

Full Length Research Paper

An ethnobotanical study of medicinal plants in chiro district, West Hararghe, Ethiopia

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Ethnobotanical study of medicinal plants is inadequate in Ethiopia in general, and in Chiro District in particular. Therefore, this study documents medicinal plant utilization, management and the threats encountered on them. The study was conducted from April 2017 to June 2018. Forty eight informants were purposively selected. Socio-economic and botanical data were gathered using group discussions, semi-structured interviews, and field observations and analysed using informant consensus factor, preference ranking and paired comparison methods. The result revealed that 60 plant species from 42 families and 58 genera were used as traditional medicine to treat human and animal diseases. The Euphorbiaceae were represented by 7 species, followed by Asteraceae (5 species), Myrtaceae and Solanaceae (3 species each), Lamiaceae, Brassicaceae and Polygonaceae (two species each). Of the 60 species, 22 (36.67%) were herbs, followed by shrubs (n=19, 31.67%), trees (n=16, 26.66%) and climbers (n=3, 5.0%). In the study area the most significant threat to medicinal plants is agricultural expansion. Even though the study revealed that the area is enriched with medicinal plant diversity, awareness should be done to enhance the conservation of medicinal plants.

Key words: Ethnomedicine, Chiro district, medicinal plants.

INTRODUCTION

World Health Organization (WHO, 2002) defines traditional medicine as 'the the sum total of the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether justifiable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and social discrepancy, and relying exclusively on practical experience and observation transferred from generation to generation, whether verbally or in writing'. Since traditional medicine is the most affordable, simple to use

and easily accessible source of treatment, especially in developing countries (Haile and Delenasaw, 2007), it became an integral part of many cultures (Pankhurst, 1965). Studies indicate that deforestation, urbanization, agricultural expansion and lack of awareness among the community are the critical threats to medicinal plants (Hunde et al., 2015; Dida, 2017).

Ethiopia is endowed with diverse biological resources (About 6,500 are higher plants) of which approximately 10% are medicinal plants (Abera, 2014; Tadesse et al., 2018). In addition, Ethiopians have used traditional

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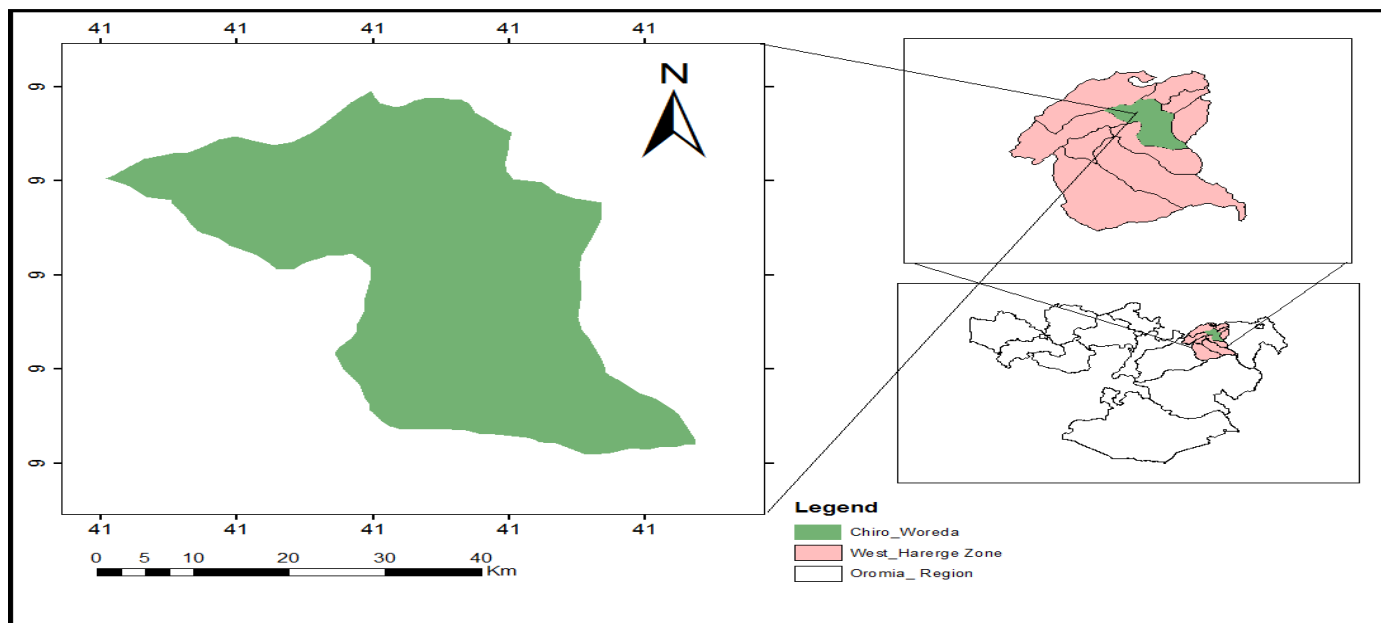


Figure 1. Location of Chiro district in the West Hararghe Zone, Ethiopia.

medicines for many centuries. The use of which has become an integral part of the different cultures in the country. Traditional people around the world have developed their own specific knowledge of plant resource uses, management, and conservation on which they depend on for food, medicine and general utilities (Zewudu, 2013).

According to Zewudu Birhanu (2013), traditional remedies are the source of therapeutics for nearly 70% of Ethiopian population and 90% of livestock in the country. There is, however, a need for sustainable use of medicinal plant materials and the associated indigenous knowledge as wild plants are under extreme pressure of increased demands (Haile and Dilnesaw, 2007). Moreover, in Ethiopia the use of wild or uncultivated plants is a common custom and this has been accelerating the deterioration of useful plant population in addition to agricultural expansion accompanied by wide cutting original forest species and environmental degradation (Abera, 2014). Hence, the current study aimed to document the indigenous knowledge of the local people on the use, threat and conservation of medicinal plants in Chiro district. This study has value in that it could be used as basis for further studies on medicinal plants in Chiro District and for future phytochemical and pharmacological studies.

MATERIALS AND METHODS

Description of the study area

Chiro District (Figure 1) is one of the 18 Districts of West Hararghe

Zone in the Oromia region of Ethiopia. Part of the West Hararghe Zone, Chiro district is located between 9°05' longitude and 40°52'E latitude. From the study district, 6 (Medicho No.3, Nejebas, Wachu Geleyi, Gara Nigus No. 1, Medicho No. 9 and Chiro Kela) kebeles were used as sampling sites for data collection.

