



# Medicinal plant species used in the treatment of skin diseases in Katabi Sub-County, Wakiso District, Uganda

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## Research

### Abstract

**Background:** The use of medicinal plants in primary healthcare is central among rural communities in Uganda due to the expensive and often inaccessible conventional healthcare. Skin diseases pose a serious health risk given the challenge of HIV-AIDS whose opportunist infections manifest themselves as skin complications. The study investigated, identified and documented plant species used to manage skin infections, the plant parts used, methods of preparation and administration of herbal remedies.

**Methods:** An ethnobotanical survey of medicinal plant species used to treat skin diseases was conducted in Katabi Sub-County, Wakiso District in Uganda using semi structured interviews. A questionnaire, checklist, and personal observation were the research instruments used. Descriptive statistics were used to present the data.

**Results:** A total of 60 respondents were interviewed from 20 villages during this study. 50 plant species belonging to 29 families were documented. The highest proportion of species (25%) was used against fungal infections. Other proportions of plant species against their respective diseases were; 24%, 20%, 16% and 16% for allergies, wounds, skin rash and warts respectively and were inclusive of each other. Other mentioned diseases were treated by low proportions of plant species. The most frequently used plants were *Psorospermum febrifugum* (33%), *Albizia coriaria* (32%), *Hoslundia opposita* (37%), *Justicia betonica* (30%), and *Euphorbia tirucalli* (25%). Herbs (55%) were the main growth habit of medicinal plant species followed by trees (25%),

shrubs (17%) and vines (2%) and grasses (1). Leaves (64%) were the most commonly used plant parts, followed by bark and roots (14% each), fruits (10%), flowers (8%), sap (5%) and pseudostem (2%). Fungal infections had the highest informant consensus factor (0.9) and *Justicia betonica* had the highest fidelity level (89%) for treatment of fungal infections. Topical administration to affected parts was the major method of administration at 54%. Other methods were oral, bathing, compresses, poultices and inhalation.

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**Ethnobotany Research & Applications**  
**18:20 (2019)**

**Conclusion:** The traditional knowledge about the use of medicinal plants for management of skin diseases was diverse in Katabi Sub-County. Fungal infections were the most common skin diseases. The dominant plant species used were; *Psorospermum febrifugum*, *Albizia coriaria*, *Hoslundia opposita*, *Justicia betonica*, and *Euphorbia tirucalli*.

Keywords: Skin diseases, Wakiso, medicinal plants, Uganda, topical administration.

## Background

Worldwide use of medicinal plants for primary healthcare is on the increase (Karuiki & Njoroge 2011). The World Health Organization (WHO 2002) estimated that about 80% of the people in developing countries depend on local medicinal plants for primary health care.

The greater part of the traditional therapy involves the use of plant for treatment of various diseases. Many cultures have a deep understanding of properties of plants, knowledge that is endangered due to lack of documentation. Plants parts, have clear pharmacological activity in our bodies, ranging from very subtle to profound (Gollin 2004). Plant based pharmaceuticals are considered worth pursuing because there is increasing awareness of the loss of biodiversity throughout the world, a loss that may preclude future discoveries of plant-based pharmaceuticals (Chen *et al.* 2016). In a bid to preserve traditional medicine knowledge, there is need to carry out inventories of plants with therapeutic value.

Healthcare practices of a community are dependent on many factors which may be physical, socio-economical, cultural or political (Kroeger 1983) and the healthcare system in existence (Shaikh & Hatcher 2005). In Katabi Sub-County, most households are in the low income bracket which prohibits them from utilization of modern health services and resort to traditional medicine (Musoke *et al.* 2014). Most residents of the area prefer self-medication using local herbs or soliciting the services of traditional healers (Musoke *et al.* 2014). Rural people believe that traditional medicine has minimal side effects on the human body as opposed to many drugs in western medical practices (Galabuzi *et al.* 2010).

The widespread use of medicinal plant species in rural Uganda is attributed to inaccessibility to modern health facilities, poverty, socio-cultural beliefs, inadequate medicines and other supplies, shortage and low motivation of the modern medical staff and the fact that traditional medicine has a wide acceptance. (Kamatenesi *et al.* 2011). Socio-cultural factors associated with the demand for traditional medicine include; beliefs and perception of illness, cultural norms, taboos, religious affiliations and household economic status (Galabuzi *et al.* 2010). A patient who believes the cause of a disease is of spiritual origin will seek care from spiritual healers even when the disease is not associated with spirits or curses. However, a saved christian may rely on prayers as a form of treatment. In addition, there is

growing resistance of various disease causing agents to allopathic medicine necessitating discovery of new drugs by conducting ethnobotanical studies (Mahbub *et al.* 2018). The use of medicinal plant species varies according to nature of the disease (Vikram *et al.* 2011). For skin infections most remedies are applied topically but at times herbs are mixed with each other or other products like oil and clay before application (Iwu 1993). In some cases plant decoctions are used directly on the wound or infected part.

Skin conditions are the abnormal or unusual appearances on the skins of adults and children in form of blisters, ulcers or rashes (Tabassum & Hamdani 2014). Skin conditions are a very common problem in Ugandan communities due to rapid urbanization that results in overcrowding in slums (Ahumuza & Kirimuhuzya 2011). Provision of treatment for these infections constrains household budgets so most families resort to the use of herbal medicine as a cheaper option.

