo	W/A	Stomach ache Malaria	FSB	Decoction drunk	2
<i>Ocimum gratissimum</i> L. (Lamiaceae) Ekijaaja (Ru)	H	Bu	W/A	Cough	FL	Infusion drunk. 500 ml given three times a day for adults for five days	1
<i>Ocimum rothii</i> Bak. (Lamiaceae) Omweya (Ru)	H	Bu	W/A	Cough, stomach ache, yellow fever Fungal infection (entunuka)	FL	Roast, squeeze, add water & drink 500 ml three times a day Apply juice on affected area	5
<i>Olea sp</i> (Oleaceae) Omusoko (Ru)			W/A	Cough	FSB	Decoction drunk	1
<i>Oxalis corniculata</i> L. (Oxalidaceae) Akanyunyambuzi akataito (Ru)	H	Ho	W/A	Cough, syphilis candida, Suture left after normal delivery	FL	Roast & chew Decoction bathed Pound & press at the wound.	5
<i>Oxalis latifolia</i> Kunth. (Oxalidaceae) Obunyunyambuzi (Ru)	H	Ho	W/A	Meat allergy Vomiting in children	FL	Powder mixed with meat. Squeeze, add water & drink	1
<i>Passiflora edulis</i> Sims. (Passifloraceae) Obutunda (Ru)	C	Ho	Cu/A	Diarrhoea, cough	FL	Pound add water, drink	4
<i>Paullinia pinnata</i> L. (Sapindaceae) Emizigambogo (Ru)	C	Bu	W/A	Diarrhoea	FL	Decoction drunk	1
<i>Pennisetum purpureum</i> Schum. (Poaceae) Orubingo (Ru)	G	Bu	W/A	Heart disease	FL	Roast leaves, add water & drink	1
<i>Persea americana</i> Mill. (Lauraceae) Avacado	T	Ho	Cu/A	Cough, kwashiorkor, high blood pressure, yellow fever	FL, FSe	Decoction or infusion drunk	3
<i>Phyllanthus capillaris</i> Schum. & Thonn. (Euphorbaceae) Omoturuka (Ru)	H	Gr	W/A	Measles	FL	Squeeze & apply on body	5
<i>Physalis peruviana</i> L. (Solanaceae) Entuutu (Ru)	H	Bu	W/A	Skin problems in babies	FL	Boil with <i>Solanum esculentum</i> , <i>Solanum melongena</i> & bath	1
<i>Plectranthus barbatus</i> Andrews (Lamiaceae) Ekinyamunsunga (Ru)	H	Ho	W/A	Cough, tape worms, malaria	FL	Infusion or decoction drunk. 4 tea spoonfuls given three times a day for adults & 1 teaspoon to children for four days	6
<i>Prunus africana</i> Hook.f. (Rosaceae) Engote (Ru)	T	Fo	W/A	Malaria	F SB	Decoction drunk. 250 ml given three times a day.	1
<i>Pseudarthria hookeri</i> Wight & Arn. (Leguminosae) Ekiragi (Ru)	H	Bu	W/A	Diarrhoea, yellow fever, cough	FL	Infusion drunk, mixed with <i>C.caajans</i> for diarrhoea. 500 ml given three times for one day.	4
<i>Psidium guajava</i> L. (Myrtaceae) Amapera (Ru)	T	Ho	Cu/A	Yellow fever, fever	FL	Infusion drunk	4
<i>Ricinus communis</i> L. (Euphorbiaceae) Ekisogasoga (Ru)	T	Bu	W/A	Fresh wounds snake bite	Sa	Sap applied on affected area Mix stem bark with black salt & chew	2
<i>Rorippa microphylla</i> (Rchb.) H.Hyl. (Brassicaceae) Akasaga (Ru)	H	Bu	W/A	Stomach upsets in babies	FL	Squeeze & give	1

Table 1 (Continued)

