http://dx.doi.org/10.4314/ajtcam.v11i5.11

MEDICINAL PLANTS USED AS HOME REMEDIES: A FAMILY SURVEY BY FIRST YEAR MEDICAL STUDENTS

Constance R. Sewani-Rusike[1*] and Marykutty Mammen[2]

Department of Physiology[1], Department of Medical Biology[2], Faculty of Health Sciences, Walter Sisulu University, P. Bag X1, Mthatha 5117 South Africa.

***Corresponding author E-mail: crusike@wsu.ac.za**

Abstract

Background: There is a hierarchical organisation of knowledge in the use of medicinal plants in communities. Medicinal use knowledge starts in the home and is passed on to family members. Next in the hierarchy are neighbours, village elders and finally, traditional healers being the most knowledgeable. For primary health care this hierarchy is actively followed in seeking remedies for ailments.
Materials and Methods: This study was a survey of medicinal plant knowledge from family members of 1st year medical students registered at Walter Sisulu University. A total of 206 first year medical students participated in this study in 2010 and 2011.
Results: Results revealed 47 species used as home remedies, 32% of which are food plants. Leaves and roots were reported as most commonly used. The top five ailments managed at home were gastrointestinal problems (25 plants), wounds (19 plants), respiratory tract problems (19 plants), infections, including sexually transmitted diseases (19 plants) and pain including headaches (19 plants). Chronic diseases such as hypertension, diabetes, cancer and reproductive ailments also formed a large group of diseases self-managed at home (29 plants).
Conclusion: Family members hold knowledge of medicinal plant use. From this study, first year medical students were made aware of the relationship between common ailments and associated home remedies. This study forms a basis for further study of medicinal plants to validate their use as medicinal remedies.

Key words: medicinal plants, home remedies, medical students, South Africa

Introduction

There is a long history of medicinal plant use in most developing countries. The World Health Organisation (WHO) reports that traditional healers constitute the main source of primary health care for at least 80% of rural populations in developing countries (WHO, 2001). Indeed, an estimated 80% of black South Africans, especially those from the more rural parts of the country, use traditional medicines (Jager et al., 1996; Mander, 1998). The Eastern Cape of South Africa is of low socioeconomic standing and predominantly rural and thus highly dependant on traditional methods of health care (Hirst, 1990). The demand for traditional medicines in the Eastern Cape and in other developing countries is evidenced by the huge multimillion rand industry as reported by Cunningham (1989), Dold and Cocks (2002) and Mander (1998). The distribution of traditional medicine knowledge, specifically concerning medicinal plants is hierarchically placed in the community (Yirga, 2010). Knowledge and services are obtained from family members, neighbours, village elders and finally, traditional healers. For primary health care this hierarchy is actively used even before seeking allopathic medicine (Akerele, 1988). To tap into this undocumented knowledge, we sought to use an "ethnobotanical survey in the classroom" approach (De Beer and van Wyk, 2011). The classroom constituted first year medical students registered at Walter Sisulu University. With the unprecedented explosion in the popularity of herbal preparations especially associated with the HIV/AIDS pandemic and chronic illnesses of lifestyle, patients self-medicate with or without informing their physicians (Erasto et al, 2005; Kaschula and Shackleton, 2012; WHO, 2002).

