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Ethnobotanical Study of Medicinal Plants in Wolaita Zone, Southern Ethiopia

Takele Bassa
Department of Biology, college of natural and computational science, P.O.Box, 419 Dilla University, Dilla Ethiopia

Abstract
The aim of this study is to investigate medicinal plant diversity, ethnobotanical study and to document indigenous knowledge of people in wolaita zone. Data were gathered from, local healers using different ethnobotanical techniques such as; semi- structured interview, field observation, and group discussion & analyzed using descriptive statistical analysis methods. Discussions were conducted with informants and residents in seeking to understand the use, threats to traditional medicinal plants and its management, and to know how knowledge is maintained and transferred through family or community. A total of 60 traditional healers (40 men and 20 women) from the age of 18 and above were selected purposefully based on their knowledge and practice on medicinal plants. A total of 102 medicinal plant species belonging to 100 genera and 54 families were collected from the study area, among them 76(74.5%), were collected from wild while the remained 26(25.49%), were cultivated in the homegardens. The Family lamiaceae contributed the highest number of medicinal plants 12(11.8%), followed by Astraceae 8(7.84%).Based on the growth forms herbs accounted the highest numbers(49%).Regarding plant parts used leaves were the most frequently sought plant parts accounting for (66%). Majority of remedies (52%) were applied in mixing with pure water and (31%) used alone. Of the total medicinal plant species reported, 84% and 9.8% were used to treat human and livestock ailments respectively. The remained 5.9% were used to against both human and livestock ailments. Greater proportion of rout of administration 80%, were oral. Analysis of preference ranking showed, Ajuga integrifolia was the most perceived & preferred medicinal plant by people of the study area to treat stomach ache. Stepania abyssinica was found to be the most preferred plant to treat stomach complains in livestock. Some medicinal plants are popular than others in treating various diseases. For instance, Allium sativum were found to be the most popular, followed by Moringa stenopetala treating malaria. Concerning informant consensus factor, the highest ICF values were linked to problems associated with stomach ache (0.71). Jaccard`s Coefficient of Similarity (JCS) revealed highest similarity 34% were, found b/n sidama. Youngsters have almost no aims to receive and to transfer medicinal plant knowledge, so concerning bodies to create awareness in the area suggested. Agricultural expansion, were reported to be the major pressure to medicinal plants & little practice of conservation measures in the area.
Keywords: Indigenous knowledge, ethinobotany and use categories, ailments, conservation & threats.

1. INTRODUCTION

1.1. Back ground of the study

Traditional medicine is defined as health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses and maintain well-being (WHO, 2001).

The indigenous peoples of different localities have developed their own specific knowledge of plant resource uses, management and conservation. As a result, traditional medicine has become an integral part of many cultures in the world (Pankhrust, 2001). Based on (Okigbo and Mmeka, 2006), traditional medicine includes remedial practices existed in long periods of time before the development of modern scientific medicine and is still in use today without much documented evidence of adverse effects. Traditional medicine has been part of the people's culture in Africa, but it is not as well organized as, for example, in India and China. Ethiopians widely practiced the use of traditional medicine, so as Ethiopia is the land of vegetation as well as livestock. (Friis, 2009). Ethiopia is the country having 6,500 and above species of higher plants, which makes the country as one of the most diverse floristic regions in the world. There are large numbers of moderate to high value medicinal plants herbs and spices existing in the wild, but only small percents are traded. Several of indigenous and exotic species and essential oil bearing plants could luxuriously grow in Ethiopia and provide remarkable benefits to the national economy, since Ethiopia as land of diverse climatic and edaphic potentials (Endashaw Bekele, 2007).

In Ethiopia, more than 95% of traditional medical preparations are of plant origin, and 70% of human and 90% of livestock populations depend on traditional medicines derived from medicinal plants for their primary health care (Endashaw Bekele and Shigeta, 2008). Development of traditional medicinal plants is indispensable in primary health care to save the foreign exchange, besides it is important to conserving our national heritage (Abiot Birhanu *et al*., 2006). Because of the beginning of modern medicine peoples in developing countries displayed disinterest towards herbal remedies, due to this there is danger that the knowledge of traditional healers will be lost if action is not taken to document the particular prescriptions involved. Besides, the rapid loss of natural

habitats, traditional community life, cultural diversity and knowledge of medicinal plants, documentation of African traditional plants is an urgent matter (Wyk *et al.,* 2002). Habitat and species are being lost rapidly as a result of the combined effects of environmental degradation, agricultural expansion, deforestation and over harvesting of species and this is further enhanced by human and livestock population increase thus speeding up the overall rural livelihood impoverishment and loss of the biological diversity and indigenous knowledge which is also of global concern (Edwards, 2001). The effective plan to conserve, develop and effectively utilize the resource needs investment commitment by government agencies, the private sector, and various global foreign aids for development. Before development of conservation measures and effectively utilization, clear allocation of the resource condition and its economic values must be worked out. This needs a detail overview of medicinal plant diversity, their demands, trade, and economic benefits in the study area. Such an overview has to come up with a formulation of conservation measures for endangered species, documentation of existing medicinal plant species and to put forward possible solutions for conservation measures. Thus, the present study aimed at investigating medicinal plant diversity, ethnobotanical study and to document indigenous knowledge of people in Wolaita zone.

2. Materials and methods

2.1. Description of the study area

2.1.1 Geography

Wolaita is one of the fourteen zones of the Southern Nations, Nationalities and Peoples' Regional State (SNNPRS) of Ethiopia with a total area of 4,471.3 km² or 438,370 hectares. Wolaita is inhabited by over 1.9 million people. Out of the total cultivable land area of the zone, which is 232,867.12 ha, the cultivated land is 142,684.88 ha (61.3 %). 91,427 ha of total land area is covered by forest, 48, 082 ha (20.6) is grazing land, 17, 022 ha irrigable, 3,113 ha irrigated and 31,710 ha is covered by others. The geographical location of the study area 6º51″ and 7º35″ North Longitude; and 37º46″ and 38º1″ East Latitude. It is located at about 330 KMs south west of Addis Ababa, and 160 km from Hawassa, the Southern regional capital and borders with Gamo Gofa zone in the south, With Dawro Zone in the west, with Sidama Zone in the east, ith Kamabata & Tamabro and Hadiya Zones & with Oromia state in the northern east.

2.1.2 Landscape

The topography of Woalaita zone is composed of rugged undulating mountain, rolling hills, plateaus and plains that extend up to low land of Lake Abaya. In terms of agro ecology the area is 9% highland (*Dega*), 56% midland (*Weina dega*) and 35% lowland (*Kolla*). The altitude ranges from the lowest at the foot of Omo river valley 501 masl to highest 2,950 masl at peak of Mount Damota. Regarding the land holding size of Wolaita 6% hh has less than 0.1ha, 47.3%hh has 0.1-0.5ha, 27% hh has 0.51-1.00ha, 5.3%hh has 1.01-2.00ha, and only 4.4% hh has 2 ha and above. Wolaita Zone has a total square area of 4,511.7 km-among this 57% well cultivated,7% can be productive if labor added and 11% grazing land and 19% is coved with forestry. Totally, it is estimated land covered with forest is 8.9%.

2.1.3 Weather

Maximum rain fall is received from July to September and ranges from 801 -1,600 mm, which compares favorably with many other places in the country. The average temperature varies from minimum 15.1^0c to maximum 31^0c. Depending on the climatic condition/nature, Wolaita Zone is categorized under rift valley crop producing .

2.1.4 Population

The average population density of Wolaita is over 385 people per square kilo meter making it one of the most densely populated areas in the country. Population density in some parts of the Zone is as high as 781 ppkm² in Damot Gale Wereda; and as low as 168 ppkm² in Humbo Woreda (Compiled from various sources and Wikipedia). Based on the data gathered by WODA in 2009 the population size and structure, the current total population of the zone is 1,906,244 of which 795,950 are children (0-14years) 901,276 are working age population and 29,352 are old age (65+1) population, women of reproductive age (15-49) are 42,572. The current average population density of the Zone is 428.2km^2.To alleviate the population increment problem, about 276,695 females and 57,956 males have been using different contraceptive methods.