Species name, family, local name, ethnic language	Growth habit	Habitat	Conservation Status	Disease treated	Part used	Mode of preparation and administration	Frequency of citation
<i>Rubia cordifolia</i> L. (Rubiaceae) Akaramata (Ru)	C	Bu	W/A	Eye infection, tape worms	Sa	Apply sap	1
<i>Rubus pinnatus</i> Willd (Rosaceae) Amakerere (Ru)	H	Bu	W/A	Tonsillitis	FL	Chew & swallow liquid	1
<i>Rumex usambarensis</i> (Eng.ex Damm.) (Polygonaceae) Rukunya (Ru)	H	Bu	W/A	Diarrhoea	FL	Squeeze, add water & drink	1
<i>Secamone africana</i> (Oliv.) Bullock (Asclepiadaceae) Akateganende (Ru)	Sc	Bu	W/A	Constipation, menstrual pains, malaria	FL	Infusion drunk. 500 ml given three times a day for adults & 250 ml to children.	3
<i>Senecio hadiensis</i> Forssk. (Asteraceae) Omugino (Ru)	Sc	Ga	Cu/A	Stop miscarriage	FL	Squeeze & mix with water & drink 500 ml once.	1
<i>Sesbania sesban</i> (L.) Merr. (Leguminosae) Omubimba (Ru)	S	Bu	W/A	Malaria	FL	Decoction drunk	2
<i>Sida cuneifolia</i> Roxb. (Malvaceae) Akasoroigano (Ru)	H	Rs	W/A	Chest pain, muscle pains	FL	Pound, add cow ghee, boil & apply 2–3 times a day for three days	2
<i>Solanum anguivi</i> Lam. (Solanaceae) Obujabara (Ru)	H	Ga	Cu/A	High blood Pressure	F/D Fr	Eat fresh or dry, pound & take as tea	3
<i>Solanum melongena</i> L. (Solanaceae) Enjagi (Ru)	H	Ga	Cu/A	Fresh wounds, skin problems in babies	FL	Squeeze & apply Boil with <i>Solanum esculentum</i> <i>Physalis peruviana</i> & bath Mix with meat	1
<i>Sonchus oleraceus</i> L. (Asteraceae) Ekizimyumuro (Ru)	H	Bu	W/A	meat allergy Malaria	FL	Mix with <i>Manihot esculenta</i> , <i>E. repens</i> leaves & steam the body	6
<i>Spathodea nilotica</i> Seem. (Bignoniaceae) Omunyarra (Ru)	T	Bu	W/A	Ear infection	FL	Squeeze & apply the juice	2
<i>Spermacoce princeae</i> (K.Schum.) Verdc. (Rubiaceae) Kisakimu (Ru)	H	Bu	W/A	Quicken delivery, fresh cuts	FL	Squeeze & drink 500 ml once	5
<i>Tagetes minuta</i> L. (Asteraceae) Omukazimurofu (Ru)	H	Bu	W/A	Appetite, healing after delivery	FL	Apply pound with <i>Chenopodium procerum</i> & drink in millet porridge	2
<i>Tetradenia riparia</i> (Hochst) Codd. (Lamiaceae) Kacuucu (Ru)	S	Ho	Cu/A	Tape worms, constipation, cough	FL	Decoction drunk	6
<i>Thevetia peruviana</i> (Pers.) K.Schum. (Apocynaceae) Akasitani (Lu)	S	Ho	Cu/A	Cough	FL	Decoction drunk	1
<i>Thunbergia alata</i> Bojer ex Sims (Acanthaceae) Wankura (Ru)	C	Bu	W/A	Clean foetus, quicken delivery	FL	Decoction drunk. 500 ml given three times a day for three days	3
<i>Triumfetta rhomboidea</i> Jacq. (Tiliaceae) Oruhugura (Ru)	H	Bu	W/A	Stomach ache, diarrhoea	FL	Pound, add water & take	1
<i>Turraea africana</i> (Welw.) Cheek. (Meliaceae) Embahira (Ru)	T	Fo	W/R	Tape worms	FL	Decoction drunk. 500 ml given three times a day for three days	2
<i>Vanilla planifolia</i> Jacks.ex Andrews (Orchidaceae) Vanilla (Sci.)	C	Ga	Cu/A	Fresh wound	FL	Squeeze & apply	1
<i>Vernonia amygdalina</i> Del. (Asteraceae) Ekibirizi (Ru)	T	Bu	W/A	Malaria, worms, skin problems	FL	Infusion drunk. 250–500 ml given three times a day for three days	21
<i>Vernonia auriculifera</i> Hiern. (Asteraceae) Ekyesembya (Ru)	T	Bu	W/A	Placenta removal	FSB	Infusion drunk	1
<i>Vigna unguiculata</i> (L.) Walp. (Leguminosae) Empindi (Ru)	H	Ga	Cu/A	Eye infection	FL	Squeeze & drop in the eyes	1
<i>Zanthoxylum gillettii</i> (De wild.) P.G.Waterrman. (Rutaceae) Mutatembwa (Ru)	T	Fo	W/A	High blood pressure, cough	FSB	Infusion drunk	3
<i>Zehneria scabra</i> Sond. (Cucurbitaceae) Kasunsa (Ru)	C	Bu	W/A	Meat allergy	DL	Powder mixed with meat	1
<i>Zingiber officinale</i> Roscoe (Zingiberaceae) Tangawuzi (Ru)	H	Ga	Cu/A	Cough	FTu	Decoction drunk	2

