Vol. 14(4), pp. 185-194, April, 2020
DOI: 10.5897/JMPR2019.6847
Article Number: E7C125C63408
ISSN 1996-0875
Copyright © 2020
Author(s) retain the copyright of this article
http://www.academicjournals.org/JMPR

ACADEMIC JOURNALS
expand your knowledge

Journal of Medicinal Plants Research

Full Length Research Paper

Medicinal plants used in gynecological procedures in Uganda

Mercy Gladys Tenywa[1], Amon Agaba[2], Patrick Engeu Ogwang[1], Casim Umba Tolo[1], Clement Olusoji Ajayi[1] and Esther Katuura[3]

[1]Pharm-Biotechnology and Traditional Medicine Center, Mbarara University of Science and Technology, Mbarara, Uganda.
[2]Department of Pharmacy, Faculty of Medicine, Mbarara University of Science and Technology, Mbarara, Uganda.
[3]Department of Plant Science, Microbiology and Biotechnology, College of Natural Sciences, Makerere University, Kampala, Uganda.

Received 24 September, 2019; Accepted 2 January, 2020

Distress and pains among other gynecological challenges mothers go through during childbirth result in mortality. This has compelled people particularly in developing countries to use traditional medicine to induce birth due to lack of more effective alternatives. In Uganda, from time immemorial most child birth and pregnancy related problems have been solved using medicinal plants as a primary alternative to conventional drugs. Although research has been done to document and validate effectiveness of these plants, it is not compil ed for communication to the wider community. This study, therefore, reviewed the medicinal plants used in Uganda for easing childbirth. The study collated and documented medicinal plants used by Traditional Birth Attendants and Traditional Health Practitioners to induce labor and ease child birth in local communities in Uganda and show the gaps that need to be investigated. The available literature on medicinal plants used in Uganda for childbirth were selected from reputable journals using citation databases including Google Scholar, Institute for Scientific Information, PubMed, Scopus, Hinari, and Scientific Information Database among others. Asteraceae, Fabaceae, and Lamiaceae, respectively were the most cited for gynecological uses by various local communities in Uganda. The commonly reported species were *Laggera alata* Sch. Bip., *Tagetes minuta* L, *Clitoria ternatea* Linn and *Ocimum lamiifolium* Hochst ex Benth among others. Authors were also determined to ascertain scientific evidence against analgesic, anti-inflammatory, oxytocic and phytochemical properties of the selected plant species.

Key words: Childbirth, medicinal plant, gynecology, Uganda.

INTRODUCTION

The painful experience women go through during pregnancy and childbirth remains a nightmare for many despite being an essential part of human existence. In sub-Saharan Africa, high maternal mortality has offset high fertility rate whereby 1 out of 20 live births results in mortality yearly (Neema, 2002). This has immensely affected population growth rates in the region. In Uganda specifically, neonatal mortality rate (NMR) remains high

*Corresponding author. E-mail: tenywamercy@yahoo.com. Tel: +256705146443.

Author(s) agree that this article remain permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

at 27 deaths per 1000 live births (Kananura et al., 2016). There is paucity of data on factors associated with NMR in rural communities in Uganda (Kananura et al., 2016). Some of the mortalities could be due to the misuse of herbs due to insufficient scientific evidence. A World Health Organization (WHO) report indicated that about 80% of the world's population depends on herbal medicines for treatment of various diseases (WHO, 2012) and to induce child birth. In Uganda, the Ministry of Health Statistics estimates that about 60% of Ugandans depend on Traditional Medicine for treatment of common diseases and conditions (MoH-UG, 2012). The inaccessibility and severe side effects of many allopathic pharmaceutical medicines could be major contributing factors as to why the rural people resort to the use of herbal medicine as an alternative to treatment of common diseases and conditions in Uganda (Kwesiga, 2002). Medicinal plants belonging to different families and species are used by birth attendants to induce labor, attain relatively painless delivery and hasten fetal delivery (Lipton, 1964; Ojewole and Elujoba, 1982). However, the information is scattered in different papers and repositories and cannot easily be a profitable reference. This study, therefore, collated and compiled the list of medicinal plants generally used in gynecological procedures at birth in Uganda.

METHODOLOGY

The available literatures on medicinal plants used in the management of gynecological conditions during child birth in Uganda were selected from reputable journals using citation databases including Google Scholar, Institute for Scientific Information, PubMed, Scopus, Hinari, Scientific Information Database, etc. A critical review of these medicinal plants was thereafter carried out to collate the information for scientific bases. Specific information sought included plants and parts used**,** method of preparation, mode of administration and ethno pharmacological use. Also recorded was the scientific evidence on the pharmacology and chemical constituents in the plants.

RESULTS

Twenty two plant families and forty two plant species were cited for review in this study. Seven plant parts were evidently used from the same plants and out of which five modes of administration were prescribed. Bathing as one of the most used modes of administration is mainly for energy boosting in pregnancy (Table 1). There are nine methods of preparation and water is used most during the preparation of the medicinal plants.

Herbal plants used to induce labor and ease childbirth in Uganda

Plant species belonging to different families used to induce labor, ease pain and solve other related gynecological problems during childbirth are presented. In addition, the distribution of the plants is presented in Table 1. The plant parts used, methods of preparation, different modes of administration and their traditional use by the local communities are provided. A summary of the plant parts and their preferred mode of administration are shown in Figure 1.

Forty two plant species belonging to twenty two different plant families were reviewed and recorded. The family Asteraceae had the highest number (21%) of plant species used to induce labor and ease childbirth, followed by Fabaceae (10%), Acanthaceae (7.4%), Basellaceae and Euphobiaceae (5%), respectively. Five different modes of administration were observed of which bathing (31.8%) was the most commonly used. Other modes include drinking (22.72%) and oral (22.72%) administration (could be by swallowing or gargling), chewing (15.9%) and topical application (6.81%), respectively.

The pharmacological and chemical compositions of the medicinal plants used by local communities during childbirth in Uganda are shown in Table 2. Most of the plants recorded have at least two chemical constituents that could be responsible for pain relief and associated gynecological activities.

A total of thirty two pharmacological activities were identified in this study. Anti-inflammatory activity was found to be the most common in the validated plants (44%) while antimicrobial (30%), antidiabetic (19%) and analgesic (13%) activities were also reported.

Most of the phytocompounds present in the different plants were: flavanoids (76%), saponins (52%), alkaloids (40%), terpenoids, and glycosides (36%) among other compounds.