Skin infections are common among pupils because of the lifestyles they lead especially in boarding schools where combs, razor blades, basins, sweaters and clothes are shared (Morakinyo *et al.* 2014). This exposes them to a wide range of fungal skin infections. In Uganda most local saloons cannot afford chemicals and equipment for sterilization of the tools used when cutting hair leading to rampant transmission of skin infections mainly of the head and neck. Such tools contain viable fungal spores which are transmitted from one person to another through micro-traumas and skin macerations during hair cutting (Uslu *et al.* 2008).

Traditional knowledge on treatment of various diseases is passed on from one generation to the next without any documentation (Badoni & Badoni 2001, Kala 2007), yet most holders of such knowledge are the elderly who may die before passing it on to the young generation. It is against this background that medicinal plant species used to manage skin infections and associated indigenous knowledge in Katabi Sub-County, Wakiso District were documented. This will ensure that traditional knowledge about use of plant species in management of skin infections is conserved. It will also form a basis for discovery of new drugs.

## Materials and Methods

### Study Area

Katabi Sub-County is located in Wakiso District, Central Uganda between 0°50'0"N and 32°28'0"E. Katabi Sub-County comprises five parishes namely Kabale, Kisubi, Kitale, Nalugala, and Nkumba. There is one hospital in the area called Kisubi. The Katabi Community has a close proximity to Entebbe-

Kampala Road and contains isolated fishing villages that extend into the marshland of Lake Victoria. Luganda is the main language spoken in the area. The people of Katabi are mainly subsistence farmers of maize, bananas, cassava, sweet potatoes, beans and yams.

#### Sampling Design

Key informants were interviewed. The survey covered all the five parishes of the sub-county. Interviewees from four villages of each parish were randomly selected. Hebron Junior School in Nalugala Parish was visited and pupils observed for prevalence of skin infections. Household data were collected using a questionnaire that comprised open ended questions. In-depth discussions guided by a checklist were held with key informants who are knowledgeable about the use of medicinal plant species and skin infections.

Data were collected about the common skin diseases, medicinal plant species used to manage them, plant parts used, mode of preparation and administration. With the help of traditional healers as guides, all medicinal plant species mentioned were collected and identified in the field based on a manual for plant identification (Katende *et al.* 1999). Plants that could not be identified were collected and identified at the Makerere University Herbarium. Correctness of scientific names of species was checked according to Tropicos:<http://www.tropicos.org> database accessed on 31<sup>st</sup> January, 2019. The data were presented using descriptive statistics. The skin diseases were put into different categories. Informant consensus factor ( $F_{ic}$ ) for the dominantly used species was calculated to indicate the homogeneity of information using the following formula proposed by (Trotter & Logan 1986);

$$F_{ic} = \frac{Nur - N_{taxa}}{Nur - 1}$$

Where Nur = Number of use reports

N<sub>taxa</sub> = Number of species in each use category

The Fidelity levels for the dominantly used plant species (FL) were calculated according to Friedman *et al.* (1986).

$$FL = I_p / I_u \times 100$$

Where  $I_p$  = Number of informants who suggested the use of a species for the same major skin condition

$I_u$  = the total number of informants who mentioned the species for any use.

## Results and Discussion

### Characteristics of respondents

A total of 60 respondents who included a medical doctor and two nurses were interviewed out of which 81% were females and 19% males. The majority of the respondents (52%) were aged between 31-45 years. The high number of females could be attributed to the fact that women are usually caretakers of children who are prone to skin infections and thus often search for remedies of skin infections. This corroborates findings of other ethnobotanical studies in Uganda (Tugume *et al.* 2016) and Rwanda (Kamagaju *et al.* 2013). The distribution of respondents by age group and gender is shown in Fig. 1.

Individuals above 60 years possessed more knowledge compared to those below 60. On average each respondent aged 60 years and above mentioned 20 plants while those below 60 years named on average five plant species. This calls for the need to document traditional medicine practices to avoid indigenous knowledge erosion in case the elderly die before transmission of such knowledge. This loss will also be exacerbated by the extinction of plant species due to urban expansion and habitat destruction. *Diversity of medicinal plant species used to manage skin diseases*

A total of 50 plant species belonging to 29 families were documented (Table 1). Asteraceae had the highest number of plant species (seven) harvested followed by Euphorbiaceae and Fabaceae (five each). 36% of plant species were used to treat fungal infections (Table 2). Families Solanaceae and Lamiaceae had three species each; Acanthaceae, Brassicaceae and Curcubitaceae had two species each while Alliaceae, Aloeaceae, Amaranthaceae, Apiaceae, Bignoniaceae, Burseraceae, Capparaceae, Caricaceae, Clusiaceae, Dracaenaceae, Lauraceae, Moraceae, Moringaceae, Musaceae, Myrtaceae, Phyllanthaceae, Phytolacaceae, Piperaceae, Poaceae and Zingiberaceae had one species each. Dominance of these families as sources of medicine has been reported by other ethnobotanical studies (Lulekal *et al.* 2008, Namukobe *et al.* 2011). This could be attributed to their widespread distribution and abundance (Wondimu *et al.* 2007) and rich bioactive ingredients (Thomas *et al.* 2009).