The district is founded at an altitude ranging from 1826 to 1950 m above sea level. The district has undulating topography and mountainous characteristics with low vegetation cover and sparsely vegetated landscapes which is highly vulnerable to erosion problems. Drought, shortage of water, soil erosion, flooding, animal forage scarcity, and lack of income diversity are the main threats to food security and sustainability. The 2007 national census reported a total population for this district of 169,912, of whom 87,003 were men and 82,909 were women; none of its population was urban dwellers (CSA, 2007). The agricultural activities are mainly mixed type with cattle rearing and crop production undertaken sideways. Major annual crops include sorghum, maize, bean, barley, teff, wheat, and pea and from cash crops Khat and Coffee are widely produced. It has a maximum and minimum temperature of 23 and 12°C, respectively and maximum and minimum rainfall of 1800 and 900 mm, respectively. Rainfall type is bimodal and erratic in nature. Main rainy season of the study area is from June to September while short rainy season is from March to May. *Croton macrostachyus* Del., *Juniperus procera*, *Podocarpus falcatus* (Thmb.) R.B. ex. Mirb., *Vernonia amygdalina* Del., and *Hagenia abyssinica* (from the natural forests), and *Juniperus procera*, *Cupressus lusitanica*, and *Eucalyptus Camaldulensis* Dehnh., J.F Gmel. (from plantations) are some of the common vegetation types of the study area

Informant selection

Forty eight informants (36 males and 12 females) aged between 18 to 81 were selected by using judgment and volunteer sampling techniques, according to the method of Abera (2014). Out of these, 12 (7 males and 5 females) key informants, were selected based on recommendations from elders and local authorities (Kebele

administration leaders and religion leaders). These key informants were singled out due to their superior knowledge of medicinal plants over the other 36 interviewees. The informants are ethnically Oromo since they are inhabiting dominantly in the study area.

Study design

Data was collected between April 2017 and June 2018 using one-on-one semi-structured interviews, field observations, and group discussions. The semi-structured questionnaire sought to gain information on the following themes: Medicinal plants resource of the study area, preparation and administration methods of decoctions, medicinal plants species used to treat human diseases, major human diseases and plant species used for the remedies, medicinal plants species used to treat livestock diseases, major livestock disease and number of plant species used, acquisition and transfer of indigenous knowledge on medicinal plants and threats to medicinal plants.

Dried specimens of the plants collected from the Chiro District were taken to the Oda Bultum University Plant Herbarium for taxonomical identification. Voucher specimens were also deposited at this herbarium.

Data analysis

A descriptive statistical method such as frequency and percentage were employed to analyze and summarize the ethnobotanical data obtained from the interviews and group discussions on reported medicinal plants and associated knowledge.

Data obtained from the questionnaire was analysed by means of quantitative statistics. Different index methods were used to analyse data on Informant Consensus Factor, as well as Preference ranking and paired comparison.

The Informant Consensus Factor (ICF) value was calculated using the formula:

$ICF = \frac{(Nur - Nt)}{(Nur - 1)}$, where Nur is the number of use report of informants for each ailment, and Nt is the number of taxa used for a specific ailment (Trotter and Logan, 1986).

Preference ranking was calculated using the formula:

Preference ranking was conducted by using ten randomly selected key informants to rank four medicinal plants against Tufa being given the highest (4 = most effective) and the least (1 = less effective values to each medicinal plants species following Martin (1995).

Paired comparison was calculated using the formula:

Paired comparison was used to evaluate the degree of preference or levels of importance of 5 reported medicinal plants for treating Chancroid following Martin (1995). A list of the pairs of selected items with all possible combinations was made and sequence of the pairs and the order within each pair was randomized before every pair is presented to the 6 selected informants and their responses recorded and total value was summarized.

Ethical considerations

Ethical clearance was sought from Oda Bultum University Ethics and Code of Conduct Committee (ECCC). Informants gave their informed consent for the publication of all results and any accompanying images before commencing with the interview

schedules, as required by the Oda Bultum University Ethics and Code of Conduct Committee (ECCC).

RESULTS AND DISCUSSION

Medicinal plants resource of the study area

Overall, 60 medicinal plant species distributed under 42 families and 58 genera were identified in the Chiro District (Table 1). The dominant families included the Euphorbiaceae, which were represented by 7 species, followed by the Asteraceae with 5 species; Myrtaceae and Solanaceae with 3 species each, and Lamiaceae, Brassicaceae and Polygonaceae with two species each. The remaining 34 families were represented by one species each. This could be an indication that the study area consists of considerable diversity of plant species similar to other districts of the country (Kalayu et al., 2013; Zewudu, 2013; Abera, 2014).

From the total of 60 medicinal plant species documented in the study area, 39 (65%) species were wild vegetation, 11 (18.33%) species were cultivated and the remaining 10 (16.67%) were both cultivated and wild vegetation. This indicates that the practitioners mostly depend on wild vegetation than home garden vegetation for preparation of medicine which is also supported by other studies in the country (Kalayu et al., 2013; Abera, 2014; Mulugeta, 2017).

Habit

Out of 60 species, 22 (36.67%) species were herbs followed by shrubs 19 (31.67%) species, tree 16 (26.66%) species and climber 3 (5.0%) species (Figure 2). The current findings show that most widely used medicinal plants in the study area are shrubs and herb in habit. High number of shrubs and herbs for medicinal plants were explained in Ethiopia in the previous studies (Bayafers, 2000; Debela, 2001; Ermias, 2005).

Preparation of medicine

The practitioners employed 10 cultural medicine preparation methods (Table 2) to prepare 87 types of cultural medicines. From the cultural medicine preparation methods used in the study area, pounding and grinding were the most popular methods of preparation contributing to 43 (49.43%) and 15 (17.24%) cultural medicine preparations, respectively. Both pounding (Solomon et al., 2015) and grinding (Kalayu et al., 2013) methods were also reported as among the dominant cultural medicine mode of preparations. Moreover, these pounding and grinding are also importantly used by the local community to preserve the medicinal plants in the form of powder. The next ranks were taken by boiling

Table 1. List of medicinal plants encountered in the study area (T= Tree; Sh= Shrub; H= Herb; L= Liana; Cl=Climber; WC= Wild and Cultivated; W= Wild; Ct= Cultivated).