2.1.5 Economy

The major economic activities are agriculture (production of legumes, root crops and some cereals – predominantly maize), and livestock rearing. Wolaita Zone is suitable for agricultural activities having various climatic conditions, variety soil profiles, 12,000 hectares of reproductive land for irrigation and intense water bodies. Among these only 8,690 lands is in use for irrigation (Compiled from various sources and Wikipedia). According to the census made in 1999 E.C, it is estimated to be 1.65 million. When it is split in sex, 50.73% are male and 49.27 % are female. The annual growth rate of Wolaita zone is 2.9%. Among the whole people, the productive group ranges from ranges 15-64 and this in 50.2% and non-productive part fewer than 15 ages and above 65 ages contributes 49.8%. Meanwhile among the productive portion of the people, 262,404 are owner farmers and an average family size is 5.5 as the information Wolaita Zone Finance and Economic department. Most people as it is mentioned

1,453,100 /88.5%/ live in the country and depends on subsistence farming. In a sq.km, 364 people dwell and surprisingly 694 in Damot Pulasa and 159 in Humbo. From the time when Wolaita Zone Administration established, much more efforts to the stability of development, good governance and democracy and peace. Wolaita Zone as has made good integration among GO's and NGO's and has ratified 5 years of development and transformation strategic plan as vital scenario (Compiled from various sources and Wikipedia)

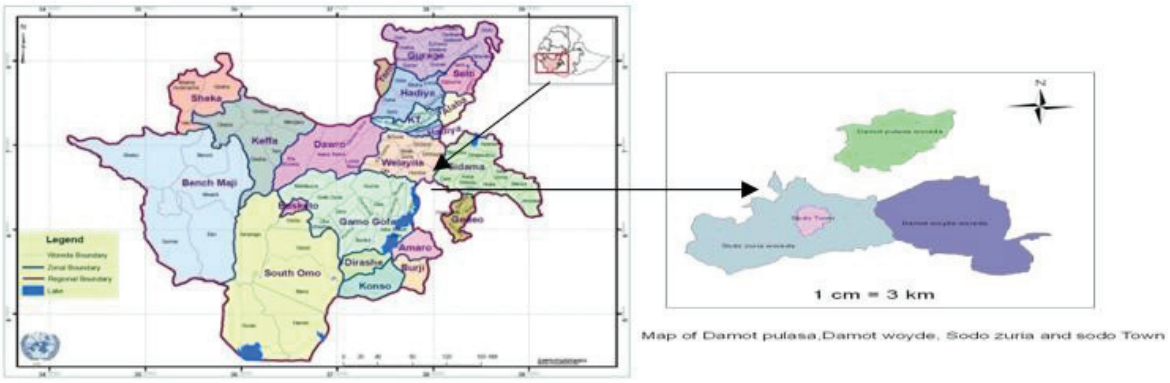

Figure: 1Map of the study area from finance & economic development bureau of Wolaita Zone.

2.2. Informant selection

In this study, 60 traditional healers (40 men and 20 women) from the age of 18 and above were selected purposefully from the four selected woredas based on their knowledge and practice on medicinal plants. From each study sites 15 key informants were selected from already interviewed informants. Information regarding the knowledge of traditional practitioners was gathered from the local people in the area and the selection of key informants took place with local administrators, elders and Development Agents (DAs). Accordingly the selection of key informants was enabled to drain necessary information's and to include at least two to three traditional medicinal practitioners in each study site.

2.3. Data collection methods.

Data collection was carried out through individual interviews with informants using semi-structured interview, FGD & walk with informants following cotton (1996). Data collection was focused mainly on the kind of ailment treated, ways of remedy preparations, route of administration, parts used, management methods, and conservation practices and dosage, information on local marketability, cultivation practices, habitat and abundance of medicinal plants, source of knowledge, ways of knowledge transfer, uses of antidotes, any taboos, distance of collection site from the home, were recorded. Local names of plants were studied by repeated inquiries at different times with the same informants to check the accuracy of information. Discussions were conducted with informants in seeking to understand the threats to traditional medicinal system of the people and its management, and to know how knowledge is maintained and transferred through family or community.

2.4. Specimen Collection and Identification.

Medicinal plants were collected from wild and cultivated areas of the study site. Based on ethnomedicinal plant information's provided by informants, the specimens were collected, numbered, pressed, and dried for further identification. Accordingly, the collected voucher specimens were taken to Dilla University for further study and taxonomic identification.

2.5 Data analysis.

A descriptive statistical method such as percentage and frequency were used. In addition, Informant consensus (ICF) was calculated using the formula, ICF = (nuc – ns)/(nuc –1), where nuc = number of use citations, ns = number of species used for each use citation (Heinrich *et al.*, 1998). Similarly, Jaccard's similarity coefficient was estimated for comparing MP species composition in 10 randomly selected areas in Ethiopia studied by different workers following Kent and Coker (1992).

Preference ranking has been involved asking each of the 10 selected key informants to arrange the items, such as 6 MPs used to treat human ailment and the other 6 MPs used to treat livestock ailment following Martin (1995). Priority ranking factors perceived as threats to medicinal plants based on their level of destructive effects (values 1- 6 were given: 1 was the least destructive threat, and 6 was the most destructive threat) and direct matrix ranking on uses perceived as threats to 5 to 6 medicinal plants were conducted for multipurpose medicinal plants that were commonly reported by healers following Cotton (1996).

Fidelity Level formula is given as FL=Ip/Iu×100, where *Ip* is the number of informants who independently

indicated the use of a species for the same major ailment and *Iu* is the total number of informants who mentioned the plant for any major ailment (Friedman *et al*., 1986).Prior to the calculation of FL, reported ailments were grouped into major disease categories following the approach of Heinrich et al. (1998). Finally, the Spearman Rank Correlation Test were employed to evaluate whether there is significant ($p < 0.05$) correlation between i) the age of traditional healers and the number of ethnomedicinal plant species reported, and ii) the educational level of healers and the number of species reported.

3. Results and discussions

3.1 General Information of Informants

Sex and age of informants

Forty (67%) male and twenty (33%) of female were take part in the study. Ninety percent of medicinal plants were mentioned by males and the remained ten percent of medicinal plants were reported by females. Informants arranged in three age groups, accordingly out of 60 informants, 6(10%) of the informants are found between the ages 18-35, 9(15%) informants were grouped between the age 36-50, and 45(81%) of informants were aged 50 and above. As observed, much of knowledge of traditional medicine obtained from elder peoples and informants reported that young people have no interests to use traditional medicine and to acquire knowledge from the elder peoples. Young peoples were unable to mention much number of medicinal plants compared with the elders. The decline in the use of medicinal plants by younger generation may gradually lead to disappearance of the indigenous knowledge associated with the plant species.

The relationship between knowledge and age of informant analysis showed that it is directly proportional to age increment. This finding is inline with works of Etana Tolasa (2007), Hussien Adal (2004); Debala Hundie (2001) and Tigist Wondimu (2003).

3.2 Religion and educational status of informants

Out of sixty informants, the highest number 41.67% of them were Orthodox religion followers followed by Protestant 38.33% and 15% were Catholics and the remained 5% were Muslims. The highest no of medicinal plants, relatively were mentioned by informants from Orthodox religion followers.

Based on educational status of informants, majority of informants 50% were illiterate, 28% of informants have completed elementary level courses and 15 % informants have completed high school level education and 7% of them were completed college level. Higher numbers of medicinal plants were reported by men than women, by informants belonging to age group 50 & above year's age than those belonging to age below 50 years and by illiterate people than literate once. This tells that younger peoples have little willingness to receive traditional medicinal knowledge from their elder once; it may be due to modernization and dependence on modern medicines.