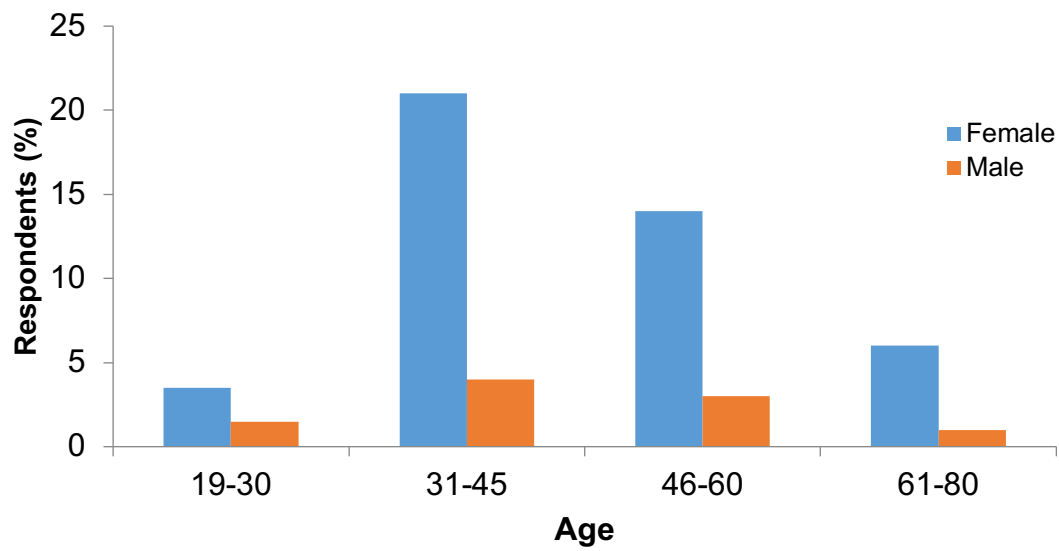


Fig. 1 Gender and age distribution of respondents

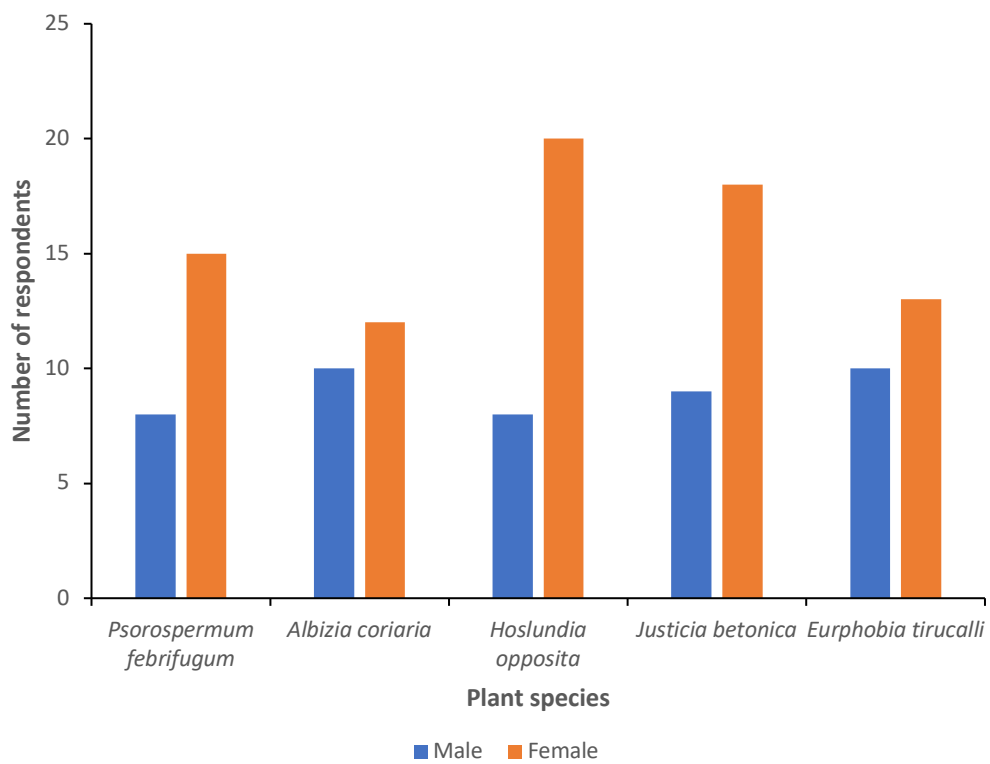


Fig. 2. Dominant species according to number of respondents and gender

Table 1. The Medicinal Plant species used to Treat Skin Diseases

Family Scientific Name Voucher No.	Local Name (Luganda)	Habit	Management status	Parts Used	Ailment treated	Method of Preparation	Mode of Administration	Reported relevant ethnomedicinal uses elsewhere
<b>ACANTHACEAE</b>								
<i>Acanthus pubescens</i> Engl. CN 008	Amatovu	S	W	L	Wounds Genital warts	Dry the leaves and make powder	Sprinkle the powder onto the Wound	Cough, tuberculosis (TB), Aphrodisiac (Ssegawa & Kasenene 2007)
<i>Justicia betonica</i> L. CN 020	Nalongo	H	C	L,R	Fungal infections  Fever	Leaves are crushed, roots cleaned, dried and pounded. Decoction of leaves	Powder rubbed into the affected area  Drink a glassful twice a day	Induce labour (Kamatenesi- Mugisha & Oryem-Origa, 2007) Diarrhoea (Khare 2007) Malaria (Stangeland <i>et al.</i> 2011)
<b>ALLIACEAE</b>								
<i>Allium sativum</i> L. CN 023	Katungul ucumu	H	C	B	Wounds Boils	Pound garlic cloves. Cut slices of garlic	Swab the affected area. Bandage them onto the area	Cough (Namukobe <i>et al.</i> 2011)
<b>ALOEACEAE</b>								
<i>Aloe vera</i> L. CN 001	Kigaji	H	C	L	Burns Wounds  Fungal infections	Cut the leaves to obtain sap  Liquid extract	Smear the sap onto the burnt area or wound Rubbed onto the area	Bacterial & fungal infections in HIV/ AIDs cases (Asimwe, <i>et</i> <i>al.</i> 2013)
<b>AMARANTHACEAE</b>								
<i>Aerva lanata</i> (L) Juss ex Schult. CN 009	Olweza	H	C	L	Skin rashes	Squeeze the leaves in water	Take a bath	Good luck (Ssegawa <i>et al.</i> 2007)
<b>APIACEAE</b>								
<i>Daucus carota</i> L. CN 004	Carrot (English)	H	C	R	Wounds Cancer	Clean the roots	Eat raw roots frequently	
<b>ASTERACEAE</b>								