No.	Scientific name	Oromipha name	Family	Habit	Degree of management	Parts used	Ailment type	Mode of preparation	Use	Route of administration
1	<i>Acacia abyssinica</i> Hochstex. Benth.	Dadecca/Lafto	Euphorbiaceae	T	WC	Leaf	Physical injury with ulcer	Pounding the leaves of <i>A. abyssinica</i> plant and creaming on the affected body	H	dermal
						Bark	Inflammation	Grinding of the root bark and mix it with water and drink it		
2	<i>Acalypha fruticosa</i> Forssk.	Baaltokkee	Euphorbiaceae	Sh	W	Root	Chest pain (stabbing pain)	Pounding fresh root and mixing it with coffee and drunk orally	H	Oral
3	<i>Acanthospermum hispidum</i> DC.	Qummuxxo	Asteraceae	H	W	Leaf	Tetanus	Pounding the leaf and put on affected area with ulcer	H	Dermal
4	<i>Achyranthes aspera</i>	Darguu	Amaranthaceae	H	W	Root	Chankroid	Grinding the root part boil it with water and drink it	H	Oral
						Leaf	Inflammation	Grinding dried leaf pound it and put the powder on affected skin part	H	Dermal
5	<i>Allium sativum</i> L.	Qullubi addii	Alliaceae	H	Ct	Bulb	Cough	Pound the bulbs of <i>Allium sativum</i> and Eucalyptus globulus and mix with butter fire it and fumigate it	H	Nasal
6	<i>Aloe macrocarpa</i> Tod.	Argiisa	Asphodelaceae	H	W	Leaf	Diabetes	Pounding the leaf and drinking	H	Oral
							Hypertension	Pounding the leaf and drinking	H	Oral
7	<i>Aloysia triphylla</i> (L 'Herit.) Britton	Xuxxoo	Verbenaceae	T	Ct	Leaf	Tonsillitis	Pounding the leaves of <i>A. triphylla</i> and mix it with ash and water drinking drop by drop	H	Oral
8	<i>Artemisia absinthium</i> L.	Harritta/Harii yuyoo	Asteraceae	H	WC	Leaf and root	Dengetegna	Drying and pounding the leaf and roots of <i>A. absinthium</i> and mixed with water	H	Oral
9	<i>Arundinaria alpine</i>	Qacc'ee	Gramineae	H	W	Young leaf	Intestinal ulcer	Pounding the young leaves and mix with water and drink it	H	Oral
10	<i>Asparagus africanus</i> Lam	Saritii	Asparagaceae	Sh	W	Root	Chankroid	Grinding the root part boil it with water and drink it	H	Oral
11	<i>Azadirachta indica</i> A. Juss.	Kinninii	Meliaceae	T	WC	Leaf	Dingetegna	Leaves of <i>A. indica</i> pounded, mixed with water and be taken orally	H	Oral
						Root	Amoebiasis	Pounding the root and drink it with water		
12	<i>Calpurnia aurea</i> (Ait.)	Ceekaa	Fabaceae	T	W	Seed	Amoebiasis	Roasting the seed and pound it and boil the powder with water and drink it	H	Oral
						Leaf	Pneumonia	Pounding the leaf and drinking it Or Boiling the leaf and fumigate the steam		
13	<i>Carica papaya</i> L.	Papaya	Caricaceae	T	Ct	Seed	Cough	Grinding and mixing the <i>C. papaya</i> seeds with the leaves of <i>Cynodon dactylon</i> and drinking with water	H	Oral
						Root	Diarrhea	By grinding the roots and mixed with water and drink it		
14	<i>Carisa Spinarum</i> L.	Agamsa	Apocynaceae	Sh	W	Root	Evil Spirit Un milking cow	Pounding the dry roots of <i>C. Spinarum</i> , <i>Solanum incanum</i> and <i>Dovyalis abyssinica</i> and mix it with water and administer it into ear and nose parts of the cow	A	Nasal and dermal

Table 1. Contd.

							Dermatitis	Pounding the roots of <i>C. Spinarum</i> and mix it with water and drink		Oral	
15	<i>Cassipourea malosana</i> Aubl.	Xilloo	Rhizophonaceae	T	W	Leaf	Tinea Versicolor	Pounding the leaves of <i>C. malosana</i> and <i>Bidens pilosa</i> L. plants together and rub over the affected skin part	H	Dermal	
16	<i>Celtic Africana</i>	Mataqomaa	Cannabaceae	T	W	Leaf	Body swelling	Pounding the leaf and drink it	H	Oral	
17	<i>Cissampelos mucronata</i> A.Rich.	Bal tokkee	Menispermaceae	L	W	Leaf	Tufa	Pounding the <i>C. mucronata</i> and <i>Biclens pilota</i> leaves and creaming on affected skin and drinking it	H	Dermal and Oral	
							Rabies	Pounding the leaves of <i>C. mucronata</i> , the roots of <i>Impatiens rothii</i> together and mix it with water and drinking it or eat it with injera	A	Oral	
							Root	Abdominal pain	By grinding the root mix it with water and drink it	H	Oral
18	<i>Coffee arabica</i> L.	Buna	Rubiaceae	T	Ct	Seed	Abdominal pain	Pounding the roasted seed and mixed with honey and administer it orally			
19	<i>Commelina africana</i> L.	Mandar buqas	Commelinaceae	H	W	Flower	Hemorrhoid	Pounding the flower part and rub put on affected body	H	Dermal	
20	<i>Crabbea velutina</i> S.Moore.	Laafaa	Acanthaceae	Sh	Ct	Leaf	Urinary problems	Drying and pounding the leaf	H	Oral	
21	<i>Crambe hispanica</i> L.	Fujul	Brassicaceae	H	W	Fruit	Ear Eche	Squeezing the <i>Crambe hispanica</i> fruit and mix it with salt and water and screen the juice and put on affected ear area	H	Dermal	
							Leaf	Ear ache	Pounding the leaves of <i>C. macrostachus</i> and <i>Thymus schmperi</i> and squeeze the liquid filter it and add in the affected ear part	H	Dermal
							Shoot	Wart	Rubbing the young shoots of <i>C. macrostachyus</i> on affected skin and let it dry over it every morning for seven consecutive days	H	Dermal
22	<i>Croton macrostachyus</i> Del.	Bakkannisa	Euphorbiaceae	T	WC	Bark	Inflammation	Grinding the dried barks of <i>C. macrostachus</i> and put on affected area	H	Dermal	
							Pneumonia	Grinding the barks of <i>C. macrostachus</i> and boil it with water and drink it	H	Oral	
23	<i>Cucumis ficifolius</i> A. Rich.	Haregoge	Solanaceae	Cl	W	Roots	Rabies	Pounding Roots of <i>C. ficifolius</i> , <i>Eragrostis teff</i> (red), and roots and leaves of <i>Verbascum sinaiticum</i> together and deliver orally with injera.	A	Oral	
							Abdominal pain	Pounding fresh roots of <i>Cucumis ficifolius</i> , mix with water and drink it	H	Oral	
24	<i>Cuminum cyminum</i> L.	Kemmuuna	Apiaceae	H	WC	Leaf	Chancroid	Pounding leaves of <i>Cuminum cyminum</i> and <i>Tragia cinerea</i> together and mix with water and drink it	H	Oral	
							Urinary problems	Pounding leaves of <i>Cuminum cyminum</i> and mix with water and drink it	H	Oral	

Table 1. Contd.