Plant parts used in medicinal plant preparations

There are seven recorded plant parts commonly used in traditional treatments (Figure 1). The leaves are used in more than two ways: They are used for bathing (31.8%) and for drinking (22.72%).

Leaves are the most commonly used parts (59%) followed by roots (23%), bark (6%), vine (4%), and flower (4%). While fruits (2%) and seeds (2%) were the least used.

DISCUSSION

This review has documented a number of different plant species belonging to different families used in gynecological procedures in Uganda's local communities. The families Asteraceae, Fabaceae, and Lamiaceae were the most cited for gynecological uses by various local communities in Uganda and the commonly reported

Table 1. Plants used in child birth with other ethno-medicinal use.

Family	Scientific name	Parts used	Method of Preparation	Mode of administration	Ethno pharmacological use	Reference
Acanthaceae	*Acanthus pubescens* L	Root	Decoction	Oral	Fasten up labor	Tugume et al. (2016)
	Justicia heterocarpa L	Leaf	Juice	Bathe early in the morning	Energy booster in pregnancy	
Alliaceae	*Justicia betonica* L	Leaf	Juice	Bathing	Energy booster in pregnancy	Kamatenesi-Mugisha and Oryem-Origa (2007)
	Allium cepa Linn	Leaf	Squeezing by hand	Chewing	Induction of labor	
Amaranthaceae	*Psilotrichum elliotii* Baker	Leaf	Crush in cold water	Bathing	Energy booster in pregnancy	Tugume et al. (2016)
Asteraceae	*Vernonia auriculifera* Heirn	Leaf	Leaves crush in water	Bathing	Delayed labor	Tugume et al. (2016)
		Root	Root is crushed in water	Bathing	Energy booster in pregnancy	
	Mangifera indica L	Bark	Decoction	Drinking	Infertility in women	
	Tagetes minuta L	Leaf	Squeezing by hand	Oral	Induction of labor	Kamatenesi-Mugisha and Oryem-Origa (2007)
	Acmella caulirhiza	Leaf	Squeezing by hand	Oral	Induction of labor	Kakudidi et al. (2016)
	Laggera alata Sch.Bip	Leaf	Squeezing by hand	Oral	Induction of labor	Kamatenesi-Mugisha and Oryem-Origa (2007)
	Ageratum conyzoides L	Leaf	Crush and mix with water	Bathing	Energy booster in pregnancy	Tugume et al. (2016)
	Microglossa angolensis L Oliv.&Hiern	Leaf	Pound and add water	Oral	Energy booster in pregnancy	
	Vernonia lasiopus Schreb	Root	Burn	Chew	Fasten Labor	
		Leaf	Crush in cold water	Bathing	Energy booster in pregnancy	
	Vernonia amygdalina Del	Root	Boil in water	Drinking	Unblock fallopian tubes	Nalumansi et al. (2017)
Basellacea	*Basella rubra* L	Leaf	Decoction from leaves	Drinking	Reduce hip pain during pregnancy	Kamatenesi-Mugisha and Oryem-Origa (2007)
	Basella alba L	Leaf	Dry, pound	Chewing	Delayed in labor	Tugume et al. (2016)
Bignoniaceae	*Kigelia afrricana(Lam)* Benth	Leaf	Half teaspoon boiled	Taken orally as tea	Ease labor	Nalumansi et al. (2017)
Capparaceae	*Cleome gynandra* L	Root	Chew the roots	Chewing	Ease delivery	Tugume et al. (2016)
Chenopodiaceae	*Chenopodium procerun* Hochst	Leaf	Squeezing leaves in water	Bathing	Energy booster during pregnancy	
Convolvulaceae	*Hewittia seblobata* L	Vine	Tie in the waist	Topical	Pregnancy care (widens pelvic girdle)	
Crasssulaceae	*Kalanchoe crenata* Adan	Leaf	Squeezing by hand	Drinking	Induction of labor	Adjanohoun al. (1993)
Euphobiaceae	*Jatropha curcas* L	Leaf	Crush in water	Bath in cold water	Energy booster in pregnancy	Tugu Tugume et al. (2016)
	Recinus communis L	Leaf	Pound, add to water	Bathing		
	Croton macrostachyus L	Vine		Tie in the waist		
Fabaceae	*Clitoria ternatea* L	Flowers	Flowers mixed with honey	Orally and taken early morning	To clean the uterus after delivery and check the bleeding from the uterus	Kamatenesi-Mugisha and Oryem-Origa (2007)

Table 1. Contd.

	Senna absus Mill	Leaf	Pound and add water	Oral	Delayed labor	
Fabaceae	*Crotalaria spinosa* L	Leaf	Crush and mix in water	Oral Bathing	Delayed labor Energy booster in pregnancy	Tugume et al. (2016)
	Dalbergia boehmii L F	Root	Decoction	Drinking	Induction of labor	Pakia and Cooke (2003)
	Ocimum lamiifolium Benth	Leaf	Squeezing by hand	Orally	Induction of labor	Kamatenesi-Mugisha and Oryem-Origa (2007)
Lamiaceae	*Tetradenia riparia* Hochst L	Leaf	Pound, mix in water and bathe	Bathing	Energy booster in pregnancy	Tugume et al. (2016)
	Ocimum bacilicum L	Leaf	Crush and smear	Topical application	Easing pain in pregnancy	Tugume et al. (2016)
Malvaceae	*Sida acuta* Burm.F	Leaf, root	Pound leaf and add water	Drinking	Pain relief	Karou et al. (2003)
	Gossypium herbaceum L	Rook, bark	Decoction	Drinking	Induction of labor	Maundu et al. (2001)
Minesparmaceae	*Cissampelos mucronata* A Rich	Leaf	Pound and add water	Bathing	Energy booster in pregnancy	
Moraceae	*Ficus natalensis* Hochst	Root	Decoction	Drinking	Ease labor and expel retained placenta	Tugume et al. (2016)
Musaceae	*Musa Sapientum* L	Root	Burn the root	Chewing	Induce labor	
	*M.paradisiaca*L	Flower	Pound the sheath	Chewing	Delayed labor	
Myrsinaceae	*Maesa lanceolata* Forssk	Leaf, bark	Squeezing by hand, chewing	Chewing	Induction of Labor	Kamatenesi-Mugisha and Oryem-Origa (2007)
Poaceae	*Cynodon dactylon* L	Seed	Decoction	Drinking	Delayed labor	Tugume et al. (2016)
Portulacaceae	*Talinum portulacifolium* Forssk	Leaf	Squeeze leaf and add water	Bathing	Ease labor	Nalumansi et al. (2017)
Rosaceae	*Rubus pinnatus* L	Fruit	Eat fresh	Oral	Energy booster	Tugume et al. (2016)
Rubiaceae	*Catunaregam nilotica* (Stapf) Tirveng	Root	Decoction	Drinking	Induction of labor	Chhebra et al. (1991)

species were *Laggera alata, Clitoria ternatea* and *Ocimum lamifolium*, respectively. While the most commonly observed plant parts are the leaves; followed by roots and bark. Leaves are commonly used in herbal preparations and this may be advantageous because there is a high benefit to plant conservation as compared to the harvesting of roots and other plant parts (Busia, 2016). Leaves also have high concentrations of secondary metabolites hence their effectiveness.

