MEDICINAL PLANTS USED BY THE PEOPLE OF HULET EJJU ENESIE WOREDA, EAST GOJJAM ZONE OF AMHARA REGION, ETHIOPIA

M.Sc. THESIS

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JUNE 2018

HARAMAYA UNIVERSITY, HARAMAYA

Medicinal Plants Used by the People of Hulet Ejju Enesie Woreda, East Gojjam Zone of Amhara Region, Ethiopia

A Thesis Submitted to the School of Biological Sciences and Biotechnology
Postgraduate Programs Directorate
HARAMAYA UNIVERSITY

In Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCINCE IN BOTANY

By:

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June2018
Haramaya University, Haramaya

APPROVAL SHEET

HARAMAYA UNIVERSITY

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DEDICATION

I dedicated this thesis manuscript to all members of my Family and Ethiopian Teachers, who sacrificed a lot to bring me up to this level, nursing me with affection, and for their dedicated partnership in the success of my life.

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By my signature below, I declare that this Thesis is my own work and, I have followed all ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of this Thesis. Any scholarly matter that is included Thesis has been given recognition through citation.

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BIOGRAPHICAL SKETCH

The author, Birhanu Adibaru, was born from his father Adibaru Abebe and his mother Shashe Yihunie on March 24, 1991 in Ayenbirhan Kebele, Hulet Ejju Inesie Woreda, East Gojjam Zone of Amhara Regional State, Ethiopia. Before starting his modern education, he had been learnt Religious education in Ethiopian Orthodox Church for six years. He attended his elementary and junior school education at Motta Ewuket Fana and Elementary School, respectively. After completing his secondary and preparatory schools at Motta high school and Preparatory school respectively, he joined Jimma University and received his Bachelor degree in Biology in 2016. He joined Haramaya University in 2017 to pursue Master of science Degree in Botany.

ACKNOWLEDGEMENTS

In the first place, I would like to thank the almighty God for helping me in all my life. I also express my special heartfelt gratitude to my Major Advisor Dr. Meseret Chimdessa and Co-Advisor Dr. Manikandan Muthsuwamy for their consistent advice, suggestion, comments and follow up from the beginning to the completion of this research work. Without them, shaping of this study could not have been realized.

I am thankful to Ministry of the Education for sponsoring my postgraduate study. I would like to extend my thanks to the school of Biological sciences and Biotechnology of Haramaya University for adjustment of conditions for taking the required courses.

I would like to thank the local people of Hulet Ejju Enesie Woreda for their hospitality and all the informants for their willingness to deliver pertinent information to my inquiries to share their knowledge about medicinal plants and other issues. My thanks are also extended to the administrators of the selected kebeles and for their collaboration to get access to key informants to get relevant data.

Furthermore, I would like to thank all of my best and thoughtful family members for their multidimensional support during data collection and the entire academic journey.

Many heartfelt thanks go to all who participated directly or indirectly for the successful accomplishment of my thesis work.

LIST OFACRONYMS

CSA	Central Statistical Agency
FL	Fidelity Level
JSI	Jaccard's Similarity Index
HEE	Hulet Ejju Enesie
IBC	Institution of Biodiversity Conservation
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
a.s.l	Above sea level
MP	Medicinal Plant
SPSS	Statistical Package for Social Science
TMP	Traditional Medicinal plants
WHO	World Health Organization
WAO	Woreda Agricultural Office

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ABSTRACT

Medicinal plants have been used as a source of medicine to treat human and livestock ailments since time immemorial. Indigenous people of a given community have their own local specific knowledge on plant. This study was conducted to document indigenous plant based medicinal knowledge in the study area. The data were collected using semi structured interviews, focus group discussions and field observations with local peoples. A total of 100 informants (70 males and 30 females) above the ages of 20 were selected to collect information on medicinal plant use. To analyze data, descriptive statistics such as percentage and frequency were employed. Moreover, Jaccard's similarity index, independent sample t-test and ANOVA, informant consensus factor, fidelity level, preference ranking and direct matrix ranking were computed. A total of 80 medicinal plant species belonging to75 genera and 52 families were documented. In terms of species diversity, Solanaceae stood first with 5 species followed by Euphorbiaceae and Malvaceae with 4 species each. Out of these medicinal plants, 53 species were used to treat only human ailments, 8 species used to treat only livestock ailments and the remaining 19 species were used for treating both human and livestock ailments. Majority of the species 43 were observed in the forest and river side. From the total medicinal plant species, shrub constitutes the largest number with 42.5% species. The most frequently used plant parts were leaves which accounts 28.9%. The major routes of administration were oral accounts 81(57%) followed by dermal 45(31.7%), nasal 6(4.2%) and others 10(7%). Some of the remedies are taken with additives include; butter, honey, milk, Injera, sugar, local alcohol (Tella or Arekie), salt, oil, coffee or tea. In the disease category with the highest (0.83) ICF value was Sudden sickness. There was highest preference (49) for Phytolacca dodecandra to treat Rabies. Cordia africana was shown to be the top multipurpose species while agricultural expansion, firewood collection and charcoal making were considered major threats to medicinal plants. This study shows that the study area rich with medicinal plants and the people HEE still rely on traditional medicine of plant based origin to treat human and livestock ailments. In order to protect the loss of indigenous knowledge on medicinal plants local communities should be given training, awareness creation and encouraged to transfer their indigenous knowledge. In addition, young generation should be taught the importance indigenous knowledge.

Key words*: Ailments, Ethnobotany, Hulet Ejju Enesie, Medicinal Plant, Traditional healers.*

1. INTRODUCTION

Indigenous people of a given community have their own local specific knowledge on plant use, management and conservation (Cotton, 1996). This knowledge about plants of their surrounding related to their use, classification and management practices is generally known as indigenous knowledge (IK) or traditional knowledge (Martin, 1995). One of such knowledge of indigenous people on plants is related to their use in traditional medicine (TM) to treat human and livestock ailments (Khandel *et al.*, 2012). Even today, plants remain the source of medicine for the majority (80%) of people in developing countries to alleviate health problems while, in developed countries such as United States, plant derived drugs constitute as much as 25% of the total drugs (Maki, 2008). Moreover, medicinal plants remain the most important and sometimes the only source of therapeutics. Besides their use in preventing and curing various ailments, some medicinal plants are serving as export commodities, source of considerable income for farmers (Assegid and Tesfaye, 2014).

The Ethiopian flora is estimated to contain between 6000 and 7000 species of higher plants of which 12% are endemic which make the country among the most diverse floristic regions of the world. The country is well known for its significant geographical diversity that favors the formation of different habitats and vegetation zones. Ethiopia is also a home to many languages, cultures and beliefs that in turn has contributed to the high diversity of traditional knowledge and practices of the people in using medicinal plants (Seyoum and Zerihun, 2014). 80% of humans and 90% of livestock in Ethiopia rely on TM for their primary health care systems (Maki, 2008; Yadav, 2013). Not only Ethiopian, but also around 60% of world population depends on traditional medicine (Khandel *et al*., 2012). The reason for high reliance of people in developing countries on TM is its cultural acceptability, effectiveness against certain type of ailments, accessibility and affordability as compared to modern medicine (Tesfaye and Sebsebe, 2009; Gidey, 2010; Moa *et al*., 2013). Regardless of its contribution to the society, traditional medicine has been given little attention in modern research and less effort has been made to promote the practice in Ethiopia (Mirutse *et al.*, 2009). Due to natural and anthropogenic factors, the biodiversity in general and medicinal plants in particular are being depleted at an alarming rate in the country (Regassa, 2013). The current loss of medicinal plants and associated indigenous knowledge links with

environmental degradation, deforestation, agricultural expansion, over exploitation and population growth are the principal threat to medicinal plants and associated indigenous knowledge in Ethiopia (Girmay *et al*., 2012). Loss of indigenous knowledge is also aggravated by the expansion of modern education, making the younger generation underestimate its traditional values. This resulted in the deterioration of traditional practices. As it was reported by (Seyoum and Zerihun, 2014) in Debre Libanos woreda, Central Ethiopia, knowledge of medicinal plants has been passed orally from one generation to the next by priests and traditional healers. But, due to highly fragile nature of the cultural systems, the skills are likely to be lost in the transfer process.

Therefore, identification, documentation and conservation of medicinal plants and the associated knowledge is calling an immediate solution in different part of Ethiopia. With this regard, many researches (Jarso, 2016; Abadi and Feto, 2017; Yeshambel, 2017) have been recently conducted in different parts of country. However, study on medicinal plants is incomplete when seen from the point of view of the diverse vegetation and IK the country has.

