

Full Length Research Paper

An ethnobotanical study of medicinal plants in Debre Libanos Wereda, Central Ethiopia

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An ethnobotanical study of medicinal plants in Debre Libanos Wereda, in central Ethiopia, was carried out from October 2008 to June 2009. A total of 60 informants were interviewed that include knowledgeable farmers, monks, nuns, herbalist farmers and full time herbalists. A total of 83 medicinal plants classified under 77 genera and 46 families were collected. Asteraceae were the most prominent family (7) species and (6) genera, followed by Fabaceae and Lamiaceae that contain four species in three genera each. These plant species were found to be used in treating 50 different types of human and livestock diseases. The majority (77.1%) were wild species whereas 22.9% of the reported medicinal plant species were cultivated in home gardens. Higher numbers of species (46.6%) were harvested for their leaves, followed by roots, seeds and fruit (14.56, 13.59 and 6.80%, respectively). Vast knowledge on the traditional uses of these plants is conveyed from one generation to the next generation through words of mouth. As a result, there is a need for urgent biodiversity conservation of the area and the indigenous traditional ethnobotanical knowledge.

Key words: Ethnobotany, medicinal plant, herbalist, disease, mode of preparation.

INTRODUCTION

Ethnobotany is the study of the relationships between plants and people with a particular emphasis on traditional cultures. The traditional use of plants to fulfill daily needs dates back to the beginning of human civilization and continues to date. Still traditional medicinal plant knowledge is the integral part of culture of many Asian and African countries indigenous community (Subramanyam et al., 2008; Bekalo et al., 2009). In Ethiopia, utilization of medicinal plant remedies in preventing or curing various ailments still plays a

significant role in most parts of the country (Birhan et al., 2011; Giday and Teklehaymanot, 2013; Tolossa et al., 2013). Particularly, traditional herbal healing is widely practiced throughout the rural population as their primary healthcare system (Yineger and Yewhalaw, 2007; Seid and Tsegay, 2011).

There is a high expectation of enormous traditional knowledge and use of medicinal plant species in Ethiopia due to the existence of diverse languages, cultures, beliefs and significant geographical diversity which

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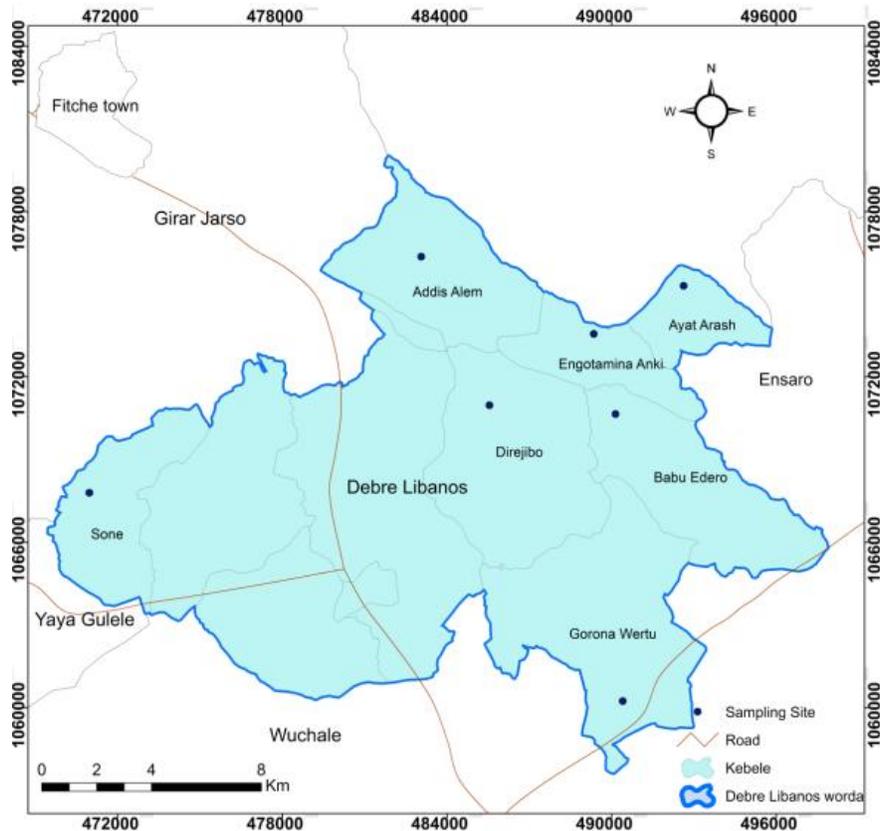


Figure 1. Location map of the study area. Data Source: Ethio-gis collected by ECSA (Ethiopian Central Statistics Authority, 2008). Software ArcGIS 9.2 was also used.

avored the formation of different habitat for medicinal plant (Cunningham et al., 2001). In Ethiopia, it has been estimated that traditional remedies are the most important and sometimes the only source of therapeutics for nearly 80% of the population of which 95% of traditional medicinal preparations are of plant origin (Hamilton, 2003). Much of the knowledge on traditional medicine is available in rural communities. Most of them are perpetuated by word of mouth within family or small community. However, since cultural systems are highly dynamic, these skills are likely to be lost when the communities emigrate to towns or regions, or if the local ecology is significantly changed (Suleman and Alemu, 2012). Furthermore, the high population pressure and its related consequences like increased need for agricultural land, settlement, fuel wood, house construction, and income generation have led to an extreme reduction of medicinal plant in all over their ranges (Bekalo et al., 2009; Belayneh et al., 2012). Teklehaymanot et al. (2006), attempted to study the medicinal plants of the present study area. But, the study covered small area as compared with the total coverage of Dere Libanos Wereda. In addition to this, the study was not able to determine the knowledge difference between the villagers and the Monastery dwellers. From this very fact, the

present study on the use and management of traditional medicinal plants by indigenous people in Debre Libanos Wereda has been initiated to complete the remaining task or to fill the research gap indicated by Teklehaymanot et al. (2006).