Table: 1 Medicinal plant use knowledge compared by age groups, religion & educational levels.

Title		Percentage	Plants cited
Age group	18 - 35	10	8
	36 - 50	15	13
	Above 50	75	81
Religion	Orthodox	42	42
	Catholic	15	23
	Protestant	38	30
	Muslim	5	7
Educational status	Illiterate	50	47
	Elementary	28	36
	High school	15	11
	College level	7	8

3.3 Diversity of Medicinal plants

A total of 102 medicinal plant species belonging to 100 genera and 54 families were recorded from the study area. Of these 50(49%) were herbs, 19(19 %) were shrubs, 30(29.41%) were trees and 2(2%) were climbers and 1(1%) were epiphytes. In the study area the families Lamiaceae accounted for the highest number of medicinal plants (12 species), which were the leading groups & could probably be due to their more abundances than the other species. The second plant species with highest number next to lamiaceae was Asteraceae (8species). Other similar studies reported in different parts of the country (Giday and Ameni, 2003; Tanto *et al*., 2003; Tadesse *et al*., 2005).

Table 2: Distribution of medicinal plant genera and species across the different families

No	Family	No of Genera	No of Species	Species (%)	No	Family	No of Genera	No of Species	Species (%)
1	*Asteraceae*	6	8	7.8	*28*	*Musaceae*	1	1	0.1
2	*Amaranthaceae*	1	1	0.1	*29*	*Moringaceae*	1	1	0.1
3	*Apiaceae*	3	3	2.9	*30*	*Myrtaceae*	3	3	2.9
4	*Alliacea*	2	2	1.9	*31*	*Malvaceae*	4	4	3.9
5	*Aloaceae*	1	1	0.1	*32*	*Menispermaceae*	1	1	0.1
6	*Annonaceae*	1	1	0.1	*33*	*Meliacea*	1	1	0.1
7	*Asparagaceae*	1	1	0.1	*34*	*Myrisinaceae*	1	1	0.1
8	*Brassicacea*	3	3	2.9	*35*	*Orchidaceae*	1	1	0.1
9	*Balsaminaceae*	1	1	0.1	*36*	*Oleaceae*	1	1	0.1
10	*Boraginaceae*	2	2	1.9	*37*	*Polygalaceae*	1	1	0.1
11	*Caricaceae*	1	1	0.1	*38*	*Polygonaceae*	1	1	0.1
12	*Cycadaceae*	1	1	0.1	*39*	*Primulaceae*	1	1	0.1
13	*Convolvulaceae*	1	1	0.1	40	*Poaceae*	2	2	1.9
14	*Combretaceae*	1	1	0.1	*41*	*Podocarpaceae*	1	1	0.1
15	*Commelinaceae*	1	1	0.1	*42*	*Phytolaccaceae*	1	1	0.1
16	*Ceratophyllaceae*	1	1	0.1	*43*	*Rutaceae*	2	2	1.9
17	Celastraceae	1	1	0.1	*44*	*Rubiaceae*	5	5	4.9
18	Clusiaceae	1	1	0.1	*45*	*Rosaceae*	1	1	0.1
19	Cucurbitaceae	1	1	0.1	*46*	*Ranunculaceae*	1	1	0.1
20	*Euphorbiaceae*	5	5	4.9	*47*	*Rhamnaceae*	1	1	0.1
21	*Fabaceae*	4	4	3.9	*48*	*Solanaceae*	6	6	5.9
22	*Geraniaceae*	1	1	0.1	*49*	*Sapindaceae*	1	1	0.1
23	*Lamiaceae*	12	12	11.8	*50*	*Typhaceae*	1	1	0.1
24	*Lauraceae*	1	1	0.1	*51*	*Urticaceae*	2	2	1.9
25	*Lineaceae*	1	1	0.1	*52*	*Verbenaceae.*	1	1	0.1
26	*Loranthaceae*	1	1	0.1	*53*	*Vitaceae*	1	1	0.1
27	*Lythraceae*	1	1	0,1	54	Zingiberaceae	**1**	**1**	0.1
Total						**54**	**100**	**102**	**100**

The highest number of medicinal plants 76(74.5%), were collected from wild while the remained 26(25.49%), were cultivated in the homegardens.This shows that wilds were the home for many medicinal plants used by peoples of the study area for livestock's & their different ailment Mirutse Giday (1999) reported similar findings in his work on medicinal plants of the Zay people. However, homegardens are promising areas for the conservation of medicinal plants in the future in the study area owing to the increasing activity of farmland expansion, environmental degradations by human influences & population growth and the need.

3.3.1 Distributions of medicinal plants in (Wora/natural habitat).

Highly diverse number of medicinal plants 76(74.5%), were collected from wild. However, wild habitats are subjected to the loss of a number of plant species due to different anthropogenic factors such as firewood collection, frequent fire, building and construction, timber & charcoal production. This displays that relatively wild has been the home for many medicinal plants than homegardens for various human uses. Similar reports showed in Sekoru District (Yineger & Yewhalaw, 2007). Majority of ethinomedicinal plant species were collected from the wild (Wora) than (Darkuwaa) home garden. Informants suggested for this, the following three main reasons –

1. It is far from the home, so nobody easily gets and disturbs them.
2. Some places are not suitable for agriculture and the plants can grow year after year.
3. The places are not easily accessible.

a b c

Figure 2: Picture "a" shows that discussion of most important plant parts with informants. Picture "b" searching medicinal plant type in its natural habitat on the mountain. Picture "c" shows that discussion of parts used, dose & remedies of medicinal plants with informants (Photo taken by Takele, 2007).

Based on the density and distributions of vegetations, wora/natural habitat vegetations with its medicinal plant species on the study area were grouped in to six categories-

(i) Geziyaa/mountain vegetations- This refers to plant species that originates and growth in the mountain environments and its surroundings. Medicinal plant species such as *Artemisia annua, Artemisia afra, Artemisia absinthium, Allium sativium, Amaranthus caudatus, Anethum graveolens, Echinopis kebericho, Foeniculum vulgare, Hagenia abyssinica, Impatiens rothii, Lippia adoensis, Linum usitatissimum, Nigella sativa, Ocimum basilicum, Rhmanus perinodes, Ruta chalepensis, Senra incana,Trachyspermum ammi, Ensete ventricosum, Vicia faba,& Catha edulis.*

(ii) Miitta gadiya/woody vegetations- is the place with many concentrations of tree varieties from lower to higher plant species such as, *Cordia africana , Croton macrostachyus, Coffe arabica, Citrus limon, Clausena anisata, Dodonaea angustifolia, Drynaria volkensii, Ehretia cymosa,Clerodenrum myricoides, Eucalyptus globules, Millettia ferruginea, Olea europaea, & Vernonia amygdalina.*

(iii) Gara/ lowland vegetations- is an environment with hot and dry weather conditions, in which drought tolerant plant and animal species live. Medicinal plant species adapted to this environment were-*Millia azandriche, Aloe spps, Manihot esculanta, Euphorbia candelabrum, Jatropa curcas, Moringa stenopetala, and Gossypium hirsutum.*

(iv) Shaapa Hera Meta/riparian vegetations- are plants grow near water and surroundings. Medicinal plant species such as- *Lysimachia ruhmeriana, Phytolacca dodecandria, Typha domingensis, and Hypericum quartinanium* mainly selects this environment.