Most herbal preparations in the local communities by traditional attendants are done by squeezing the plant materials by hand or using the plant part in its whole form. The administration is usually done at the onset of labor for the herbs that fasten labor (Kamatenesi-Mugisha, 2004). Most of the plants with oxytocic activity are labor inducing and when taken in wrong dosages or even before onset of labor; they may act as abortifacients (Kamatenesi-Mugisha, 2004) such as *Sida acuta* commonly used for labor induction but when taken in wrong dosages has abortifacients activities (Karou et al., 2003).

The chemical constituents recorded in this study are of significance as they could be responsible for the pharmacological activities in these plants. Different plants were recorded to have various pharmacological activities. Plants such as *L. alata, C. ternatea*, and *O. lamifoliium* were reported to have analgesic properties by 73, 29.7 were reported to have analgesic properties by 73, 29.7 and 23.8%, respectively (Wu et al., 2006; Panthong et al., 2007; Maity et al., 2012). *Sida acuta* was reported to have hepatoprotective and antiemetic activities (Kirtilar and Basu, 1975).

Several chemical constituents such as essential oils, flavonoids, alkaloids, and saponins were reported to have analgesic, anti-inflammatory and oxytocic activities in the various listed plants. The presence of alkaloids in plants could be responsible for the oxytocic activities observed, for example, Ergot alkaloids (Bowman and Rand,

Table 2. Plants used for child birth, pharmacological effects and their chemical components.

Family name	Plant name	Part used	Pharmacology of the plant	Chemical constituents	Reference
Acanthaceae	*Justicia betonica* L	Leaf	Antitumor, anti-platelet, cytotoxicity, anti-inflammatory, anti-diarrhea, ant malarial	Alkaloids, flavonoids	Caprio et al. (2000), Day et al. (1999), Kanchanapoon et al. (2004), Subbaraju et al. (2004), Sridhar et al. (2006), Navarro et al. (2001a), Katuura et al. (1999), and Bossa et al. (2013)
Alliaceae	*Allium cepa* Linn	Leaf, Bulb	Antiplatelet, antidiabetic, anti-cancer, anti-microbial, anti-oxidant, hepatoprotective, anti-inflammatory	Flavonoids, terpenoids, volatile compounds, minerals (Calcium, Iron, Magnesium) and vitamins (A,E,K,B_6)	Yoichi Ueda et al. (1994), Wang et al. (2012), Kadan et al. (2013), Benmalek et al. (2013), Obioha et al. (2009), and Dorsch et al. (1990)
Asteraceae	*Vernonia auriculifera* Hiern	Leaf, Root	Antibacterial	Tannins, flavonoids, terpenoids, saponins	Prashant et al. (2011), Pradeep et al. (2014) and Dermarsh et al. (2011)
Asteraceae	*Vernonia amygdalina* Del.	Leaf	Oxytocic	Saponins, alkaloids, tannins, flavonoids	Katuura et al. (2019)
Anacardiaceae	*Mangifera indica* L	Bark, Leaf, Fruit	Antioxidant, Antidiuretic, Anti-inflammatory, Anti-parasitic	Flavonoids, triterpenoids, polyphenols, alkaloids, saponins, vitamins (A, B, Carotene)	Scartezzini and Speroni (2000), Shankarnarayanan et al. (1979), Ross (1999), Rocha et al. (2007), Sharma et al. (1997), Diplock Atet al. (1998) and Das et al. (1989)
Asteraceae	*Tagetes minuta* L.	Leaf	Antiseptic, antiplasmodic, anti-inflammatory, antispasmodic, antioxidant, cytotoxic, antibacterial, antihelminthic, antimicrobial, diuretic, antispasmodic	Essential oils, flavonoids terpenoids	Amat (1983), Tereschuk et al. (1997), Shirazi et al. (2014), Shirazi et al. (2014), Oliveira et al. (2016), Giarratana et al. (2017)
Asteraceae	*Laggera alata* (D. Don) Sch.-Bip ex Olivier	Leaf	Hepatoprotective, anti-inflammatory	Essential oils flavonoids	Ekundayo et al. (1989) and Wu et al. (2006);
Basellaceae	*Basella rubra* L	Leaf	Hypoglycemic, larvicidal antibacterial, anti-hyperglycemic, anti-oxidant, anti-inflammatory cytotoxic antigiogenic anti-proliferative	Phenolic acids, sterols, carotenoids, tannins flavonoid terpenoids, saponins	Das et al. (2007), Nirmala et al. (2009), Murakami et al. (2001, 2013), Kumar et al. (2015), Priya et al. (2015), Kilari et al. (2016) and Kumar et al. (2018)
Bignoniaceae	*Kigelia africana (Lam)*Benth	Leaf Root Bark	Cytotoxicity, anticancer, anti-ulcer, anti-inflammatory, and analgesic	Alkaloids, tannins, saponins, glycosides, and flavonoids	Saini et al. (2009), Olatunji and Atolani (2009), Picerno et al. (2005), Adoum (2008), Hussain et al. (2007), Owolabi and Omogbai (2007) and Gouda et al. (2003)
Caesalpinaeceae	*Cassia fistula* Linn	Leaf/ Pod/ Root	Laxative, antiperiodic, depurative, anti-inflammatory antibacterial, antifungal	Tannins, terpenoids, alkaloids, flavonoids saponin, steroids, glycosides, anthraquinone, proteins amino acids	Bhalodia and Shukla (2011), Seyyednejad et al. (2014)

Table 2. Plants used for child birth, pharmacological effects and their chemical components.