MATERIALS AND METHODS

The study area

The study area is located in central part of Ethiopia at about 104 km north of the capital city and situated between $38^{\circ} 05' 01''$ to $38^{\circ} 05' 51''$ E longitude and $9^{\circ} 40' 11''$ to $9^{\circ} 40' 51''$ N latitude (Figure 1). The total area coverage of the study area is 29,776 hectares. The study area encompasses ten peasant associations (rural administrative divisions) and one Administrative town. Interviews were carried out in seven peasant associations (sampling sites) (Figure 1). The total population of the study area is 62,830, of this about 90.4%, that is, 56,798 people live in rural area. The altitudinal range of the study area is between 1500 and 2700 m.a.s.l (Kemal et al., 1996).

The area is characterized by bimodal rainfall during the long rainy season (June to September) and shorter rainy season (March to April). The highest average monthly rainfall was recorded in July (353.99 mm) and the lowest in November (5.5 mm). The daily average maximum temperature was recorded in the month August (17.67°C) and daily average minimum temperature 6.14°C

(Kemal et al., 1996).

The most frequent soil type in the area is blackish and red soil. Black soil being dominant of all constitutes about 56% (16,675 hectare), while the red soil comprises 38% (11,341 ha) and the rest 6% (1,787 hectare) are mixture of different soil type. The soil texture is 63% clay, 27% silt and 10% sand (Kemal et al., 1996). The vegetation of the study area is characterized by, *Acacia-Commiphora* dominate at lower elevations, old remnant afro montane forest in the middle altitudes, and grasslands dominant at higher elevations in the highlands. The old afromontane forest in the middle altitude is owned by Debre Libanos Monastery of Ethiopian Oriental Orthodox Church. The common vegetations in the study area are mostly remnants of trees in agricultural fields, bushes, shrubs and secondary forests. The common plant species of the study area include *Allophylus abyssinicus* (Hochst.) Radlk, *Acacia abyssinica* Benth., *Prunus africana* (Hook.f.) Kalkman, *Juniperus procera* Hochst. ex Endl. and *Olea europaea* subsp. *cuspidata* (Wall. & G.Don) Cif.

Methods

Ethnobotanical data were collected from November 2008 to January 2009. Data were collected through observation, site and informant selection, semi structured interviews, guided field walks with informants, and group discussions to obtain indigenous knowledge of the local community on medicinal plants. Local people were involved during the whole period of investigation as a guide, informants, and as technical assistances. Seven informants were asked to rank five medicinal plants that are used to treat ascariasis. Seven informants were selected from local people for pair wise comparison of medicinal plants used to treat wound.

Two types of interviews were carried out; semi structured interviews and focused group discussion. A total of 60 (50 males and 10 females) informants that include knowledgeable farmers, monks, nuns, herbalist farmers and full time herbalists, were selected. The informants were grouped into three age groups, young (27-35), adult (36-50) and elderly (above 50) to see how the knowledge varies with age. Among them 15 key informants were selected based on the information obtained from knowledgeable elders and local authorities (Development Agents workers and Peasant associations administration leaders). The other 45 informants were selected randomly from the local people of the study area to record general knowledge about plant use. This was done by tossing a coin and using him/her as informant whenever head of the coin face up if he/she volunteered to participate.

Semi-structural interviews were conducted in a place where the informants were most comfortable and during the time they have chosen. Discussion was made with volunteer traditional healers and knowledgeable farmers on the knowledge and use of important medicinal plants. At the time of discussion all informants were allowed to talk freely without interruption.

Plant identification was carried out by voucher specimens collection. Preliminary identification of the collected specimens was made in the field, and then they were dried, deep-frozen and identified in the National Herbarium (ETH), housed in Addis Ababa University using the published volumes of the Flora of Ethiopia and Eritrea and by comparing with authentic herbarium specimens and finally confirmed by assistance of taxonomists.

Data analysis

Data was analyzed and summarized using descriptive statistics such as percentage and frequency. Fisher facility was employed to identify the most common ailments in the study area. In addition to this preference ranking, paired comparisons were made for some selected medicinal plants based on methods given by Martin (1995)

and Cotton (1996). In the preference ranking exercise, an integer value (1, 2, 3, 4 and 5) was given, where the most important medicinal plant was given the highest value (5), while the least important is assigned a value of "1". These numbers were summed for all respondents, giving overall ranks to the medicinal plants. Informant consensus factor was also computed to evaluate the reliability of information recorded during the interview using the formula below (Martin, 1995):

$$ICF = \frac{n_{ur} - n_i}{n_{ur} - 1}$$

Where n_{ur} is citations in each category, n_i = number of species used.

RESULTS

A total of 83 medicinal plant species, distributed across 46 families and 77 genera, have been reported to be utilized by the local people in Debre Libanos Wereda as a remedies against various human and livestock ailments (Table 1). Asteraceae appeared as the most prominent family that contains 7 species, within 6 genera, followed by Lamiaceae and Fabaceae (4 species, 3 species). 83 medicinal plant species reported by local peoples in the study area as remedies for human and livestock diseases, 77 species (92.7%) are reported as a remedy for human ailments and 6 species (7.3%) for livestock.

Herbs were the dominant life forms among the reported medicinal plants that contained 32 species (38.6%) followed by shrubs with 30 species (36.1%). Trees (15 species, 18.1) and climbers (6 species, 7.2) were least abundant life forms of medicinal plants recorded from the area. Among the medicinal plant species recorded in the study area, the majority 64 species (77.1%) were wild, whereas 19 species (22.9 %) were cultivated in home gardens.

Plant parts widely used by local people in the study area to treat human and livestock diseases include leaves, root, seed, and fruits. The maximum percentage of the species (46.6%) was harvested for their leaves followed by roots, seed and fruit (14.56, 13.59 and 6.80%) respectively as a source of remedies. Other parts consist of only 18.45% (Table 1).