(v) Matanne mokia metata/grass land vegetations– is refers to vegetations grow in the grass lands. Plant species including-*Stephania abyssinica, Sida rhombifolia, Solanum nigrum, Securidaca longepedunculata, Phyllanthus leucanthus, Rumex abyssinicus, and Pycnostachys abyssinica.*

(vi) Road side vegetations- referes to plant species grow arround the road sides' examples of plant species were *Phytolacca dodecandria, Momordiav foetidia, Pentas lanceolata, Parthenium hysterophorus, Kosteletzkya adoensis, Farsetia stenoptera, Galium aparinoides, Geranium aculeolatum, Girardinia bullosa, Disa scutellifera, Datura stramonium, Commelina benghalensis, Ceratophyllum demersum & Arabis alpine.* Informants explained that in the study area some plant species exists in more than one place. For example *Moringa stenopetala, Aloe spps* and some other species were cited more than once by informants. Informants also attempted to show abundances of medicinal plant species cited mreo than one place in the study area. This may be due to they brought by humans as well as dispersal agents from their original places. Furthermore medicinal plant species are not evenly distributed in their natural habitats as seen above. Generally high plant diversity exists in mountains' areas than the other places such as, grass land and road sides, water shores, desert and woody lands. As it was reported from the informants, from the other place to collect medicinal plant species, mountain is suitable place. This may be due to the place was not suitable for agricultural expansion, so the plant species remain in their natural places year after year and vegetations of mountain are not easily accessible and affected by human influence.Un even distributions of medicinal plants in other place comparing with mountain vegetation is, they may be affected during cutting trees for various human benefits, agricultural expansions, road constructions, and buildings.

3.3.2 Distributions of medicinal plants in (Darkuwaa/home garden).

On the upper slope of the home, specifically behind the house, both left and right sides with some front parts, it is locally said to be **darkuwaa**/homegarden is present**,** which holds many plant species such as enset, maize and coffee integrated with trees and other supplements are grown besides medicinal plants (Figure 3).

1 2 3

Figure: 3 one of the homegardens of key informants at Soddo zuria Woreda Damota kebele picture "1" represents enset varites around homegarden and "2" represents the home of informants surrounded with enset varites, different medicinal plants & other edible plant species. Picture "3" represents cultivation practices of medicinal plants by one of informants at home garden level (Photo taken by Takele, 2007).

Twenty five percents of medicinal plants were collected from darkuwa/homegardens. Darkuwaa has different shapes, sizes and locations in relation to the living house but is always attached to home. Based on the plant growth and their density study areas people were categorized Darkuwaa in to two different places. They were vertical and horizontal structures. Vertical structure has three components, which are Upper part-is dominated by broad-leaved trees (*Cordia africana*, *Croton macrostachyus, Milletia ferruginea*), fruit trees like *Persea americana*, *Mangifera indica*, *Chata edulis*), *Psidium guajava*), *Punica granatum, Annona reticulata.*

- ✓ Middle part-containing *Ensete ventricosum*, *Coffea arabica*, *Manihot esculanta, Becium grandiflorum and Lerodendrum myricoides, and*

- ✓ Lower part-containing some herbaceous and spice species such as, *Nigella sativa, Ocimum lamiifoliu Trachyspermum ammi,* and *Anethum raveolens.*

Informants from the study area identified five components of horizontal structures of darkuwa.

i. Kare'a baga/front yard- refers to portion of **darkuwaa** found in the front part of the house, which contains trees having cultural values, medicnal values and used for fuel. Trees like, *Olea europea, Podocarpus falcatus, Croton macrostachyus, Cordia africana, Milletia ferruginea, Eucalyptus globules and grass species such as Cynodon dactylon* and *Acmella caulirhiza* species.

ii. Ketasa'a/house-site – is the site dedicated only for the construction of the house. Next to this there is a plate surfaces locally called **bassuwaa,** where humans and domestic animals return to home. In both of them no plant growth takes place.

iii.**Eremiya/Darincha/spice-patch-** is the main component of home garden in which many indispensable medicinal plants and other useful spices grow. It is the places near to the cattle are penned downhill at the back side locally called **mizaa aquwaa**. Across mizaaaquwaa, a channel is opened in the ground to take urine and soft dung out of the house to the garden. In here mainly herbaceous medicinal plant species such as *Ajuga integrifolia, Artemisia annua, Artemisia afra, Artemisia absinthium, Ruta chalepensis, Ocimum basilicum, Foeniculum vulgare, Leucas calostacys, Lippia adoensis, Mentha spicata, Vitis vinifera*, can grow and shrubby plants brought from their original place/natural habitats and can also grow here as mentioned by the informants and also observed in the darincha or darkuwa.

As it was revealed by Seta (2004), some informants pointed out the importance of the spice patch locally as Nuuyoo xaale keetannee mattaa qoccaa giyaa, meaning traditional pharmacy and local market/primary health centre because these plants have medicinal value against different ailments and one can easily get from his/her immediate homestead. Climbers like *Stephania abyssinica, Cynodon dactylon* and *Acmella caulirhiza* growth in front of darkuwa near darencha.

Iv. Utta darkuwaa (enset-garden) - is the place concentrated with *enset ventricosum* varieties. In here some plants have multipurpose roles such as fire, fodder, food, fence, construction and timber harvesting materials besides medicinal values.

V .Shoka/shukare darkuwaa (last edge of darkuwa)–is mainly as agricultural land and is the place where sweet potato, potatoes, and cereal plant cultivation takes place. In shukaare darkuwaa/shoka, the other plant species can also cultivate, such as *Capsicum frutescens* and *Eragrostis teff.*

Generally diversity of medicinal plant species decreases, when somebody goes from home to the last edge of darkuwa called shoka.This may tells us plant spices grown near the house have many advantages to grow and then plant species grown at the far/last edge of darkuwa, because of Eremiya/ Darincha is the most nearest place to the house, plants grown near the house may use wastes that can be collected from the house including animal dung's and others garbage's,so diversity increases when somebody goes from far edge of the house to ermiya/darincha than from ermiya/daricha to shoka in the darkuwa. Furthermore, medicinal plant species diversified and distributed highly in the ermiya/darincha near the house than shoka or far/last edge of the house

3.4 Growth forms of medicinal plants.

Figure 4 below shows that herbs accounted for (49%) followed by trees (29%), shrubs (19%), climbers (2%) and epiphytes (1%).The present study showed that people in the study area use more of herbs (49%) than trees (29%). Similarly findings showed that more than half of the Zay plant remedies were obtained from herbs (Giday *et al*., 2003). The trend of using more of herbaceous plants could be advantageous as it is easier to cultivate them, when they are in short supply. Naturally, there are more herbaceous plant species as compared to trees. Due to the above mentioned factors use of herbs as medicinal plant sources minimizes plant species reductions.

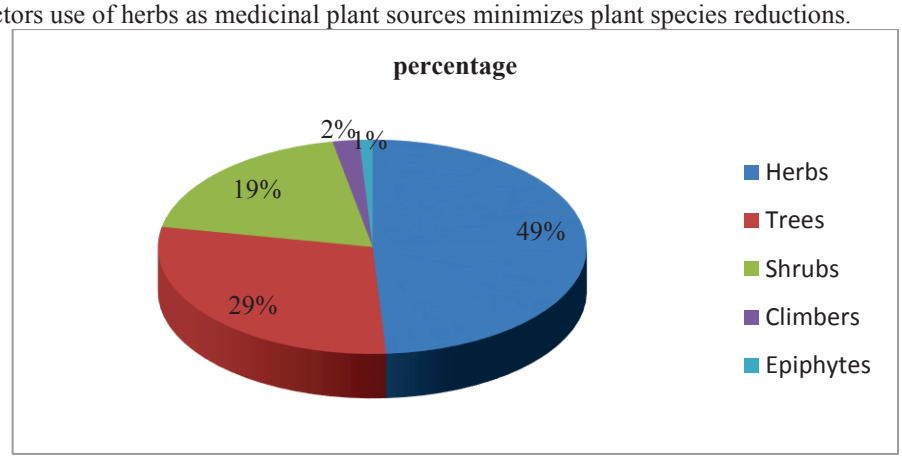

Figure: 4 Growth forms of medicinal plants.