Capparaceae	*Cleome gynandra* L	Root, Leaf	Anti-inflammatory, anti-Cancer, anti-diabetic	Flavonoids, phenols, saponins, triterpenes,	Adhikari et al. (2014), Paul et al. (2012), Narendhirakannari et al. (2005), Nagpal et al. (2017) and Das and Ahmed (2017)
Euphobiaceae	*Ricinus communis* L	Leaf	Antifertility, antinociceptive, antioxidant, Hepatoprotective, anti-inflammatory	Steroids, saponins, alkaloids, flavonoids, glycosides	Sani and Sule (2007), Taur et al. (2011), Gupta et al. (2006), Shukla et al. (1992), and Saini et al. (2010)
Euphobiaceae	*Croton macrostachyus* L	Vine	Anthelmintic activities, anti-convulsant, Antidiabetic, anti-diarrhea, anti-inflammatory, antioxidant	Alkaloids, cardiac glycosides, Flavonoids, coumarins, phenolic compouds, saponins, tannins	Eguale et al. (2006), Bum et al. (2012), Geyid et al. (2005), Kamanyi et al. (2009), Teugwa et al. (2013), and Arika et al. (2015)
Fabaceae	*Clitoriaternatea*Linn. (CT)	Leaf	Antipyretic, anti-inflammatory analgesic, diuretic, local anesthetic, antidiabetic, antimicrobial and insecticidal	Triterpenoids, flavonol glycosides, anthocyanins and steroids	Parimaladevi et al. (2004), Kelemu et al. (2004), Mukherjee et al. (2008), Maity et al. (2012)
Lamiaceae	*Ocimum lamiifolium* Benth	Leaf, Flower	Antibacterial, antimicrobial, analgesic, epatoprotective, antioxidant, antimalarial, anti-inflammatory, antifungal, insecticidal, antipyretic	Essential oils (Bornyl acetate, P-cymene,alpha-pinene, beta-pinene, Camphene)	Desta (1993), Makonnen et al. (2003), Mequanint et al. (2011), and Mukazayire et al. (2011)
Lamiaceae	*Tetradenia riparia*	Leaf	Antimicrobial, antifungal, antiallergic, antispasmodic	Alkaloids, saponins, flavonoids, phenols	Sultana and Ata (2008) and Farquar (1996)
Malvaceae	*Sida acuta* Burm. f.	Leaf, Root	Hepatoprotective anti-helminthic, antiemetic, analgesic, abortifacient, anthelmintic, diaphoretic, antipyretic, antimicrobial, antiplasmodial, antimalarial	Alkaloids coumarins, flavonoids, terpenoids, steroids, glycosides and phenolics	Kirtikar and Basu (1975), Prakash et al. (1981), Karou et al. (2003), Karou et al. (2007), Banzouzi et al. (2004), Malairajan et al. (2006), Sreedevi et al. (2009), Ahmed et al. (2011); Konaté et al. (2012)
Malvaceae	*Gossypium herbaceum* Linn	Leaf, Root	Antioxidant	Glycosides, saponins, flavonoids	Tiwar et al. (2011)
Myrsinaceae	*Maesa*, *Lanceolata*, Forssk.	Leaf	Anthelmintic, larvicidal antiviral, molluscicidal antibacterial cytotoxic, antioxidant antileishmanial	Saponins, benzoquinones, flavonoids, glycosides, phenolic compounds, tannins, terpenoids, anthocyanins	Sindambiwe et al. (1999, 2000), Foubert et al. (2009) and Elisha et al. (2017)
Poaceae	*Cynodon dactylon* L	Seed	Anti-diabetic, antibacterial, cardiovascular, antiparasitic, antioxidant, anti-inflammatory	Flavonoids, alkaloids, glycosides, terpenoids, saponins, tannins	Paranjpe (2011), Kumar et al. (2011), Annapurna et al. (2013), Abhishek and Thakur (2012), Nafisi et al. (2012), Pranita et al. (2012), Kazembe and Makusha (2012), Saroja et al. (2012), Rajaretinam and Vincent (2012) and Garg et al. (2011)

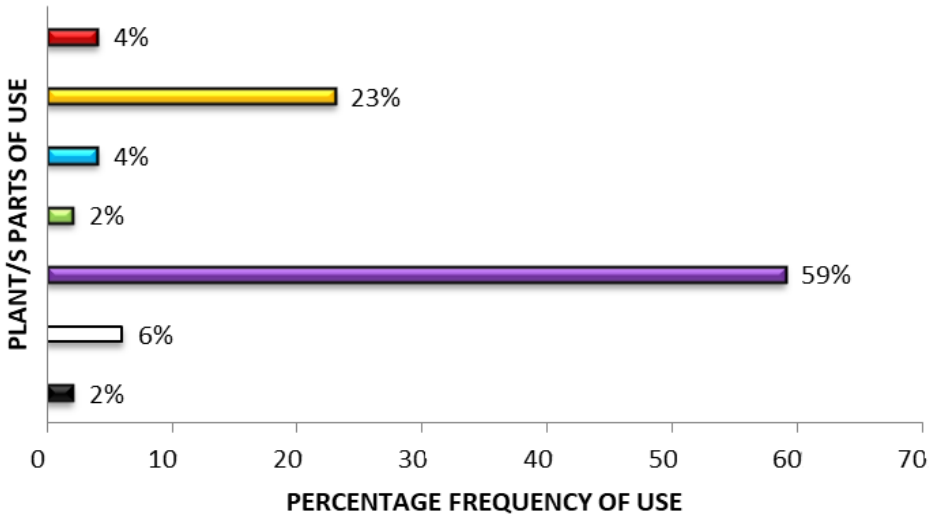

Figure 1. Frequency of the parts used from the plants.

1980). All plants have several chemical constituents which could be responsible for a number of pharmacological activities important during childbirth. Compounds such as flavonoids have a variety of different activities in the human body. They work as anti-inflammatory, anti-platelet, anti-hypertensive, antihepatotoxic, antiviral, antineoplastic, antiulcerogenic and antioxidant (Rodrigo et al., 2010). The appearance of anti-inflammatory activity in most of the plants could be justified by the presence of flavonoids in these very plants (Rodrigo et al., 2010). Coumarin derivatives exert anti-inflammatory and antioxidant activities (Casley-Smith et al., 1986). Terpenoids and essential oils occur as diterpenes, triterpenes and tetraterpenes. When they acquire oxygen, they change to terpenoids and examples are camphor, methanol, fernesol and artemisin. Artemisin is essential as an antimalarial. They also have antimicrobial, analgesic, sedative, anti-inflammatory, spasmolytic and locally anesthetic remedies (Al-Reza et al., 2010).