A significant percentage (54.3%) of the medicinal plant was used in fresh form for remedy preparations. Relatively few medicinal plants (34.9 %) were reported to be used in dried form and the remaining very few medicinal plants were reported to be used either fresh or dried (10.8%). Very common methods of remedy preparation in the study area were reported to be through crushing or pounding the usable part by using wooden or stone made material that cover 50.64% followed by squeezing (12.84%), chewing (11.0%), decoctions (7.34%), covering (6.42%), chopping (3.67%) and smoke (1.84%) (Figure 2). Local peoples also used additives such as butter, edible oil for wound and skin disease, and they used coffee, honey, and local beverages like

Table 1. Plant species used for treatment of human and livestock diseases and their mode of preparation and application in Debre Libanos Wereda, Ethiopia.

S/N	Botanical name	Family name	Local name	Disease treated	Mode of preparation and application
1	<i>Acacia abyssinica</i> Hochst. ex Benth.	Fabaceae	Girar	Goat intestinal parasite Nose bleeding	Crush the seed together with fruit and make a juice by mixing with cold water; give to the infected animal as a drink Squeeze flashy leave and drop to nostrils.
2	<i>Achyranthes aspera</i> L.	Amaranthaceae	Tilenj	Anthrax Eye	Crush the leaves and mix with fruit of <i>Cucumis ficifolium</i> and make a juice with cold water then give the cattle as a drink. Squeeze the leave and drop the fluid in to the eye.
3	<i>Allium cepa</i> L.	Alliaceae	Keye shinkurt	Asma malaria	Squeeze the bulb and take one tea spoon every morning Chew the bulb and swallow it
4	<i>Allium sativum</i> L.	Alliaceae	Nech shinkurt	Common cold Snake bit Abdominal pain	Crush the bulb and swallow it. Additionally, insert the bulb in the nostrils. Crush the bulb and put it on the site of bites and tie it Crush the bulb and mix with honey take a tea spoon each morning.
5	<i>Allophylus abyssinicus</i> (Hochst.) Radlkofer	Sapindaceae	Enbis	Skin itching	Squeeze the leave and rub on the skin
6	<i>Amaranthus caudatus</i> L.	Amaranthaceae	Bahr tef	Intestinal disorder Diarrhea	Crush the seed and mix with black teff flour then make a bread to eat. Squeeze the leaves and make a juice
7	<i>Artemisia rehan</i> L.	Asteraceae	Arity	Diarrhea	Boil leaves with water and dink half cup of coffee the hot decoction every day
8	<i>Asparagus africanus</i> Lam.	Asparagaceae	Serity	Abdominal pain. Tooth ache	Fresh root of this plant is chewed and swallowed Chew the root and hold it near the infected teeth.
9	<i>Bersama abyssinica</i> Fresen.	Melanthaceae	Azamir	Ascaris	Fresh leaves are boiled in water and drunk for three consecutive days.
10	<i>Brassica oleracea</i> L.	Brassicaceae	Yabesha gomen	(Stomack burn	Boil the leaves and mixed with oil of <i>Nigela sativa</i> L. and eat with injera.
11	<i>Brusea antidysenterica</i> J.F.Mill.	Simaroubaceae	Abalo	Wound and Skin itching	Crush leaves and mix with butter then cover the wound
12	<i>Buddleja polystachya</i> Fresen.	Loganiaceae	Anfar	Eye disease	Squeeze the leave and drop on the infected eye
13	<i>Calotropis procera</i> (Ait.) Ait.f.	Asclepiadaceae	Kobo	Wound	Squeeze fresh leave and pour the content on wound, or put the leave on fire then cover the wound with fired leave.
14	<i>Calpurnia aurea</i> (Alt.) Benth.	Fabaceae	Digita	Abdominal pain External parasite	Crush the leave and mix with coffee powder then make a juice with water. Chop the leave and put it in water for few days then wash the affected site.

Table 1. Contd.

15	<i>Capparis tomentosa</i> Lam.	Capparidaceae	Gumero	Spiritual disorder For any sudden ailment	Crush the root and put it on fire and smoke the bedroom of the patient Crush the root and mix with Tela then a glass of the mixture is given as a drink.
16	<i>Carica papaya</i> L.	Caricaceae	Papaya	Amoeba	Crush seeds and mix with honey and water then drink the juice each morning for a week.
17	<i>Carissa spinarum</i> L.	Apocynaceae	Agam	Spiritual disorder (unable to sleep at night) Evil eye	Make a powder from the root and mix with water, put a spoon full in to a cup of coffee and drink Smoke the root all over the body of the patient
18	<i>Catha edulis</i> (Vahl.) Forssk. ex Endl.	Celastraceae	Chat	Coughing	Boil the leave and stem with water then add honey and then set it aside to get cooled. At last drink a glass of cold mixture.
19	<i>Citrus limon</i> (L.) Burm.f.	Rutaceae	Lomi	Asma	Boil the leave of <i>Citrus limon</i> together with stem of sugarcane then drink hot decoction.
20	<i>Clematis simensis</i> Perr and Guill	Ranunculaceae	Yeazo hareg	Wound	Leaf of <i>Clematis simensis</i> are crushed, smashed and tied on wound.
21	<i>Clerodendrum myricoides</i> (Hochst.) R.Br.ex Vatke.	Verbenaceae	Misireg	Spider poison	Crush leaves and mix with butter then rub on the affected skin.
22	<i>Cordia africana</i> Lam.	Boraginaceae	Wanza	Gastric ulcer	The seed is Chewed and swallowed
23	<i>Croton marcostachyus</i> Del.	Euphorbiaceae	Bisana	Skin disease	The leaves are squeezed and the content is dropped on the infected site.
24	<i>Cucumis ficifolium</i> A.Rich.	Cucurbitaceae	Yemdir enboay	Wound Snake bite	Roots are Crushed and mixed with butter are put on wound. Chewing the root and swallowing the juice only
25	<i>Cucurbita pepo</i> L.	Cucurbitaceae	Duba	Tape worm	Roost the seed and eat
26	<i>Datura stramonium</i> L.	Solanaceae	Astenagir	Dandruff Wound	Crush leaves and seed of this plant mix with butter then apply the paste to affected area (head). Leaves are crushed and applied to affected area.
27	<i>Diplophium africanum</i> (Turez.)	Apiaceae	Feres zeng	Ascariasis	Squeeze leaves, mix with water and drink (for children)
28	<i>Dodonaea angustifolia</i> L.f.	Sapindaceae	Kitkita	Wound	Leaves are crushed and applied on wound
29	<i>Dorstenia barnimiana</i> Schweinf.	Moraceae	Work bameda	Leprosy	Crush the root, mix with seeds of <i>Lepidium sativum</i> L. and sorghum flour and then extract local alcohol (Areke) from it, then the patient drinks it until he/she recovers.
30	<i>Dovyalis abyssinica</i> (A.Rich.) Warb.	Flacortiaceae	Yabesha Qoshm	Hypertension Acariasis Bleeding gum	Root and stem tuber are smashed, mixed with 'Tela' and drink Boil seeds with water and drink. Eat fresh fruit
31	<i>Ekebergia capensis</i> Spamm.	Meliaceae	Sembo	Skin rash	Crush leaves and mix with butter and apply on the site of infection.