3.5 Plant parts used & mode of preparation.

Figure 5 shows that leaves were the most frequently sought plant parts accounting for (66%) of the claimed medicinal plants. Roots and seeds were accounted for (14%) and (10%) of the claimed medicinal plants, respectively. Plant species harvested for their fruits (4%), stem (3%), and bark accounted for (2%) and flower accounted for (1%) as reported from informants in the study area. Most of the remedies were harvested for immediate uses. Freshly prepared and administered medicinal plant species accounted in the study area were (76%), and (22%) prepared and administered after quick drying. Small proportions (2%) were indicated to be dried and stored for future uses. Majority of remedies (52%) were applied in mixing with pure water and (31%) used alone. Other modes of preparation including blending with different materials (13, %), cooking (2%), smoking, heating and boiling each accounted (1%).

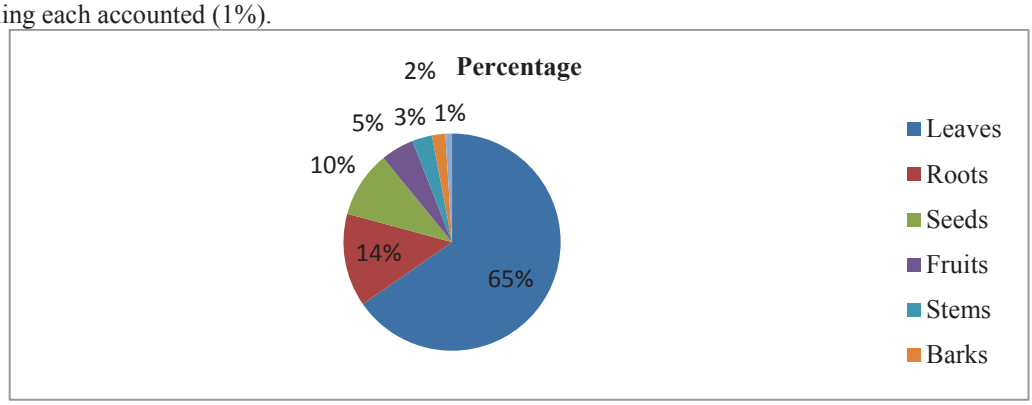

Figure: 5 Plant Parts used for remedies

This study revealed that leaves are the most widely harvested plant parts to treat health problems and it is similar with findings conducted in other part of the country (Endalew Amenu, 2007; Haile Yineger *et al*., 2008; Mirutse Giday *et al*., 2009 Seyoum Getaneh, 2009 and Tesfaye). Herbal preparation that involves roots, rhizomes, bulbs, barks, stems or whole parts have effects on the survival of the mother plants (Dawit Abebe & Ahadu Ayehu 1993). In the study area, there was no such fear due to the major part of plant used by healer to treat remedies were leaves.

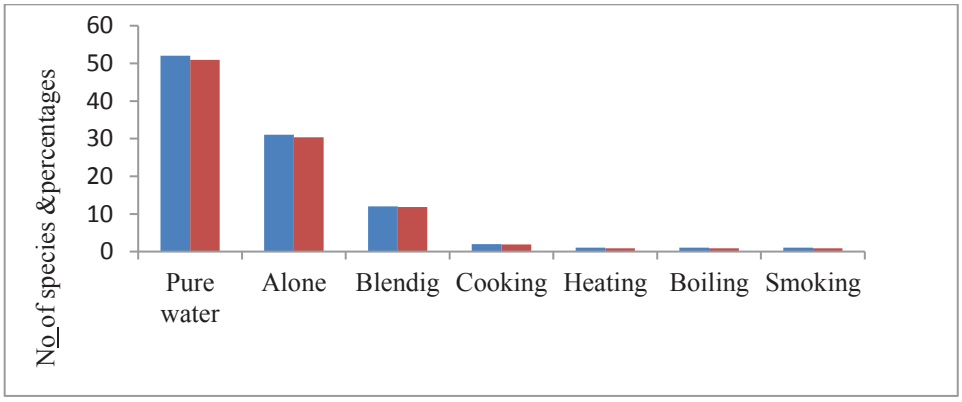

Figure: 6 Preparation methods of medicinal plants of the study area

3.6 Ailments treated

Figure 7 shows that of the total medicinal plant species reported, 86 (84.31%) and 10(9.8%) were used to treat human and livestock ailments respectively. The remained 6(5.9%) were used to against both human and livestock ailments. Based on the remedies of medicinal plants in the study area the highest proportions were used to against human ailments. Among them (51%), accounted to treat gastro-intestinal complaints, (26%) skin-related diseases and (9%), were used to treat respiratory system problems. This finding is common with research conducted in Meinit ethnic group in Ethiopia by (Mirutse Giday, 2009).

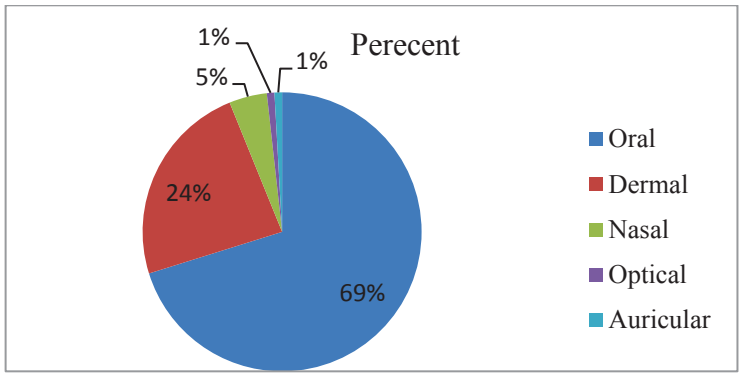

Figure: 7 Ailments treated by medicinal plants in the study area

Plant species recorded against malaria (8%) tooth ache and hepatitis (5%), retained placenta and womb/pregnancy related problems, hypertension, evil sprit (Buddhism), snake poisons (4%), rabies and urinary related problems, glandular disease (3%) STDs, milk production in human, bone setting, eye disease, spider poison, ear ache, heart fever, dandruff, head ache problems each accounted (2%) epilepsies and,mangites,fatness related problems each accounted (1%).

Ethiopia is characterized by having diverse ecology and diverse mix up of socio-cultural and linguistic groups of communities, which might have contributed to the existence of rich knowledge in managing and using large numbers of different medicinal plants against both human and livestock ailments (Assefa *et al*.,2010.), however in the study area the interview pointed out less number of medicinal plant species as livestock remedies compairing with human disease this may be due to almost all peoples or most peoples in the area depends on the agriculture and its products rathre than using livestoclk and their products

3.7 Route of administration and dosage used.

The informants reported both internal and external applications in the treatment of various human and livestock ailments in the study area. (In figure 8 below) Great proportions of medicinal plant remedies route of administration used by healers were oral (69%), followed by dermal (24%), nasal (5%), auricular, and optical treatment (1%).

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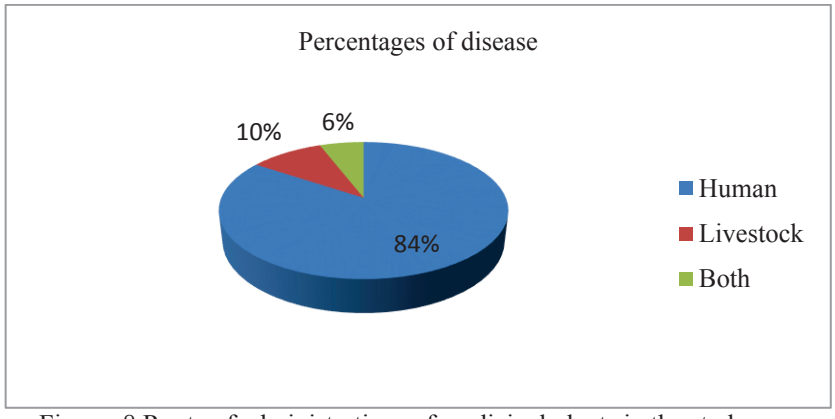

Figure: 8 Route of administrations of medicinal plants in the study area

Dosage of the remedies were carried out mainly by guess that means counting the leaf number, full of cup or glass and half of glass or cup and with the use of time intervals such as early morning three days or more days based on the effectiveness of medicinal plants. Most of the informants in the study area pointed out that oral root

of administrations were the best method than other methods. Because they use some facilitators such as, water, milk, butter, honey etc for some medicinal plant species. The additives such as honey, milk, and coffee 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 Tolossa *et al.,* 2007). In addition to this, similar findings were reported by many other researchers (Tilahun Teklehymanot *et al.,* 2007). However, there is no consensus on the dosage used and frequency of the medication among healers.