However, most of these chemicals have not been properly profiled. The need to quantify the active compounds for proper dosages to be derived is important. More so these compounds can be used as lead templates in production of effective medicines that can be used to relieve pain and other complications hence reduce mortalities associated with hard labor.

Conclusion

The study reviewed medicinal plants used in gynecological procedures in local communities in Uganda. Plants documented in this study have been established for their acclaimed ethno botanical use while others are still under investigation. Therefore, this study was able to generate information on their current state in order to guide users on their research status.

ACKNOWLEDGEMENT

The authors would like to acknowledge the Pharm-Biotechnology and Traditional Center (PHARMBIOTRAC), Mbarara University of Science and Technology, Mbarara, Uganda for the fellowship.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Abhishek B, Thakur A (2012). Anthelmintic activity of *Cynodon dactylon*. Journal of Pharmacognosy and Phytochemistry 1(3):1-3.

Adhikari PP, Paul SB, Choudhury MD, Choudhury S (2014). GC-MS studies on the steam-distillate of the medicinally important plant *Cleome gynandra* L. International Journal of Applied Research Studies 3:1-4.

Adoum OA (2008). Determination of toxicity effects of some savannah plants using brine shrimp test (BST). International Journal of Applied Science 2(3):1-5.

Ahmed F, Toume K, Ohtsuki T, Rahman M, Sadhu SK, Ishibashi M (2011). Cryptolepine, isolated from *Sida acuta*, sensitizes human gastric adenocarcinoma cells to TRAIL-induced apoptosis. Phytotherapy Research 25:147-150.

Alencar NMN, Oliveira JS, Mesquita RO, Lima M , Vale M , Etchell JP, Ramos M V (2006). Pro and anti-infl ammatory activities of the latex from *Calotropis procera* (Ait.) R . Br are triggered by compounds fractionated by dialysis. Inflammatory Research 55:559-564.

Amat AG (1983). Pharmacological research for major taxons of Bonaerenses Compositae (in Spanish). Acta Farm Bonaerense 2:23-36.

Annapurna HV, Apoorva B, Ravichandran N, Purushothaman K, Brindha P, Swaminathan S, Vijayalakshmi M, Nagarajan A (2013). Isolation and in silico evaluation of antidiabetic molecules of *Cynodon dactylon* (L). Journal of Molecular Graphics and Modelling 39:87-97.

Arika MW, Abdirahman AY, Mawia AM (2015). In vivo antidiabetic activity of the aqueous leaf extract of Croton macrostachyus in alloxan induced diabetic mice. Pharmaceutica Analytica Acta 6(11):1-5.

Banzouzi JT, Prado R, Menan H, Valentin A, Roumestan C, Mallie M, Pelissier Y, Blache Y (2004). Studies on medicinal plants of Ivory Coast: Investigation of *Sida acuta* for *in vitro* antiplasmodial activities and identification of an active constituent. Phytomedicine 11:338-341.

Benmalek Y, Yahia OA, Belkebir A, Fardeau ML (2013). Anti- microbial and anti-oxidant activities of Illicium verum, Crataegus oxyacantha ssp monogyna and Allium cepa red and white varieties, Bioengineered 4(4): 244-248.

Bhalodia NR, Shukla VJ (2011). Antibacterial and antifungal activities from leaf extracts of Cassia fistula l: An ethnomedicinal plant. Journal of Advanced Pharmaceutical Technology and Research 2(2):104-109.

Bum EN, Ngah E, Mune RMN (2012). Decoctions of Bridelia micrantha and Croton macrostachyus may have anticonvulsant and sedative effects. Epilepsy and Behavior 24(3):319-323.

Busia K (2016). Fundamentals of Herbal Medicine: Major plant families, Analytical Methods, Materia medica, Bloomington, IN: xlibris coporation.

Casley-Smith JR, Casley-Smith JR (1986). In High protein oedemas and the benzopyrones. Sydney J B. Lippincott.

Das A, Ahmed AB (2017). Natural permeation enhancer for transdermal drug delivery system and permeation evaluation: A review. Asian Journal of Pharmaceutical and Clinical Research 10:5.

Das D, Arber N, Jankowski JA (2007). Chemo prevention of colorectal cancer Digest 76:51-67.

Das PC, Das A, Mandal S (1989). Anti-inflammatory and antimicrobial activities of the seed kernel of *Mangifera indica*. Fitoterapia 60:235-240.

Day S, Chiu N, Won S, Lin C (1999). Cytotoxic lignans of *Justicia ciliata*. Journal of Natural Products 62:1056-1058.

Degu A, Engidawork E, Shibeshi W (2016). Evaluation of the anti-diarrheal activity of the leaf extract of Croton macrostachyus Hocsht. Ex Del. in mice model. BMC Complementary and Alternative Medicine 16(1):379.

Desta B (1993). Ethiopian traditional herbal drug part II: antimicrobial activity of 63 medicinal plants. Journal of Ethnopharmacology 39:129-139.

Dewan S, Sangraula H, Kumar V L (2000). Preliminary studies on the analgesic activity of latex of Calotropris procera. Journal of Ethnopharmacology 73(1-2):307-311.

Diplock AT, Charleux JL, Crozier-Willi G, Kok FJ, Rice-Evans C, Roberfroid M (1998) Functional food science and defense against reactive oxidative species. British Journal of Nutrition 80:77-112.

Dorsch W, Schneider E, Bayer T, Breu W, Wagner H (1990). Anti-inflammatory effects of onions: Inhibition of chemotaxis of human polymorphonuclear leukocytes by thiosulfinates and cepaenes. International Archives of Allergy and Applied Immunology 92(1):39-42.

Ekundayo O, Laakso I, Oguntimein B, Hiltunen R (1988).Volatile components of Cleistopholis patens. Planta Medica 54(4):338-340.

.Elisha IL, Dzoyem JP, Botha FS, Eloff JN (2017). The efficacy and safety of nine South African medicinal plants in controlling *Bacillus anthracis* Sterne vaccine strain. BMC Complementary and Alternative Medicine 16:5.

Falade OS, Otemuyiwa IO, Oladipo A, Oyedapo OO, Akinpelu BA, Adewusi SR (2005).The chemical composition and membrane stability activity of some herbs used in local therapy for anemia. Journal of Ethnopharmacology 102(1):15-22.

Farquar JN (1996). Plant sterols and their biological effects in humans, Handbook of Lipids in Human Nutrition. BOCA Rotan HL CRC Press, pp 101-105.