Table 1. Contd.

32	<i>Eucalyptus globulus</i> Labil	Myrtaceae	Nech bahirzaf	Sudden physiological change	Boil leaves in water and inhale the vapor
33	<i>Euphorbia abyssinica</i> J.F.Gmel.	Euphorbiaceae	Qulqual	External parasite Wound	The latex (milky juice) is applied to affected area. Milky juice(latex) is applied on wound
34	<i>Ferula communis</i> L.	Apiaceae	Inslal	Hypertension Unable to urinate	Crush leaves add to boiled tea and drink. Crush leaves mix with water and drink.
35	<i>Ficus vasta</i> Forssk.	Moraceae	Warka	Constant lose of weight in cattle	Chop the bark boil it in water pour to the moth of the cattle
36	<i>Ficus palmata</i> Forssk.	Moraceae	Beles	Skin rush	Crushed leaves are mixed with butter then the paste is applied on the affected site.
37	<i>Glinus lotoides</i> L.	Aizoaceae	Metere	Tooth ache	Chew the root and hold tightly near the infected teeth.
38	<i>Glycine wightii</i> (Wight & Arn.) Verdc.	Fabaceae	Yelam chew	Tape worm	Crush seed and mix with Lin seed and then eat it.
39	<i>Grewia flavescens</i> Juss.	Tiliaceae	Lenquata	Constant lose of weight in cattle)	Crush fresh seed and leaves make a juice like fluid pour to the moth of the cattle.
40	<i>Helinus mystacinus</i> (Ait.) E. Mey.ex Steude.	Rhamnaceae	Shnbirit	Bloating	Crush leaves mix with water and drink.
41	<i>Jasminum floribundum</i> R.Br	Oleaceae	Tembele	'Globa' (Cattle disease)	Leaves and stem are Crushed and boiled in water and put aside until it gets cooled. Then pour in to the mouth of the cattle.
42	<i>Laggera tomentosa</i> (Sch. Bip.ex A. Rich.) Oliv. & Hiern	Asteraceae	Nech kese	Eye treatment	Squeeze leave and put dropsthrough ear.
43	<i>Leonotis ocymifolia</i> (Burm.f.) Iwarsson	Lamiaceae	Eras kimir	Tape worm	Leaves are crushed, mixed with water and then the patient will take a glass of the mixture as a drink.
44	<i>Lepidium sativum</i> L.	Brassicaceae	Feto	Common cold	Hold fresh leaves tightly in to the nostrils
45	<i>Linum usitatissimum</i> L.	Linaceae	Telba	Abdominal pain	Squeeze leaves add in a cup of coffee and drink.
46	<i>Lycopersicon esculentum</i> Mill.	Solanaceae	Timatim	Abdominal pain	Crush seed and mix with other dishes ('Injera')
47	<i>Maesa lanceolata</i> Forssk.	Myrsinaceae	Kelawa	Intestinal wound	Crush the seeds in to powder and mix with water then drink a glass of juice before food each morning until recovery
48	<i>Momordica foetida</i> Schumach. & Thonn.	Cucurbitaceae	Ababure	Weak feeling	Squeeze the fruit and mix with <i>Allium cepa</i> L. Mix the juice in a cup of tea and drink it every morning
				Skin disease	
				Characterized by itching and black spots	Crush seed and mix with butter then apply on infected site.
				Swelling wound	Roots are crushed mixed with butter and applied on the affected site.

Table 1. Contd.