Part used; FL, fresh leaf; DL, Dry leaf; FTu, fresh tuber; FSe, fresh seed; Dse, dry seeds; FFL, fresh flower; DFL, dry flowers; FFr, fresh fruit; FSB, fresh stem Bark; DSB, dry stem bark; FR, fresh roots; Bu, bulb. Ethnic language; Ru, rutooro; Rg, rukiga; Eng, English; Lu, lusoga; Sci, scientific; Growth habit; H, herb; T, tree; G, grass; Sc, scandent; S, shrub; C, climber; Cr, creeper; Habitat; Bu, bush land; Gr, grassland; Ho, homestead; Rs, roadside; Pl, plantation; Sw, swamp; Ga, garden; Fo, forest; Gz, grazing land; Wo, woodland; Conservation status; W/A, wild and abundant; W/R, wild and rare; Cu/A, cultivated and abundant; Cu/R, cultivated and rare.

Decoction: water extraction by boiling of dissolved plant material.

Infusion: the plant material is added to hot water, left to steep for few minutes & taken as tea.

Kwashiorkor: a disease due to severe protein deficiency in children.



Fig. 1. Location of Kibale National Park and the study area.

representative of the area studied. These plants however could be culturally important in other parts of the country where they are cited highly for particular diseases (Okello and Ssegawa, 2007) or they may be a specialist knowledge of unusually high value (Heinrich et al., 2009).

Among the plant families described in Table 1, Asteraceae, Leguminosae, Euphorbiaceae, Poaceae and Solanaceae were the most cited families with Asteraceae being top most with 21 species and Leguminosae closely following with 14 species. Asteraceae stood out with the largest number of medicinal plants because of the large number of bioactive compounds that this family possesses (Thomas et al., 2009). Asteraceae, Leguminosae and Euphorbiaceae are well recognized for their medicinal value in Uganda (Hamill et al., 2000). The number of species in each of the other described families was less than ten. Medicinal plants recorded in the study area grow as herbs (52%), 22% as trees and 10% as shrubs. For the rest of the growth form, each accounts for less than 10% of the total medicinal plants (Fig. 2). Medicinal plants are mostly collected throughout the year from the bush land (47%) and forest (5%) where they grow wild. Those that are collected from homesteads and gardens where they are cultivated account for 17% and 15% respectively (Fig. 3). Most of the medicinal plants that grow wild are abundant with exceptions of some species like *Chenopodium procerum*, *Turraea africana*, *Mondia whitei*, *Zanthoxylum gillettii*, *Dicliptera laxata*, *Dichrocephala integrifolia*, *Diospyros abyssinica* and *Blighia unijugata* which were noted to be rare.