Because of mainly the dose were by estimation that means they measure using the number of leaf, half the spoon or pull of spoon, if (powder), half the cup and a cup and number of drops also used for (liquids). In some part a glass of it used once or consecutively 1-3 days. Generally the leaf sizes, exact volume of cup as well as glass were not clear. If the dose was more and starts to harm the patient, they give neutralizers to recap the patients. If patients did not show any sign of improvement over the treatment period, they were referred to near by clinics or modern health centers. It was noted that dosage was influenced, among others, by the type of ailment, seriousness of the illness and age of the patients and the length of the time. Generally the plant parts that have been processed for administration and, amount of dose used was roughly estimated and therefore, lacked precision.

3.8 Medicinal plants and its trade

Majority of medicinal plant species (human as well as livestock) that serves for only medicinal & other values were harvested from wild environments and some of them collected from homegardens by the traditional healers or by any body who needs them. But some of traditional medicinal plant species that were not easily accessible from the wild or homegardens can be getting from the market. As reported from the informant's medicinal plants such as, *Hagenia abyssinica*, *Echinopis kebericho* & *Psychotria orophila,* which are important for stomach ache, *malaria* & bone settings mainly obtained from the near by market by buying. For example as reported from the people of the area, ½ kg of *Hagenia abyssinica* can get by 22birr, ½kg of *Echinopis kebericho* can obtained by 10 birr & ½ kg *Psychotria orophila* can get by 13birr.

Medicinal plant species that serves as medicine & spices values were obtained from the merchants' that sold them in the market. As reported from the informants this plant species were Artemisia absinthium, Artemisia afra, Allium sativium, Allium cepa, Zingiber officinale, Trachyspermum ammi, Rosmarinus officinalis, Nigella sativa, Ocimum basilicum, for food & medicine values such as, Rhmanus perinodes, Persea americana, Linum usitatissimum, Lepidium sativium,Carica papaya, Capsicum frutescens, as medicine & stimulants values such as,Catha edulis, & Nicotiana tabacum.Findings in different parts in the country, similarly revealed (B and M Development consultant 2001), that lack of consistent market was one factor for the reduction of the number of local people that involve in the medicinal plant trade.

Some medicinal plant species that were also marketed for medicine and other different use-values, e.g Nicotina tabacum & Ruta chalepensis were also obtained from the market. From the collected medicinal plant species plant only serves as medicinal values and can obtained from the market were Hagenia abyssinica and Psychotria orophila.

3.9 Habitat and distributions of medicinal plants.

Table 3 indicates that majority (75%) of medicinal plants in the study area were diversified out of homegarden, while the remained (25%) were distributed in around homegarden. As it were observed and mentioned by the informants medicinal plants were unevenly distributed in different parts in the study area. Similarly studies conducted in Ethiopia as well as other countries in the world reported as majority of medicinal plants harvested from wild (Etana Tolessa, 2007; Ermias Lulekal, *et al.,* 2008; Ugulu, *et al.,* 2009). This indicated that local peoples did not yet cultivate majority of medicinal plants and they were harvest more medicinal plant species from the wild than from homegardens. Great proportions of herbs were found in out of homegardens, such as mountains, woodlands, grass lands, water shore, road sides, deserts and semi desert places. The tree species were found in open woodland, farm borders, roadsides, live fences and in coffee plantation areas. Medicinal plants like *Allium sativum*, *Artemisia abyssinica*, *Capsicum anuum*, *Lepidium sativum*, *Ensete ventricosum*, *Nicotiana tabacum*, *Ocimum lamiifolium*, *Ruta chalepensis* & *Zingibe officinale* were mainly restricted homegardens to farmlands, farm boarders, live fences and home gardens.

Table: 3 vegetation types and number of species in the study area

Types of vegetations	**No of species**
Mountain vegetations	38
Woody/forest vegetations	28
Lowland /semi desert vegetations	7
Water shore &road side vegetations	9
Grass land & homegarden vegetations	20

3.10 Informant consensus factor by category of diseases

The ailment categories with highest ICF value were stomache ache with out any symptoms. Medicinal plant species used for this value were, *Anethum graveolens, Arabis alpine, Artemisa afra ,Artemisia absinthum, Ceratophyllum demersum, Citrus limon, Dodonaea angustifolia, Echinopis kebericho, Euphorbia candelabrum, Foeniculum valgare, Leucas stachydform, Leucas calostachys, Nigella sativa, Parthenium hysterophorus, Phytolaca dodecandria, Rosmarinus officinalis, Stephania abyssinica, Vernonia amygdalina.*

Diarrhea, amoeba, intestinal parasites, gastritis were categorized as second groups. Medicinal plant species under these categories were *Aloe spps, Annona reticulate, Capsicum frutescens, Carica papaya, Coffee arabica, Echinopis keberecho, Ehretia cymosa, Erachyspermum ammi Clerodendrum myricoides, Embelia schimperi, Eucalyptos globules, Hagenia abussinica, Pentas lanceolata, Phytolaca dodecandria, Punica granatium, Rumex abyssinicus, & Sida rhombifolia.*

Malaria & Headaches are the third categorize of disease reported by informants in the study area. Medicinal plant species used to treat them were, *Allium sativium, Artemisia annua, Artemisia absinthium, Carica papaya, Echinopis kebereicho, Lysemacha ruhmeriana, Moringa stenopetala, Rosmarinus officinales, Vernonia amygdalina.* Generally, gastro intestinal problems were the worst disease especially in the rural community of the study area. Prevalence of this disease in the area may be due to lake of ample clean water supply, unsanitized environment and personal hygiene. The other remained category of diseases occurs occasionally in the area; due to this they have low ICF value.

Table: 4 Informant consensus factor by category of diseases

Disease category	No.of species .	No. of use citation	ICF
Stomach ache	18	59	0.71
Diarrhea, amoeba, intestinal parasites &gastritis	17	50	0.67
Malaria & Headache	10	27	0.65
Ear, Eye and Tooth ache	9	20	0.57
Cattle diseases (Anthrax, blotting and external parasite)	13	29	0.57
Pregnancy related ,bone setting and hypertension	10	20	0.52
Skin diseases(small pimples on skin spots and wound	20	36	0.46
Respiratory system problems(comman cold,coughing,glottis)	9	15	0.42
Kidney and Liver Diseases	8	13	0.41
Sexually transmitted diseases,epilipsi and mengites and rabies	7	10	0.33
Snake bite, Spider poison	6	7	0.16

3.11. Ranking of medicinal plants in the study area based on their effectiveness.

3.11.1 Preference ranking

Preference ranking was takes place when, different species prescribed for the same health problems. Peoples in the study area showed predilection in searching for treatment of particular ailments either from health centers or from local healers. As reported in the Table 5 below medicinal plant, *Ajuga integrifolia* perceived as high in its efficacy to treat stomach ache in human than the other species, while *Euphorbia candelabrum* was relatively less in its effectiveness to treat stomach aches in humans.