<i>Ageratum conyzoides</i> L. CN 007	Namirem be	H	W	L	Skin rashes	Pound the leaves	Rub the affected area	Gonorrhoea (Lulekal <i>et al.</i> 2008)

<i>Aspilia africana</i> C.D Adams (Pers.) CN 015	Makayi	H	W	Ar	Ringworm	Pound the aerial parts	Rub the infected area	Haemorrhoids (Soladoye <i>et al.</i> 2010)
<i>Bidens pilosa</i> L. CN002	Ssere	H	W	L	Wounds	Pound the fresh leaves	Apply the liquid extract onto the wound to effect healing and quick clotting	Eye infection, nose bleeding, yellow fever, diarrhoea, ulcers (Namukobe <i>et al.</i> 2011) Wound (Kamatenesi <i>et al.</i> 2011, Ssegawa <i>et al.</i> 2007)
<i>Conyza floribunda</i> Kunth. CN 003	Kafumbe	H	W	L	Ringworm	Crush the leaves	Rub the infected area	Colic pain, Stomach ache, syphilis, fever (Asiimwe <i>et al.</i> 2014)
<i>Erlangea tomentosa</i> S.Moore (Oliv & Hiern) CN 012	Ettwatwa	H	W	L	Promotes a healthy skin	Squeeze leaves in water	Take a bath	Indigestion (Ssegawa <i>etal.</i> 2007)
<i>Vernonia auriculifera</i> Hern. CN 011	Kikooko ma	S	W	L	Fights skin infections	Squeeze leaves in water	Take a bath occasionally	
<i>Vernonia cinerea</i> (L.) Less. CN 010	Kayayana	Sh	W	L	Skin infections	Pound the fresh leaves	Rub the infected area	Good luck (Ssegawa <i>et al.</i> 2007)
<b>BIGNONIACEAE</b>								
<i>Spathodea campanulata</i> P. Beav. CN 005	Kifabakazi	T	W	L,B	Skin rash Genital warts	Decoct the leaves and bark. Add some salt	Drink regularly Compress the affected area	TB (Bunalema <i>et al.</i> 2014)
<b>BRASSICACEAE</b>								
<i>Brassica oleracea</i> L. CN 013	Cabbage	H	C	L	Wounds	Pound the leaves	Put sap onto the wound	
<i>Cardamine trichocarpa</i> Hochst. ex.A. Rich. CN 014	Magereg ankoko	H	W	L	Wounds Boils	Pound the leaves	Apply Compress	
<b>BURSERACEAE</b>								
<i>Canarium schweinfurthii</i> Engl. CN 006	Omuwafu	H	C	SP	Scabies	Cut the bark to get the viscous resin	Rub the affected area. Applied as ointment	Possessed by spirits (Ssegawa <i>et al.</i> 2007)
<b>CAPPARACEAE</b>								

