J Intercult Ethnopharmacol 2013; 2(3):155-164 *ISSN:2146-8397*

GESDAV

Journal of Intercultural Ethnopharmacology

available at www.scopemed.org

Original Research

Ethnobotanical uses of *Lantana trifolia L.* and *Sida cuneifolia Roxb.* in Mukungwe and Wabinyonyi sub-counties of central Uganda

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Received: June 25, 2013

Accepted: August 09, 2013

Published Online: November 7, 2013

DOI : 10.5455/jice.20130809114525

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Keywords: Conservation, culture, ethnomedicine, ethnoveterinary, plants

Abstract
Aim: This was an ethnobotanical study that was carried out to establish the traditional uses of *Lantana trifolia* L. and *Sida cuneifolia* Roxb. plants in selected parts of Central Uganda.
Methods: The ethnobotanical study was done in August and September, 2012 in Mukungwe and Wabinyonyi sub-counties in Masaka and Nakasongola Districts respectively located in Central Uganda. Study sites and respondents were purposefully selected and information was obtained through semi-structured interview guides, key informant interview guides as well as observations. Eighty respondents were considered for semi-structured interviews and 15 for key informant interviews.
Results: Seven ethnobotanical uses for *Lantana trifolia* were cited by respondents and majority (46.25%) of them used it as a herbal remedy. As a herbal remedy, *Lantana trifolia* managed 13 human disease conditions and mainly used in the management of cough and common colds by 22.5% of the respondents. Four ethnobotanical uses were cited for *Sida cuneifolia* and majority of the respondents (62.5%) used it as a herbal remedy as well as sweeping brooms. As a herbal remedy, *Sida cuneifolia* was reported to be useful in management of 12 disease conditions, fractures and sprains (bone setting) being mentioned by the majority of the of respondents (36.25 %).
Conclusion: In conclusion, *Lantana trifolia* and *Sida cuneifolia* were culturally important ethnomedicines. Scientific validation of traditional claims as well as conservation of these plants should be encouraged in order to preserve and promote their use.

INTRODUCTION

Uganda is endowed with a wide diversity of plant resources that people have interacted with for years, which form part of their traditional knowledge (TK) systems to improve their livelihoods. This knowledge can contribute to local economic and political empowerment, preserves local cultures through instilling pride and represents an important component of global knowledge on development issues [1]. However, TK faces an ever-growing threat of extinction through ethnocide of indigenous cultures and languages, ecocide of indigenous habitats and genocide of indigenous peoples [2]. Urgent action is required to safeguard traditional knowledge as this will contribute to the conservation and sustainable use of biological diversity [3]. Integrating cultural context in all medicinal plant research is also important in shaping the health and well being of traditional knowledge custodians in addition to the scientific world [4]. *Lantana trifolia* L. (Verbenaceae) and *Sida cuneifolia*

Roxb. (Malvaceae) are some of the culturally important plants in Central Uganda but the information about their cultural significance has not been adequately documented. This study therefore highlighted and documented the traditional knowledge systems associated with *Lantana trifolia* and *Sida cuneifolia* in two selected areas of Central Uganda.

MATERIALS AND METHODS

Study area description

The study was conducted between August and September 2012 in two areas of Central Uganda, Mukungwe and Wabinyonyi sub-counties of Masaka and Nakasongola districts respectively, on traditional usage of *Lantana trifolia* and *Sida cuneifolia*.

Masaka is located in the Lake Victoria basin dominated by tropical grassland vegetation. According to Fungo, Grunwalds (5), the climate regime is characterized by bimodal rainy seasons. The altitude ranges from 1,200-1,260 meters above mean sea level, slopes are gentle to moderate and soils are classified as ferralsols. It is located on the East African plateaus and characterized by hills and ridges that are highly dissected by streams and drainage ways. Agro-economically the area is part of the banana-coffee system and farmers rely on rain fall for cultivation which forms the base of agricultural production. The main inhabitants are Baganda and Luganda is the most widely spoken language. Nakasongola District is located south of Lake Kyoga and forms part of the cattle corridor dominated by semi-arid rangelands. According to Kisamba-Mugerwa (6), this zone covers natural grassland, bush land and wood land. The area is characterized by low and erratic rain fall regimes leading to frequent and severe droughts and fragile soils. Agro-economically, pastoralism is the main activity. The most widely spoken languages in this area are Luruli and Luganda.