Table: 5 Preference ranking of selected medicinal plants based on their degree of treating stomach ache in humans

Medicinal plant species	Respondents(1-10)										Total	Ranke
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	I_9	J10		
Echinopis kebericho	3	4	5	3	6	3	3	3	5	3	38	3rd
Phytolacca dodecandria	2	1	4	3	1	4	3	3	2	4	27	4th
Artemisia absinthum	6	3	5	4	6	3	5	4	6	4	46	2nd
Arabis alpine	2	1	3	2	4	2	3	1	2	3	23	5th
Ajuga integrifolia	6	5	5	6	5	5	5	4	5	6	50	1st
Euphorbia candelabrum	2	2	1	4	1	2	1	3	2	3	21	6th

In Table 6 below for medicinal plants that were identified by the informants to be used in treating stomach problems in livestock, Preference ranking was made among five medicinal plants. Ten informants participated in this activity. Based on the information below in the table, *Stephania abyssinica* was 1st in its effectiveness, *Sida rhombifolia*, *Clerodendrum myricides, Dodonaea angustifolia, and Ceratophyllum demersum* were 2nd, 3rd, 4th and 5th respectively.

Table: 6 Preference ranking of medicinal plants used to treat stomach problems in livestock's

Medicinal plant species	Respondent(1-10)										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Ceratophyllum demersum	3	1	2	3	4	2	2	3	1	4	25	5th
Dodonaea angustifolia	2	4	3	5	4	3	3	4	4	3	35	4th
Clerodendrum myricides	3	3	5	6	4	4	3	2	4	5	39	3rd
Sida rhombifolia	4	5	3	3	6	5	4	5	3	6	44	2nd
Stephania abyssinica	5	4	5	5	6	4	5	4	6	5	49	1st

3.11.2 Direct matrix ranking for multipurpose medicinal plants.

From the informants in the study area eight multipurpose plant species with variety of uses were reported. The main significances of plant species in the area were mentioned including construction, fire wood, charcoal, fence, medicine, fodder, food value, and timber. Regarding to their multipurpose, eight plant species were involved in order to evaluate their essence to the local people & based on this in the Table 7 below, *Cordia africana* and *Hagenia abyssinica* were the most preferred medicinal plants by local people in the study area & ranked 1and 2.

Table: 7Average score for direct matrix ranking of eight medicinal plant species based on their general use values 5 ,best 4 ,very good 3 , good, 2 less used, 1 least used and 0 ,not used.

Plant species	Important values								Total	Rank
	Construction	Fire wood	charcoal	Fence	Medicinal use	Fodder	Food value	Timber		
Ajuga integrifolia	0	0	0	0	5	3	0	0	8	8th
Annona reticulata	3	4	3	3	4	1	5	1	24	4th
Carica papaya	0	0	0	2	4	3	5	0	14	6th
Cordia africana	5	5	4	4	4	0	1	5	28	1st
Embelia schimperi	0	0	0	0	3	4	4	0	11	7th
Hagenia abyssinica	4	4	3	4	5	2	0	4	26	2nd
Persea americana	3	4	2	2	3	3	5	2	25	3rd
Vernonia amygdalina	3	3	3	3	5	3	0	3	23	5th

They were also the most threatened plant species in the area as it was observed and reported by the local people of the area. Plant species such as, *Persea americana*, *Vernonia amygdalina,* were relatively low in destruction comparing with the above mentioned multipurpose plant species and were ranked 3 and 4 respectively. This may be their plentiful growth in the area and intermittent need of them by the local people. Plant species such as, *Annona reticulata, Carica papaya, Embelia schimper and Ajuga integrifolia* were ranked 5, 6, 7 and 8 respectively. However except for medicinal and food value they are not appreciated by the local people regarding to their multipurpose value. Finally the long expectations of plant species ranked first and second level would be under question, since the daily demand of the local people has been increasing with lesser rate of re-plantation, except for some plant species.

3.12. Jaccard`s Coefficient of Similarity (JCS)

Jaccard`s Coefficient of Similarity (JCS) revealed that the study area has the highest similarity in medicinal plant diversity, 36 common species (34%) with the study conducted around sidama, followed by 33 common species (21%) similarity with Chelya Wereda. The least similarity 13 (7.3%) was linked with the study conducted on Meinit ethnic group (Table 8). Calculated values of Jaccard`s Coefficient of Similarity displayed that medicinal plant species were not evenly distributed when compared with other places. This was also true, even by itself in the study area medicinal plants were not equally distributed. The highest similarity in distribution between the study area and sidama people may be due to they share some similar geographic environments, socio-economic relationships as well as cultural similarity using medicinal plants.

Besides they were also border at the south western part of the country, this may contribute cultural & socioeconomic relationships between the tow communities and to use more similar type of traditional medicinal plants for their remedies and their livestock's due to their interactions & interrelationships. Medicinal plant species diversity with its use differs with their different species compositions as seen in the table below, this is because of cultural and geographic diversity in community made them to use different plant parts in different area in the country. Furthermore even they have diverse plant composition community's have some similarities in the use of traditional medicinal plants, since peoples occasionally have interactions and relations for various socio-economic purposes.

Table: 8 JCS between the area and compared place

Sample area	N0of spps	a	b	c	JCS%	Sources
Wolaita people	102	-	-	-	-	-
Wonago Wereda	58	25	77	33	18.51	Fisseha Mesfin, 2007
Wayu Tuka Wereda	126	32	70	94	16.32	Moa Megersa 2010
Kafficho people	124	38	64	86	20.21	Tesfaye Awas
Konta Special Wereda	120	21	81	99	10.45	Tesfaye H/mariam, *et al*,2009
Gimbi Wereda	85	25	77	60	15.43	Etana Tolessa, 2007
Hawassa TTC	40	13	89	27	10.07	Reta Regassa ,2013
Chelya Wereda	89	33	69	56	20.88	Endalew Amenu, 2007
Meinit ethnic group	51	13	89	76	7.30	Mirutse Giday,*et al,* 2009
Sidama	48	36	66	4	33.96	Girma Tefera, *et al*, 2013

3.13. Fidelity level index

In the Table 9 below Fidelity Level (FL) was calculated for medicinal plant species that used to treat major categories of disease and for the other groups of medicinal plant species not mentioned as major category of disease by the informants in the study area. Based on FL values, medicinal plant species such as, *Hagenia abyssinica, Ajuga integrifolia and Echinopis kebericho* have highest values of FL, for treating the major category of diseases termed as gastro intestinal problems and they were ranked 1, 2 and 3, respectively. The other categories of medicinal plant species used to treating the second major category of diseases called malaria were, *Moringa stenopetala,Vernonia amygdalina,* and *Allium sativium,* with the FL values 78, 67 and 89 respectively so, based on the informants agreements, *Moringa stenopetala & Allium sativium* have high effectiveness on treating malaria in the study area .

Medicinal plant species best in treating head ache were *lipidium sativium & nigela sativa*, like this there were disease categories such as, Pregnancy related problems, Urinary problems, Hypertension and others with relatively high FL values, but they were not major category of disease in the study area, based on the reports from the informants. Since FL value is the healing potential of particular medicinal plant species for a given ailments, all plant species have not equal treatment potentials, due to this as we can observe in the (Table 9) below variations was seen in the treatment of different disease between medicinal plant species. Furthermore medicinal plant species that were with highest FL values and that show repetitive fashions in the fidelity level value may have equal remedies or healing potentials for the given category of disease and may be are more likely to be biologically active to treat a given ailment.

Table: 9 Fidelity level (FL) values of medicinal plants cited by four or more informants for being used against a given major ailment category.

Ailment type	Medicinal plants	*Ip*	*Iu*	FL (%)
Gut problems	*Ajuga integrifolia*	7	10	70
	Echinopis kebericho	6	10	60
	Hagenia abyssinica	7	10	90
Malaria	*Allium sativium*	8	9	89
	Moringa stenopetala	7	9	78
	Vernonia amygdalina.	6	9	67
Headache	*Lipidium sativium*	7	11	63
	Nigella sativa	5	11	10

3.14. Threats to Medicinal Plants in the Study Area

Table 10 below shows that the main threats for medicinal plants in the study area were habitat loss by cutting trees or deforestation for agricultural expansion, secondly drought, forest fire, timber production, road construction, building, charcoal production, were also mentioned. These factors combined with the natural vulnerability of the area may lead to further reduction in natural habitats of the medicinal plants. As it was revealed from the informants in the area, trees have been cut for various purposes such as, charcoal production, timber, firewood, fodder, house construction purpose, road construction and medicinal values, this also lead to exposure of the area for water scarcity and erosion.