Foubert K, Theunis M, Apers S, Vlietinck AJ, Pieters L (2009). Chemistry, distribution and biological activities of 13,28-epoxy-oleanane saponins from the plant families Myrsinaceae and Primulaceae. Current Organic Chemistry 12:629-642.

Garg VK, Paliwal SK (2011). Anti-Inflammatory of aqueous extract of *Cynodon dactylon*. International Journal of Pharmacology 7(3):370-375.

Giarratana F, Muscolino D, Ziino G, Lo Presti V, Rao R,Chiofalo V, Giuffrida A, Panenbianco A (2017). Activity of catmint (*Nepeta cataria*) essential oil against Anisakis Larvae. Tropical Biomedicine 34(1):22-31.

Geyid A, Abebe D, Debella A (2005) Screening of some medicinal plants of Ethiopia for their anti-microbial properties and chemical profiles. Journal of Ethnopharmacology 97(3):421-427.

Gouda YG, Abdel-baky AM, Darwish FM, Mohammed KM, Kasai R, Yamasaki K (2003). Iridoids from Kigelia pinnata DC. Fruits. Phytochemistry 63(8):887-892.

Gupta MK, Sharma PK, Ansari SH (2006). In-vitro antioxidant activity of the successive extracts of Ricinus communis leaves. International Journal of Plant Sciences 1(2):229-231.

Hao B, Wu Y, Wang J, Hu S, Jasmin D, Hu H, Zhao Y (2012). Hepatoprotective and antiviral properties of isochlorogenic acid A from Laggera alata against hepatitis B virus infection. Journal of Ethnopharmacology 144(1):190-194.

Hussain H, Krohn K, Ahmad UV, Miana GA, Green IR (2007). Lapachol: An overview, Arkivoc 2:145-171.

Iqbal Z, Lateef M, Jabbar A, Muhammad G, Nisar M(2005). Anthelmintic activity of Calotropis procera (Ait.) Ait . F . flowers in sheep. Journal of Ethnopharmacology 102(2):256-261.

Jahurul MHA, Zaidul ISM, Ghafoor K, Al-Juhaimi FY, Nyam K-L, Norulaini NAN, Sahena F, Mohd Omar AK (2015). Mango (*Mangiferaindica* L.) by-products and their valuable components: A review. Food Chemistry 183:173-180.

Kadan S, Saad B, Sasson Y, Zaid H (2013). In vitro evaluations of cytotoxicity of eight antidiabetic medicinal plants and their effect on GLUT4 translocation. Evidence Based Complementary and Alternative Medicine 549345.

Kakudidi E, Kirimuhuzya C, Anywar G, Katuura E (2016). Medicinal Plants Used in the Management of Noncommunicable Diseases in Medicinal Plants Used in the Management of Noncommunicable Diseases in Uganda. In Medicinal Plants-Recent Advances in Research and Development. Springer, Singapore pp. 397-418.

Kamanyi A, Mbiantcha M, Nguelefack TB (2009). Antinociceptive and anti-inflammatory activities of extracts from the stem bark of Croton macrostachyus (Euphorbiaceae) in mice and rats. Journal of Complementary and Integrative Medicine 6(1).

Kamatenesi-Mugisha M, Oryem-Origa H (2007). Medicinal plants used to induce labour during childbirth in western Uganda. Journal of Ethnopharmacology 109(1):1-9.

Kananura RM, Tetui M, Mutebi A, Bua J N, Waiswa P, Kiwanuka SN, Makumbi F (2016). The neonatal mortality and its determinants in rural communities of Eastern Uganda. Reproductive Health 13:13.

Karou D, Dicko MH, Sanon S, Simpore J, Traore AS (2003). Antimalarial activity of *Sida acuta* Burm f. (Malvaceae) and *Pterocarpus erinaceus Poir* (Fabaceae). Journal of Ethnopharmacology 89:291-294.

Karou SD, Nadembega WMC, Ilboudo DP (2007). *Sida acuta* Burm f. A medicinal plant with numerous potencies. African Journal of Biotechnology 6:2953-2959.

Kazembe T, Makusha C (2012). Evaluation of mosquito repellencies of *Capsicum frutescens*, *Carica papaya* and *Cynodon dactylon* extracts and extract mixtures. Bulletin of Environment, Pharmacology and Life Sciences 1(7):34- 40.

Kelemu S, Cardona C, Segura G (2004). Antimicrobial and insecticidal protein isolated from seeds of Clitoria ternatea, a tropical forage legume. Plant Physiology and Biochemistry 42(11):867-873

Kilari BP, Kotakadi VS, Penchalaneni J (2016). Anti-proliferative and Apoptotic Effects of *Basella rubra* (L.) Against 1 , 2-Dimethyl Hydrazine-induced Colon Carcinogenesis in Rats 17:73-80.

Kirtilar KR, Basu BD (1975). Indian Medicinal Plants. Reprint (Ed) Bishen Singh Mahendrapal Singh, Dehradun.

Konaté K, Bassolé IHN, Hilou A, Aworet-Samseny RRR, Souza A, Barro N, Dicko MH, Datt JY, M'Batchi B (2012). Toxicity assessment and analgesic activity investigation of aqueous acetone extracts of *Sida acuta* Burn F. and *Sida cordifolia* L. (Malvaceae), medicinal plants of Burkina Faso. BMC Complementary and Alternative Medicine 12(120):1-11.

Kumar AS, Gnananath K, Kiran D, Reddy AM, Raju Ch (2011). Antidiabetic activity of ethanolic extract of *Cynodon dactylon* root