Data collection methods

This was a qualitative cross-sectional ethno-botanical study. Methods used included semi-structured interviews, key informant interviews and observations (7, 8). Pre-tested Interview guides were used during the interview sessions and interviews were conducted in Luganda the language used by the locals. Purposeful sampling and snow-ball sampling (9) were used to select the study sites and population. Eighty purposefully selected respondents, 40 per sub-county rich in general ethno-botanical knowledge were selected for semi-structured interviews. The selection criteria also considered study sites with prominent poultry production since use of these plants in poultry farming was important to this study. Eleven key informants were interviewed for classified ethnobotanical knowledge about the two plants which included herbalists, bone-setters and traditional birth attendants.

The data obtained through semi-structured interviews included: general uses, the human ailments treated, use in livestock management especially poultry. The data obtained through key informant interviews included: medicinal preparations and administration, cultural beliefs/values and any conservation efforts. Observations were made on cultivation, availability and the practical use of these plants. The two plants were collected and identified and voucher specimen prepared and preserved as *Lantana trifolia* L. (RN 01) and *Sida cuneifolia* Roxb. (RN 02) at the Botany unit herbarium of Makerere University, Kampala. The names and families of plants were according to Brummitt and Powell (10). Ethical clearance was obtained from the Ethical Review Board of the College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, reference number, VAB/REC/13/05. Permission was sought from the authorities in the study areas. Oral informed consent was also obtained from the respondents.

Data analysis

Data was analysed qualitatively and the methods used for analysis of written records from the interviews were content analysis and thematic analysis (11). Descriptive statistics (frequencies and percentages) were used to express the results.

Quantitative value indices were also calculated for the general uses of these plants. Relative frequency of citation (RFC) was calculated by dividing the frequency of citation (FC) by the total number of informants in the survey: RFC=FC/N (12).

The percentage of respondents who had knowledge (PRK) regarding the use of a species (percent use value) in the treatment of diseases was estimated using the formula: (number of people interviewed citing species/ the total number of people interviewed) × 100 (13).

RESULTS

Gender distribution of respondents

Among respondents for semi-structured interviews, the gender distribution in Mukungwe sub-county showed that 50% of the respondents were males and 50% were females. In Wabinyonyi sub-county, 52.5% were males and 47.5% were females. For the key informant interviews, only one respondent from Mukungwe sub-county was a male while the rest of the fourteen respondents were females.

General uses of *Lantana trifolia* and *Sida cuneifolia* plants

Considering the total frequency citations on plant usage, the knowledge was more distributed amongst females (99 for Mukungwe and 49 for Wabinyonyi) compared to males (20 for Mukungwe and 30 for Wabinyonyi). Respondents in Mukungwe cited uses of these plants more frequently (20 for males and 99 for females) compared those in Wabinyonyi (30 for males and 49 for females). *Lantana trifolia* was most commonly used as herbal remedies with RFC of 0.4625 giving a percentage of 46.25% respondents. *Sida cuneifolia* was commonly used as sweeping brooms and for human medicine with RFC of 0.625, giving a percentage of 62.5% respondents. (Table 1).

Human diseases/conditions that are managed, preparation and administration of the remedies

Cough and common colds were the most commonly cited conditions treated by *Lantana trifolia* with a percentage respondents' knowledge (PRK) of 22.5. *Sida cuneflolia* was most commonly cited for treatment of fractures and sprains (bone setting) with PRK of 36.25 (Table 2).

Uses of *Lantana trifolia* and *Sida cuneifolia* plants in livestock production and management

Lantana trifolia and *Sida cuneifolia* were used in preparation of ethnoveterinary remedies and as an animal fodder. *Lantana trifolia* was commonly used for management of respiratory symptoms and diarrhea in poultry with PRK of 7.5 while *Sida cuneifolia* was commonly used for induction of labour in ruminants with PRK of 6.25 (Table 3).

Cultural beliefs associated with these plants

Locally, *Sida cuneifolia* was called "akakumilizi" or "akeeyeyo" or "akabamba maliba". The word "akakumilizi" comes from a Luganda word, "okukumilira" which means to collect or to gather. This plant was traditionally used to gather and accumulate wealth with the assumption that it brings good luck, hence the name "akakumilizi". The word "akeeyeyo" comes from the word "okweera" literally meaning to sweep, this plant is locally used to sweep compounds. The aerial part of *Sida cuneifolia* was put in the brooms which swept the houses, shops and market stalls for cleansing intentions.