<i>Cleome gynandra</i> L. CN 019	Ejobyo	H	C,W	F	Fungal infections	Squeeze the flowers	Rub the affected area	Headache, ringworms, eye disease (Kamatenesi <i>et al.</i> 2011)
<b>CARICACEAE</b>								
<i>Carica papaya</i> L. CN 018	Epapari	H	C	Fr	Fungal infections  Burns  To soften the skin	Cut the unripe fruit to extract the latex. A few drops of the pawpaw sap is boiled in water. Cut the unripe fruit into pieces. Boil the cut pieces. Mix the resultant liquid with Vaseline	Rub the affected area with the latex  Use the resulting water to wash the burn. Smear body parts especially, hands. Apply the sap to wounds	Anaemia (Lulekal <i>et al.</i> 2008), Malaria Stangeland <i>et al.</i> 2011)
<b>CLUSIACEAE</b>								
<i>Psorospermum febrifugum</i> Sprach CN 021	Akanziro nziro	T	W	B	Skin rashes	Dry the bark. Pound into powder. Mix the powder with Vaseline	Smear all over the skin	Syphilis, skin rash, induction of labour, pre-hepatic jaundice, fever (Ssegawa & Kasenene 2007)
<b>CRASSULACEAE</b>								
<i>Kalanchoe pinnata</i> L. CN 022	Ekiyondo	H	W,C	L	Wounds  Burns	Pound 1 handful of washed leaves, add 1 teaspoon of sugar, heat up the mass until it turns brown. Pounded leaves are boiled for a short time in a little water	Use as a wound dressing  Apply as a poultice	Diarrhoea, immune boosting (Nalumansi <i>et al.</i> 2014)
<b>CURCUBITACEAE</b>								
<i>Cucumis sativus</i> L. CN 052	Akatanga	H	W	L	Skin blemishes	Squeeze the leaves in water	Take a bath	
<i>Mormodica foetida</i> K.Schum CN 029	Ebombo	H	W	L	Body odours Itching skin	Squeeze the leaves in water	Bathe the whole body	Diarrhoea, Syphilis, gonorrhoea (Okello & Ssegawa, 2007)

<b>DRACAENACEAE</b>								
<i>Dracaena steudneri</i> Engl. CN 027	Ekkajjoly enjovu		W	L	Good luck	Squeeze leaves in water	Take a bath	Abdominal pain (Hamill <i>et al.</i> 2000)
<b>EUPHORBIACEAE</b>								
<i>Acalypha bipartita</i> Mull. Arg. CN 028	Ejere ngesa	H	W	L,R	Wounds Headache	Boil clean roots Burn the leaves	Wash the wound Inhale the smoke	Snake bite (Tabuti <i>et al.</i> 2003)
<i>Euphorbia tirucalli</i> L. CN 030	Enkoni	S	W	Sp	Warts	Break the stem joints to obtain sap	Apply the sap onto the wart 3 times a day	Labour induction (Kamatenesi & Oryem-Origa 2006)
<i>Jatropha curcas</i> L. CN 026	Ekiroowa	S	C,W	L	Wounds	Boil two handfuls of fresh leaves with one l of water. Filter	Use it for washing the wound	Pyrrhoea (Katewa & Guria 1997)
<i>Sapium ellipticum</i> (Hochst.) Pax. CN 035	Omusasa	T	W	L	Abscess	Pound fresh leaves. Add a little salt	Apply as a poultice	Retained placenta, pre-hepatic jaundice, Syphilis (Ssegawa & Kasenene 2007)
<i>Manihot esculenta</i> Crantz CN 034	Muwogo	Sh	C	L	Fungal infections	Dry the leaves. Pound and Mix powder with vaseline	Smear the infected area	Fever (Namukobe <i>et al.</i> 2011)
<b>FABACEAE</b>								
<i>Albizia coriaria</i> Oliv. CN 031	Omugav u	T	W	L,B	Skin rashes Wounds	Pound the leaves and bark separately	Compress the affected area	Possessed by spirits Non-meat eaters to eat meat (Ssegawa & Kasenene 2007)
<i>Entada abyssinica</i> Steud ex. A. Rich. CN 032	Omwolol a	T	W	B	Promotes proper skin growth	Bark is boiled	Used in a bath	Diarrhoea (Hamill <i>et al.</i> 2000) Skin rash (Ssegawa & Kasenene 2007).
<i>Erythrina abyssinica</i> Lam. CN 033	Ejirikiti	T	W	B	Clears skin infections	Decoct the bark	Take a bath of the whole body	Toothache (Kamatenesi <i>et al.</i> 2011), Syphilis, Malaria (Ssegawa & Kasenene 2007), Splenomegaly, Nausea, dysentery (Asiimwe <i>et al.</i> 2014)
<i>Phaseolus lunatus</i> L. CN 040	Kayindi yindi	H	W,C	L, Fl	Skin diseases	Dry the leaves and flowers. Pound to get powder.	Mix powder with Vaseline and smear the body	
<i>Tamarindus indica</i> L. CN 036	Omukoo ge	T	W	L	Wounds	Decoct the leaves	Drink regularly	Laxative (Tangjitman <i>et al.</i> 2015)



<b>LAMIACEAE</b>								
<i>Hoslundia opposita</i> Vahl. CN 037	Kamunye	Sh	W	L	Wounds Toothache	Squeeze leaves  Squeeze a handful in quarter litre of boiled water. Add some salt	Compress the wound Use as a garble	Epilepsy (Kamatenesi <i>et al.</i> 2011) Malaria (Stangeland <i>et al.</i> 2011)
<i>Leonotis nepetifolia</i> (L.) R. Br. CN 038	Kifumufumu	H	W	L, Fl	Wounds	Dry leaves. Make into powder	Sprinkle powder to the wound to effect quick healing	Backache (Ssegawa & Kasenene 2007)
<i>Plectranthus barbatus</i> Andr. CN 039	Kibwankulata	H	W,C	L	Wounds  Ulcers	Squeeze the leaves. Dry leaves under shade for four days. Then dry under direct sunlight for a few hours and pound Squeeze the leaves Make a decoction	Apply the liquid extract to the wounds till it heals  Mix with Vaseline and smear Drink regularly	TB (Bunalema <i>et al.</i> 2014), Deworming, sinuses, Urinary tract infections, Skin allergy, stomach infections, syphilis (Asiimwe <i>et al.</i> 2014)
<b>LAURACEAE</b>								
<i>Persea americana</i> Mill. CN 042	Vakedo	T	C,W	Fr	Nourishes the skin	Cut up the ripe fruit	A dressing of the avocado flesh works as a natural emulsion and nourishes infected or dry skin	Immune booster (Asiimwe <i>et al.</i> 2013), Malaria, Diarrhoea, vomiting (Nalumansi <i>et al.</i> 2014)
<b>MORACEAE</b>								
<i>Ficus ovata</i> Vahl CN 041	Omukokoowe	T	W	Sp	Warts	Detach fresh leaves from the stem to get the white sap	Apply the sap onto the wart till it breaks off the skin	
<b>MORINGACEAE</b>								
<i>Moringa oleifera</i> Lam CN 043	Mulinga	T	C	Se, L F, R	Wounds ,	Pound the fresh leaves. Dry fresh leaves and pound.	Smear the wound. Powder is added to	Malaria (Ssegawa & Kasenene 2007)