						Fruit	Kidney problems	Boiling the fruit with water and drink it	H	
						Leaf	Mastitis	Pounding and creaming on the affected animals udder	A	Dermal
25	<i>Datura stramonium</i> L.v	Banji	Solanaceae	H	W	Seed	Tooth ache	Grinding the seeds mix with water and put on affected tooth part	H	Oral
26	<i>Dodonaea angustifolia</i> L. f.	Ittaacha	Sapindaceae	Sh	W	Shoot	Eye disease	Pounding shoot and young leaves together with water and squeeze and drop on affected eye	H	Ocular
27	<i>Echinops longisetus</i> A.Rich.	Qoree Adi	Asteraceae	Sh	W	Shoot	Ulcer	Cutting young shoot and collect the yellowish juice by squeezing it and put on affected skin part	H	Dermal
28	<i>Ehretia cymosa</i> Thonn.	Ulagaa	Boraginaceae	T	W	Leaf	Febrile illness (Mich)	The leaves of <i>Ehretia cymosa</i> , and <i>Cucumis ficifolius</i> pounded and squeezed and mixed with water	H	Oral and dermal
29	<i>Eleusine floccifolia</i> Forssk.	Coqorsa/Akrima	Poaceae	H	W	Root	Vomiting	By chewing the root and swallow it	H	Oral
30	<i>Eucalyptus globulus</i> Labill.	Bar gamoo	Myrtaceae	T	WC	Leaf	Megagna , common cold (Mich)	Boiling the lef in water and fumigate it	H	Nasal
31	<i>Euphorbia tirucalli</i> L.	Qinchibe	Euphorbiaceae	Sh	W C	Stem	Hemorrhoid	Cutting the stem and collect the juice and put on the affected body part	H	Oral
32	<i>Euclea racemosa</i> subsp. Schimper	Me'essaa	Ebenaceae	Sh	W	Root	Chancroid	Boiling the root of <i>Euclea racemosa</i> with water and drink it	H	Oral
33	<i>Ficus sycomorus</i> L.	Oda	Moraceae	T	W	Leaf	Befta (Dermal disease)	Roasting the leaven with fire and pounding it and put the powder on the affected part	H	dermal
34	<i>Fuerstia africana</i> T.C.E.Fr.	Guran qaayee	Lamiaceae	Sh	W	Root and leaf	Mastitis	Pounding the roots and leaves of <i>F. africana</i> and drink it	A	Oral
35	<i>Gomphocarpus purpurascens</i> A. Rich.	Ari-Yuyo	Asclepiadaceae	Sh	W	Root	Pneumonia	Fumigate the root and /or boiling and drink it	H	Oral, Nasal
36	<i>Helichrysum elephantinum</i> Cufod.	Arado	Asteraceae	Sh	W	Leaf	Head ache	Squeezing the leaves of <i>H. elephantinum</i> and drop the liquid through nose	H	Nasal
37	<i>Impatiens rothii</i> Hook. F	Buri	Balsaminaceae	H	W	Young stem	Anthrax	Burying the young stem of <i>I. rothii</i> in the necks of affected animals	A	Dermal
						Leaf	Mastitis	Pounding and creaming on the affected animals udder	A	Dermal

Table 1. Contd.

38	<i>Jasmiun floribundum</i> L.sub sp. Floribundum (R.Br. ex. Freesen.) P.S. Green	Biluu	Oleaceae	Sh	W	Leaf, roots	Tufa	Pounding Leaves of <i>J. floribundum</i> , <i>Premna schimperi</i> , <i>R. glutinosa</i> , <i>Ehretia cymosa</i> , <i>Grewia bicolor</i> and roots of <i>C. spinarum</i> and wrap over affected body parts	H	Dermal
39	<i>Justicia schimperiana</i> (Nees) T. Anderson	Loomii	Euphorbiaceae	T	Ct	Fruit	Tonsillitis	Smash and Mix the <i>C. aurantifolia</i> juice with ash and administer it orally	H	Oral
40	<i>Lepidium sativum</i> L.	Fexxoo	Brassicaceae	H	Ct	Leaf	Febrile illness (Mich)	Squeezing the leaves of <i>Ocimum gratissimum</i> and <i>Lepidium sativum</i> and applying on the skin and /or drinking orally	H	Dermal /oral
41	<i>Myrtus communis</i> L.	Adasii	Myrtaceae	Sh	WC	Leaf	Pneumonia	Boiling the leaf and fumigating the steam	H	Nasal
42	<i>Nigella sativa</i> L.	Asmudi gurati	Ranunculaceae	H	WC	seed	Dermal Ulcer	Grinding the seeds of <i>Nigella sativa</i> and put it on affected body	H	Dermal
							Milk production	Grinding the seeds of <i>Nigella sativa</i> and mix it with water and administer orally and rub over the udder	A	Oral and dermal
							Kidney problems	Grind the seeds of <i>Nigella sativa</i> mix with honey eat every morning before meal	H	Oral
43	<i>Ocimum gratissimum</i> L.	Daamakasee	Flacourtiaceae	Sh	WC	Leaf	Tooth ache	Chewing and holding the leaves of <i>Ocimum gratissimum</i> with affected tooth part	H	Oral
							febrile illness (Mich)	Squeezing the leaf and cream over the skin	H	dermal
44	<i>Ocimum lamiifolium</i> Hochst. ex Benth	Damakesse	Lamiaceae	H	WC	Leaf	Febrile illness (Mich)	Squeezing the leaves of <i>O. lamiifolium</i> applying on the skin and /or drinking orally	H	Oral
45	<i>Pavonia patens</i> (L.F). Redoute	Hiccini	Malvaceae	Sh	W	Leaf	Intestinal Parasites (Diarrhea)	Pounding the <i>P. patenis</i> and <i>Calpurnia auria</i> leaves together and drink it	A	Oral
46	<i>Phytolacca dodocandra</i> L. Herit.	Haandoodee	Phytolacaceae	L	W	Leaf	Dermatitis	Pounding the leaf mix with oil and cream on affected body	H	Dermal
47	<i>Podocarpus falcatus</i> (Thunb.) Mirb.	Birbisa	Podocarpaceae	T	W	Leaf	Snake bite	Pounding together leaves of <i>Podocarpus falcatus</i> , <i>Cynoglossum coeruleum</i> and <i>Impatiens rothii</i> together and mix with water and drink it and put on affected body	H	Oral, Dermal
48	<i>Polygala sphenoptera</i> Fresen.	Harmel	Polygonaceae	H	W	Root	Chancroid	Boiling the root with water and drinking	H	Oral
							Mastitis	Pounding the roots of <i>Polygala sphenoptera</i> , <i>Tragia cinerea</i> , <i>Carisa Spinarum</i> , and <i>Allium sativum</i> together and mix with water and administer it in left nose	A	Nasal

Table 1. Contd.