Therefore medical students are an ideal population for this study. As they prepare for their careers, they should be aware of common medicinal plants most likely used by their potential clients. We anticipated that the study will also reveal the common ailments for which home remedies are employed. Previous studies have demonstrated the desire by medical students to learn more about complementary and alternative medicine (CAM) (Greiner et al, 2000) and medical schools are becoming aware of the need to provide CAM-related education (Astin et al, 2006). Indeed, there are schools of thought in support of incorporating traditional medicine into the National Health Care System of South Africa (Pinkoane et al, 2012). Ethnobotanical studies on medicinal plants have been conducted in the Eastern Cape Province of South Africa, specifically for plants used in the treatment of diabetes (Erasto *et al*., 2005; Oyedemi *et al*.,2009), HIV/AIDS (Otangi et al, 2012), diarrhoea (Bisi-Johnson et al, 2010), cancer (Koduru et al, 2007) and obesity (Afolayan and Mbaebie, 2010). There is no study reported to determine plants used for self medication. 80% of our students are from the O.R Tambo District Municipality of Mthatha in the Eastern Cape of South Africa (Figure 1). This is a predominantly Xhosa speaking area and it is largely rural. Thus, the medical students involved in this study were representative of the O.R Tambo District Municipality population. This study was an ethnobotanical study of plants used for self medication in homes. The knowledge was obtained from family members of 1st year medical students registered at Walter Sisulu University. The information compiled was shared among classmates in the form of oral presentations and written projects.

Method

The study was carried out over a two- year period by first year medical students registered at Walter Sisulu University in 2010 and 2011. Information on folkloric use of plants for management of common ailments was obtained by these students through conversational interviews of family members (Jovel et al, 1996). Students were instructed to obtain information on up to three plants. The information was collected over the April university vacation of both years. The common and scientific names of the plant were reported by the student. Each student was requested to bring a sample of the plant(s) as a "potted" live specimen. Thus where the scientific name was unknown, the plant sample was taken to a botanist for identification and authentication. In addition, botanical names were also searched in literature especially relying on the work of Dold and Cocks (1999) and botanist expert knowledge. Information on the plant part used, what diseases it was used to manage, medication preparation and dosing were also obtained by the student for each plant. Where information was missing for any plant, the result was not reported. A consent form was signed by each of the relatives who participated in this study.

http://dx.doi.org/10.4314/ajtcam.v11i5.11

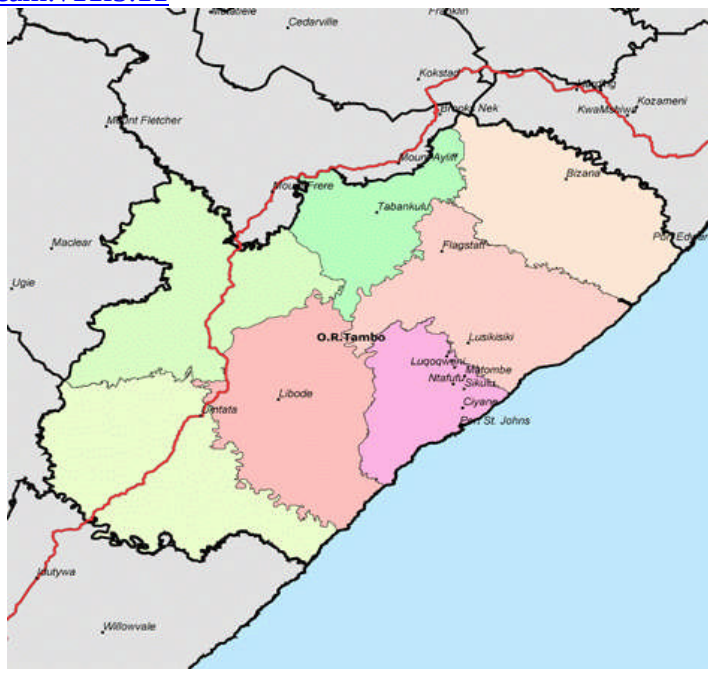

Figure 1: Map showing O.R. Tambo District Municipality. Source: http://www.thinasinako.co.za/files/documents/290806175904.pdf

Data Analysis

Data collected was descriptive and therefore information is presented to show plant botanical and local name, part used and preparation for medicament and frequency of reporting by students. Information on a total of 47 plant species and one animal product (hyraceum) are listed in Table 2.

Results and Discussion

Table 1 shows a breakdown of first year Medical students who took part in this study. A total of 206 first year medical students participated in this study, 98 in 2010 and 108 in 2011 (Table 1). A total of 164 students (80%) have their homes in the Eastern Cape.