49	<i>Myrsine africana</i> L.	Myrsinaceae	Kechemo	Endoparasites (Tape worm and Ascaris)	Crush fruits and make a juice then drink.
50	<i>Myrtus communis</i> L.	Myrtaceae	Ades	Headache	Crush leaves and boil with water then drink with cup.
51	<i>Nicotiana tabacum</i> L.	Solanaceae	Timbaho	To remove leeches from cattle mouth	Crush dry leaves mix with water and give it to cattle as a drink.
52	<i>Ocimum lamiifolium</i> Hochst. ex Benth.	Lamiaceae	Damakese	Headache and cough	Leaves are Squeezed and drunk alone or with coffee.
53	<i>Osyris quadripartita</i> . Decn.	Santalaceae	Keret	Abdominal pain Urine problem	Chewing the stem and swallowing the fluid only. Crush and boil with water and drink.
54	<i>Otostegia integrifolia</i> Benth.	Lamiaceae	Tungut	Abdominal pain Evil eye	Crush laves mix with water and drink. Burn stem and leaves and in hale the smoke
55	<i>Otostegia fruticosa</i> (Forssk.)Schweinf.ex Penzig	Lamiaceae	Geram tungut	Tonsillitis	Squeeze leaves while adding few drops of water and drink the juice.
56	<i>Pentas schimperiana</i>	Rubiaceae	Ese zeye	Snake bite	Chewing the root and swallowing only the liquid part of root.
57	<i>Phytolacca dodecandra</i> L.Herit.	Phytolaccaceae	Indod	Abortion Toothache	Crush the root and mix with water and drink. Chew the stem and hold it tightly to the infected teeth.
58	<i>Premna schimperi</i> Engl.	Verbenaceae	Chocho	Eye disease	Squeeze fresh leaves and drop a drop of the extract on the affected eye.
59	<i>Prunus persica</i> (L.) Batsch.	Rosaceae	Kok	Appetite	Eat fruits
60	<i>Pterolobium stellatum</i> (Frossk.) Brenan	Fabaceae	Kentafa	Goiter	Crush leaves mix with butter then apply the paste and tie it and cover it
61	<i>Rhus retinorrhoea</i> A.Rich.	Anacardiaceae	Tilem	Liver infection	Roots of <i>Rhus retinorrhoea</i> crushed together with flower of <i>Catha edulis</i> and (<i>Rumex nervosus</i>) and mixed with water and add small amount salt then drink
62	<i>Ricinus communis</i> L.	Euphorbiaceae	Gulo	Eye disease	Leaves are slightly heated and applied on the affected part of the eye
63	<i>Rosa abyssinica</i> Lindley.	Rosaceae	Kega	Gastric	Eat fruit and seeds
64	<i>Rumex nervosus</i> Vahl	Polygonaceae	Enboacho	Anti-bleeding	Crush dried leaves in to powder and apply on the cut.
65	<i>Rumex abyssinicus</i> Jacq	Polygonaceae	Mekemeko	Hypertension	Crush root in to powder mix with bubs of <i>Allium sativum</i> add the mixture in to boiled water and drink the hot decoction in a cup
66	<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Tult	Diarrhea	Crush root mixed with water and drink

Table 1. Contd.

67	<i>Ruta chalepensis</i> L.	Rutaceae	Tenadam	Abdominal pain	Stem and leaves are crushed and added in to a cup of tea or coffee and drunk or chewing fresh stem and leaves and swallowing
68	<i>Schinus molle</i> L.	Anacardiaceae	Kundo berbere	Tuberculosis	Crushed seeds are mixed with honey and then eaten.
69	<i>Sesamum angustifolium</i> (Oliv.) Engl.	Pedaliaceae	Selit	Ear defect	Extract oil from the seed and drop the extract it the ear
70	<i>Solanecio gigas</i> (Vatke) C.Jeffrey.	Asteraceae	Yeshe koko gomen	Skin disease	Leaves are crushed and pasted on affected body
71	<i>Solanum anguivi</i> Lam.	Solanaceae	Dekak enboay	Skin disease (itching)	Dry seeds are crushed, mixed with oil and applied on the site. For fresh seeds no need of using oil.
72	<i>Steganotaenia araliaceae</i> Hochst.	Apiaceae	yegibmrkuz	To remove leaches from cattle	Crush leaves boil with water then pour in to the mouth of the cattle
73	<i>Stephania abyssinica</i> (Dillon. et A.Rich.) Walp.	Menispermaceae	Yayit hareg	Wound	Roots are Crushed and mixed with milk and applied on wound.
74	<i>Trigonella foenum-graecum</i> L.	Fabaceae	Abish	Abdominal pain	Crush seeds and make a juice by mixing it with water then add hone to drink
75	<i>Verbascum sinaiticum</i> Benth	Scrophulariaceae	Yahiya joro	Skin disease	Leaves are crushed and mixed with water wash the affected part with the mixture and tie with the soaked leave.
76	<i>Verbena officinalis</i> L.	Verbenaceae	Atuch	Abdominal pain	Dry roots are crushed and mixed with water and drunk. For fresh root, chew and swallow only the liquid part of root.
77	<i>Vernonia amygdalina</i> Del.	Asteraceae	Girawa	Abdominal pain	Crush leaves in to powder and mix with water then drink.
78	<i>Vernonia bipontini</i> Vatke	Asteraceae	Gobez tekes	Toothache Eye disease	Chew leaves and hold it close to the infected teeth. Squeeze leaves and drop one or two drops of the extract on the eye
79	<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Gizaw	Spiritual disease.	Smoke the entire body of the patient with dried leaves
80	<i>Xanthium strumarium</i> L.	Asteraceae	derkus	Skin rash	Leaves are crushed and mixed with butter and applied on the infected site.
81	<i>Ximenia caffra</i> Sond.	Olacaceae	Atat	Snake bite	Take seven leaves of this plant and chew it well then swallow the juice
82	<i>Zehneria scabra</i> (Linn.f.)Sond	Asteraceae	Hareg ressa	Wound	Leaves are crushed and mixed with oily substance and applied on the infected site.
83	<i>Zingiber officinale</i> Rosc.	Zingiberaceae	Zingible	Abdominal pain	Direct eating or crushed and mixed with tea and drunk.

'Tela' and 'Areke' for those plants having bitter taste.

The most common mode of administration in the study area was oral that cover 49.4%. Most of the

remedies prescribed by traditional healers are applied in various ways such as drinking like a

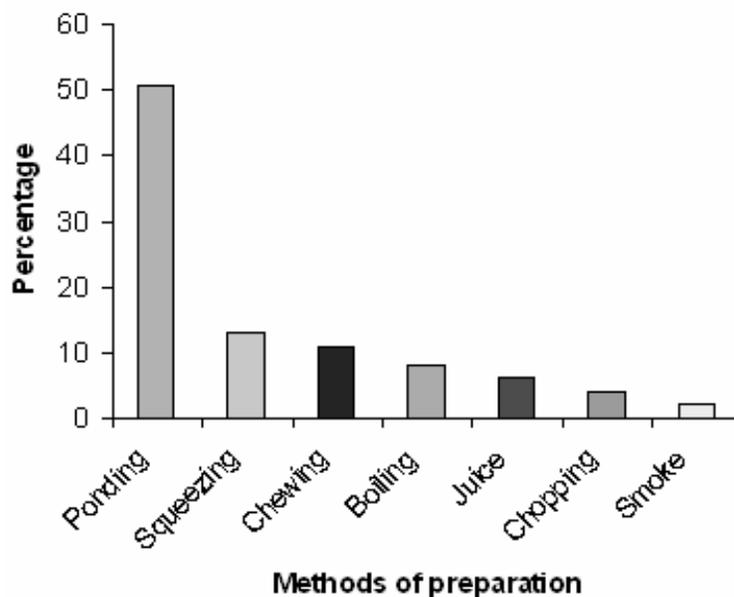


Figure 2. Mode of preparation of medicinal plants.