3.2. Preparation of remedies and mode administration

Herbal medicines in the researched area are prepared from different plant parts. Most of the remedies are made from leaves (74.0%), stem bark (6.7%), seed (2.7%) and roots (2.7%). The rest

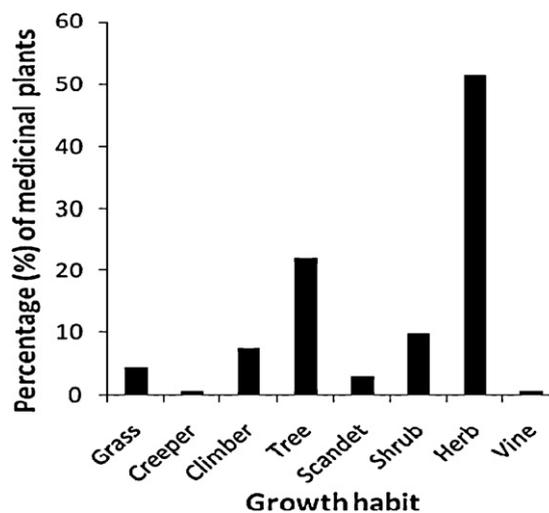


Fig. 2. Percentage of life forms of the recorded medicinal plants ($n = 131$).

of the other plant parts (fruits, flowers, tubers, bulb and sap) are rarely used accounting for less than 5%. It was also established that the leaves are mostly used because of their potency as well as their fast regeneration. Medicinal plants were either used singly or as a mixture of more than one species to make a particular remedy. The use of different plants for the effective treatment of one particular disease could be due to the synergistic effect. It was also noted that one plant could be used for several diseases probably due to the presence of many metabolites in one particular plant and also the fact that the same molecule can be active on different pathogens.

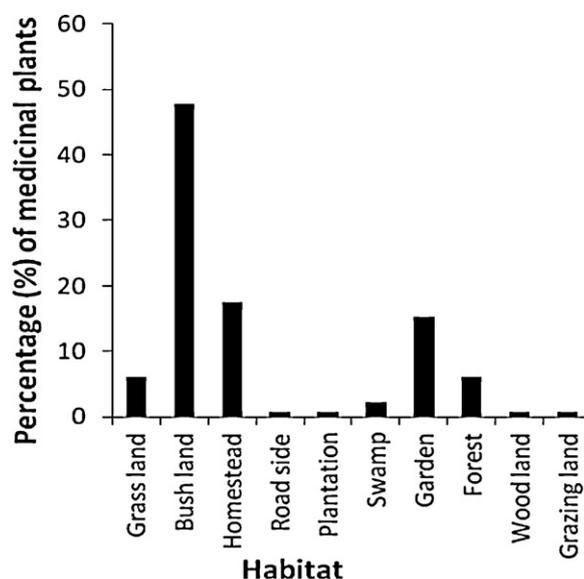


Fig. 3. Richness of habitats for the recorded medicinal plants (n = 131).

The remedies are normally prepared as decoctions or infusions for fresh and dried plant parts using water. Some are roasted and squeezed/pounded before water or tonto (banana brew) is added. In some cases, the remedies are extracted from the plants by chewing.

The modes of administration of the herbal medicines were different and they included:

- (i) Decoction, infusion or squeezed material is drunk, bathed or applied on affected area.
- (ii) Chewing: this is common in mothers who chew and give the resultant juice to the infants through the mouth.
- (iii) Powder applied to small incisions made on the affected area.

3.3. Diseases treated

The medicinal plants recorded in this study have been known to treat 43 physical illnesses/diseases. Cough was found to be treated by most of the plant species (14.6%) followed by malaria (12.2%), diarrhoea (9.4%) and yellow fever (8.5%) (Table 2). Cough is a symptom of many diseases like bacterial or viral respiratory tract infections, allergies and this supports the use of many plants in the treatment of clinical symptom (Chang and Glomb, 2006). The treatment of malaria by many plants reflects the prevalence of this disease in the area. In this area, fever is used as a traditional diagnostic tool for malaria disease. Similar research in other parishes around Kibale National Park by Kakudidi et al. (2000), reported stomach ache as the most treated disease (26.5%) followed by cough (24.2%) and malaria (12.9%).