					Fungal infections	A paste is made from seeds	Vaseline and smeared to clear the skin.	Haemorrhoids (Soladoye <i>et al.</i> 2010), TB (Bunalema <i>et al.</i> 2014)
					Boosts good health	Boil the roots Powder is obtained from flowers. Fresh leaves are prepared as vegetable	Drink regularly. Taken as tea	
<b>MUSACEAE</b>								
<i>Ensete ventricosum</i> (Welw) Cheesman CN 044	Ekitembe	H	W	Ps, Fr	Skin ulcers	Boil the pseudo stem thoroughly	Drink frequently	Expel placentas, aphrodisiac, Asthenia (for women) (Hamill <i>et al.</i> 2000)
<b>MYRTACEAE</b>								
<i>Maesopsis eminii</i> Engl. CN 050	Musizi	T	W	B	Boosts skin growth	Boil the bark	Take a bath	
<b>PHYLLANTHACEAE</b>								
<i>Bridelia micrantha</i> (Hochst) Baill. CN 049	Katazami t	S	W	L	Skin infections Rashes	Dry the leaves. Pound into powder	Rub powder into the rash	Tapeworm, Abdominal pain (Hamill <i>et al.</i> 2000)
<b>PHYTOLACACEAE</b>								
<i>Phytolacca dodecandra</i> L' Hér CN 045	Oluwoko	H	W	Se, L, R	Burns  Wounds	Squeeze ripe seeds. Crush leaves to get a foam  Burn the leaves to ash. Dry the roots, make powder	Spread the paste over the burn. Topically apply the foam  Sprinkle the ash and root powder onto the burn and wound	Relaxation of pelvic region for child delivery (Ssegawa & Kasenene 2007)
<b>PIPERACEAE</b>								
<i>Piper guineense</i> Schumach. Thonn. CN 046	Kigaman sole	V	W	R, L	Skin infections  Venereal diseases, Cough	Decoct leaves.  Make a brew from roots	Take a bath.  Take orally	Haemorrhoids (Soladoye <i>et al.</i> 2010)

<b>POACEAE</b>								
<i>Cymbopogon citratus</i> ( D.C) Stapf. CN 047	Ekisubi	G	C,W	L	Skin care	Distill the leaves	Scented product is added into skin care products	Haemorrhoids (Soladoye <i>et al.</i> 2010), Cough, TB (Asiimwe <i>et al.</i> 2013)
<b>SOLANACEAE</b>								
<i>Nicotiana tabacum</i> L. CN 048	Taaba	H	W, C	L	Ringworm	Harvest clean insect free leaves	Rub affected areas with leaves	Haemorrhoids (Soladoye <i>et al.</i> 2010)
<i>Lycopersicon esculentum</i> Mill. CN 049	Nyanya	H	C	L, Fr	Fungal infections	Pound the leaves, harvest ripe fruits	Rub affected area Eat as a vegetable	Headache (Ssegawa & Kasenene 2007)
<i>Solanum nigrum</i> L. CN 050	Ensugga	H	W, C	L	Nourishes skin	Harvest young aerial parts, steam them	Eat as a vegetable	
<b>ZINGIBERACEAE</b>								
<i>Aframomum angustifolium</i> K. Schum. CN 051	Matungulu	H	W	Fr, R	De-wormer	Fruits and roots are washed	Eaten as a snack	Dysentery (Gazzaneo <i>et al.</i> 2005)

**Parts used:** Ar – Aerial parts; B – Bark; Fl – Flower; Fr – Fruit; Se – Seed; Sp –Sap; R – Root, Ps- pseudo stem

**Growth form:** G – Grass; H – Herb; Sh – Shrub; T – Tree; V – Vine.

**Management status:** C – Cultivated; W – Wild.

Table 2. Percentage of plant species used to treat different skin disease categories

Skin disease category	Percentage of plants used for treatment (N=50)
Fungal infections	36
Wounds	32
Skin rash	22
Warts	10
Burns	8
Boils	6
Scabies	2