One of such place in Ethiopia to see such problems is the Amhara Regional State. This Region is suffering in habitat and species loss due to continued deforestation and agricultural expansion (Fentahun and Herbert, 2010) as well as loss of associated indigenous knowledge. Little has been done to document medicinal plants and the associated knowledge which is basic for conservation and community developments activity. However, there are also places in Amhara Regional State where such studies are lacking. One of such area is Hulet Ejju Enesie woreda (HEE), which is found in East Gojjam Zone in that medicinal plants and associated indigenous knowledge have been depleted. Therefore, this study was meant to carry out documentation of medicinal plants of HEE woreda and their use in treatment of human and livestock ailments.

General objective

- To document the traditional medicinal plants used by indigenous people of Hulet Ejju Enesie woredato treat human and livestock ailments.

Specific objectives

- To document plant parts used for medicinal purposes, methods of preparation and ways of administration.
- To collect, identify and document medicinal plants used by people of Hulet Ejju Enesie woreda.
- To document indigenous knowledge of the people in the study area regarding to MP used.
- To assess the threats to medicinal plants and associated IK and conservation practices of the local people.

2. LITERATURE REVIEW

2.1. Ethnobotany

Ethnobotany formed from two words, ‘ethno’ which means the study of people and ‘botany’ which means study of plants. As it was reported by Cotton (1996) the term Ethnobotany is defined differently depending on the interest of the workers involved in the study. Ethnobotany is an interdisciplinary and multidisciplinary science which focuses on analyzing and documenting of the IK, belief and practices related to plant resources (Martin, 1995). The focus of ethnobotany is on how plants have been used, managed and perceived in human societies and includes plants used for food, medicinal, rituals, social life and others (Kargioglu *et al*., 2008). The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their use for religious ceremonies, ornamentation and health care (Khan and Islam, 2007). Since ancient times, plants have been vital sources of both preventive and curative TM preparations for human beings and livestock. Historical accounts of traditionally used medicinal plants depict that, different medicinal plants have been used as early as 5000 B.C in China and 1600 B.C by Syrians, Babylonians, Hebrews and Egyptians (Morvin, 2014).

Currently, ethnobotany has become a more diversified and multidisciplinary subject that requires experts in various fields of academic study such as Botany, Anthropology, Agriculture, linguistics, Archeology and Economics (D’avigdor *et al*., 2014; Prabhu *et al*., 2014). Ethnobotany is rapidly growing science, attracting people with widely varying academic backgrounds and interests (MacDonald, 2009) and nowadays ethnobotany has tended to become cross disciplinary and multi institutional (Hamilton *et al.*, 2003). Ethnobotanical studies are now growing in fast progress throughout the world. One of the main motivating forces behind this expansion is the increasing awareness of the considerable practical and social value of traditional knowledge (Wright, 2005).

2.2. Indigenous Knowledge

Indigenous Knowledge is the local knowledge that is unique to a given culture or society and the base for agriculture, health care, food preparation, education, environmental conservation and a host of other activities. The complex knowledge, beliefs and practices, develop and

change with time and space generally known as indigenous knowledge (Ik). It is a systematic body of knowledge built up by a group of people through generation of living in close contact with nature and it is dynamic (Stephan and Justin, 2003; Jackak and Saklani, 2007). This concept includes indigenous technical knowledge, traditional environmental knowledge, rural knowledge, local knowledge and farmer's or pastoralist's knowledge. Indigenous knowledge is important for an essential first step for development projects, allows better innovation and adaptation of technologies, adds to scientific knowledge, increases understanding between researchers and local people, increases the local capacity to experiment, innovate and empowers local people (Kargioglu *et al*., 2008).

One important feature of IK system is its adaptive nature for local people acquired informally through interaction with the natural environments (Zemede and Tigist, 2007). One of the widely used indigenous knowledge system in many countries is the knowledge and application of traditional medicine. Such knowledge known as ethnomedicinal knowledge (EMK) involves traditional diagnosis, collection of raw materials, preparation of remedies and its prescriptions to the patients (Khan and Ahmad, 2014). Indigenous knowledge on remedies in many countries passed from one generation to the other generation verbally with great secrecy. Such secret and crude transfer makes IK or EMK vulnerable to distortion and in most cases, some of the lore is lost at each point of transfer. Hence there is a need for systematic documentation and record of such useful knowledge through ethnobotanical research (Fisseha *et al*., 2009; Atinafu *et al*., 2017).

2.3. Traditional Medicines

Traditional medicine has been defined as the sum total of all knowledge and practices, whether explicable or not, used in the diagnosis, prevention and elimination of physical, mental or social imbalances and relying exclusively on practical experience and observation handled down from generation to generation, whether verbally or in writing. This system of health care is also known as folk medicine/ethno medicine (EM) or indigenous medicine (WHO, 2008). About 60-85% of the population in every country of the developing world has to rely on traditional medicine. The practice of TM is widespread in China, India, Japan, Pakistan, Sri Lanka and Thailand (Khan and Islam, 2007). Practitioners include herbalists, bonesetters, traditional birth attendants, traditional psychiatrists, herb sellers, and other

specialists. Traditional medicinal plants play typical role in the lives of many people in terms of health support, financial income and livelily hood security (Haile, 2005).

2.4. Sources of Medicinal Plants

Local forests are sources of plant processes into therapies used in traditional medical system (Balick and Cox, 1996). The natural ecosystems of the forests, grasslands, woodlands, wetlands, field margins, contain a significant number of medicinal plant species. These are places where traditional healers and other members of the community collect medicinal plant species (MPs) (Endashaw, 2007). Similarly, the work of Tesfay and Sebsebe (2009) indicated that most of the MPs in Ethiopia are collected from the wild, some are cultivated and some others are grown in home gardens either purposely for medicinal use or non-medicinal purpose. According to Zemede (1997) plant species cultivated in Ethiopian home gardens for the purpose of medicine is about 6%.

2.5. The Importance of Medicinal Plants for Development of Modern Drugs

Ethno pharmacology is highly diversified approach to drug discovery involving the observation, description, and experimental investigation of indigenous drugs and their biologic activities (Ghorbani, 2005). It is based on botany, chemistry, biochemistry, pharmacology, and many other disciplines including anthropology, archeology, history and linguistics that contribute to the discovery of natural products. Ethno-pharmacology is the cross-cultural study of how people derive medicines from plants, animals, fungi, or other naturally occurring resources. In addition, Taxonomy and the newer discipline ethnobotany has now become an integral part of drug discovery from plants (Jachak and Sakalani, 2007). Searching new drug from traditionally used medicinal plant can be the shortest path to success and indigenous people remain the ultimate resource for retrieving this information for the purpose of application particularly, in modern medicine **(**Muthu *et al*., 2006). The number of higher plant species (angiosperms and gymnosperms) on this planet is estimated between 250,000-500,000. Of these, only about 6% have been screened for biologic activity and reported 15% have been evaluated phytochemically (Fabricant and Farnsworth, 2001). Currently, there are more drugssuch as (aspirin from*Filipendilaulmaria* (Rosaceae), Quinine from *Cinchona pubescens* (Rubiaceae), Morphine from *Papaver somniferum* (Papaveraceae) and ephedrine from

Ephedra sinica prescribed in North America and Europe. About 80 drugs prescribed in the industrialized world as a whole, were discovered based on information derived from ethnobotanical investigation (Kargioglu *et al*,. 2008). Medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drug (Wright, 2005). Various modern drugs were extracted from medicinal plants through the use of plant material as indigenous cure in folklore or traditional system of medicine and it is believed that half of the top 25 best selling medicines in the world originate from natural materials including plant materials (Ohigashi, 2008).

2.6. Ethno-veterinary Medicine

Manoj and Ekta (2014) defined ethno veterinary medicine as people's beliefs, knowledge, skills and practices relating to care of their animals. Ethno-veterinary research is defined as holistic, interdisciplinary study of local knowledge and its associated skills, practices, beliefs, practitioners, and social structures pertaining to the healthcare and healthful husbandry of food, work and other income producing animals, always with an eye to practical development applications with livestock production and livelihood systems, and with the ultimate goal of increasing human wellbeing via increased benefits from stock raising (Rodrigo *et al*., 2005; Jitin, 2013).