This study agrees with the findings of Kakudidi et al. (2000) on uses of selected plants in the treatment of various problems in other parishes around Kibale National Park where *Vernonia amygdalina* was reported to predominantly treat malaria, *Bidens pilosa* (fresh wounds), *Coffea canephora* (diarrhoea), *Crassocephalum vitellium* (fresh wounds) and *Turraea africana* (worms). In this study, we report for the first time in this area, the use of *Drypetes battiscombei*, *Combretum paniculatum* and *Erlangea tomentosa* in the treatment of various diseases. *Drypetes battiscombei* and *Combretum paniculatum* has been cited 6 times and once respectively for treatment of diarrhoea. *Erlangea tomentosa* was cited 3 times for treatment of cough. New plant medicinal uses were also reported for some plants. For instance *Secamone africana* has been used in other parishes around Kibale National Park for the treatment of syphilis, constipation and

Table 2
Diseases treated using medicinal plants.

Disease/ailment	Frequency ^a (n = 213)	% Frequency
Cough	31	14.6
Malaria	26	12.2
Diarrhoea	20	9.4
Yellow fever	18	8.5
Taeniasis (Tape worms)	11	5.2
Fresh wounds	10	4.7
Stomach ache	8	3.8
Snake bite	7	3.3
Skin infections	7	3.3
Infertility in men	5	2.3
Eye infection	5	2.3
Measles	5	2.3
Induction of labour	4	1.9
Heart disease	4	1.9
Menstrual pains	4	1.9
Ringworms	3	1.4
High blood pressure	3	1.4
Constipation	3	1.4
Meat allergy	3	1.4
Ulcers	3	1.4
Flu	2	0.9
Pneumonia	2	0.9
Ear infection	2	0.9
Athletes foot	2	0.9
Memory enhancement	2	0.9
Headache	2	0.9
Poisoning	2	0.9
Placental removal	2	0.9
Anemia	2	0.9
Burns/Boils	2	0.9
Chest pain	1	0.5
Vomiting in children	1	0.5
Hernia	1	0.5
Stop miscarriage	1	0.5
Fungal infection (Entunuka) (Ru)	1	0.5
Throat infection	1	0.5
Syphilis	1	0.5
Candida	1	0.5
Hemorrhage	1	0.5
Kwashiorkor	1	0.5
Toothache	1	0.5
Nose bleeding (epistaxis)	1	0.5
Loss of appetite (anorexia)	1	0.5
Gonorrhoea	1	0.5

^a Frequency, indicates the number of plants that are used to treat a particular disease.

antenatal (Kakudidi et al., 2000) but in the study area, this plant has also been reported to be used in the treatment of malaria. The treatment of malaria by this plant was cited once.

4. Conclusions

From this study, several medicinal plant species have been found to be used by the local communities in the northern sector of Kibale National Park for the treatment of a number of diseases/ailments. It has been established that traditional medicinal plants contribute significantly in the treatment of several diseases in this area. For instance the use of *Vernonia amygdalina* and *Albizia coriaria* in the treatment of malaria and cough respectively is significant. The therapeutic claims over some of these medicinal plants like *Vernonia amygdalina* has been evaluated for their efficacy and therefore there is a need to do more studies that lead to formulation of a herbal product from this plant. There is need to validate the use and effectiveness of plants that are purported to cure a diversity of human diseases and are not yet evaluated like *Albizia coriaria*. This will help to evaluate which plant species are efficacious and safe to use and thus increase on the acceptability in the use of these plant medicines. Uganda has many prevalent diseases including malaria and the promotion and development of plant medicines especially

the antimalarials could be a promising solution to the treatment of malaria.

Most of the medicinal plants collected are not cultivated and face a risk of getting depleted or threatened with extinction through habitat destruction and over exploitation. There is need for sensitization of the local community and herbalists to start growing medicinal plants in their gardens and around homesteads. Though Kibale National Park is under the Protected Area Systems, it is accessible to the communities and therefore there is need to improve the conservation for both plants found in the forest and used by wild fauna species including the threatened Chimpanzee (Krief et al., 2005) and those obtained outside the forest.