One plant could be used to treat more than one skin disease types

The commonest growth forms were herbs (55%) followed by trees (25%), shrubs (17%) and vines (1%) and grasses (1%). The predominant use of herbs is attributed to their abundance all year round as reported in other studies from Uganda (Namukobe *et al.*, 2011, Tugume *et al.*, 2016). Herbs have also been found to contain high pharmacologically active ingredients compared to woody plants (Kamatenesi *et al.* 2011), a characteristic that makes them very useful for the management of ailments. 62% of medicinal plant species recorded were harvested from the wild. Cultivated plants constituted 21% while partially domesticated constituted 17%. This indicates heavy dependence on wild sources instead of home gardens for medicinal plants collection and that cultivation of medicinal plants is not well embraced in the area. The high proportion of medicinal plant species from the wild exposes them to the risk of being endangered due to rampant clearance of wild habitats in favor of agriculture and human settlement. The low numbers of medicinal plant species cultivated could be attributed to low growth rates (Vines 2004). Being an urban area, land availability limits cultivation of medicinal plants. Sometimes cultivated plants are considered to be qualitatively inferior in comparison to wild plants (Schippmann *et al.* 2002). Cultivated plants included *Moringa oleifera* and *Aloe vera* which are mainly grown for commercial purposes. Medicinal plants under ex-situ conservation were grown under the mono-cropping system. This calls for an urgent need to document local flora ecosystems and growth requirements so that commonly used wild plants with a potential of being overexploited are conserved ex-situ. Some of the cultivated plants such as *Carica papaya*, *Manihot esculenta* and *Moringa oleifera* are nutraceuticals, a factor that favors their cultivation. Dominant species identified according to gender of respondents were; *Psorospermum febrifugum*,

*Albizia coriaria*, *Hoslundia opposita*, *Justicia betonica* and *Euphorbia tirucalli*. More females used these plants for management of skin diseases compared to men (Fig. 2).

Leaves were the most commonly used parts (54%), followed by roots and flowers (11%) each while the other plant parts had proportions below 10%. Leaves and roots generally form the most frequently used plant parts in traditional medicine as reported by Giday (2003) and Wondimu *et al.* (2007). Leaves are available all year round. Seeds, flowers and fruits are least used because they are seasonal. The bark and roots though moderately used require proper harvesting skills to avoid damaging the plants leading to their eventual death. The use of individual plant parts to treat skin diseases contrasts findings of Rahmatullah *et al.* (2011) in Bangladesh where whole plants were commonly used. Herbaceous plants can be used as whole plants because of the ease of extraction compared to trees or shrubs that present difficulty in harvesting wholly.

The methods of preparation of herbal medicines with their respective proportions of use were compresses (12%), poultices (24%), drying and pounding (16%), sap extraction from fleshy parts by cutting (14%), decoctions (28%), squeezing in cold water (14%), chewing (10%) and burning to inhale the smoke (2%). More than one preparation method could be used to prepare remedies from the same plant depending on plant parts. Sap and other resinous liquid extracts were obtained by cutting fleshy plant parts like those of *Aloe* and *Euphorbia*. Boiling was done to extract active ingredients and to increase the shelf life of herbal remedies. The mode of administration of the remedy for skin diseases was by topical application which involved rubbing or smearing the affected parts. Baths were occasionally applied. *Cleome gynandra*, *Entanda abyssinica*, and *Plectranthus barbatus* which were identified were also used to treat ringworms, skin rashes and skin allergy respectively in other areas (Table 1). Forty one plant species (82%) identified were used for treatment of other ailments in Uganda and other parts Africa (Table 1). Such widespread use of these plants by different societies in different countries to a certain extent could be attributed to their effectiveness against the diseases they are used to treat (Maroyi 2013).

#### Informant consensus agreement ( $F_{ic}$ )

The  $F_{ic}$  highlights the plant species with a healing potential for a specific major skin disease (Table 3).  $F_{ic}$  values close to zero indicate a low degree of agreement among respondents about the use of a plant species for treatment of a particular skin condition. Fungal infections scored the highest  $F_{ic}$  (0.9). High  $F_{ic}$  values indicate that a species is used

by a large proportion of informants and there is exchange of information. Species that are effective have high  $F_{ic}$  values (Cakilcoglou *et al.* 2011). The important species used against fungal infections were *Justicia betonica*, *Aloe vera*, *Aspilia africana*, *Conyza floribunda*, *Cleome gynandra*, *Carica papaya*, *Manihot esculenta*, *Moringa oleifera*, *Nicotiana tabacum* and *Lycoperscon esculentum*. The high  $F_{ic}$  values for fungal infections indicate agreement among respondents on the different plant species used to manage them and the significance residents of the study area attach to them. Boils and scabies had  $F_{ic}$  of zero since each respondent reported different species used for boils and only one reported the use of *Canarium schweinfurthii* against scabies.

Table 3. Consensus agreement about uses of medicinal plants for skin disease category

Skin disease category	Ntaxa	Nur	$F_{ic}$
Fungal infections	36	19	0.9
Wounds	32	20	0.7
Burns	8	6	0.4
Warts	10	7	0.5
Skin rash	22	12	0.9
Boils	6	6	0
Scabies	1	1	0

*Fidelity leves (FL) of dominantly used plant species*  
For each of the five dominantly used plant species a fidelity level was calculated to quantify their importance in the treatment of a major skin condition. *Justicia betonica* had the highest fidelity level of 89% against fungal infections. All the five plant species had high fidelity levels of greater than 50% (Table 4). This indicates the outstanding preference of *J. betonica* against fungal infections of the skin.