Livestock raisers, both farmers and herders have developed their own ways of keeping their animal health and productivity. Ethno-veterinary medicine involves the use of medicinal plants, surgical techniques and livestock management practices to prevent a range of animal diseases (Manoranjotham and Kamaraj, 2016).

2.7. Medicinal Plants and Ethnomedicine in Ethiopia

The various climatic and topographic conditions of the country contributed to a rich biological diversity. Ethiopia is a home for about 6,000 species of higher plants with approximately 10% endemic (Vivero *et al.*, 2006). Similarly, as it was reported by IBC (2015), the flora of Ethiopia consists of an estimated number of 6000-7000 species of plants with 10-12% endemism. Like all other parts of the world, plants are used as a source of medicine in Ethiopia. According to Endashaw (2007) 95% of traditional medicinal preparations are plant

origin. Although a significant number of people in Ethiopian societies use traditional medicinal plants for their primary health care, much of the earliest knowledge was not written down due to the secret kept by priests and other knowledgeable persons. It is not easy to get traditional medicinal knowledge of the healers because they claim that the knowledge is their own and wanted to transfer their knowledge only to a person they want to pass, mostly to the eldest son. This becomes practical when they approach death (Tesfaye and Sebsebe, 2009). Due to its long period of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people (Mirutse *et al*., 2003).

About 80% of human population and 90% of livestock of Ethiopia are dependent on traditional medicines for their health care practice (NBSAP, 2005). Due to cultural and biological diversity, MPs are more known in the south and south-western parts of Ethiopia (Edwards, 2001). Since knowledge and use of plant is an integral part of many ethnic rural cultures, the extent has not yet been studied in depth (Engedasew *et al*., 2015). Perhaps the best known species is *Phytolacca dodecandra*. Extracts of the plant, commonly known as *Endod*, are used as an effective molluscicide to control shistomiasis (Aklilu *et al.,* 1984) and *May tansine*, an active principle against cancer was isolated from Maytenus species (Sebsebe, 2003).

2.7.1. Medicinal Plant Diversity and Distribution in Ethiopia

Ethiopia is a country with a great range of ecological, edaphic and climatic conditions. The number of plant species in each corner of the country and the vegetation type is also varied ranging from arid lowland to Afro alpine vegetation (Abebe, 2001). Similarly, it was reported that the variation in vegetation type of the country is due to the country's significant geographical diversity (Haimanot, 2010). As it was reported by Edwards (2001), the wood lands, mountain vegetation including grassland, forests and the evergreen scrubs and rocky areas contain more medicinal plants which indicated that traditional medicinal plant (TMP) species are not equally distributed throughout the country similar to the distribution of the total plant species. According to this report the vegetation types found in the wood lands contain more medicinal plant species while the Afro-alpine vegetation consists of the least medicinal plants of all the vegetation types.

2.7.2. Ethno-veterinary Medicine in Ethiopia

Ethno veterinary medicine provides traditional medicines, which are locally available and usually cheaper than standard treatments. Livestock holders can prepare and use homemade remedies with minimum expense. In rural Ethiopia mixed farming which encompasses crop cultivation and herding is the major means of livelihood though some alternative income generating activities such as; fattening, petty trade, traditional bee keeping, firewood collection, hand craft, and wage based employments are also practiced to some extent (Atinafu, 2017).

In general, Ethiopia is one of the top ranking in African countries and among the first ten in the world in livestock resources which directly constitutes important sources of livelihood in addition to contribution to crop production (Semayat, 2017). Although the number of livestock population is many in number, disease play role in reduction. To overcome this problem, many people mainly use traditional medicines to treat their livestock ailments. This is due to insufficient number of veterinary drugs, high cost of most drugs and far and out of the reach of the Ethiopian farmers and pastoralists (Mirutse and Gobena, 2003). In Ethiopia, conventional veterinary services have been playing a paramount role in the control and prophylaxis of livestock diseases in the last three decades (Fitsum *et al*., 2017).

However, they can't yet deliver complete coverage in preventive and curative healthcare practices because of inadequate human labor, logistical problems, an erratic supply of drugs, and the high cost of drugs and equipment. As a result, the majority of those raising livestock in rural areas are far from the site of veterinary stations, and those who have access to veterinary services may not be able to afford to pay for them (Asayegn and Abiy, 2009). Hence, raising awareness on ethno veterinary medicine by emphasizing on plants used for the treatment of livestock disease has vital importance to livestock management. In addition, proper documentation and understanding of farmers' knowledge, attitude and practices about the occurrence, cause, treatment, prevention and control of various ailments is important in designing and implementing successful livestock production (Phondani *et al*., 2010).

2.8. Major Threats to Medicinal Plants and Indigenous Knowledge

As medicinal plants are part of the total plant of the different ecosystems of the earth, they are affected by anthropogenic and natural forces. Apart from other species of plants, MP species exploited for their medicinal value. Medicinal plant species have been affected by unsustainable harvesting for export and extraction of pharmaceuticals. As a result, several medicinal plant species exploited that are seldom found in unprotected areas (Williams, 2004). People who have some traditional knowledge and those professional healers harvest medicinal plant mainly from the wild habitat (Tesfaye and Sebsebe, 2009).

According to Abebe (2001) and Kebu *et al*. (2004) collection of traditional medicinal plant species declined from time to time. Similar to other countries of Africa, medical plant species of Ethiopia is vulnerable to problems of continuity and sustainability primarily, due to loss of taxa of medicinal plants and loss of habitats. Generally, there are two sources of threaten to medicinal plants, i.e. Manmade and natural causes. Rapid increase in population, the need for fuel, urbanization, timber production, over harvesting, destructive harvesting, degradation, agriculture expansion and habitat distraction are caused threaten factor of medicinal plants. Likewise, natural causes including recurrent drought, bushfire, disease and pest outbreaks are threats to medicinal plants (Miruts *et al.,* 2003). Beside these known factors which threaten medicinal plant species, other condition like the types of the medicinal plant and the part used also affect the medicinal plant. For example, harvesting the roots and barks of medicinal plant possess more of a threat than collecting leaves for medicinal value (Edwards, 2001; Haile, 2005).

2.9. Conservation and Sustainable Use of Medicinal Plants

As it was stated by Abebe (2001) conservation should be aimed at conserving maximum diversity within each species to ensure that its genetic potential will be available in the future. Sustainable management of traditional medicinal plant resources is important not only because of their value as a potential source of new drugs but also due to reliance on traditional medicine for health. As it was reported by different researchers, plant species with medicinal value that are harvested from the wild especially, those which are highly used either for local use or trade are not found in a nearby place rather the professional traditional healers move

long distance to harvest. In contrast to this problem of scarcity, the demand and recognition for traditional medicine is increased and this is a good opportunity to the medicinal plants to conserve (Fisseha *et al*., 2009).

According to Manoranjotham and Kamaraj (2016) the wise use of medicinal plants species needs the involvement of different sectors and greater public support and for this, awareness creation is recommended. Home gardens have a great contribution to conservation of biodiversity in general and at the same time medicinal plants species can also be conserved, thus home gardens are strategies and ideal farming systems for the conservation, production, and enhancement of medicinal plants (Zemede, 2001). Some traditional medicinal plants are collected on selective days and seasons. Plant species which grown in religious sites like churches, mosques and the like are forbidden to be cut whether medicinal or non medicinal plants (Berhane *et al*., 2014).

Moreover, harvesting of medicinal plants using pointed wooden digging stick than using metal axes are some of the cultural methods of medicinal plant collection and this has contribution to the conservation strategy (Phondani*et al*., 2010). In the field, medicinal plants conservation goes side by side with conservation of ethnobotanical and ethno pharmacological information. The conservation of medicinal plants is achieved through in situ and ex situ conservation methods (Khan and Ahmad, 2014).