							Anthrax	Stem of <i>I. rothii</i> , roots of <i>Senna petersiana</i> , and roots of <i>Solanum incanum</i> mixed and pounded together and administered orally	A	Oral
49	<i>Prunus persica</i> (L.)Batsch	Kookii	Rosaceae	T	Ct	Shoot	Infertility	Pound the shoots of <i>Prunus persica</i> , <i>Cuminum cyminum</i> , <i>Premna schimperi</i> , <i>Croton macrostachyus</i> and <i>Rumex nervosus</i> drink with one cup of water	H	Oral
50	<i>Psidium guajava</i> L.	Zeyituna	Myrtaceae	T	Ct	Root	Diarrhea	Grinding the roots of <i>Psidium guajava</i> and <i>Impatiens rothii</i> mix with water and drink it	H	Oral
51	<i>Rhus glutinosa</i> Hochst. Ex.A.Rich	Xaxeeyisa	Anacardiaceae	T	W	Leaf	Tufa	Pounding the leaves of <i>R. glutinosa</i> , <i>Jasmiun floribundum</i> , <i>Olea europea</i> , <i>Juniperus procera</i> , <i>Croton macrostachus</i> and wrap on the affected body for Seven days.	H	Dermal
52	<i>Rhus vulgaris</i> Meikle	Dabobechaa	Anacardiaceae	Sh	W	Leaf	Hepatitis	Pounding the young leaves of <i>R. vulgaris</i> and mix with water and drinking it for seven consecutive days	H	Oral
53	<i>Rumex nervosus</i> Vahl	Dhangaggo	Polygonaceae	Sh	W	leaf	Tufa	Smashing the leaves of <i>Rumex nervosus</i> and <i>P. schimperi</i> mix with honey and administer either orally or wrap on affected body	H	Oral and dermal
54	<i>Ruta chalpensis</i> L.	Xalatom/ciraad ama	Rutaceae	H	Ct	Leaf	Psychosis	Burn the dried leaves with fire and fumigate it	H	Nasal
55	<i>Solanum incanum</i> L.	Hiddi Bude	Solanaceae	H	W	Root	Milking Phobia	<i>S. incanum</i> root, <i>Urtica simensis</i> , <i>Grewia beguinotleaf</i> and root <i>C. macrostachus</i> root and aloe leaf smashed together mixed with water and drink	A	Oral
56	<i>Suregada procera</i> (Prain) Croizat	Xilloo	Euphorbiaceae	H	W	Stem	Hemorrhoid	Burn the stem and fire it on affected area	H	Dermal
57	<i>Tragia cinerea</i> (Pax) Gilbert & Radcl. Smith	Laalessaa	Euphorbiaceae	H	W	Leaf	Inflammation	Pounding the leaves of <i>Tragia cinerea</i> and <i>Impatiens rothii</i> together with water and drinking and creaming on affected skin part	A,H	Dermal
58	<i>Urtica simensis</i> Steudel.	Dobii	Urticaceae	H	W	Root	Erectile dysfunction	Chewing the roots of <i>Urtica simensis</i> and /or pounding the root with water and drink it.	H	Oral
59	<i>Vernonia amygdalina</i> Del.	Eebicha	Asteraceae	Sh	W	Leaf	Dingetegna	Pounding the leaves of <i>V. amygdalina</i> and mix it with water and drink it	H,A	Oral
							Hepatitis	Pounding the leaves of <i>V. amygdalina</i> and mix it with water and drink it	H	Oral
							Hypertension	Pounding the leaf of <i>V. amygdalina</i> mix with water and drink it	H	Oral
60	<i>Zingiber officinale</i> Roscoe	Jinjibila	Zingiberaceae	H	Ct	Root	Alzheimer	Chewing the root part thoroughly	H	Oral
						Stem	Cough	Grinding the stem mix it with sugar and water boil it and drink it	H	Oral

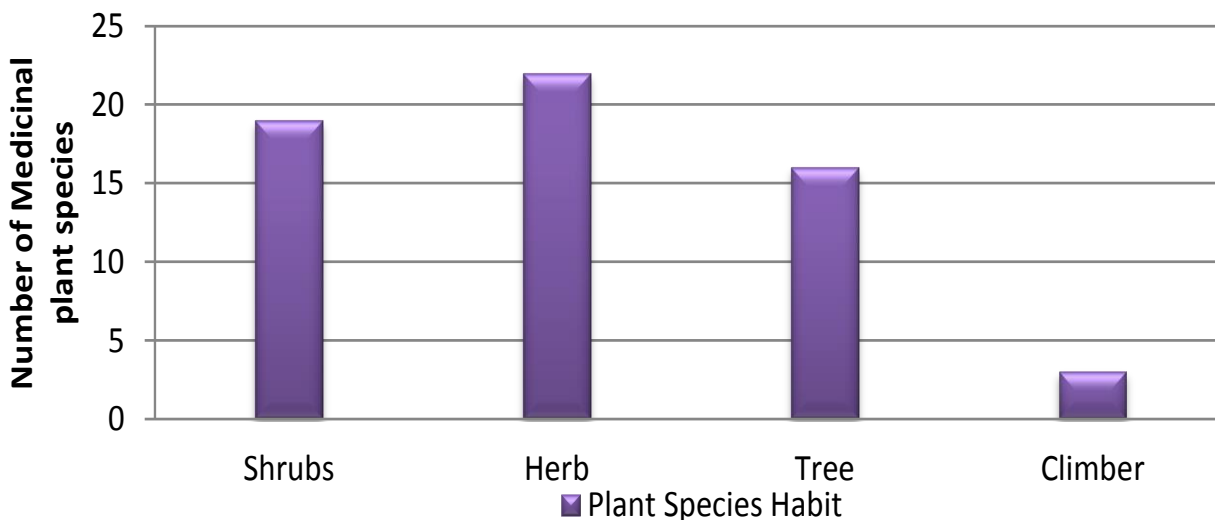


Figure 2. The growth forms of the medicinal plant species.

Table 2. Methods of cultural medicine preparation by people of the study area.

No.	Methods of preparation	Medicinal treatments	Percentage
1	Pounding	43	49.43
2	Squeezing	6	6.90
3	Roasting	2	2.30
4	Boiling	7	8.05
5	Grinding	15	17.24
6	Crushing	2	2.30
7	Smashing	4	4.59
8	Chewing	5	5.74
9	Burning	2	2.30
10	Burying	1	1.15
Total		87	100

7 (8.05%), squeezing 6 (6.90%), chewing 5 (5.74%), smashing 4 (4.59%) etc. Others collectively constitute 7 (8.0%) preparation methods.

The current finding showed that in the study area most remedies 66 (75.86%) were prepared from single plant species while, 21 (24.14%) remedies were prepared from combined plants. This finding agrees with finding of Dawit Abebe (1986) and Debela Hunde (2001).

Administration methods

In the study area, various routes of administration methods (Figure 3) were employed of which, oral administrations method leads the rank [60 (63.20%)].