Table 2. Informant consensus factor of medicinal plants of Debre Libanos Wereda, Ethiopia by categories of diseases.

Categories (diseases)	No of species	Percentage of total species	No. of informant	Percentage of no. of informant	ICF (%)
Skin diseases and wounds	21	25.3	45	19.7	54.5
Respiratory infections and cough	5	6	11	4.8	60
Intestinal parasites, abdominal pain, diarrhea.	14	16.9	52	22.8	74.5
Malaria and hypertension	4	4.8	8	3.5	57.1
Snake bites and spider poisons	5	6	9	4	50
Common cold, headache and sudden physiological change	7	8.4	55	24	88.9
Spiritual disorder	5	6	6	2.6	20
Swelling and bleeding	7	8.4	9	4	25
Organs disease (eye, teeth, kidney, liver)	10	12	18	7.9	47.1
Cattle disease (bloating anthrax, leaches and external parasites)	5	6	15	6.6	71.4

juice, take a drop of squeezed plant part or chewing and swallow the liquid part only, etc. Dermal is the second most important route of administration of traditional medicine which covers 33.7%. There are various ways of dermal application of traditional medicine. For example, they may apply as a form of paste, coated and tie or crushed the plant part and put the powder on the affected part and so on. Only few medicinal plants were reported to be administered through oral and nasal, eye, nose and ear (about 16.9%).

Almost all traditional healers in the study area do not have sufficient knowledge on dosages. An ethnobotanical data in this study showed that all administrations are not standardized. Healers determine the dosages based on age, physical appearance and

strength of the disease. Children are given small doses of medicine than considered in case of adult patient. Small amount such as drops, hand palms, coffee cups are applied as small dosage. For larger dosages, they use water glasses or other local materials that are used for drinking.

The highest percent informant consensus factor (% ICF) value was obtained with problems associated with common cold, headache and sudden physiological change (febrile illness characterized by fever, headache, skin rash and muscle spasm) (88.9%) followed by problems related to intestinal parasites, abdominal pain, diarrhea (74.5%). The lowest %ICF value was obtained in diseases associated with spiritual disorder (20%) (Table 2).

Table 3. Informant consensus.

Botanical name of medicinal plant	No. of informants	Percentage
<i>Glinus lotoides</i>	60	100
<i>Ocimum lamiifolium</i>	60	100
<i>Ruta chalepensis</i>	60	100
<i>Zingiber officinale</i>	60	100
<i>Allium sativum</i>	55	91.7
<i>Croton macrostachyus</i>	50	83
<i>Brucea antidysenterica</i>	49	81.7
<i>Vernonia amygdalina</i>	45	75
<i>Lepidium sativum</i>	38	63
<i>Cucumis ficifolius</i>	35	58

Table 4. Preference ranking of medicinal plants of Debre Libanos Wereda, Ethiopia used to treat Ascariasis.

Lists of medicinal plants	Informant labeled from R1-R7							Total	Rank
	R1	R2	R3	R4	R5	R6	R7		
<i>Ruta chalepensis</i> L.	3	4	4	3	3	4	3	24	3
<i>Malva verticillata</i> L.	5	5	4	4	5	5	5	33	1
<i>Diplolophium africanum</i> Turcz.	4	3	3	2	1	2	3	18	5
<i>Vernonia amygdalina</i> Delile	3	3	4	3	3	3	2	21	4
<i>Lepidium sativum</i> L.		4	5	5	4	4	4	31	2

The study revealed that some medicinal plants are well known for their medicinal value among the herbalist and the local community at large than the other. As a result, local informants cited such plants repeatedly as a remedy of different diseases. For example, *Glinus lotoides* L., *Ocimum lamiifolium* Hochst. ex Benth and *Ruta chalepensis* L. were cited by 60 informants (100%) as a source of remedy for tapeworm, sudden physiological change, and abdominal pain respectively (Table 3). *Allium sativum* L. was cited by 55 informants (91.7%) as a remedy for malaria, common cold and other illness while *Croton macrostachyus* Hochst. ex Delile was cited by 50 informants (83%) for gastric ulcer. On the other hand, *Lepidium sativum* L. and *Cucumis ficifolius* A.Rich. were cited as the least commonly used medicinal plants by the informants (58%) (Table 3).

Preference ranking was made for five most important medicinal plants that are used to treat abdominal problems associated with ascariasis. Among the five selected medicinal plants *Malva verticillata* L. stands first followed by *L. sativum* L. (Table 4).

The result of pair wise comparison indicates that *Brucea antidysenterica* J.F.Mill. followed by *Calotropis procera* (Aiton) Dryand. and *Stephania abyssinica* (Quart.-Dill. & A.Rich.) Walp. ranked first, second and third, respectively for the treatment of wound. The other two less preferred medicinal plants for wound treatment were *Clematis simensis* Fresen. and *Verbascum sinaiticum* Benth. (Table 5).

DISCUSSION

The number of reported medicinal plants (83 species, 77 genera and 46 families) and their uses by the community witness show how rich the area is in terms of medicinal plants diversity and the depth of the local indigenous knowledge on medicinal plants and their applications. A number of studies elsewhere in Ethiopia have reported similar number of species of medicinal plants as traditional medicines against human and livestock ailments (Yinger and Yehwalahu, 2007; Bekalo, 2009; Tolosa et al., 2013). The relatively higher number of traditional medicinal plant species documented from the study area is mainly attributed to strict conservation of forest resources of the monastery. The monastery harbors various medicinal plants including those medicinal plants that have been widely used long time ago. The monastery has played a key role in conserving the remnant afro montane forest which is a source of most medicinal plant species, even though any plant in the monastery is strictly forbidden to be used as traditional medicine. Furthermore, the acceptance of folk medicine and the limited access to public healthcare services in the community may be factors contributing to the knowledge of medicinal species in local medical practices. However, the traditional systems and religious beliefs that generally restrict the way of transferring indigenous knowledge might have constrained, to some extent, the free flow of information on medicinal plants in

Table 5. Pair wise comparison of medicinal plant of Debre Libanos Wereda, Ethiopia used to treat wound.