stalks in streptozotocin induced diabetic rats. International Journal of Advances in Pharmaceutical Research 2(8):418-422.
Kumar BR, Anupam A, Manchikanti P (2018). Identification and characterization of bioactive phenolic constituents , anti-proliferative and anti-angiogenic activity of stem extracts of Basella alba and rubra. Journal of Food Science and Technology 55(5):1675-1684.
Kwesiga CJ (2002). Women's Access to Higher Education in Africa. Uganda's Experience. Fountain Publishers, Kampala, Uganda.
Lanzotti V (2006). The analysis of onion and garlic. Journal of Chromatography A 1112:3-22.
Lipton A (1964). Effects on anaesthesized animals of an oxytocic glycoside extracted from Albizia gummifera. Journal of Pharmacy and Pharmacology 16(6:369.
Mahadevan N, ShivaliKambo P (2009). *Hibiscus sabdariffa* Linn an overview. Natural Products Radiance 8(1):77-83.
Maity N, Nema NK, Sarkar BK, Mukherjee PK (2012). Standardized *Clitoria ternatea* leaf extract as hyaluronidase, ealstase and matrix-metalloroteinase-1 inhibitor. Indian Journal of Pharmacology 44(5):584.
Makonnen E, Debella A, Abebe D, Teka T (2003). Analgesic properties of some Ethiopian medicinal plants in different models of nociception in mice. Phytotherapy Research 17:1108-1112.
Malairajan P, Gopalakrishnan G, Narasimhan S, JessikalaVeni K (2006). Antiulcer activity of *Sida acuta* Burm. Natural Product Sciences 12:150-152.
Mequanint W, Makonnen E, Urga K (2011). In vivo anti-inflammatory activities of leaf extracts of *Ocimum lamiifolium* in mice model. Journal of Ethnopharmacology 134:32-36.
Ministry of Health-Uganda .- MoH-UG (2012). Estimated statistics dependence on Traditional Medicine
Mohd-Esa N, Hern FS, Ismail A, Yee CL (2010). Antioxidant activity in different parts of roselle (*Hibiscus sabdariffa* L.) extracts and potential exploitation of the seeds. Food Chemistry 122(4):1055-1060.
Mukazayire MJ, Allaeys V, Buc Calderon P, Stévigny C, Bigendako MJ, Duez P (2011). Evaluation of the hepatotoxic and hepatoprotective effect of Rwandese herbal drugs on *in vivo* (guinea pigs barbiturate-induced sleeping time) and *in vitro* (rat precision-cut liver slices, PCLS) models. Experimental and Toxicologic Pathology 62(3):289-299.
Mukherjee PK, Kumar V, Kumar NS, Heinrich M (2008). The Ayurvedic medicine Clitoria ternatea From traditional use to scientific assessment 120:291-301.
Murakami T, Hirano K, Yoshikawa M (2001). Medicinal food stuffs. XXIII. Structures of new oleanane-type triterpeneoligoglycosides, Basellasaponins A, B, C, and D, from the fresh aerial parts of *Basellarubra* L. Chemical and Pharmaceutical Bulletin 49:776-779.
Nafisi S, Nezhady MA, Asghari MH (2012). Comparative and mixture effect of Cynodon dactylon, electromagnetic field and insulin on diabetic mouse. Balkan Medical Journal 29(4):345-348.
Nagpal M, Aggarwal G, Jain UK, Madan J (2017). Extraction of gum from Abelmoschus esculentus: Physicochemical peculiarity and antioxidant prepatent. Asian Journal of Pharmaceutical and Clinical Research 10:174.
Neema S (2002). Women's organisations: a gateway to women's health in Uganda. In Tripp AM, Kwesiga JC (Eds), The Women's Movement in Uganda. History, Challenges, and Prospects. Fountain Publishers, Kampala, Uganda, pp 58-71.
Nirmala A, Saroja S, VasanthiHr, Lalitha G (2009). Hypoglycemic effect of *Basellarubra* in streptozotocin - induced diabetic albino rats. Journal of Pharmacology and Phytotherapy 1:025-030.
Nunes MA, Rodrigues F, Alves RC, Oliveira MBPP (2017). Herbal products containing Hibiscus sabdari ff a L., Crataegus spp and Panax spp. Labeling and safety concerns. Food Research International 100:529-540.
Núñez-Sellés AJ, Vélez-Castro HT, Agüero-Agüero J, González-González J, Naddeo F, De Simone F, Rastrelli L (2002). Isolation and quantitative analysis of phenolic antioxidants, free sugars, and polyols from mango (*Mangiferaindica* L.) stem bark aqueous decoction used in Cuba as a nutritional supplement. Journal of Agriculture and Food Chemistry 13:762-766.
Olatunji AG, Atolani O (2009). Comprehensive scientific demystification of *Kigelia Africana*:A review. African Journal of Pure and Applied Chemistry 3(9):158-164.
Obioha UE, Suru SM, Ola-Mudathir KF, Faremi TY (2009). Hepatoprotective potentials of onion and garlic extracts on cadmium-induced oxidative damage in rats. Biological Trace Element Research 129(1-3):143-156.
Ojewole JAO, Elujoba AA (1982). Preliminary Investigation of the Oxytocic Action of an Aqueous Extract of Lagenaria brevifloraFruit. International Journal of Crude Drug Research 20(4):157-163.
Owolabi OJ, Omogbai EKI (2007). Analgesic and anti-inflammatory activities of the ethanolic stem bark extract of Kigelia africana (Bignoniaceae), African Journal of Biotechnology 6(5):582-585.
Padhy BM, Srivastava A, Kumar VL (2007). *Calotropisprocera* latex affords protection against carbon tetrachloride induced hepatotoxicity in rats. Journal of Ethnopharmacology 113:498-502.
Panthong A, Supraditaporn W, Kanjanapothi D, Taesotikul T, Reutrakul V (2007). Analgesic, anti-inflammatory and venotonic effects of Cissus quadrangularis Linn. Journal of Ethnopharmacology 110:264-270.
Paranjpe P (2011). Indian medicinal plants: Forgotten healers. 1st (Ed). Chaukhamba Sanskrit Pratishthan Delhi pp. 75-76.
Paul SB, Choudhury S, Adhikari PP (2012). Isolated chemical components from spider weed, Cleome gynandra Linn: An overview. Assam University Journal of Science and Technology 10:166-173.
Pakia M, Cooke JA (2003). The ethnobotany of the Midzichenda tribes of the coastal forest areas in Kenya : 2 . Medicinal plant uses. South African Journal of Botany 69(3):382-395.
Parimaladevi B, Boominathan R, Mandal SC (2004). Anti-inflammatory, analgesic and antipyretic properties of *Clitoria ternatea* root. Fitoterapia 74:345-349.
Picerno P, Autore G, Marzocco S, Meloni M, Sanogo R, Aquino RP (2005). Anti-inflammatory activity of verminoside from Kigelia Africana and evaluation of cutaneous irritation in cell cultures and reconstituted human epidermis. Journal of Natural Products 68:1610-1616.
Prakash A, Verma RK, Ghosal S (1981). Alkaloidal constituents of *Sida acuta, S humilis, S. rhombifolia* and *S. spinosa.* Planta Medica 43:384-388.
Pranita K, Sawarkar HA, Mishra KK (2012). Antibacterial evaluation of ethanolic extract of *Cynodon dactylon*(L). Pers. Global Journal of Research on Medicinal Plants and Indigenous Medicine 1(6):218-224.
Rajaretinam RK, Vincent SG (2012). Cynodon dactylon and Sida acuta extracts impact on the function of the zebrafish embryos. Journal of Biomedical Research 26:90-97.
Rocha RSM Queiroz JH, Lopes RME, Campos FM, Pinheiro SHM (2007). Antioxidant in mango (*Mangifera indica* L) pulp. Plant Foods for Human Nutrition 62:13-17.
Rodrigo G, Ana LC-R, Adriano LSS, Helton CS, Claire L, Jacqueline A-L, Virginia SL, Mauro M (2010). Teixeira. The flavonoid dioclein reduces the production of pro inflammatory mediators in vitro by inhibiting PDE4 activity and scavenging reactive oxygen species. European Journal of Pharmacology 633:85-92.
Ross IA (1999). New Jersey Totowa: Human Press. Medicinal plants of the world.
Roy S, Sehgal R, Padhy BM, Kumar VL (2005). Antioxidant and protective effect of *Calotropisprocera* against alloxan-induced diabetes in rats. Journal of Ethnopharmacology 102:470-473.
Saini AK,Goyal R, Gauttam VK, Kalia AN (2010). Evaluation of anti-inflammatory potential of *Ricinus communis* Linn. Leaves extracts and its flavonoids content in Wistar rats. Journal of Chemical and Pharmaceutical Research 2(5):690-695.
Saini S, Kaur H, Verma B, Ripudaman, Singh S (2009). Kigelia africana (Lam.) Benth. An Over view. Natural Product Radiance 8(2):190-197.
Saroja M, Santhi R, Annapoorani S (2012). Antioxidant potential of ethyl acetate fraction of Cynodon dactylon against ELA implanted Swiss albino mice. International Journal of Pharmacy and Biological Science 3(2):415-419.
Sani UM, Sule MI (2007). Antifertility activity of methanol extracts of three different seed varieties of *Ricinus communis* Linn. Journal of Pharmaceutical Sciences 6:78-83.
Seyyednejad SM, Maleki S, Damab N, Mirzaei, Motamedi H (2014). Antibacterial Activity of *Prunus mahaleb* and Parsley (*Petroselinum crispum*) Against Some Pathogen. Asian Journal Biological Science 1(1):51-55.