Table 1. General uses of *Lantana trifolia* and *Sida cuneifolia* in central Uganda

Plant uses	Mukungwe FC*		Wabinyonyi, FC		Total FC per plant use	RFC**	Percentage citation
	Males	Females	Males	Females			
Lantana trifolia							
Human medicinal remedies	6	20	4	7	37	0.4625	46.25
Tooth brushes/oral hygiene	4	16	2	5	27	0.3375	33.75
Food (fruits are eaten)	2	5	8	3	18	0.225	22.5
Animal production and management		5		1	6	0.075	7.5
Herbal bath (ekyogero)		4			4	0.05	5
Female genital modification		2			2	0.025	2.5
Cultural rituals		3		3	6	0.075	7.5
Sida cuneifolia							
Human medicinal remedies	5	21	9	15	50	0.625	62.5
Sweeping brooms	3	16	7	14	50	0.625	62.5
Animal production and management		3		1	4	0.05	5
Cultural rituals		4			4	0.05	5
Total frequency citations	20	99	30	49	198		

FC*: Frequency of citation

RFC**: Relative frequency of citation = frequency of citation (FC) divided by the number of informants who were interviewed (n=80).

Table 2. Frequency citations of *Sida cuneifolia* and *Lantana trifolia* in management of human diseases/conditions

Parts used per plant species	Body organ/system treated	Disease/condition	Mode of preparation and administration	Use reports n=80	PRK*
Sida cuneifolia					
Leaves	Respiratory system	Cough and common colds	Squeeze leaves in clean water, wash the face, apply 2-3 drops in the nose	1	1.25
Leaves	Reproductive system	Induction of labour during child birth	Squeeze leaves in cool boiled water, drink 500mls thrice daily	3	3.75
Leaves	Reproductive system	Menstrual pains	Squeeze leaves in cool boiled water, drink 500mls thrice daily	3	3.75
Leaves	Reproductive system	Manhood enhancement	Chew leaf	1	1.25
Leaves	Nervous system	Epilepsy and infant cerebral malaria	Squeeze leaves in clean water, pour on head	2	2.5
Leaves	Nervous system	Dizziness	Squeeze leaves in clean water, pour on head	3	3.75
Leaves	Head	Headache	Squeeze leaves in clean water, pour on head	5	6.25
Leaves	Several organs and systems	Fever	Squeeze leaves in clean water, bath	2	2.5
Leaves, stem	Teeth	Toothache	Chew leaves or stem back	2	2.5
Leaves	Skeletal system	Bone setting	Pound leaves, mix with local cow ghee, align the bones, apply preparation, topically	29	36.25
Leaves	Integumentary system	In rashes due to measles and other skin rashes	Powder mixed with jelly and smeared topically on skin	3	3.75
Leaves	Immune system	Prevention of allergies due to meat consumption	Use powder in to make tea and drink or add in food	2	2.5
Lantana trifolia					
Leaves	Respiratory system	Cough and flue	Boil leaves in water or local banana juice drink or Squeeze leaves to produce juice apply 2-3 drops in the nose Burn leaves to ashes and leak	18	22.5
Roots and Leaves	Respiratory system	Asthma and sinusitis	Burn leaves to ashes and leak or dry roots and pounded to make a fine powder, add 2 tea spoons to 500mls of boiled water, drink	4	5
Leaves	Respiratory system	Chronic rhinitis	Squeeze leaves to produce juice apply 2-3 drops in the nose	2	2.5
Leaves	Reproductive system	Menstrual pains	Boil leaves in water, drink 500mls thrice daily	1	1.25
Leaves	Nervous system	Epilepsy and Infant cerebral malaria	Boil leaves in water, drink 500mls thrice daily	1	1.25
Leaves	Nervous system	Madness	Squeeze leaves to produce juice, apply 2-3 drops in the nose thrice daily	1	1.25
Leaves	Eye	Eye infections (trachoma, conjunctivitis)	Squeeze leaves to produce juice, apply 2-3 drops topically on the eyes thrice daily	3	3.75
Leaves	Ear	Otitis	Squeeze leaves to produce juice, apply 2-3 drops topically on the eyes thrice daily	2	2.5
Leaves	General body systems	Fever	Boil leaves in water, drink 500mls thrice daily	2	2.5
Leaves, Stem	Teeth	Toothache	Steam leaves to soften them, squeeze to produce juice, apply on the affected tooth Or chew clean leaves Or dry leaves and flowers, pound to powder and add salt, apply on a tooth brush and brush the affected teeth Or Brush teeth with the stem	5	6.25
Leaves	Blood	Sickle cell anaemia	Boil leaves in water, drink 500mls thrice daily	1	1.25
Leaves	Stomach	Stomachache	Boil leaves or root in water, drink 500mls thrice daily	2	2.5
Leaves	Integumentary system	Skin rashes due to measles and other skin rashes	Squeeze or boil leaves in water, orally administer 250mls thrice daily Or squeeze leaves, apply topically all over the skin Or powder mixed with jelly and smeared topically on skin	2	2.5