Medicinal plant	Informant labeled from R1-R7								Total	Rank
	R1	R2	R3	R4	R5	R6	R7			
<i>Brucea antidysenterica</i> J.F.Mill.	4	5	4	5	5	4	5	32	1	
<i>Calotropis procera</i> (Aiton) Dryand.	4	5	5	5	4	4	3	30	2	
<i>Clematis simensis</i> Fresen.	3	4	2	3	5	3	4	24	4	
<i>Stephania abyssinica</i> (Quart.-Dill. & A.Rich.)	4	3	5	4	3	4	5	28	3	
<i>Verbascum sinaiticum</i> Benth.	4	3	4	2	3	4	2	22	5	

this study. Secondly, it could be attributed to the scope of the study that attempted to study the medicinal plants in there agro ecological zones, lowland, middle elevations and highlands unlike Teklehaymanto et al. (2006) that confined his study only in the monastery and its immediate vicinity.

The trees and shrubs constitute more than 70% of the traditional medicinal plant in the study area. This could be attributed to various factors. First it can be related with the floristic composition of the vegetation of the area, which is dominated by herbs and exotic *Eucalyptus* sp. in the high lands and *Acacia-commiphora* woodland in the low lands. Secondly, a high usage of herbs could be an indication of their abundance, since the area receives relatively high amount of rain fall that fosters the flourishing of herbs. Thirdly, the affinity to use herbs as traditional medicinal plant could be attributed to strong bioactive compounds. Studies in various parts of the world have raveled that herbs contain phytochemicals like alkaloids and falvanoids that have strong anti bacterial and anti fungal effects (Legesse et al., 2011). A number of studies carried out elsewhere in Ethiopia have documented that herbs and shrubs are plant species mostly used by indigenous communities of Ethiopia as treatment against various human and livestock ailments (Teklehymanot et al., 2006; Bekalo et al., 2009; Mesfine et al., 2009). For example, Konta people use more of herbs (about 68 species) than trees (20 species) (Bekalo et al., 2009) in a similar pattern as reported from India, where about 19 out of 54 species were herbs and shrubs were about 12 species (Ayyanar and Ignacimuthu, 2005). More than half of the Zay plant remedies were also obtained from herbs (Giday et al., 2003)

Most of medicinal plants (75%) utilized by local people of the study area are collected from wild; only few (25%) are harvested from home garden. There is little tradition or practice by local people to cultivate medicinal plants. Plants were harvested and processed only when needs aroused. The use of uncultivated plants is a common practice in Ethiopia (Giday and Ameni, 2003) and this has been creating an additional pressure on the populations of wild plants besides enviromental degradation and deforestation. For example, similarly Gebre (2005) found that about 76.5% of the remedies were reported from wild. The same author also noted that most of the medicinal plants are under the threat as long as the

destruction and fragmentation of wild habitat continues. This is also true in the present study area. Furthermore, Asfaw and Woldu (1997) reported that only 6% of the plants maintained in home gardens in Ethiopia are primarily cultivated for their medicinal value even though many other plants grown for non-medicinal purposes are used for preparation of medicines.

In the present study, the leaf is one of the most extensively used plant parts in preparation of traditional herbal medicine followed by root and seed. The common use of leaf in the preparation of remedies could partly be due to the relative ease of finding this plant part. The practice of using leave part for remedies preparation helps to reduce the rate of threat on plant species or helps for sustainable harvesting of plants since removal of an appreciable amount of leaf is tolerated by the plant. Roots appeared also to be the second most plant part commonly used by the healers in the current study area. This could be associated with the fact that roots remain in the soil and are easily available, even during the long dry seasons in arid and semi-arid areas. But, harvesting roots for medicinal value could possibly put a strain on the survival of the plant since aerial parts of the plant are highly dependent on underground parts (root) for physical support and physiological process. In agreement with our study, similar studies in other parts of Ethiopia reported that roots and leaves are indeed the most commonly used medicinal plant parts (Bekalo et al., 2009; Bussmann et al., 2011). Inspection of the results on number of preparations and plant parts used may lead to the conclusion that harvesting medicinal plants for use in traditional medicine is not destructive to the natural vegetation of the study area since leaves are the most frequently sought parts of the plant. On the other hand, it may also lead to the conclusion that harvesting of medicinal plants is likely to be destructive because the second most frequently used part is the root.

According to the present survey, a significant number (56.88%) of the medicinal plants were to be used in fresh form in remedy preparations. This indicates that local people of the study area are highly dependent on fresh remedies that may put medicinal plants under serious threat, since there is no habit of preservation or storage plant parts for later use. Ethnobotanical studies of medicinal plants elsewhere in Ethiopia have documented the same mode of preparation (Seifu, 2004; Gebre, 2005;

Amenu, 2007; Beyene, 2007).

Very dominate methods of remedy preparation in the study area were reported to be through crushing (grinding) followed by squeezing, and chewing. Local people also used additives such as butter, edible oil for wound and skin diseases, and cup of coffee, honey, and local beverages like 'Tela' and 'Areke' for those plants having bitter taste. This finding is consistent with some reports elsewhere in Ethiopia (Tekelhaymanot and Giday, 2007; Bekalo et al., 2009; Flatie et al., 2009) but disagrees with some reports where other methods of remedy preparation are employed (Abebe and Ayeahu, 1993; Yirga 2010). It is likely that these differences are associated with the differences in culture and knowledge in different socio-cultural groups.