Scartezzini P, Speroni E (2000). Review on some plants of Indian traditional medicine with antioxidant activity. Journal of Ethnopharmacology 71:23-43.

Shahzadi I, Hassan A, Khan UW, Shah MM (2010). Evaluating biological activities of the seed extracts from *Tagetes minuta* L. found in northern Pakistan. Journal of Medicinal Plants and Research 4:2108-2112.

Shankarnarayanan D, Gopalakrishman C, Kameswaran L, Arumugum S (1979). The effect of mangostin, mangostin-3, 6-di-O-glucoside and Mangiferin in carbon tetrachloride liver injury. Mediscope 22:65.

Sharma SR, Dwivedi SK, Swarup D (1997). Hypoglycemic potential of *Mangifera indica* leaves in rats. International Journal of Pharmacology 35: 130.

Shirazi MT, Gholami H, Kavoosi G, Rowshan V, Tafsiry A (2014). Chemical composition antioxidant, antimicrobial and cytotoxic activities of Tagetes minuta and Ocimum basilicum essential oils. Food Science and Nutrition 2(2):146-155.

Shukla B, Visen PKS, Patnaik GK, Kapoor NK, Dhawan BN (1992). Hepatoprotective effect of an active constituent isolated from the leaves of Ricinus communis Linn. Drug Development Research 26(2):183-193.

Sindambiwe JB, Calomme M, Cos P, Totté J, Pieters L, Vlietinck A, Vanden Berghe D (1999). Screening of seven selected Rwandan medicinal plants for antimicrobial and antiviral activities. Journal of Ethnopharmacology 65:71-77.

Singh NP, Gajurel P, Rethy P (2015). Ethnomedicinal value of traditional food plants used by the Zeliang tribe of Nagaland. Indian Journal of Traditional Knowledge 14:298-305.

Sreedevi CD, Latha PG, Ancy P, Suja SR, Shyamal S, Shine VJ, Sini S, Anuja G I, Rajasekharan S (2009). Hepatoprotective studies on *Sida acuta* Burm. Journal of Ethnopharmacology 124:171-175.

Stark TD, Mtui DJ, Balemba OB (2013). Ethnopharmacological Survey of Plants Used in the Traditional Treatment of Gastrointestinal Pain, Inflammation and Diarrhea in Africa: Future Perspectives for Integration into Modern Medicine. Animals (Basel) 3:158-227.

Sultana N, Ata A (2008).Oleanolic acid and related derivatives as medicinally important compounds. Journal of Enzyme Inhibition and Medicinal Chemistry 23:739-756.

Suresh KP, Suresh E, Kalavathy S (2013). Review on a potential herb *Calotropisgigantea*(L) R. Br. Scholars Academic Journal of Pharmacy2(2):135-143.

Taur DJ, Maruti GW, Rajendra SB, Patil RY (2011). Antinociceptive activity of *Ricinus communis* L. leaves. Asian Pacific Journal of Tropical Biomedicine 1(2):139-141.

Tereschuk ML, Riera MV, Castro GR, Abdala LR (1997). Antimicrobial activity of flavonoids from leaves of *T. minuta*. Journal of Ethnopharmacology 56:227-232.

Teugwa MC, Sonfack DC, Fokom R, Penlap BV, Amvam ZPH (2013). Antifungal and antioxidant activity of crude extracts of three medicinal plants from Cameroon pharmacopeia. Journal of Medicinal Plants Research 7(21):1537-1542.

Tilahun G, Gidey M, Mekonnen Y, Eguale T (2006). In vitro anthelmintic activities of four Ethiopian medicinal plants against Haemonchuscontortus. Pharmacology online 3:153-165.

Wang Y, Tian WX, Ma XF (2012). Inhibitory effects of onion (*Allium cepa* L.) extract on proliferation of cancer cells and adipocytes via inhibiting fatty acid synthase. Asian Pacific Journal of Cancer Prevention 13(11):5573-5579.

World Health Organisation (2012). Traditional Medicine in Africa. WHO, Geneva.

Wu Y, Zhou C, Song L, Li X, Shi S, Mo J, Zhao Y (2006). Effect of total phenolics from Laggera alata on acute and chronic inflammation models. Journal of Ethnopharmacology 108:243-250.

Yoichi U, Takako T, Ryuichi M (1994). Composition of Sulfur-Containing components in onion and their flavor. Characters, Bioscience, Biotechnology and Biochemistry 58(1):108-110.