Next to this dermal [26 (26.32%)] and nasal [8 (9.47%)] took the 2nd and 3rd ranks, respectively. The remaining administration method was ocular 1 (1.05%). The higher

employments of oral and dermal administration methods were in line with the works of Dawit and Ahadu (1993), Haile and Delnesaw (2007) and Kalayu et al. (2013).

Medicinal plants used for treating human and livestock ailments

Medicinal plants species used to treat human diseases

Out of the total 60 medicinal plant species collected from the study area, 55 (91.67%) species were used to treat 39 types of human diseases. Of these 55 medicinal plant species, 48 (87.27%) species were used only for human ailments and the remaining 7 (12.73%) species were used for both human and livestock treatments. These 55 medicinal plant species comprised 39 families and 53

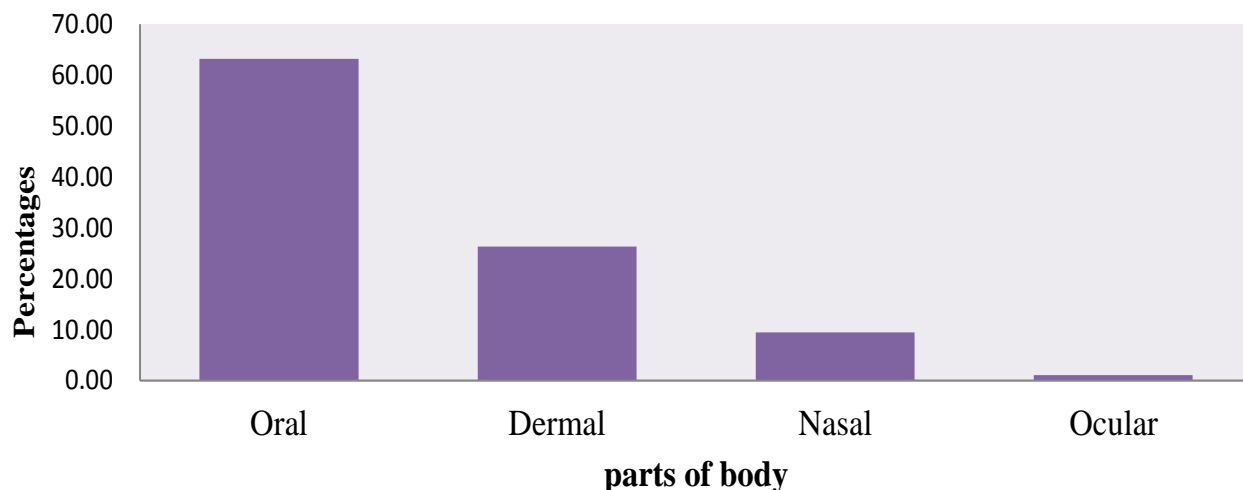


Figure 3. Cultural medicines routes of administration against human and livestock diseases.

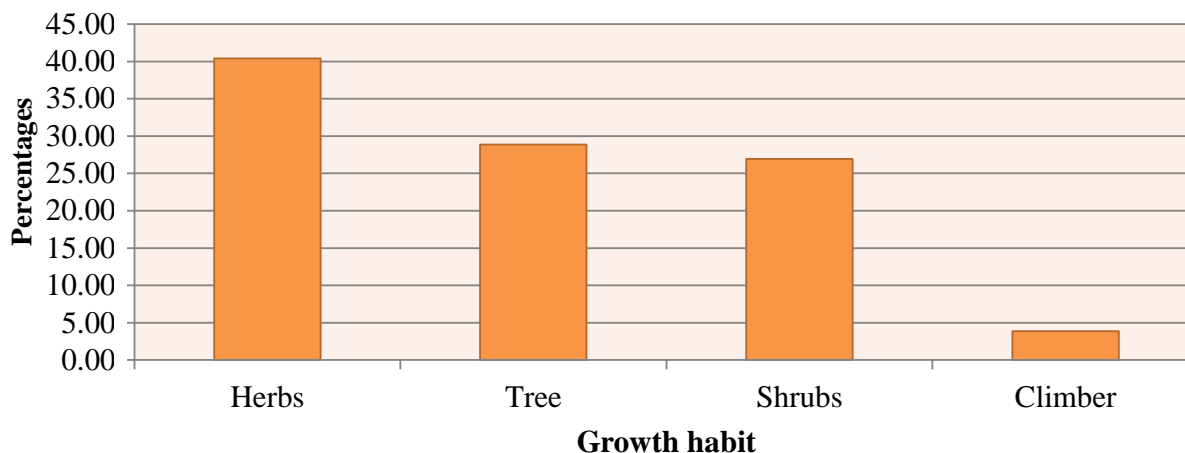


Figure 4. Proportion of medicinal plants used to treat human ailments in growth habit.

genera. The medicinal plants used for treatments of human ailments constitute herbs 20 (36.36%) species, tree 17 (30.91%) species, shrubs 15 (27.27%), species and Lianas 3 (5.45%) species (Figure 4). This indicates that most of the medicinal plants used for human ailments are herbs, trees and shrubs. This was in agreement with the works of Bayafers (2000) and Debela (2001).

Most (36 (65.45%) of the 55 medicinal plant species used for human ailments were collected from wild, followed by cultivated [11 (20 %) species], and wild and cultivated [8 (14.54)] species. This action has ecological meaning by the reduction of wild plant species. This finding also was explained by Mirutse (1999) and Bayafers (2000).

With regard to plant parts used, traditional practitioners mostly [31(46.96%)] harvested leaves and roots

[16(24.24%)] for treating human ailments (Figure 5). The other parts include seed 5(7.58%), shoots 4 (6.06%), fruits 3(4.55%), stem 3 (4.55%) and others 4(6.06%). Studies showed that the use of leaves for medicinal purpose has little effect for rare plants in the area

However, the use of root (that is, the second mostly harvested plant part) for medicinal purpose leads to the destruction of mother plants that could affect the survival and ecological aspect of the plant (Odera, 1997; Kalayu et al., 2013).

Major human diseases and plant species used for the remedies

This study showed that a total of 39 human diseases were recorded which are treated by the 55 plant species.