In-situ is a type of conservation where species are conserved in their natural habitats which include the national park and reserves. This method is especially preferable for those species where domestication and management is difficult out of their natural and normal habitats and ecosystem (Regassa, 2013). Ex situ conservation is another method of conservation where endangered species are protected by removing part of them from a threatened habitat and place them in a new location which may be a wild area or within the care of humans which includes seed gene banks, field gene banks, botanic gardens (Berhane *et al*., 2014). In situ and ex situ should be complementarily implanted in Ethiopia to conserve valuable plant species which are threatened due to natural or manmade factors (Abebe, 2001).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

3.1.1. Geographical Location

The study was conducted in Hulet Ejju Enesie district, East Gojjam Zone of Amhara Regional state, Ethiopia. The district is 120 kms East away from the capital city of the Amhara Regional state, Bahir Dar and 202 kms north from the administrative zone, Debre Markos. It is 363 kms to the north of Addis Ababa and it is located between 10^{o} 40' 00" to 11^{o}10' 00" N latitude and 37^{o}40' 0" to 38^{o}10' 0" E longitudes (Fig. 1). The district has an altitude range of 1290-4036 m a.s.l. The Woreda is bordered on the South by Debay Telat, on the west by Bibugn, on the Northwest by the west Gojjam zone, on the North by the Abay River (which separates it from the south Gonder zone), on the East by Goncha siso Enesie, and on the South East by Enarjnawga. Among the towns in this administrative division are Motta, Keraniyo and Sede. Rivers in Hulet Ejju Enese include Tijjan (Abiya), Temme a tributary of Abay. The *Sabero Dilde*y (also known as the "Second Portuguese Bridge" or the "Broken Bridge") crosses the Abay here, connecting Hulet Ejju Enesie with Este a woreda in South Gondar (WAO. 2011).

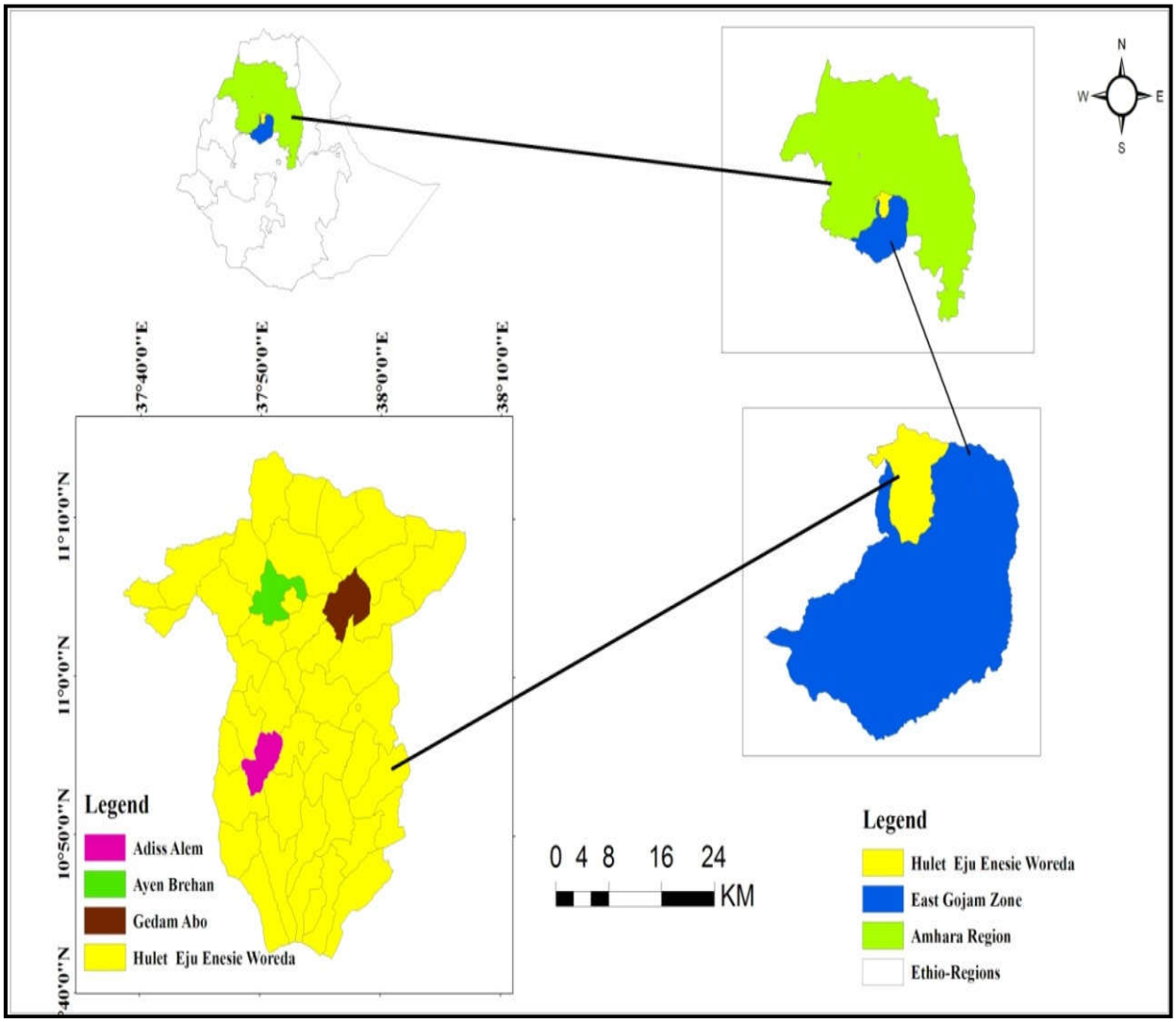

Figure1: Map of the Study Site (GIS).

3.1.2. Population

Based on the 2007 national census conducted by the Central Statistical Agency (CSA), the district consists of 40 rural and 6 urban Kebeles and has a total population of 275,638 of which 137,382 are men and 138,256 are women. Out of this number, 30,594 are urban inhabitants with an area of 1,496.69 square kilometers. Hulet Ejju Enesie has a population density of 184.17 persons per square kilometer. There are 64,272 households with average of 4.29 persons per household. The majority of the inhabitants practice Ethiopia Orthodox Christianity with 95.3% reporting that as their religion, while 4.7% of the population is Muslims. The largest ethnic group reported in Hulet Ejju Enesie is Amhara (99.93%) (CSA, 2007). The land

use pattern is classified into five categories; 66.7% cultivated 13% grazing, 7.2% bushes and forest land around homestead, 12.96% land is not in use (WAO. 2011).

3.1.3. Livestock Production

The livestock production is one of the major economic bases of the area. The total livestock population in the district is estimated to be 726,157 of which 88,112 (12.12%) cattle, 488,649 (67.2%) sheep, 19,579 (2.7%) goats, 17,183 (2.36%) equines and 113,634 (15.62%) are poultry (Habtamu *et al*., 2016).

3.1.4. Agro ecology and Climatic Condition

The climate of the study area varies with altitude. Agro ecologically, the district is classified as 52% of the area is midland(*"Weinadega"*) (2,387 -2555 m.a.s.l) and has temperature of 18^{o}C-24^{o}C with an average rainfall of 1190mm per annum, 18% of highland (*"Dega"*) (2555-4036 m a.s.l) with temperature of 13^{o}C-20^{o}C and average rainfall of 1260mm per annum and 30% of the area cover by *"Kola"* (lowland) (1290-2387 m a.s.l), which has a temperature of 22^{o}C-28^{o}C with an average rainfall1000 mm per annum (WAO. 2011). The Woreda's high rainfall season is during summer (June-September). However, there is small rain falls between April and May ("*Belge*"). The mean annual temperature is 18.5°C and the range is from mean minimum of 10°C to mean maximum 27°C (CSA, 2007).

3.2. Reconnaissance Survey and Ethnobotanical data collection

A reconnaissance survey was conducted from August 1 to 10, 2017 to select 3 potential kebeles. Of the total forty-six Kebeles, Gedamabo (1700m a.s.l), Ayenbirhan (2,487 m a.s.l) andAddisalem (3410 m a.s.l) from Lowland, Midland and highland selected respectively. Those Kebeles were selected purposively based on the availability of traditional medicine practitioners, traditional medicine use history and altitudinal variation between the kebeles. Prior to Ethnobotanical data collection on medicinal plants, respondents were selected from the selected kebeles. Once respondents were selected, ethnobotanical data on medicinal plants were collected from 100 respondents (aged >20) of which 55 (36 men and 19 women) were non-healers and 45 (34 men and 11 women) were key informants (traditional healers) available for this study (Table 1).

Table 1: Total number of informants in the study area in each *Kebele*

Name of Kebele	Traditional Healers			Nontraditional Healers			Total Informants		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Ayenbirhan	11	5	16	9	7	16	20	12	32
Gedamabo	13	4	17	14	4	18	27	8	35
Addisalem	10	2	12	13	8	21	23	10	33
Total	34	11	45	36	19	55	70	30	100

Key informants were selected based on the information gathered from the local people while, other respondents were randomly selected. Semi-structured interviews, group discussions, and guided field walks with key informants for field observations are methods of data collection (Abebe, 2013). First key informants interviewed individually in order that they mention about the local names of the plants, their use to treat diseases, diseases treated, plant parts used, methods of preparation of remedies, route of application of the remedies, dosage, and factors that threaten medicinal plants. Similarly, the same procedure was followed with randomly selected non-practitioners of traditional medicine.