Table 1: Characteristics of MBChB 1 students involved in medicinal plant survey in 2010 and 2011.

Parameter	2010 group		2011 Group	
	Number	%	Number	%
Total	98	100	108	100
Male	44	44.9	53	49.1
Female	54	55.1	55	50.9
Age ≤ 19 yrs	49	54.4	68	63.2
Age >19	41	45.6	40	36.8
Black Africans	83	84.7	95	88
Indian	15	15.3	12	12
Eastern Cape	76	77.6	88	81.5
Other Provinces	22	22.4	20	18.5

The result of the present study revealed a total of 47 plant species and 1 animal product (hyraceum) used by members of families of medical students in the management of common ailments at home (Table 2). A total of 498 plant frequency reports were made. Out of the 47 plant species obtained in the present survey, 15 species (32%) are cultivated and used either for direct consumption as food or sold commercially and some are domesticated. These species included *Zingiber officinale, Punica granatum, Opuntia aurantiaca, Ocimum tenuiflorum, Nigella sativa, Mentha piperita, Lavandula spp, Eugenia caryophyllata, Eucalyptus regnans, Curcuma langa, Cinnamomum verum, Calendula officinalis, Aspalatus linearis, Allium sativum* and *Allium cepa*. Since these species are used on a day to day basis, they are therefore easily accessible for household self medications. The use of easily accessible plants for medicinal purposes is also reported in a study in Bangladesh by the Kavijares (Rahmatullah et al, 2010).

The various plant parts used included leaves, stems, roots, barks, flowers and fruits (Table 3). Leaves and roots are most commonly used compared to the other parts. For some species, more than one part is used medicinally. This seems to be a common practice in other cultures too (Giday et al, 2003; Rahmatullah et al, 2010; Wondimu et al, 2007). The majority of plant preparations for oral treatments involve either chewing the plant part to extract the juice or preparation of an aqueous infusion. A few cases report preparation of decoctions which typically involves boiling the plant part (leaf, root, bark) in water. Rarely is a plant dedicated to the treatment of one ailment. In general a single plant is used to treat multiple ailments. Twenty eight (28) plants were used to treat gastro intestinal tract disorders, which included constipation, indigestion, stomach ache an diarrhoea. Nineteen (19) plants were used for treating wounds while eighteen (18) plants each were used for the treatment of respiratory tract problems and infections, especially urinary tract infections and sexually transmitted diseases.

This suggests that these first four are the main ailments afflicting communities of reporting medical students. Indeed, it was interesting to note the high number of plants associated with wound healing in a culture that incorporates circumcision as a coming of age ritual. Post-circumcision treatment

http://dx.doi.org/10.4314/ajtcam.v11i5.11

Table 2: Medicinal plants used for home remedies in the Eastern Cape Province, South Africa.