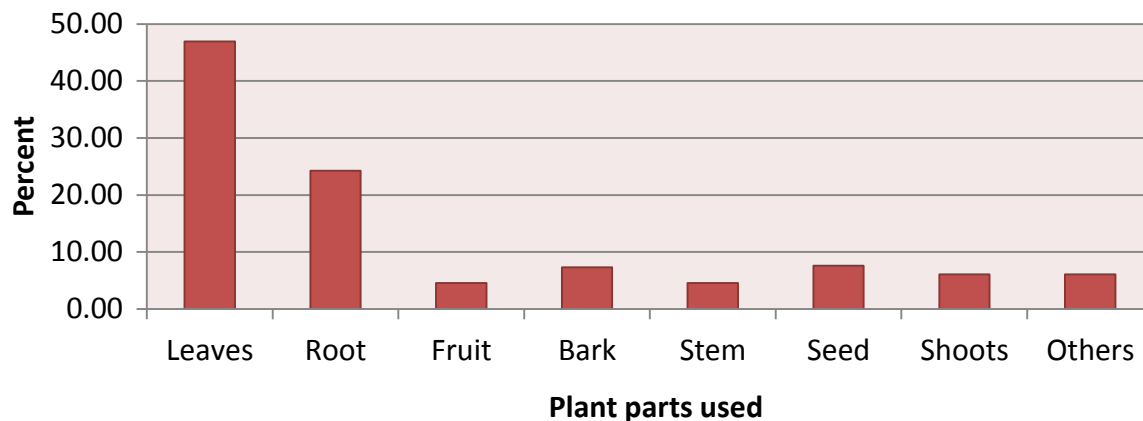


Figure 5. Medicinal plant parts used for human ailment treatments.

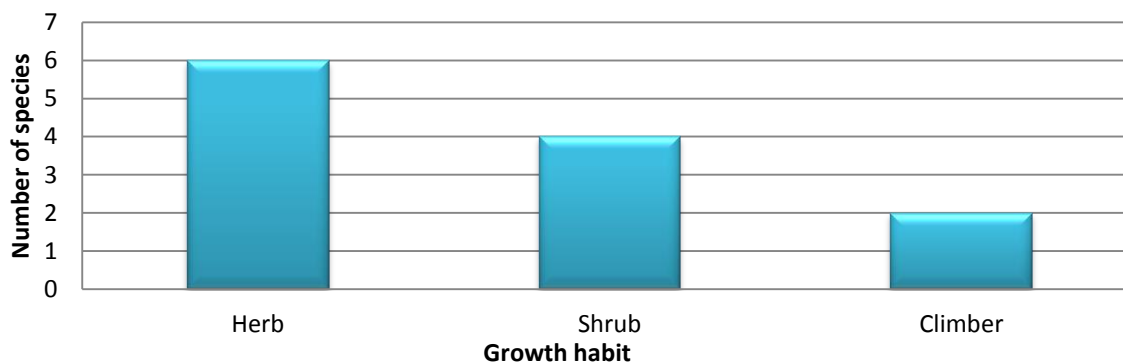


Figure 6. The growth form of medicinal plants used to treat livestock ailments.

The identified diseases may be treated by one or more species and vice versa. As a result, the total number of plants (71) used to treat human health in the study area were greater than the total number of medicinal plant (55) species which were documented for treatment of human disease. This clearly indicates that some plant species were used to treat more than one type of disease. For example; *Carissa spinarum* used to treat evil spirit, tonsillitis and snake bite. As shown in Table 4, the informants know more plant species to treat Chancroid, inflammation, fibril illness (Mich), Pneumonia, and Tufa (treated by medicines prepared from 4 and above plants each). This finding shows that about 50% of the diseases were treated with cultural medicines prepared from two or more different plant species which increases the conservation of medicinal plants.

Medicinal plants species used to treat livestock disease

Out of the total 60 medicinal plant species recorded in the study area, 12 (20%) species were used for treatment of

livestock ailment. Of which 7 (58.33%) species were used for treatment of livestock and human ailments. The remaining 5 (41.67%) species were used for treatment of only livestock ailments. These 12 species were distributed under 11 families and 12 generas. Family Solanaceae represent 2 species while the remaining 10 families were represented by single species each.

These medicinal plants which were used to treat livestock comprised herbs [6 (50%)] species, shrubs 4 (33.33%) species, and Lianas 2 (16.67%) species (Figure 6). This indicates that, most of the plant species used to treat livestock were herbs (50%) followed by shrubs [4 (33.33%)]. This finding was in agreement with the work of Etana (2007). The remaining was liana.

The rational practitioners were familiar with using varieties of plant parts to prepare different types of traditional medicines (Figure 4). Moreover, they show certain preferences over this plant parts for their medicine preparation. In doing so, the traditional practitioners mostly used leaves from 6 (46.15%) species, roots from 5 (38.46%) species, stems and seeds from 1 (7.69%) species each. This analysis clearly showed that leaves and roots were the most important plant parts used to

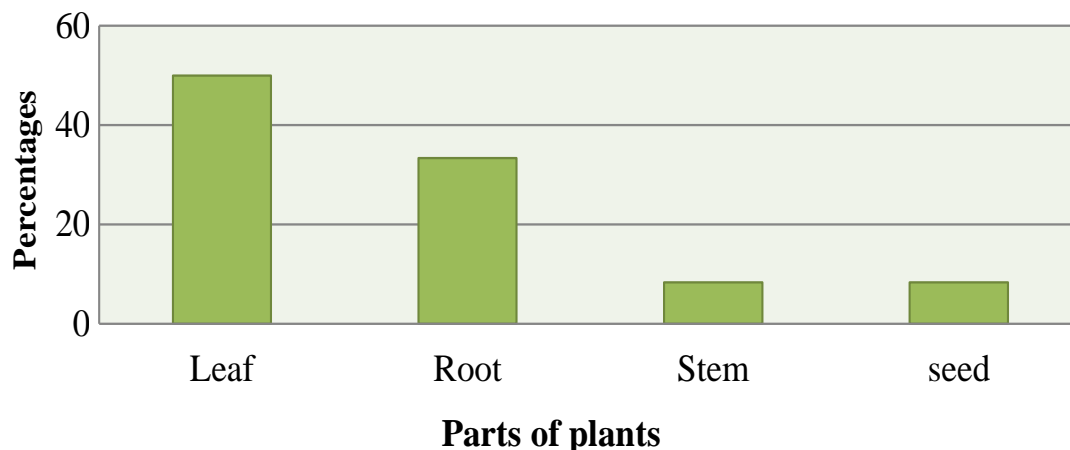


Figure 7. Medicinal plant parts used to treat livestock ailments.

treat different livestock diseases followed by seed and stem parts from single plant species each in the study area. The previous study in different part of Ethiopia also showed that leaves and roots are the most important plant parts used to treat various health problems (Dawit and Estefan's, 1991; Bayafers, 2000; Mirutse and Gobana, 2003).

Major livestock disease and number of plant species used

In the study area a total of 9 livestock diseases were recorded which are treated by the 12 plant species. The informants know more species to treat Mastitis and Anthrax.

Medicinal plant species used for both human and livestock

From the total 60 medicinal plant species recorded in the study area, 7 (3.33%) species were used for treatment of both human and livestock. These 7 species were distributed under 7 families and 7 generas. With regard to plant parts used, practitioners' harvested leaf parts from 4 plants, roots from 3 plants, fruits and seeds from single plants each to prepare the 19 cultural medicines used to treat the 14 human and livestock diseases.