Table 4. Fidelity levels (FL) of dominantly used medicinal plant species

Plant species	Therapeutic use	$I_p$	$I_u$	FL (%)
<i>Psorospermum febrifugum</i>	Skin rash	20	30	67
<i>Albizia coriaria</i>	Wounds	31	35	89
<i>Hoslundia opposita</i>	Wounds	15	25	60
<i>Justicia betonica</i>	Fungal infections	30	40	75
<i>Euphorbia tirucalli</i>	Warts	10	15	67

#### *Other uses of medicinal plant species identified in the current study*

Some of the identified medicinal plant species were reported for other uses by different studies. These were important for food, fodder, material culture, firewood, charcoal, ceremonial purposes and income generation (Table 5). The multipurpose use of these species makes them an important source of livelihood which makes them susceptible to overexploitation. Multipurpose species need to be sustainably used and conserved to avoid negative impacts on the livelihoods of the users and the environment.

#### Conclusions

The traditional knowledge about the use of medicinal plants for management of skin diseases was diverse in Katabi Sub-County. The dominant plant species used were; *Psorospermum febrifugum*, *Albizia coriaria*, *Hoslundia opposita*, *Justicia betonica*, and *Euphorbia tirucalli*.

The study showed that medicinal plants have a great potential to cure different skin diseases. Fungal infections were the most common skin diseases treated using medicinal plants and had the highest

$F_{ic}$  indicating a high level of agreement among respondents of the plant species used to treat them. The important species used against fungal infections were *Justicia betonica*, *Aloe vera*, *Aspilia africana*, *Conyza floribunda*, *Cleome gynandra*, *Carica papaya*, *Manihot esculenta*, *Moringa oleifera*, *Nicotiana tabacum* and *Lycoperscon esculentum*. *Justicia betonica* had the highest fidelity level and thus could be considered a potential plant for further pharmacological investigations that could lead to the discovery of new drugs against fungal skin infections. The dominantly used species deserve priority for ex-situ conservation so as to minimize dangers of overexploitation. Some of the medicinal plant species identified have other uses which puts them on high demand leading to overexploitation.

Table 5. Other ethnobotanical uses of some medicinal plant species identified

Plant species	Ethnobotanical uses
<i>Aloe vera</i>	Pulp edible as a confection, vegetable and pickles (Mathur & Joshi 2013)
<i>Bidens pilosa</i>	Vegetable ( Senbeta <i>et al.</i> 2013)

<i>Vernonia auriculifera</i>	Construction of bee hives (Senbeta <i>et al.</i> 2013)
<i>Carica papaya</i>	Edible fruit (Tabuti 2012)
<i>Albizia coriaria</i>	Firewood, charcoal, construction (Tabuti 2012)
<i>Entanda abyssinica</i>	Honey (Senbet <i>et al.</i> 2013)
<i>Tamarindus indica</i>	Fruit (food) Leaves (fodder), Stem (fuel, material for roofing) (Asase & Oteng-Yeboah 2012)
<i>Persea americana</i>	Firewood (Nyamukuru <i>et al.</i> 2015)
<i>Ficus ovata</i>	Bedding, death, religious and wedding rituals (Kakudidi 2004); material for wood furniture (Senbeta <i>et al.</i> 2013); cosmetics, hairdressing, fodder, vegetable (Mathur & Joshi 2013)
<i>Maesopsis eminii</i>	Timber, firewood (Tabuti 2012)
<i>Nicotiana tabacum</i>	Wedding present to the elderly (Kakudidi 2004)

## Recommendations

The commonly used plant species should be screened for their haemostyptic, disinfectant, analgesic and antibiotic properties in order to develop new drugs. The therapeutic recipes revealed by the study need to be evaluated through phytochemical and pharmacological investigations to discover their active compounds.

There is need to document traditional medicine practices to avoid indigenous knowledge erosion in case the elderly die due to breakdown of traditional societal structures of knowledge transmission. Therefore documentation of traditional knowledge in the use of plant species to treat different ailments needs to be carried out in different cultures to prevent erosion of such information that could be collected into a database for future research and potential drug development.

Women who heavily relied on using herbal medicine are already burdened with other household activities. Thus, there is need to increase male knowledge about traditional medicine through sensitization. Additionally on-farm conservation of medicinal plants should be encouraged to supplement wild collection. Links between traditional medical practitioners, researchers, conventional health practitioners and pharmaceutical companies should be promoted to enhance sharing of knowledge about the potential of medicinal plants for new drug development.

## Declarations

### List of abbreviations

WHO: World Health Organisation

### Ethics approval and consent to participate:

All participants gave their prior informed consent before any study.

### Competing interests

The authors declare that they have no competing interests.

### Availability of data: N/A

### Funding: N/A

### Author's contributions

Cissy conceptualized the study, designed the methods, conducted the ethnobotanical survey, analysed the data and drafted the manuscript. Patience and Clement conceptualized the idea of this manuscript and participated in reviewing the manuscript. Maud reviewed the manuscript. All authors read and approved the final manuscript.

## Acknowledgements

We extend our sincere thanks to the Community of Katabi Sub-County who provided us with the information required for this study. Special thanks go to the staff of Makerere University Herbarium who helped us in plant identification.

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