Based on the check list prepared, group discussion was made with key informants and field visit was made with them for onsite observation and collection of the plants. The collected voucher specimens were pressed and dried for identification. For some species, preliminary identification was done in the field using illustrations after which further identification of all specimens was done by comparison with authentic specimens, illustrations and taxonomic keys from Flora of Ethiopia and Eritrea, and with the assistance of experts at Herbarium of Haramaya University. The identified specimens were deposited in Haramaya University Herbarium.

3.3. Data Analysis

A descriptive statistical method (e.g., percentage and frequency) were employed to summarize ethnobotanical data.

Jaccard's Similarity Index: Jaccard's similarity index was calculated to compare similarity of medicinal plant knowledge between purposively selected kebeles of different altitude. For this, presence of a given plant species and its utility as medicine or its absence/not considered as medicine are used as data sets(Cunningham, 2001).

$$JI = \frac{c}{a + b + c}$$

Where JI is the Jaccard similarity index, 'c' is the number of species shared by the study kebeles, 'a' is the number of species in Kebele A only and 'b' is the number of species in Kebele B only. The JI values range between 0 and 1, whereby a value of 1 indicates complete similarity.

Independent sample t-Test and analysis of variance (one-way ANOVA): Differences in traditional medicinal knowledge due to gender was analyzed using independent t-test, but age group and educational level were analyzed using analysis of variance (one way- ANOVA) by using number of medicinal plants reported as a dependent variable and gender, age group and education level as independent variable. Statistical test was done using SPSS version 20.

Informant Consensus Factor (ICF): Informant consensus factors were calculated for categories of ailments to identify the agreements of the informants on the reported cures using the formula used by (Rodrigo *et al*., 2005). ICF was calculated as follows: number of use citations for each ailment minus the number of species used for that ailment, divided by the number of use citations for each ailment minus one.

$$ICF = \frac{n_{ur} \quad n_t}{n_{ur} \quad 1}$$

Where n_{ur} is number of use citations for each ailment and (n_t) is number of species used for that ailment.

Fidelity Level: The fidelity level (FL) the percentage of informants claiming the use of a certain plant for the same major purpose, was also calculated for the most frequently reported diseases or ailments using the following equation (Tilahun *et al*.,2007).

$$FL(\%) = \frac{NP}{N} x100$$

Where Np is the number of informants that claim the use of a plant species to treat a particular disease, and N is the number of informants that use the plants as a medicine to treat any given disease.

Preference Ranking: To compare the most effective medicinal plants used by the community to treat the Rabies disease, preference ranking was conducted following Martin (1995) and Cotton (1996). For this, ten informants were selected to identify the best preferred medicinal plant species for treatment of this disease and Preference ranking of seven medicinal plants were conducted for treating Rabies. Rabies disease was preferred for preference ranking hence it is communicable and the local communities treat this communicable disease only by local medicinal plants. Each informant provided with mentioned medicinal plants reported to cure the illness with leaves of medicinal plant used being paper tagged then asked to assign the highest value(7) for the most preferred species against the illness and the lowest value (1) for the least preferred plant and in accordance of their order. The value given to each species was summed up and the rank for each species was determined based on the total score.

Direct Matrix Ranking: Direct matrix ranking exercise was done following martin (1995) and Cotton (1996) in order to compare multipurpose use of a given species so as to relate to the probable pressure exerted on that species by the local people. Based on information gathered from informants, multipurpose tree species were selected out of the total medicinal plants and use diversities of these plants were listed for selected key informant to assign use value to each species. Each key informant then asked to assign use values (5=best, 4=very good, 3=good, 2=less used, 1= least used, and 0=not used). Accordingly, each key informant's use values were summed up and ranked.

4. RESULTS AND DISCUSSION

4.1. Summary of Socio-Demographic about the Informants in the Study Area

The distribution of informants with respect to age class shows that, the highest number of informants was obtained in the age group between 41 and 60. Seventy of the total informants were male and 30 were females. Regarding to educational Status from hundred informants, 54 were illiterate followed by writing and reading 24, Primary School 15 and the least is Secondary School and above 7 (Table 2).

Table 2: Summary of Information about the Informants in the Study Area

Sex		Age			Educational Status			
Male	Female	20-40	41-60	>60	Illiterate	Read and Write	Primary School	Secondary School and above
70	30	31	50	19	54	24	15	7

4.2. Medicinal Plants of the Study Area

Totally, 80 medicinal plants species used in traditional medicine were collected and documented in Hulet Ejju Enesie woreda. These plants were distributed in 75 genera and 52 families. Out of the collected medicinal plants, 53 species were used to treat only human ailments, 8 species used to treat only livestock ailments and the remaining 19 species were used for treating both human and livestock ailments (Appendix table1). This study agrees with the finding of (Melesse *et al*., 2015, Assegid and Tesfaye, 2014) in which most species were used to treat human ailments than livestock ailments. This result indicates that the local communities mostly used medicinal plants to treat human ailments than livestock ailments. The data collected from the study site showed that 49 medicinal plants were collected from forest site and river side, 17species of medicinal plants from agricultural and grazing lands and the remaining 14 species from home gardens/around home (Appendix table 2). This agrees with the general pattern seen in many investigations in Ethiopia in which more medicinal plants are collected from the forest than home gardens (Endalew, 2007; Etana, 2007; Haile and

Delenasaw, 2007). This finding also shows that contribution medicinal plants from home garden appear minimum than forest and other habitat and it needs to be emphasized.

In terms of species diversity, Solanaceae stood first with 5 species which dominated the medicinal plants followed by Euphorbiaceae and Malvaceae with 4 species each Cucurbitaceae, Rutaceae and Verbenaceae each with 3 species Acanthaceae, Apocynaceae, Boraginaceae, Celastraceae, Fabaceae, Lamiaceae, Moraceae, Myrsinaceae, Myrtaceae, Oleaceae, Polygonaceae each with 2 species. The remaining 36 families were represented by one species each (Appendix 1).

Regarding the habit diversity of the reported medicinal plants, majority of them were shrubs followed by herbs, trees and climbers (Fig. 2). The dominance of shrubs as medicinal plants of the study area are because they can be harvested year round compared to herbs, which are short lived and the remaining growth form trees and climbers are scattered in the study area. Although some previous researches reported herbs as the main life forms used for medicinal plants, some researchers (Getnet, 2011; Melesse *et al*., 2015) have reported shrubs as the dominant medicinal plants of their study sites.

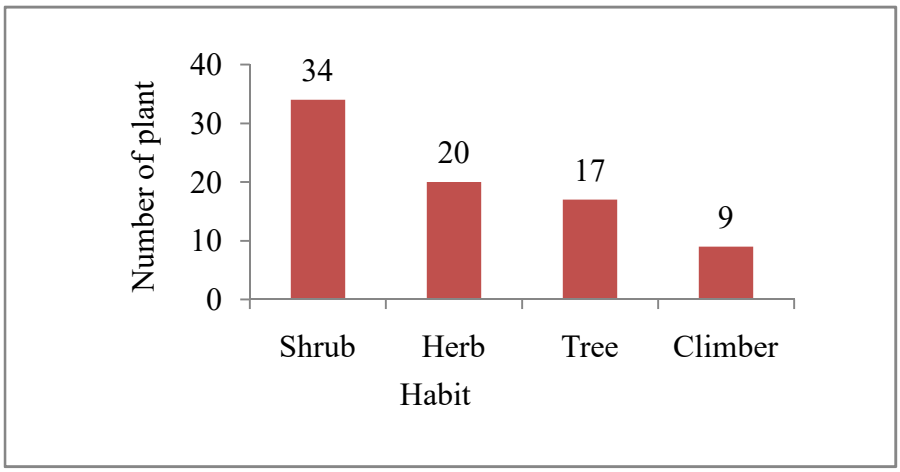

Figure 2: Proportion of the different plant life forms

4.3. Plant Parts Used, Preparation and Route of Administration of Medicinal Plants

People of the study area harvest different plant parts for preparation of traditional medicines. However, mostly used plant part is leaf followed by root, seed, fruit, etc (Fig. 3). In many

other studies also (Eskedar, 2011; Mersha, 2011), leaf was the major plant part used for remedy preparations.