The people in the Northern sector of Kibale National Park are the owners of the knowledge presented in this paper and any benefits that may arise from this information must be shared with them.

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References

- Ashafa, A.O.T., Afolayan, A.J., 2009. Screening the root extracts from *Biden pilosa* L. var. *radiata* (Asteraceae) for antimicrobial potentials. *Journal of Medicinal Plants Research* 3, 568–572.
- Challand, S., Willcox, M., 2009. A Clinical trial of the traditional medicine *Vernonia amygdalina* in the treatment of uncomplicated malaria. *The Journal of Alternative and Complimentary Medicine* 15, 1231–1237.
- Chapman, C.A., Chapman, L.J., Wrangham, R., Isabirye-Basuta, G., Ben-David, K., 1997. Spatial and temporal variability in the structure of a tropical forest. *African Journal of Ecology* 35, 287–302.
- Chang, A.B., Glomb, W.B., 2006. Guidelines for evaluating chronic cough in paediatrics: ACCP evidence-based clinical practice guidelines. *Chest* 129, 260S–283S.
- Chiranjibi, P., Sudhakar, R., Dhal, N.K., Rashmita, D., 2006. Some phytotherapeutic claims by tribals of Rayagada district, Orissa, India. *Ethnobotanical Leaflets* 10, 189–197.
- Dhillion, S.S., Amundsen, C., 2000. Bioprospecting and maintenance of biodiversity. In: Svarstad, H., Dhillion, S.S. (Eds.), *Responding to Bioprospecting: From Biodiversity in the South to Medicines in the North*. Spartacus Forlag As, Oslo.
- Fabiana, L.S., Dominique, C.H.F., Josean, F.T., 2011. Compilation of secondary metabolites from *Bidens pilosa* L. *Molecules* 16, 1070–1102.
- Geissberger, P., Sequin, U., 1991. Constituents of *Bidens pilosa* L.: do the components found so far explain the use of this plant in traditional medicine? *Acta Tropica* 48, 251–261.
- Hamill, F.A., Apio, S., Mubiru, N.K., Mosango, M., Bukenya-Ziraba, R., Maganyi, O.W., Soejarto, D.D., 2000. Traditional herbal drugs of Southern Uganda. *Journal of Ethnopharmacology* 70, 281–300.
- Heinrich, M., Edwards, S., Moerman, D.E., Leonti, M., 2009. Ethnopharmacological field studies: a critical assessment of their conceptual basis and methods. *Journal of Ethnopharmacology* 124, 1–17.
- Howard, P.C., 1991. *Nature Conservation in Uganda's Tropical Forest Reserves*. IUCN, Gland, Switzerland/Cambridge, UK.
- Kakudidi, E.K., Bukenya-Ziraba, R., Kasenene, J.M., 2000. The medicinal plants in and around Kibale National Park in western Uganda. *Lidia, A Norwegian Journal of Botany* 4, 109–124.
- Koshimizu, K., Ohigashi, H., Huffman, M.A., 1994. Use of *Vernonia amygdalina* by wild chimpanzee: possible role of its bitter and related constituents. *Physiological Behaviour* 56, 1209–1216.
- Krief, S., Hladik, C.M., Haxaire, C., 2005. Ethnomedicinal and bioactive properties of the plants ingested by wild chimpanzees in Uganda. *Journal of Ethnopharmacology* 101, 1–15.
- Lamorde, M., Tabuti, J.R.S., Obua, C., Kukunda-Byobona, C., Lanyero, H., Byakika-Kibwika, P., Bbosa, S.G., Lubega, A., Ogwal-Okeng, J., Ryan, M., Waako, P.J., Merry, C., 2010. Medicinal plants used by traditional medicine practitioners in the treatment of HIV/AIDS and related conditions in Uganda. *Journal of Ethnopharmacology* 130, 43–53.
- Li-Ping, Y., Fei-Hu, C., Ling, L., Peng, F., Hu, B., Ming-Mei, Z., Li-Juan, X., 2008. Protective effects of total flavonoids of *Bidens pilosa* L. (TFB) on animal liver injury and liver fibrosis. *Journal of Ethnopharmacology* 116, 539–546.