Plant Species	Local name	Part(s) used and preparation	Uses	No.
Acacia karroo (Fabaceae)	***Umnga***	Leaves: crush, boil and drink infusion	Headache	2
Agathosma apiculata (Rutaceae)	***Ibuchu***	Leaves and roots: chew or make an infusion and drink	Abdominal pain, fever, tiredness, chest congestion, urinary infections	5
Alcea rosea (Malvaceae)	***Inqwabeba***	Leaves: infusion taken orally	respiratory ailments, mental retardation	4
Alepidea amatymbica (Apiaceae)	***Iqwili***	Rhizome roots: cut into pieces and chewed or decoction or infusion taken orally	flu, asthma, good luck charm, coughs	54
Allium cepa (Lilliaceae)	***Onion***	Root bulb: cooked whole or decoction taken orally	colds, flu, coughs, cardiovascular conditions, lower cholesterol, prevents tooth decay	16
Allium sativum (Lilliaceae)	***Garlic; ivimbampunzi***	Root cloves: In food, or take raw orally grated or whole	Hypertension, antibiotic, expectorant, diabetes ,heartburn, lower cholesterol	6
Aloe ferox (Aloaceae)	***Aloe vera; Ikhala***	Leaves – the leaf gel for topical application or crushed leaf in water and taken orally.	sunburns, wounds, nausea, diabetes, acne, obesity, abdominal pain, arthritis, sinus congestion, diarrhea, peptic ulcers	40
Arctostaphylos uva-ursi (Ericaceae)	***Bearberry***	Stem and leaves: Boil and decoction taken orally	diarrhea, kidney problems	3
Artemisia afra (Asteraceae)	***Umhlonyane***	Roots, leaves: Decoction taken orally	fever, colds and flu, nasal congestion, coughs, respiratory problems, blood purifier, earaches, asthma, sweaty feet, headaches, sore throat,	51
Aspalatus linearis (Fabaceae)	***Rooibos, inkanga***	Leaves: boil and drink as tea	insomnia, headaches, nervous tension, hypertension, eczema, stomach cramps, cervical cancer, anti-oxidant, asthma	6
Calendula officinalis (Asteraceae)	***Marigold, ibhosisi***	Flower: dried and mixed with body creams, infusion taken orally	anti-inflammatory, heals wounds, antiseptic, cleanse blood, stomach cramps, gastric ulcers, blood stained urine,	2
Centella eriantha (Apiaceae)	***Iphuzi***	Roots: Decoction taken orally or grind and mix with water then apply topically	Sexually transmitted infections (STI's), erectile dysfunction, burning urination, male infertility wound healing	2
Cinnamomum verum (Lauraceae)	***True cinnamon***	Bark: infusion taken orally or apply topically for bee sting	indigestion, nausea, colds and flu, bee stings	5
Crinum bulbispermum (Amaryllidaceae)	***Ibhucu***	Bulb: Crush and mix with bath water	pimples and rashes	1
Curcuma langa (Zingiberaceae)	***Tumeric***	Roots: infusion taken orally or topical application	antiseptic, arthritis, allergies, asthma, cancer, gastric ulcers, acne, to lower cholesterol levels	12
Cynodon dactylon (Poaceae)	***Uqaqaqa***	Leaves and roots: decoction taken orally or applied topically	sterilise open wounds, anti- inflammatory, nausea	2
Cyrtanthus obliquus (Amaryllidaceae)	***Umathunga***	Leaves: Topical application or infusion taken orally	wound healing, flu, stomach ache	6
Elephantorrhiza elephantine (Fabaceae or Leguminosae)	***Intolwane***	Root infusion taken orally	Stomach ache and other gastrointestinal problems	
Eucalyptus regnans	***Gumtree***	Leaves: Add boiling water and breath in the	Cold and flu, tonsillitis, cough	5