PRK*: Percentage respondents' Knowledge

Table 3. Uses of *Lantana trifolia* and *Sida cuneifolia* in animal production and management

Parts used per plant species	Livestock	Uses	Preparation and administration	Use reports n=80	PRK*
Sida cuneifolia					
Leaves, Roots	Poultry	Management of diarrhea	Squeeze or boil leaves in water, mix in drinking water given to poultry Or pound roots, add to boiled water, mix with drinking water for poultry.	3	3.75
Leaves	Ruminants	Induction of labour during calving	Squeeze leaves in water, administer orally	5	6.25
Leaves	Poultry	Animal feed	Suspend in poultry house with other vegetables	3	3.75
Leaves	Swine		Mix fresh leaves with other feeds	2	2.5
Lantana trifolia					
Leaves, roots	Poultry	Management of respiratory symptoms and diarrhea	Squeeze or boil leaves in water, mix in drinking water given to poultry Or pound roots, add to boiled in water, mix with drinking water for poultry	6	7.5
Leaves	Poultry	Improving egg size, yolk colour and strengthening of the uterus	Dry leaves, mix with other feeds	3	3.75
Leaves	Swine	Animal feed	Mix fresh leaves with other feeds	1	1.25
Leaves	Goats	Animal feed	Goats browse this shrub	4	5

PRK*: Percentage respondents' Knowledge

For prevention of fatal bad omens on babies whose parents committed adultery, *Sida cuneifolia* leaves were squeezed and the parent passed it in his or her hands and topically all over the child's body. This would prevent the child from acquiring bad omens from their parents. The root of *Sida cuneifolia* was also tied around the baby's waist in form of a belt to alleviate conditions like weakness and emaciation which affected infants due to poor birth spacing. When using *Sida cuneifolia* to make any concoction, the practitioner was advised to make the preparations from the leaves on a standing live plant. This was done in an effort to conserve this plant.

Locally, *Lantana trifolia* was called "akayukiyuki akasekera nyonyi" comes from a Luganda word meaning a plant that makes birds happy. The fruits of this plant are so attractive to birds and they eat them especially for deworming purposes. *Lantana trifolia* was also called "akasekera" because the gods are always very happy with it when it is used in most of the cultural rituals. *Lantana trifolia* was involved in most cultural rituals to appease gods. The leaves of *Lantana trifolia* were also put in the "herbal bath" for babies to acquire blessings. People also brushed their teeth using *Lantana trifolia* stem in the morning to acquire good luck and fortune during the day. The stem of *Lantana trifolia* was put on the roof on the house by parents who had stubborn children to prevent them from committing repeated crimes. *Lantana trifolia* was also used to curtail criminal investigations for those who were being accused for crimes.

Plant propagation and distribution

There was limited domestication of these two plants in Wabinyonyi sub-county compared to Mukungwe sub-county. *Sida cuneifolia* was observed frequently on cultivated land and in compounds. In Mukungwe and Wabinyonyi, seventeen and five respondents respectively had this plant in their compounds. It was propagated mainly by seeds through the habit of sweeping the compound hence encouraging seed dispersion. However, it could also be propagated by root stalks. *Lantana trifolia*, was very common in Mukungwe, where it grew mainly in the wild and was rarely cultivated. However, two respondents had *Lantana trifolia* in their gardens. It was mainly dispersed by the birds that eat the fruits but it could also be planted by people using the seeds and the root stalks. In Wabinyonyi, *Lantana trifolia* was very rare and if found, it was only in the wild and never domesticated. Respondents also reported that other *Lantana species* which were more invasive competed with *Lantana trifolia* making its conservation difficult.