The choice of oral administration may be related to the use of some solvents or additives (butter, edible oil, coffee, honey and local beverages like 'Tela' and 'Areke') that are commonly believed to serve as a vehicle to transport the remedies. The additives are also important to minimize discomfort, improve the taste and reduce adverse effects such as vomiting and diarrhea, and enhance the efficacy and healing conditions (Etana, 2010). Similar findings were reported by many other researchers, indicating the oral route as the most preferred mode of administration (Filate et al., 2009; Mesfine et al., 2009; Addisie et al., 2012).

Dosage is not always well measured in most of the traditional medicine practitioners. The result of this study also showed that all administrations are not standardized. Other similar findings were reported by many other researchers (Yinger and Yehwalahu, 2007; Tolosa et al., 2013). Although, most of the remedies were reported to have no serious adverse effects except vomiting and temporary inflammations. This could be attributed to the low toxicity of the remedy preparations of the medicinal plant species used by the traditional healers in the study area. However, the toxicity of some medicinal plants and their potential to do harm is a common complaint among those who would like traditional medicine to be standardized. It is commonly believed that traditional practitioners either do not know the strength of their own medicines or do not bother to fit doses to the size or body weight of the patients (Hillenbrand, 2006). However, it is known that some traditional healers do give different dosages and frequency of application depending on age, sex and other condition or vary the medicine itself on such differences.

The highest numbers of plant species were reported to be used for treatment of intestinal parasites, abdominal pain and diarrhea indicating that there is relatively high consensus on the treatment of gastro intestinal problems with the medicinal plants of the area. This is mainly attributed to the highest prevalence of gastro intestinal problems ailments prevalent in the study area. A similar analysis found high value of informant consensus factor (ICF) for gastrointestinal illness in similar studies carried

out in different parts of Ethiopia (Tolosa et al., 2013). According to the information obtained from Debere Libanos local health center, intestinal parasites were the first among the top ten diseases treated in the health center in the year 2008. The frequent occurrence of these diseases might have given the chance for herbalists to develop diversified knowledge associated with this problem. The ICF results could be useful in prioritizing medicinal plants for further scientific validation of plants and plant products (Giday et al., 2006; Subramanyam et al., 2008) as pharmacologically effective remedies are expected from plants with higher ICF values (Trotter and Logan, 1986; Etuk and Mohammed, 2009). Indeed, documentation of inherently rich traditional ethno-medicinal knowledge based on ICF values have provided valuable information on new pharmacological dimensions for better health care of livestock and humans regarding many ailments (Etuk and Mohammed, 2009) and also assist conservation and management of rare, gradually vanishing important ethno-medicinal plant species

Traditional healers of the study area use different plants for the same ailment. But, when all plants are available at the same time they prefer one over the other. This is mostly done based on the effectiveness of the plants to cure the ailment. As a result, both preference ranking and paired comparison revealed *Malva verticillata* and *Brucea antidysenterica* as the most effective medicinal plants for the treatment of ascariasis and wound, respectively, at least in the context of local people. This indicates that indigenous people of the study area have sufficient knowledge on the healing power of medicinal plants.

It has been agreed that threats to biodiversity are increasing dramatically from time to time in such a way that the rate of biodiversity loss outweigh the rate of recruitments. Informants have pointed out that deforestation to expand agricultural land and for firewood collection are the major threats that threatened the survival of medicinal plants. Similar studies in different localities of Ethiopia have documented that medicinal plants are under severe anthropogenic threats. For example, wild habitats are subjected to the loss of a number of plant species due to different anthropogenic factors such as firewood collection (24.8%); frequent fire (22.3%) and harvesting medicinal plants for use in construction (19%) (Bekalo et al., 2009). A study conducted in Sekoru District (Yinger and Yehwalahu, 2007) has also showed that, there are different threats to medicinal plants such as deforestation (40%), drought (17.5%), agricultural expansion (12.5%) and fire (12.5%).

This study revealed that, most of the knowledge on herbal remedies is handed down to the younger members of the community by elders, who are 41-50 years old. This hints at the fact that ethno-medicinal knowledge is concentrated in the elderly members of the community and the relative difficulty in its transfer from the elders to the young generation. This might be related

to the waning of interest of the young generation on indigenous knowledge. Furthermore, since all most all part of the forest belongs to Debre Libanos Monastery of Ethiopian Oriental Orthodox Church, harvesting of any part of medicinal plant is strictly forbidden. A canon called "GIZIT" in the church language prohibits harvesting of any plant from the church compound. Move over, person who uses medicinal plants from the church compound or nearby area is believed not to get the expected cure from the health problem because of "GIZIT". As a result, many medicinal plants that are rare in other parts of the study area are found in the church compound or nearby area. These might appear to prevent the use of available medicinal plants by the herbalist and impart the expansion of the traditional medicine somehow. However, the strict conservation of the plant species by monastery is utmost important from the whole biodiversity conservation point of view. As a means for sustainable utilization of medicinal plants, plants in the church compounds and nearby area must be protected and used as a source of seeds for requirement and herbalist can now plant the seeds and grow the medicinal plants and use them as they wish. It might seem that herbalists are restricted to use. Different studies in different areas showed that medicinal plant knowledge and transfer of knowledge to the young generation have been affected by modernization (having access to modern education and health service) and environmental change (Bekalo, 2009; Tolosa et al., 2013). Furthermore, Western style health care services as provided by governments and NGOs, in particular in rural areas, seem to have contributed to a decline in traditional knowledge, in part because the local population simply regards Western medicine as more effective and safer.

Conclusion

The study area is home for several medicinal plants. These plants have a great value for the health problems of poor local people. Herbalists and knowledgeable farmers are using these plants to cure human and livestock diseases. The young generations have not shown much interest in this life long accumulated knowledge. This tendency of disinterestedness in traditional medicinal practices is likely to be one of the major causes for losing this wealth of knowledge in the near future. Therefore, it is important that the government create awareness among community members on the significance of preserving traditional knowledge and conserving medicinal plants before they disappear, and thereby ensure the rights of people to apply their traditional practices which are known for their proven safety and effectiveness.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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