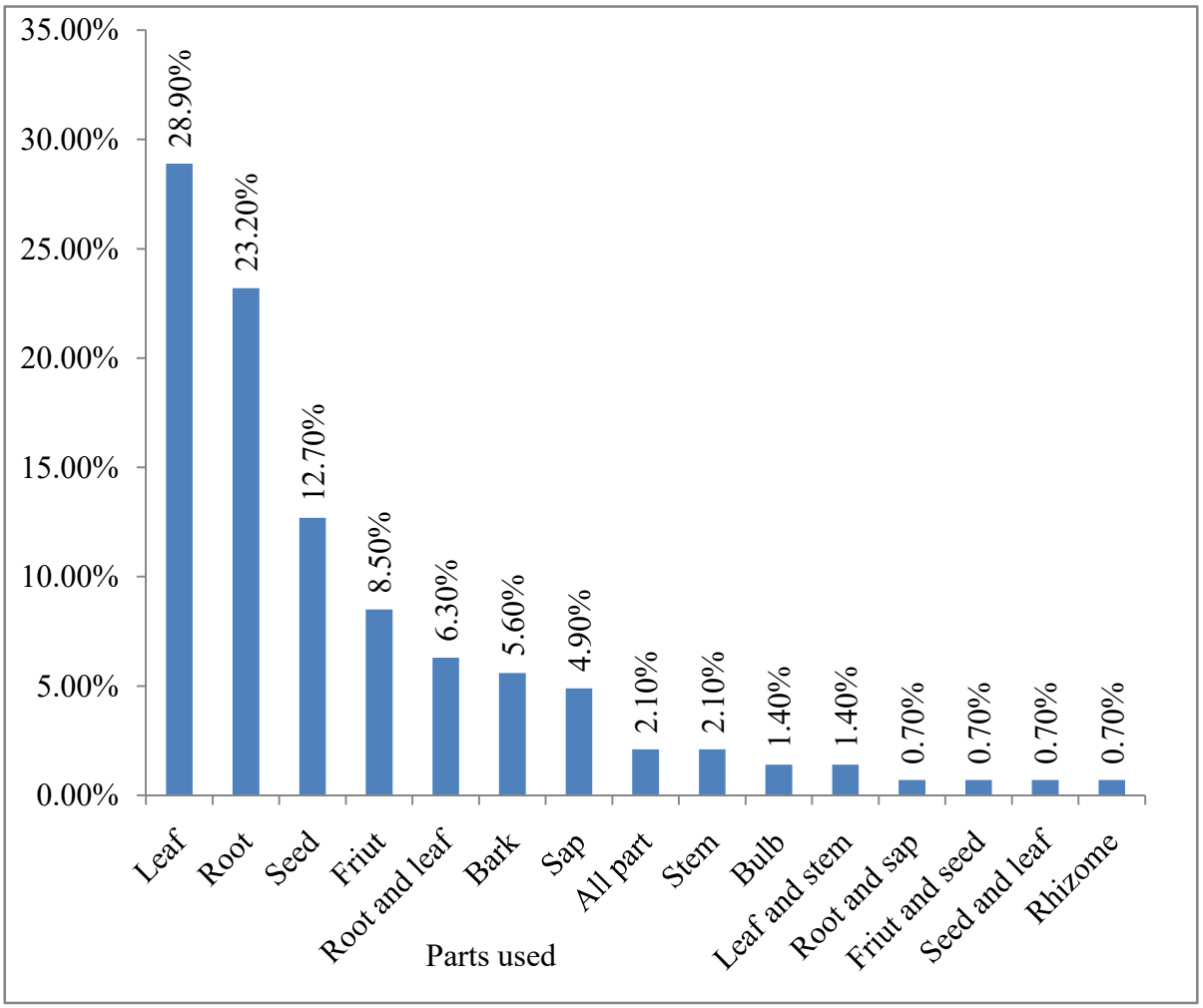

Figure 3: Plant Parts used in preparation of remedies

According to the respondents, herbal remedies are prepared using fresh plant material 58.5% followed by dried plant material 30.3% and 11.2% of them reported the use of plant materials in fresh or dried form (Fig. 4). Many previous researches (Abiyu *et al*., 2014; Yibrah, 2015) also reported the same, suggesting that use of fresh material is more curative than dry form.

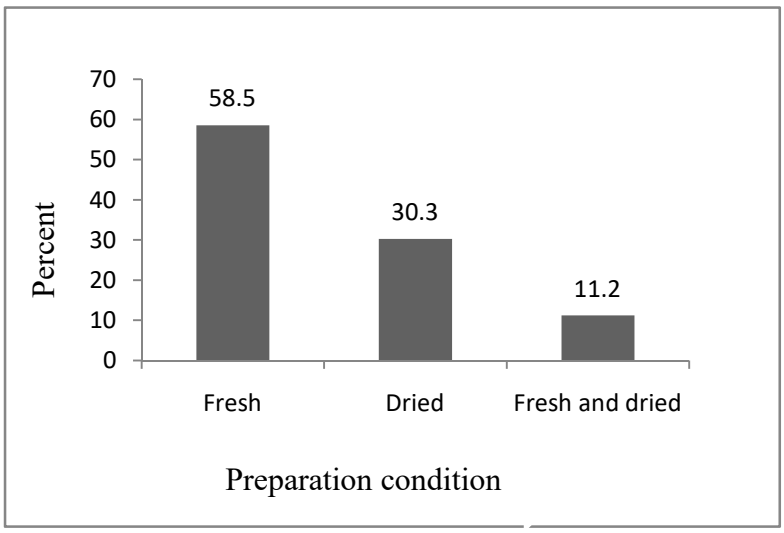

Figure 4: Preparation conditions of herbal remedies

Traditional remedies were prepared in different ways, which actually, according to the respondents depends on the type and position of the disease. The common ways of remedial preparations reported were crushed, ground, powdered, and squeezed, boiled and other. Routes of administration of the remedies also appear to be dependent on part of the body affected and include mainly oral (whereby the patients drink and eat the preparations), followed by dermal (where remedies are creamed, rubbed against the skin, tied on the skin or bathed the skin with the remedies), nasal (where remedies are sniffed/smoked) (Table 3). This result was similar to the findings of previous investigators (Eskedar, 2011; Abiyu; 2014; Assegid, Tesfaye, 2014.) who reported that oral application was the dominant route of administration.

Table 3: Route of administration of traditional medicines in the study area

Route of application	Frequency	Percent%
Oral	81	57
Dermal	45	31.7
Nasal	6	4.2
Other	10	7.1
Total	142	100

It was noted that is there no precise dosage for remedies, but people determine the amount in count or volume based on the age and physical condition of the patient. This has been the main drawback of traditional medicine (Dawit and Ahadu, 1993). Some of the remedies are taken with different additive and solvents. The additives include butter, honey, milk, *Injera*, sugar,

local alcohol (*Tella* or *Arekie*), salt, oil, coffee or tea. These additives have double function i.e. to get better taste and reduce adverse effects such as vomiting and diarrhea and enhance the efficacy and healing conditions as explained by informants.

4.4. Agreement of Respondents on Medicinal Values of Plants and Use Value Ranking

4.4.1. Jaccard's Similarity Index

Analysis of Jaccard's similarity index was conducted using number of medicinal plants reported from each Kebeles to show their traditional medicinal plants knowledge similarity between kebeles. Jaccard's similarity index (JSI) showed that the study area has the highest similarity between Ayenbirhan and Gedamabo followed by Ayenbirhan and Addisalem with (JSI) 0.91, 0.77, respectively. The least similarity in study area was observed between Addisalem and Gedamabo which have Jaccard's similarity index of 0.65 (Table 4). This result showed that almost all sites similar in traditional medicinal plants knowledge as each of them were related to each other agro ecologically and this is also the result of their geographical proximity among the three sites and the same ethnic group with the same cultural back ground inhabiting in the three kebeles.