Table 4. Previous research findings on the two plants

Species	Reference notes
Sida cuneifolia	
Antimicrobial activity	Showed good antimicrobial activity against *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli*, *Candida albicans* [40]
	Showed good antibacterial activity against *Streptococcus faecalis*, *Staphyloccus aureus*, *Escherichia coli*, *Salmonella typhimurium* [25]
Some perceived traditional claims	Used in Western Uganda for treatment of chest and muscle pains [41].
	Used in Uganda for treatment of HIV and related conditions [42].
	Used in Uganda for fixing of dislocated bones [43]
	Used in Western Uganda by pregnant women for induction of labour [34].
	Used in Southern Uganda for treatment of athlete's foot, broken bones, prevention of miscarriage, eaten by pregnant women to boost foetal health [44].
	Used in Western Kenya for treatment of stomachache [45].
Lantana trifolia	
Bioactivity	The ethanolic and ethyl acetate extracts contain flavone glycosides which exhibit intense sedative effect [23].
	The plant extracts demonstrated good anti-inflammatory in rats in a study in Venezuela [26].
	The leaves contain Umuhengerin, a flavonoid exhibiting good anti Staphylococcal activity [18].
	The aqueous extracts of the chewing sticks from this plant showed good anti-streptococcal activity [27].
	The essential oils from this plant contain sesquiterpenes with good antimycobacterial activity [46].
	This plant showed good antibacterial activity [22].
	Used by the Amazonians for treatment of Central Nervous System disorders and exhibited good psychoactive activity on experimental animals [28].
	The plant was effective in treatment of cutaneous Leishmaniasis [47].
	The plant extracts exhibited good antimicrobial and antiviral activities [20].
	Showed good antibacterial activity against *Streptococcus faecalis*, *Staphyloccus aureus*, *Escherichia coli*, *Salmonella typhimurium* [25].
	The hexane and dichloromethane leaf extracts are active on *Mycobacterium tuberculosis* [21].
	The leaf extracts are active on *Mycobacterium fortuitum* [19]
	The methanol leaf extracts are active on *Staphylococcus aureus* and *Pseudomonus aeruginosa* [24].
Toxicity studies	The ethanol extracts showed mild toxicity on Brine shrimp [48].
Some perceived traditional claims	Used in Bulamogi, Uganda for treatment of cough [49].
	Used in Southern Uganda for oral hygiene [44].
	Used in Rwanda for treatment of gonorrhoea and heart failure [19].
	Used in Rwanda for treatment of angina, gonorrhea and hepatitis [20].
	Used in Uganda for treatment of tuberculosis and related ailments [50].
	Used in Kibale, Western Uganda for treatment of malaria, yellow fever diarrhea and cough [41].
	Used in Nyakayogo sub-county, Western Uganda for treatment of malaria [51].
	An ethnomedicinal plant in Ethiopia [52].
	Used by the people of Kagera region Tanzania for treatment of Malaria [48]..
	Used in Loita, Kenya by Masai people for cultural rituals involving livestock mainly for cleansing and blessing [31].
	Used in Bagamoyo District, Tanzania as an ingredient in ritual bath water and in preparation of medicine which helps to give birth to male children [30].
	The fruits are consumed in Konso, Ethiopia as a wild food plant [29].

DISCUSSION

Studies have been done in some parts of Uganda and the world on *Lantana trifolia* and *Sida cuneifolia* which listed some ethnomedicinal uses with some experimental evaluations of their medicinal values (Table 4). However, the uses of *Sida cuneifolia* in the treatment of epilepsy, infant cerebral malaria, menstrual pains, skin conditions, allergies and manhood enhancement have been documented for the first time. The uses of *Lantana trifolia* in the treatment of asthma, sinusitis, menstrual pains, epilepsy, infant cerebral malaria, madness, eye infections, sickle cell anaemia, stomachache and skin conditions have also been documented for the first time in Uganda. The uses of these two plants to carry out cultural rituals and as livestock feeds have also been documented for the first time in Uganda.