Medicinal plants use report/Informant consensus

Some medicinal plants and their utilization were more popular than others. In the study area, plant species *Ocimum lamiifolium* (Damakesse) took the lead where it was cited by 42 (87.5%) informants. *Ruta chalpensis* L. (Xalatom/ciraadama) with 41 (68%) informants and *Allium sativum* L. (Qullubi addii) with 40 (66.67%)

informants took their consecutive ranks.

Informant consensus factor

The frequently observed diseases in the study area probably become the primary area of concern to treat them and therefore need to accommodate more indigenous knowledge than less frequently appeared disease categories. In the current study, most of the diseases mentioned in the table have higher ICF value. This indicates the diseases which mentioned in Table 7 were common for the study area and many people have great knowledge to cure the diseases. Among the 39 diseases encountered in the study area, only 17 of them were considered. In comparison, chancroid, cough, diarrhea, tonsillitis, diarrhea, ear ache, hemorrhoid, inflammation and tufa has the highest ICF values (0.99) each followed by Alzheimer, hepatitis, hypertension, and pneumonia with ICF value 0.98 each (Table 3).

Preference ranking

The study showed that diarrhea and tufa were among the common diseases in the study area. The highest rank was given for *Jasmiun floribundum* being as effective treatment against the disease called tufa (Table 4). *Cissampelos mucronata* and *Rhus glutinosa* took the 2nd and 3rd ranks (Table 4).

Paired comparison

Paired comparison was used to evaluate the degree of preference of 5 reported medicinal plants for treating chancroid following Martin (1995). Therefore the study identified that *C. cyminum* is the most preferred plant species used to treat chancroid in the study area.

Table 3. Informant consensus factor for certain disease

No.	Disease treated	No. of plant species used	No. of use citations	ICF value
1	Abdominal pain	2	40	0.97
2	Alzheimer	2	50	0.98
3	Chancroid	5	130	0.99
4	Cough	3	80	0.99
5	Diarrhea	2	135	0.99
6	Dingetegna	3	111	0.99
7	Ear ache	2	93	0.99
8	Hemorrhoids	3	75	0.99
9	Hepatitis	2	66	0.98
10	Hypertension	2	60	0.98
11	Inflammation	4	152	0.99
12	Fibrill Illness (Mich)	4	188	0.99
13	Pneumonia	4	45	0.98
14	Tonsilitis	2	70	0.99
15	Tooth ache	2	34	0.97
16	Tufa	4	198	0.99
17	Urinary problem	2	28	0.96

Table 4. Medicinal plant species preference ranking by informants to treat Tufa.

Plant species used to treat Tufa	Respondents										total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
<i>Cissampelos mucronata</i>	8	8	9	7	8	9	8	9	6	8	80	2
<i>Jasmiun floribundum</i>	10	9	10	8	9	10	7	10	7	7	87	1
<i>Rhus glutinosa</i>	7	7	8	9	8	8	7	8	5	6	73	3
<i>Rumex nervosus</i> Vahl	6	7	8	7	8	7	6	7	5	7	68	4

Table 5. Paired comparison of medicinal plants used to treat Chancroid.

Plant species used to treat diarrhea	R1-R6					Total	Rank
<i>Cuminum cyminum</i>	-	Cc	Cc	Cc	Cc	4X	1
<i>Polygala sphenoptera</i>	-	-	Ps	Ps	Ps	3X	2
<i>Achyranthes aspera</i>	-	-	-	Aa	Aa	2X	3
<i>Asparagus africanus</i> Lam	-	-	-	-	Aal	1X	4
<i>Euclea racemosa</i> subsp. Schimperii	-	-	-	-	-	0X	5

Similarly, *Polygala sphenoptera* and *Achyranthes aspera* were cited as the second and third ranked plants respectively to treat Chancroid (Table 5).

Acquisition and transfer of indigenous knowledge on medicinal plants

In the study area, most 36 (75%) of the informants who have acquired the knowledge on medicinal plants were from their parents and close relatives. The other 12 (12%) got the knowledge by reading different written

material, by giving incentive for elders and by trial and error. Most of the informants 39 (81.25%) have already trained their family and close relatives. Some informants require incentive to give their knowledge for other person.

Threat to medicinal plants

In the study area, the survival of medicinal plants affected by both natural (dry time) and anthropogenic (fire wood, overgrazing, agricultural expansion, construction and medicine) activates. In the study area, the most threat for

Table 6. Priority ranking factors perceived as threats to medicinal plants based on the level of destructive effects (values 1-7 were given: 1 is the least destructive threat, and 7 is the most destructive threat).

Factor	Respondents							Total	Rank
	R1	R2	R3	R4	R5	R6	R7		
Dry season	5	6	3	4	6	5	6	35	3 rd
Land slide	2	3	1	1	1	1	1	10	7 th
Fire wood	6	7	7	6	5	4	6	41	2 nd
Over grazing	3	5	5	2	3	2	3	23	5 th
Agriculture	7	4	6	7	7	7	5	43	1 st
Construction	4	2	4	5	4	6	7	32	4 th
Medicinal value	1	1	2	3	2	3	2	14	6 th

distraction of medicinal plants is agricultural expansion. The 2nd and 3rd threats for disappearance of medicinal plants were fire wood and dry season (Table 6).

Conclusion

In this study, 60 plant species with medicinal value distributed under 42 families and 58 genera were identified and documented. This shows the area is rich in plant diversity. About 39 (65%) species were found from wild vegetation, 11 (18.33%) species were cultivated and the remaining 10 (16.67%) were both cultivated and wild vegetation. Herbs were the dominant growth forms used for the preparations of traditional remedies followed by shrubs.

In the study area, 48 ailments were reported (39 for human and 9 for livestock) to be treated by traditional medicinal plants of the area. As indicated by informants, high numbers of medicinal plant species were applied for treatment of the informants know more plant species to treat chancroid, inflammation, fibril illness (Mich), pneumonia, and tufa (treated by medicines prepared from 4 and above plants) for human and mastitis and anthrax for livestock.

Humans and natural factors are the major threats to plant species in general and to the medicinal plants in particular in the study area. As suggested by most informants, in the area, the human induced threats including agricultural expansion, fire wood, construction, over grazing, and natural factors such as extended dry times were cited to be major threats for reduction of medicinal plants.

Recommendations

1. The indigenous knowledge and skill of traditional medicine practitioners must be encouraged and protected. This could be the way through which such people could exercise their knowledge boldly.
2. Establishing conservation measures strategies to

ensure the sustainability of multipurpose and widely used medicinal plants as most medicinal plants are obtained from the wild.

3. Create awareness of the local people on the magnitude of loss of medicinal plants and associated knowledge to ensure sustainable harvesting of medicinal plants.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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