Table 4: Jaccard's similarity index of medicinal plants knowledge among selected sites

Kebeles	Ayenbirhan	Gedamabo	Addisalem
Ayenbirhan	1	0.91	0.77
Gedamabo	0.91	1	0.65
Addisalem	0.77	0.65	1

4.4.2. Informant Consensus Factors

All cited human and livestock diseases were categorized into nine categories. Namely, blood and circulatory problems, gastrointestinal related disease, malaria, rabies, snake bite, problems of nervous system, problems of respiratory system, problems of urino-genital system, sudden sickness (headache, fever, fibril illness), sensorial problem (toothache, eye, ear, nose disease) and skin problem. These diseases were categorized based on the nature of disease, place of attack, sign and symptoms of diseases. Disease categories with relatively higher ICF values were sudden sickness (0.83), Sensorial problem (0.74), Blood and circulatory problems (0.67)

and Skin related problem (Table 5). This indicates the common occurrence of these diseases so that more number of people exchanging information and agree on plant species that can be used to treat these diseases than the rest. A high value of ICF (close to one) indicated that the informants rely most on the same taxa to treat a specific disease while, lower value of ICF (close to zero)indicates that the informants disagree to treat a given ailments (Tilahun Teklehaymanot and Mirutse Giday, 2010).

Table 5: Informant consensus factor for major categories of human and livestock diseases

No	Categories of ailments	No of use citation (Nur)	No of species (Nt)	ICF
1	Sudden sickness (Headache, Fever, Fibril illness, etc)	53	9	0.83
2	Sensorial problems (toothache, eye, ear, nose disease etc)	39	11	0.74
3	Skin problems	69	21	0.71
4	Blood and circulatory problems	28	10	0.67
5	Malaria, Rabies, Snake Bite, etc	49	20	0.60
6	Problems of respiratory system	28	12	0.59
7	Problems of the genitourinary system	33	15	0.56
8	Gastrointestinal related disease	47	22	0.54
9	Problems of nervous system	14	8	0.46

4.4.3. Fidelity Level Index

Fidelity level (FL) values were calculated for some commonly used medicinal plants against some commonly reported ailments: *Verbena officinalis* (against stomachache), *Embelia schimperi* (against Tapeworm), *Zehneria scabra* (against febrile illness, Skin rash*), Rosa abyssinica* (against Tapeworm, Stomachache), *Datura stramonium* (against Dandruff, Toothache), *Phytolacca dodecandra* (against Gonorrhea, Rabies, Anthrax), *Croton macrostachyus* (against Febrile illness, Ascariasis, Wart), *Kalanchoe laciniata* (against Nasal bleeding, Body swelling, Leg swelling), *Justicia schimperiana* (against Rabies, Gonorrhea, Wound, Diarrhea). Fidelity level values in the study area varied from 72 to 100%. Generally, the medicinal plants that are widely used by local people to treat several ailments have less fidelity level value, while medicinal plants used to treat one or few aliment have 100% FL. The result of this study shows that *Verbena officinalis* and *Embelia schimperi* had 100% FL value. These medicinal plants have the highest FL values which could be an indication of their good healing potential in the study area and the others are below 100%. For example,

Justicia schimperiana is widely used species to treat many ailments and its FL is 72% (Table. 6).

Table 6: Fidelity level index of the relative healing potential of some selected medicinal plants used against human or livestock ailments

Botanical Name of Medicinal Plants	Ailment to be treated	NP	N	FL	FL%
Verbena officinalis	Stomachache	40	40	1	100
Embelia schimperi	Tapeworm	34	34	1	100
Zehneria scabra	Fibril illness, Skin rash	31	33	0.94	94
Rosa abyssinica	Tapeworm, Stomachache	26	28	0.93	93
Datura stramonium	Dandruff, Toothache	20	22	0.91	91
Phytolacca dodecandra	Gonorrhea, Rabies, Anthrax	38	44	0.86	84
Croton macrostachyus	Febrile illness, Ascariasis, Wart	22	26	0.85	85
Kalanchoe laciniata	Nasal bleeding, Body swelling, Leg swelling	12	16	0.75	75
Justicia schimperiana	Rabies, Gonorrhea, Wound	18	25	0.72	72

4.4.4. Preference Ranking

Preference ranking of seven medicinal plants that were reported for treating Rabies was conducted after selecting ten key informants. The informants were asked to compare the given medicinal plants based on their effectiveness and to give the highest number (7) for the medicinal plant which they thought most effective and the lowest number (1) for the least effective plant in treating Rabies. Result showed that *Phytolacca dodecandra* ranked first to treat rabies. Therefore, it is the most effective medicinal plant to treat rabies followed by *Cucumis ficifolius, Argemone mexicana, and Euphorbia tirucalli*and *Rumex nervosus* (Table7).

Table 7: Preference ranking of selected medicinal plants based on the degree of their curative power against rabies as perceived by informants

Respondents	Species						
	Acanthus sennii	*Argemone Mexicana*	*Cucumis ficifolius*	*Euphorbia tirucallia*	*Justicia schimperiana*	*Phytolacca dodecandra*	*Rumex nervosus*
R1	4	6	5	5	1	3	4
R_2	5	4	5	1	3	6	1
R_3	3	5	6	7	2	5	4
R_4	2	7	2	3	3	3	6
R_5	7	3	6	2	2	7	4
R_6	4	4	7	5	5	5	3
R_7	2	7	1	6	6	4	2
R_8	4	4	5	5	4	5	5
R_9	3	3	5	2	5	6	6
R_{10}	5	1	5	4	2	5	4
Total	36	44	47	40	33	49	39
Rank	6^{th}	3^{rd}	2^{nd}	4^{th}	7^{th}	1^{st}	5^{th}

4.4.5. Direct Matrix Ranking

Many medicinal plants were reported to have used other than medicine. These were used for charcoal making, construction, firewood, fencing, forage, furniture and medicine. Six commonly reported multipurpose species and seven use categories were involved in direct matrix ranking exercise in order to evaluate their relative importance to the local people and the extent of the existing threats related to their use values. The direct matrix ranking result showed that *Cordia africana* ranked first being the most multipurpose medicinal plant by local people for various uses followed by *Eucalyptus globulus, Dodonaea angustifolia, Acacia abyssinica, Croton macrostachyus* and *Euphorbia abyssinica* (Table 8). *Cordia africana* is the most threatened species as the informants reported, which is evidently shown by its distribution scarcity and the time required for collection of this species. Even though the *Eucalyptus globulus* is required for various use values and ranking 2^{nd} it is abundantly recorded in the area as human beings plant it. Similarly, the use values reported across the selected species were summed up and ranked. The results show that the local people harvest six multipurpose species mainly for firewood, fencing, medicine, charcoal, furniture, construction and forage with the rank of 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th} and 6th respectively (Table 8).

Table 8: Direct matrix ranking for six selected plant species and main use in study area

Plant Species	Use Categories								
	Medicinal	**Forage**	**Fire wood**	**Charcoal**	**Fence**	**Construction**	**Furniture**	**Total**	**Rank**
Croton macrostachyus	5	2	5	2	4	0	1	19	5th
Eucalyptus globulus	3	0	5	3	5	5	5	25	2nd
Cordia Africana	2	5	5	3	4	3	5	27	1st
Acacia abyssinica	3	2	5	5	3	2	0	21	4th
Dodonaea angustifolia	3	4	5	2	5	3	0	22	3rd
Euphorbia abyssinica	5	0	4	3	4	0	3	16	6th
Total	21	13	29	18	25	13	14		
Rank	3rd	6th	1st	4th	2nd	6th	5th		

4.5. Threats to Medicinal Plants and Associated Indigenous Knowledge

The cause of threats to medicinal plants can be generally grouped into natural and human induced factors. However, as respondents reported in this study most of the causes for the threats to medicinal plants and the associated indigenous knowledge are the anthropogenic factors such as agricultural expansion, firewood, charcoal, timber, construction materials. Informants ranked agricultural expansion as the most serious threat to the medicinal plants followed by fire wood/charcoal collection and overgrazing (Table 9). As some of the medicinal plants are of multipurpose, their extraction for medicine has also increased the threat. With increasing population size and demand for farmland, agricultural expansion has always been reported by different researchers (Eskedar, 2011) as the main threatening factor in rural areas. Secrecy in disclosing of the knowledge by traditional healers and negligence of the young generation to learn indigenous knowledge were also noticed as factors that contribute to the loss of IK.

Table 9: Ranking factors threatening to medicinal plant species in the study area. Ranking was done based on the use criteria rated as 5 = extremely high; 4 = Very high; 3 = high; 2 = low; 1 =very low.