http://dx.doi.org/10.4314/ajtcam.v11i5.11

(Myrtaceae)		steam or drink hot infusion		
Euclea species (Ebenaceae)	***Umtshekesane***	Root: decoction taken orally. Stem chewed and used as toothbrush	Respiratory problems, dental hygiene	11
Eugenia caryophyllata (Myrtaceae)	***Clove***	Flower buds: infusion taken orally	nausea, toothache, indigestion, viral infections, flatulence	4
Helichrysum ordoratissimum (Asteraceae)	***Impepho***	Leaves, stems: boil and steam in it or burn and inhale the smoke, infusion taken orally	fever, cough, insomnia, stomach ache, toothache, headache	18
Helichrysum pedunculatum/ nudifolium (Asteraceae)	***Isicwe***	Leaves: boil and drink; prepare paste and apply topically	Used during male circumcision to heal wound, anti-inflammatory, viral infections, treat allergies, remove stretch marks, skin treatments,	50
Hypoxis hemerocallidea (Hypoxidaceae)	***African potato, Ilabatheka***	Root corm: infusion taken orally, cooked and taken with food, paste applied topically	immune booster in HIV/AIDS infection, blood purification, sunburns, antibiotic, septic sores, headaches, purgative, anti-oxidant, flu, cancer, acne, diarrhea,urinary tract infections, testicular tumors, arthritis, diabetes, prostate gland enlargement,treat infertility	48
Hyraceum	***Umchamo wenfene***	Fossilized rock rabbit urine infusion taken orally	Taken in pregnancy to ease pregnancy complications. Diabetes, prostate problems	66
Kniphofia drepanophylla (Aloaceae)	***Ixonya***	Roots: Decoction taken orally	stomach ache, loss of appetite, gastric worms/parasites	2
Lauridia tetragonia (Celastaceae)	***Umdlavuza***	Leaves: prepare paste with water and apply topically	healing of wounds and blisters	2
Lavandula spp	***Lavender***	Leaves: boil to form paste and apply topically on painful area.	headaches, abdominal cramps, dysmenorrhea	3
Lantana rugosa (Verbenaceae)	***Utywala bentaka***	Leaves infusion taken orally; crushed leaves applied topically	Diabetes, stomach ache, insect repellant	2
Malva parviflora (Malvaceae)	***umajikanelanga,***	Leaves: infusion taken orally; paste applied topically	Stomach aches, wound healing	2
Mentha longifolia (Lamiaceae)	***Inxina***	Leaves	Flatulence, stomach ache, wound healing	2
Mentha piperita (Lamiaceae)	***peppermint***	Leaves and stem: infusion with boiling water taken orally	anti- inflammatory, anti-spasmodic, aromatic, anti- emetic, calm nervousness, antimicrobial, analgesic, stimulant,	3
Nigella sativa (Ranunculaceae)	***Black cumin***	Leaves and fruit: infusion taken orally	stomach ache, lactogogue, diuretic, antipyretic, diabetes, gastric ulcers, jaundice	2
Ocimum tenuiflorum (Lamiaceae)	***Basil***	Stem and leaves: fresh crushed or dried – in food or as an infusion taken orally	anti-inflammatory, night blindness, cough, hypertension ,migraines	2
Opuntia aurantiaca (Cactaceae)	***Itolofiya***	Leaves: burn to ashes and mix with petroleum jelly for topical application; Infusion taken orally	Wound and sore healing, diabetes, Hypertension	2
Pentanisia prunelloides (Rubiaceae)	***Sicimamlilo***	Leaves: grind to form paste and apply on affected area	Healing burns, shingles	2
Portulaca oleracea (Portulacaceae)	***Udywangudywangu***	Leaves: as an infusion taken orally	increase production of breast milk, stomach aches, relieve blisters and corns on feet,	8

http://dx.doi.org/10.4314/ajtcam.v11i5.11

			sore throats, mouth sores, TB, diarrhea,	
Ptaeroxylon obliquum (Rutaceae)	***Umthathi***	Leaves: chewed and juice swallowed	Toothaches, headaches, Hypertension	4
Punica granatum (Lythraceae)	***Pomegranate***	Bark, roots, fruit peel, seed: Decoction taken orally or applied topically	diarrhea, hoarseness or loss of voice, stomach ache, hyperactivity, indigestion, poor appetite, nausea, morning sickness, intestinal worms, fever, skin irritation, bleeding piles	3
Rapanea melanophloeos (Myrsinaceae)	***Itshongwe; umaphipha***	Leaves: infusion/decoction of dried leaves taken orally	diarrhea, stomach ache, headache, anti-emetic, nausea	6
Rumex obtusifolius (Polygonaceae)	***Idolo lenkonyane***	Leaves and roots – infusion taken orally or topical application	Astringent, blood purifier	1
Solanum aculeastrum (Solanaceae)	***Umthuma***	Fruit: burn and inhale the smoke through the mouth	relief of toothache	3
Sutherlandia frutescens (Fabaceae)	***Umnwele***	Leaves and flower petals – Infusion or decoction taken orally	Cancer, inflammation, immune booster in HIV/AIDS infections, antibiotic, stomach ache, fungal infections,	15
Talinum caffrum (Portulacaceae)	***Umhlabelo***	Root: infusion taken orally	Heal fractured/painful bones, nervousness	1
Teedia lucida (Scrophulariaceae)	***uvhete***	Root: infusion taken orally	Hypertension, diabetes	3
Tetradenia riparia (Lamiaceae)	***Iboza***	Leaves: infusion taken orally	stomach ache, diarrhea, coughs, colds, gastric ulcers, respiratory ailments	6
Tulbaghia acutiloba (Alliaceae)	***Isivumbampuzi***	Roots and leaves: Boil and drink the decoction	stomach ache, cough and fever, chest pain, constipation, cramps, headache, colds and flu, detoxification agent	2
Zingiber officinale (Zingiberaceae)	***Ginger; Ujinja***	Root: in food or as an infusion taken orally	antibacterial, period pains, muscle cramps, cold and flu, cough	3