Similar studies revealed in other part of the country (Balemie *et al,* 2004) Pressure from agricultural expansion, wide spread cutting for fuel wood combined with seasonal drought was also reported. Studies in other part of the country also revealed that many of the threats to medicinal plant species are similar to those causing endangerment to plant diversity in general. The most serious proximate threats generally were habitat loss or habitat degradation and over-harvesting (Hamilton, 2004).

According to (Roberson, 2008) about 15,000 medicinal plant species may be threatened with extinction world widely due to habitat loss and over harvesting and it is estimated that the earth is losing on potential major drug every two-year.

In the area ethnomedicinal plant species having other than medicinal values were significantly greater than those with out any added values. During the study, it was observed that large number of big trees of *Cordia africana*, *Olea europaea*, *Croton macrostachyus, Podcarpous falcatus and Syzygium guineense* were already in the way to extinct due to their harvest for agricultural expansion and timber production. Furthermore these factors combined with the natural vulnerability of the area may lead to further reduction in natural habitats of the wild vegetations with existing medicinal plants species.

The other threats for medicinal plants in the area were modernization that means unwillingness of youngsters to receive knowledge from their elders due to these elders left with out transferring their knowledge, hindering of knowledge by some peoples and, expansion of health centers, clinics, and Hospetals and public health centers.

Table: 10 Priority ranking factors perceived as threats to medicinal plants based on their level of destructive effects (values 1-5 were given: 1 is the least destructive threat, and 5 is the most destructive threat)

Factors	Respondents(1-8)								Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8		
Building & construction	3	4	3	5	4	5	4	5	33	3rd
Drought & Fire wood	4	4	5	4	5	4	4	5	35	2nd
Timber production	4	5	3	4	4	3	4	5	32	4th
Road construction	2	1	1	2	2	3	1	2	13	5th
Agricultural expansion	5	4	5	5	5	5	5	4	38	1st

3.15. Conservation of Medical plants in the study area

Medicinal plants in the study area were conserved in various forms as it was suitable to conserve parts of plant species. Based on the informants' information medicinal plants can be conserved at their homegarden level, if seeds it was conserved in the home by drying up to the rain season, in their natural habitats, Knowing time of collection, Collection by healers or knowledgeable persons. Informants in the area told that conservation of multipurpose medical plants were limited except some species that has been protected by governmental organizations or any private organization on their natural habitat. Besides, the peoples' culture and spiritual beliefs somehow had helped in the conservation of medicinal plants. For instance, the claim of the traditional healers that medicinal plant will be effective only if cut and administered by the healers or healers' relatives' had helped in the conservation of the medicinal plants. Also, lack of knowledge to identify medicinal plants on their natural habitat helped the plant species from threatened as reports from informants in the area & helped to conserve plant species. Majority of the plant part that has been collected were leaf was also the other importance to conserve and sustain their existence in expectations. Some peoples conserve medicinal plants at their homegarden, collecting them from their natural habitats. This enables them to conserve some type of medicinal plant species such as, *Ajuga integrifolia, Allium sativium, Artemisia afra, Artemisia absinthium, Echinopis kebericho, Psychotria orophila, Ruta chalepensis,* and *Solanum cerasiferum.*

There was a difficulty in conserving some plant species at homegarden levels. It is also true for local peoples and healers to conserve not all but some of medicinal plant species out of their natural habitats based on their information so, it is very important to keep some medicinal plants in their natural place than out of it. Besides, belief has also some contributions in conserving medicinal plants in the study area. Informants reported that they collects medicinal plants locally (**Balgo**) Kermit- than (**Boniya)** bega- in order to limit elimination of original plant parts such as roots and stems and to reduce the influences of generally the mother plants. Similar results revealed by (Moa Megersa, 2010) in the study conducted by (Etana Tolessa, 2007) in Gimbi Wereda.

As we can see in the Table 11 below, informants in the study area conserved medicinal plants best in their natural places and secondly they selected to conserve them in the homegarden level. Furthermore homegarden level conservations were the promising mechanisms for the study area peoples whatever the factors that affects them to conserve in the homegarden level and probably homegarden conservation mechanism saves the plant species from the incoming agricultural explanations and other influences that can disturbed their persistence in the area.

Table: 11 Strategies of conservation perceived as conservation methods to medicinal plants (values 1-6 were given: 1 is the least methods, and 6 is the most method)

Conservation methods	Respondents								Total	Rank
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8		
Homegarden	3	3	4	3	5	3	4	5	30	2nd
Drying at home up to rainy season	2	4	3	4	4	3	3	2	25	4th
Keeping at their natural habitat	4	4	5	6	6	5	4	5	39	1st
Collection by healers & spiritual beliefs	3	4	3	2	2	3	2	4	23	3rd
Knowing time of collection	3	2	1	1	3	2	3	2	15	5th

4. Conclusion & Recommendation

4.1 Conclusion

Indigenous peoples of the study area have deep knowledge's to fight against both human and livestock ailments, but their knowledge was differ with their sex, age, educational levels and religions. Peoples categorized their natural vegetations in to two big parts, one as darkuwa/homegardens and wora/out of homegarden or natural vegetations. Majority of medicinal plants 76 (74.5%), were diversified and grow in wora/ their natural habitats and 26(25.49%) darkuwa/home gardens. The total medicinal plant species identified and collected from the area were 102, which were distributed in the 100 genera & 54 families.

From the collected medicinal plant species the leading percent were from family lamiaceae 12(11.8%), followed by Astraceae 8(7.8%). Peoples have deep knowledge's on identification about plant parts, use, preparation, dosage and route of administration, although the knowledge was not evenly distributed among the age groups, sex, educational levels and religions.

Leaves had been the most utilized plant parts, which has advantages over the use of other plant parts, since the plants were not under pressure, relatively when the leaves used and oral route of administration were common methods of applications by the local peoples of the study area. Common disease reported in the area were gastrointestinal complains followed by malaria. Environment had been faced with some problems such as, deforestation, timber production, fire wood collection and agricultural expansion. Among them the main threats for vegetations in the area were come from expansion of agricultural lands. Furthermore, some plant species that had been used as medicinal value and spices conserved at their natural habitats and around the home gardens in the study area. Even peoples of the study area have deep knowledge on medicinal plants and their remedies, plants were not conserved properly around their gardens.

4.2 Recommendation

Only the elder peoples have deep knowledge's in the use of traditional medicinal plants so, special consideration must be made to inherit the knowledge for the next generation and its sustainability in the area. Traditional medicine practitioners must be encouraged to disseminate the knowledge and skills for the younger generation. This can enables continuity of knowledge and saves skills of elder peoples on the mind of young generation. Human influences were the main factors for devastations of natural vegetations, so developing effective management and conservation measures were the major solutions for prosperity of medicinal plants on the area. Traditional medicine practitioners should be promoted, awarded and certified for their works from the governments, in the future they should to keep medicinal plants from elimination, and creating conservation systems at home garden level.

Traditional medicines are the bases for many effective modern drugs so; Ministry of health should give specific attentions for their conservation measures by training peoples and creating awareness for those species that were vulnerable in the environment. Highly effective and mostly cited medicinal plants should be researched for their biochemical activity and effectiveness, and then the results should be known for the local peoples. This may encourages peoples of the study area to develop conservation measures. Furthermore, currently the most effective and multipurpose plant species were in the way of extinction in the study area so, it is important to paving the ways and strategies from any concerning bodies for those vulnerable species to save them.

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