- Masaba, S.C., 2000. The antimalarial activity of *Vernonia amygdalina* Del (Compositae). *Transactions of the Royal Society of Tropical medicine and Hygiene* 94, 694–695.
- Ohigashi, H., Huffman, M.A., Izutsu, D., 1994. Towards the chemical ecology of medicinal plant use in chimpanzees: the case of *Vernonia amygdalina*, a plant used by wild chimpanzees possibly for parasite-related diseases. *Journal of Chemical Ecology* 20, 541–553.
- Okello, J., Ssegawa, P., 2007. Medicinal plants used by communities of Ngai Subcounty, Apac District, northern Uganda. *African Journal of Ecology* 45, 76–83.
- Olila, D., Bukenya-Ziraba, R., Kamoga, D., 2007. Bio-prospecting studies on medicinal plants used to manage poultry diseases in the Mount Elgon region of Uganda. *Research Journal of Pharmacology* 1, 56–60.
- Oryem-Origa, H., Kakudidi, E.K., Katende, A.B., Bukenya-Ziraba, R., 1997. Utilization of Medicinal Plants in Bundibugyo District, Uganda. In: Kinyua, Am., Kofi-Tsekpo, W.M., Dangana, L.B. (Eds.), *Conservation and Utilization of Indigenous Medicinal Plants and Wild Relatives of Food Crops*. UNESCO, Nairobi, pp. 75–80.
- Sheldon, J.W., Balick, M.J., Laird, S.A., 1997. Medicinal plants: can utilization & conservation coexist? *Advances in Economic Botany* 12 (The New York Botanical Garden, New York).
- Shrestha, P.M., Dhillion, S.S., 2003. Medicinal plants diversity and use in the highlands of Dolakha district, Nepal. *Journal of Ethnopharmacology* 86, 81–96.
- Tabuti, J.R.S., Dhillion, S.S., Lye, K.A., 2003a. Traditional medicine in Bulamogi County, Uganda. Its practitioners, users & viability. *Journal of Ethnopharmacology* 85, 119–129.
- Tabuti, J.R.S., Lye, L.A., Dhillion, S.S., 2003b. Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. *Journal of Ethnopharmacology* 88, 19–44.
- Tabuti, J.R.S., Kukunda, C.B., Waako, W.J., 2010. Medicinal plants used by traditional medicine practitioners in the treatment of tuberculosis and related ailments in Uganda. *Journal of Ethnopharmacology* 127, 130–136.
- Thomas, E., Vandebroek, I., Sanca, S., Van Damme, P., 2009. Cultural significance of medicinal plant families and species among Quechua farmers in Apillapampa, Bolivia. *Journal of Ethnopharmacology* 122, 60–67.
- Tobinaga, S., Sharma, M.K., Aalbersberg, W.G.L., Watanabe, K., Iguchi, K., Narui, K., Sasatsu, M., Waki, S., 2009. Isolation and identification of a potent antimalarial and antibacterial polyacetylene from *Bidens pilosa*. *Planta Medica* 75, 624–628.
- Tona, L., Cimanga, R.K., Mesia, K., 2004. In vitro antiplasmodial activity of extracts and fractions from seven medicinal plants used in the Democratic Republic of Congo. *Journal of Ethnopharmacology* 93, 27–32.
- United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), 2002. *Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) Annual Report Data, WCMC CITES Trade Database*. UNEP-WCMC, Cambridge, UK.
- World Health Organisation (WHO), 1995. *Traditional Practitioners as Primary Health Workers: Guidelines for Training Traditional Health Practitioners in Primary Health Care*. WHO, Geneva.
- World Health Organisation (WHO), 1978. *The Promotion & Development of Traditional Medicine*. Technical Report Series, vol. 622. WHO, Geneva.