http://dx.doi.org/10.4314/ajtcam.v11i5.11

Table 3: Parts of medicinal plants used to treat various ailments

Part used	Number of species
Leaf	28
Root	20
Stem	3
Flower	3
Fruit	3
Bark	2
Seed	1

may account for this high reporting of plants used for wound healing. Other ailments for which home remedies are used include general pain including toothache (11) and headaches (8); chronic illnesses such as diabetes (7), hypertension (5) and cancer (3); reproductive ailments including erectile dysfunction, prostate problems and infertility (6), dysmenorrhoea (5) and lactation problems (3). Thus pain, chronic diseases and "embarrassing" illnesses such as STI's and reproductive ailments seem to be managed at home. In an area with high HIV prevalence, only 2 plants are reported as immune boosters in HIV infection. This may be because treatments in the home are mostly associated with management of AIDS associated opportunistic infections which commonly affect the gastrointestinal and respiratory systems, correlating with the high reporting of these ailments in our study. This study therefore, while primarily revealing plant species used as home remedies, it also highlights the common ailments for which home remedies are used. From this study, first year medical students were made aware of this relationship of common ailments and associated home remedies. It was, indeed, a fundamental lesson for the medical students, early in their careers, that their potential patients will most likely have taken a home remedy prior to presenting themselves to the hospital. Studies have shown that patients first seek medicinal plants before presenting to a primary health care clinic or practitioner. This study also forms a basis for further study of these plants to validate their use as medicinal remedies.

Conclusion

The results of the study revealed that there is rich diversity of medicinal plants used to treat various ailments in the Eastern Cape of South Africa. Families and the local community in the study area possess diverse knowledge of medicinal plants used as home remedies for common ailments. It is interesting to note that domesticated plants are also used as home remedies, thus making the medicaments readily available without fears of sustainable harvesting methods. This study highlights the inherent knowledge in communities concerning medicinal plants – knowledge that is culturally passed down from generation to generation.

Acknowledgements

We wish to acknowledge WSU medical students, their parents and relatives who enthusiastically participated in this study. Without their willingness to participate, this study would not have been possible. We also wish to acknowledge NRF interns who were working with us in this study.