The usage of *Lantana trifolia* and *Sida cuneifolia* plants varied among respondents. According to gender, women were more knowledgeable compared to men. In many human societies, women are in charge of the domestic arena [14] explaining why women are the main upholders of traditions linked to these plants [15]. *Lantana trifolia* and *Sida cuneifolia* had common uses in these two study areas. Consistent pattern of ethnomedicinal usage of plants within or between cultural groups is attributable to probable scientifically reliable biological effectiveness [16]. The common usage patterns could also indicate common ancient culture inherited vertically to these two communities [17].

Lantana trifolia was reportedly used in management of various conditions, which is probably attributed to its biological effects as demonstrated by previous researchers [Table 4]. Management of various infections in humans and livestock could be as a result of its antimicrobial properties as demonstrated by [18-25]. Silva, Martins [26] reported anti-inflammatory activity of *Lantana trifolia*, which probably explains the basis of its use in management of various inflammatory conditions and pains. The use of *Lantana trifolia* for oral hygiene has been reported by earlier studies carried out in Uganda and has been validated for anti-streptococcal activity [27]. The plant also has sedative effects [23] and psychoactive activity [28] hence its use for treatment of nervous conditions. Consumption of *Lantana trifolia* fruits has also been reported in Konso, Ethiopia [29] and this indicates that its use as food is common in the two counties.

The use of *Lantana trifolia* as an ingredient of the herbal bath corresponds with findings by Hurskainen [30] who documented its use in ritual bath water in Bagamoyo District of Tanzania. The use of *Lantana trifolia* for cultural rituals is comparable to that of the Masai in Kenya who use it to cleanse and bless their livestock as reported by Maundu, Berger [31]. Uganda, Kenya and Tanzania are neighboring countries and this may explain the similarities in some of the rituals about *Lantana trifolia*. Previous studies have indicated that plants play an important role in cultural practices, have associated taboos and such lifestyles link people to nature and are important elements of conservation and sustainable use in many cultures [32]. However, this mysterious form of traditional medicine cannot easily be investigated, rationalized or explained scientifically and its explanation is beyond the ordinary scientific human intelligence or intellectual comprehension [33].

The use of *Sida cuneifolia* for inducing child birth seems to be widely practiced since it was also reported in Western Uganda by Kamatenesi-Mugisha and Oryem-Origa [34]. *Sida cuneifolia* contains and therefore provides nutrients such as ascorbic acid, potassium, magnesium and vitamin K that are thought to be associated with improved bone health. In addition it produces alkaline metabolites that might improve bone health by reducing calcium excretion [35]. Plants also contain flavonoids which improve femoral bone mineral density and markers of bone turnover as demonstrated by Hyson [36]. These attributes could be the reasons for their use in bone setting. The use of *Sida cuneifolia* for treatment of diarrhea in poultry has also been cited in earlier studies and this could be attributed to the antimicrobial activity against some disease-causing agents which manifest with diarrhea as a symptom [25, 37].

These plants were more distributed in Mukungwe compared to Wabinyonyi. This is probably because people in Mukungwe made use of these plants more frequently than those in Wabinyonyi. Local communities where traditional cultures persist have been appreciated as repositories not only of knowledge but also of biological diversity [38]. Abandoning these beliefs reduces traditional influences hence potentially leading to destruction of formerly protected natural resources [32]. *Lantana trifolia* was mainly distributed in the wild contrally to *Sida cuneifolia* which was frequently domesticated. There have been concerns about collection of most medicinal plants from the wild and rare domestication, yet wild medicinal plant resources are increasingly under threat from habitat destruction caused by encroachment [39].

CONCLUSION AND RECOMMENDATIONS

The study has revealed that *Lantana trifolia* and *Sida cuneifolia* are useful plants in the traditional knowledge system of central Uganda and therefore conservation and domestication of these plants should be

encouraged. Scientific validation of the therapeutic claims of *Lantana trifolia* and *Sida cuneifolia* should be carried out especially their efficacy and safety since this information is scanty. This will benefit both the scientific world and the consumers of this medicine. There is need to follow up this preliminary study by focusing more on quantitative aspects to establish the general representation of the community. Since this work was carried out in only two sub-counties, the findings do not necessarily represent the entire central Uganda. Similar studies should be done in other areas of this region for comparison purposes.

ACKNOWLEDGEMENTS

The researchers are very grateful to Regional Initiative in Science and Education: African Natural Products Network/ Science Initiative Group (RISE-AFNNET/ SIG) for funding this study.

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