References

1. Afolayan A.J., and Mbaebie B.O. (2010). Ethnobotanical study of medicinal plants used as anti-obesity remedies in Nkonkobe Municipality of South Africa. Pharmacog J 2(11): 368–373.
2. Akerele-Curare O. (1988). Medicinal plants and primary health care: An agenda for action. Fitoterapia 59: 355–363.
3. Astin J.A., Soeken K., Sierpina V.S., and Clarridge B.R. (2006). Barriers to the integration of psychosocial factors in medicine: results of a national survey of physicians. J Am Board Fam Pract 19(6):557–565.
4. Bisi-Johnson M.A., Obi C.L., Kambizi L. and Nkomo M. (2010). A survey of indigenous herbal diarrhoeal remedies of O.R. Tambo district, Eastern Cape Province, South Africa. Afr J Biotechnol 9(8):1245-1254
5. Cunningham AB (1989). Herbal medicine trade: a hidden economy. Indicator South Africa 6:51–54.
6. De Beer J., and van Wyk B.E. (2011). Doing an ethnobotanical survey in the life sciences classroom. Am Biol Teach 73(2):90–97.
7. Dold A.P. and Cocks M.L. (2002). The trade in medicinal plants in the Eastern Cape Province, South Africa. SAJS 98:589-597.
8. Dold A.P., and Cocks M.L. (1999). Preliminary list of Xhosa plant names from the Eastern Cape,South Africa. Bothalia, 29(2):267-292.
9. Erasto P., Adebola P.O., Grierson D.S., and Afolayan A.J. (2005). An ethnobotanical study of plants used for the treatment of diabetes in the Eastern Cape Province, South Africa. Afr J Biotechnol 4:1458-1460.
10. Giday M., Asfaw Z., Elmqvist T., and Woldu Z. (2003). An ethnobotanical study of medicinal plants used by the Zay People in Ethiopia. J Ethnopharmacol, 85:43-52.
11. Greiner K.A., Murray J.L., and Kallail K.J. (2000). Medical student interest in alternative medicine. J Altern Complement Med 6 (3):231–234.
12. Hirst M. (1990). The healer's art: Cape Nguni diviners in the township of Grahamstown. PhD thesis, Rhodes University, Grahamstown.
13. Jager A.K., Hutchings A., and Van Staden J. (1996). Screening of Zulu medicinal plants for prostaglandin-synthesis inhibitors. J Ethnopharmacol 52:95-100 Jovel E.M., Cabanillas J. and Towers G.H.N. (1996). An ethnobotanical study of the traditional medicine of the Metizo people of Suni Mira_o,Loreto, Peru. J Ethnopharmacol 53:149-156.
14. Kaschula S. and Shackleton C.M. (2012). How do HIV and AIDS impact the use of natural resources by poor rural populations? The case of wild animal products. SAJS 108(1/2):1-9.
15. Koduru S., Grierson D.S. and Afolayan A.J. (2007). Ethnobotanical information of medicinal plants used for treatment of cancer in the Eastern Cape Province, South Africa. Curr Sci 92(7):906-908.
16. Mander M. (1998). Marketing of Indigenous Medicinal Plants in South Africa. A Case Study in KwaZulu-Natal. Food and Agriculture Organization, Rome.
17. Otangi W.M., Grierson D.S. and Ndip R.N. (2012). Ethnobotanical survey of medicinal plants used in the management of opportunistic fungal infections in HIV/AIDS patients in the Amathole District of the Eastern Cape Province, South Africa. J Med Plant Res 6(11):2071-2080.
18. Oyedemi S.O., Bradley G. and Afolayan A.J. (2009). Ethnobotanical survey of medicinal plants used for the management of diabetes mellitus in the Nkonkobe municipality of South Africa. J Med Plant Res, 3(12):1040-1044.
19. Pinkoane M.G., Greeff M. and Koen M.P. (2012). A model for the incorporation of the traditional healers into the National Health Care delivery system of South Africa. Afr J Tradit Complement Altern Med 9(3S):12-18.
20. Rahmatullah M., Ferdausi D., Mollik A.H., Jahan R., Chowdhury M.H. and Haque W.M. (2010). A survey of medicinal plants used by Kavirajes of Chalna area, Khulna district, Bangladesh. Afr J Tradit Complement Altern Med 7(2):91–97.
21. Wondimu T., Asfaw Z .and Kelbessa E. (2007). Ethnobotanical study of medicinal plants around 'Dheera' town, Arsi zone, Ethiopia. J Ethnopharmacol 112:152-161.
22. World Health Organization (WHO) (2001). Legal Status of Traditional Medicine and Complementary/ Alternative Medicine: A Worldwide Review. WHO 2001, Geneva.
23. World Health Organization (WHO): WHO traditional medicine strategy 2002–2005. WHO, Geneva.
24. Yirga G. (2010). Assessment of indigenous knowledge of medicinal plants in Central Zone of Tigray, Northern Ethiopia. African Journal of Plant Science 4(1):006-011.