Threat factors	Respondents										Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10		
Agricultural expansion	4	4	5	5	4	5	5	5	4	4	45	1st
Fire wood and charcoal	4	5	5	4	4	4	5	4	4	5	44	2nd
Overgrazing	5	4	5	5	4	5	4	4	5	4	40	3rd
Drought	4	4	3	4	5	4	4	3	4	3	38	4th
For construction	3	4	3	4	3	3	4	4	3	5	36	5th
For medicinal value	1	2	3	2	1	2	3	2	3	3	22	6th

4.6. Conservation of Medicinal Plants and Indigenous Knowledge

The above causes of threats to medicinal plants and associated knowledge are due to lack of conservation of medicinal plants and associated indigenous knowledge in the community. The local community of the study area conserves plant species through ex-situ conservation methods by the help of the government. Plants are managed and conserved found like around church and mosques because of their spiritual, ritual and material values. These types of management practice indirectly preserve medicinal plants in the study area. Even if religious practitioners transfer their knowledge secretly, they conserve by documenting indigenous medicinal plant's knowledge. This is a good practice for the conservation of medicinal plants and associated knowledge.

4.7. Socio-Demographic Factors Influencing Medicinal Plant Knowledge

Statistical analysis showed that gender age, and educational statuses of respondents were found to influence knowledge of medicinal plants of the local community. Respondents were categorized into 3 age categories; 20-40, 41-60 and >61 years of age. Analysis of variance (one-way ANOVA) revealed that there was significant (P=0.015, ANOVA) difference between age categories in their traditional medicinal plant knowledge. Respondents of age above 61 years reported 5.00 ±0.49 medicinal plants and the age between41-60 reported 4.00 ±0.29 while, those of less than 40 reported about 3.35±0.23 plants on average. The results of this study show that number of medicinal plants reported by respondents increase with age the elders have accumulated indigenous knowledge on medicinal plants than the young

generation. This is the fact that the elders have long experience to use local medicinal plants against different disease traditionally. But young generations are under the influence of modernization and globalization and disinterested towards traditional practice.

On traditional medicinal knowledge, gender also had significant impact (P=0.005, independent T-test) that males having reported 4.29±0.25 plants and females reported 3.03±0.19 plants. Related to educational status, respondents were grouped into four educational level such as; illiterate, read and write, primary school, high school and above. Like age and gender, educational level also had significant difference (P=0.000, ANOVA) on traditional medicinal knowledge. Respondents which can read and write reported 6.67±0.57 medicinal plants, followed by illiterate which having reported 3.46±0.19 plants species, primary school list 2.07±0.20 plants and 1.86±0.26 medicinal plants reported by high school and above on average.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary and Conclusions

A study of medicinal plant use, indigenous knowledge and management of medicinal plants by local people of Hulet Ijju Inesie woreda, East Gojjam zone of Amhara Region, Ethiopia was conducted. The study aimed to document the traditional medicinal plants used by indigenous people to treat human and livestock ailments, plant parts used for medicinal purposes, methods of preparation, ways of administration and associated indigenous knowledge by the people of the study area. Ethnobotanical data on medicinal plants were collected from 100 respondents (aged >20) of which 55 (36 men and 19 women) were non-healers and 45 (34 men and 11 women) were key informants (traditional healers) participated for this study. Ethnobotanical data were collected through semi- structured interviews, observation, group discussion and guided field walk. Descriptive statistics was used to summarize data.

Eighty medicinal plants distributed in 75 genera and 52 families that are used to treat various human and livestock ailments were documented from the study area. From total medicinal plants 43(53.8%) are observed in the forest and river side, 19(23.7%) in agriculture and grazing land and 17(22.5%) in home garden and around home. Out of 80 medicinal plant species 53(66.3%) were used to treat only human ailments, 8 species (10%) used to treat only livestock ailments and the remaining 19 (23.7%) species were used for treating both human and livestock ailments. Analysis of growth forms of these medicinal plants revealed that shrubs are the dominant growth form which accounts 34(42.5%) followed by herb 20(25%), tree17 (21.3%) and climber 9(11.3%). Remedies are prepared using fresh (58.5%), dried (30.3%) and remaining (11.2%) used in both fresh and dried form for preparation of plant based remedies. The highest number (28.9%) plant parts used for the preparations of remedies were harvested from leaves followed by roots (23.2%), seed (12.7%), fruit (8.5%) and the remaining plant part cover (26.7%). Most of the medicinal plants are administered orally 81(57%) followed by dermal 45(31.7%), nasal 6(4.2%) and others 10(7%). The common ways of preparations of traditional medicines were crushed and grounded. Gender, age, and educational statuses of respondents were found to influence knowledge of medicinal plants of the local community.

The people of Hulet Ejju Enesie Woreda rich with indigenous knowledge to use and conserve plant resources in general and medicinal plants in particular. They have a wide knowledge to use plants for various purposes such as for medicine, food, household utensils, fodder, fuel, construction and other. The results of the present study provide evidence that medicinal plants continue to play an important role in the health care system of the study sites. Knowledge and uses of herbal medicine for the treatment of various ailments in the study area are still a major part of their livelihood and culture. This knowledge transferred from elders to young generation through oral traditions and personal experiences. But this way of knowledge transmission will lead to distortion of the original knowledge or total disappearance of the practice. This shows that there is a problem in the transfer of knowledge from the elders to the young generation. The main threats to indigenous knowledge are arising due to the introduction of modern education, religious factors, spiritual and culture related problems and negligence of the young generation to have the knowledge in the study area. In conclusion, this study shows that the study area rich with medicinal plants and the people HEE still rely on traditional medicine of plant based origin to treat human and livestock ailments.

5.2. Recommendations

Based on the result of the study, the following recommendations are forwarded.

- Training and awareness creation should be given to traditional healers and the local community with respect to the management of medicinal plants and IK.
- Young generation should be taught of the importance of preserving indigenous knowledge and government should protect the loss of indigenous knowledge via education program.
- Traditional healers should be encouraging to transfer their indigenous knowledge to the next generation.
- Further and relevant scientific research should be conducted to document indigenous knowledge related to medicinal plants.

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7. APPENDIXES

7.1. Raw Data

Appendix table1: List of medicinal plants used for treating human and live stocks ailments in the study area; with scientific name, family name local name, habit, parts used, disease treated, and method of preparations and rout of application. Note: All local names are in Amharic language and the no in parenthesis with common name is collection number.

Key; Hu= Human, Li =live stocks, HL= human and live stocks,Ay=Ayenbirhan, Ge=Gedamabo, Ad=Addisalem, D=dry=fresh.

No	**Botanical nameand plant habit**	**Family name**	**Local name and No of collaction**	**Organism treated**	**Ailments**	**Part used and mode of preparation of the remedies**	**Route of application**
1	*Acacia abyssinica* Hochst. Ex Benth . **Tree**	Fabaceae	Girar (Ad71)	H	Stomachache	**Root F:** The fresh root of *Acacia abyssinica* is powdered; mix withSour milk or "ergo" and drunken one cup before food until treated.	Oral
				H	Insect bite	**Bark F:** The insider part of the fresh bark of *Acacia abyssinica* is ground and tied on the bitted body part.	Dermal
2	*Acanthus sennii* Chiov. **Shrub**	Acanthaceae	Kusheshile (Ay5)	Li	Rabies	**Root D:** The root of *Acanthus sennii* with the root of *Rumex nervosus* and *Grewia ferruginea* grounded together and mix with milk then given to dog.	Oral
3	*Achyranthes aspera* L. **Herb**	Amaranthaceae	Telenj (Ay69)	Hu	Wound (Liffe)	**Root F:** Crushed and powdered, mixed with honey & tied for three days then with butter same day.	Dermal
				Li	Bleeding	**Above ground F:** Above ground part	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name And No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
						of *Achyranthes aspera* is Crushed and tied on bleeding part of all animals.	
4	*Acokanthera schimperi* (A.DC.) Schweinf. **Tree**	Apocynaceae	Merz (Ge28)	Hu	Liver Problem	**Leaf F:** The leaf of *Acokanthera schimperi* is crushed, powdered, mixed with honey and then eaten about three-four days before food.	Oral
5	*Allium sativium L***Herb**	Liliaceae	Nechshinkurt (Ge26)	Hu	Malaria	**Bulb F:** The bulb of *Allium sativum* with seed of *Lepidium sativum* is powdered together and mixed with little water then drunk or eaten by Injera.	Oral
				Hu	Common cold	**Bulb F:** The bulb of *Allium sativium* crushed and capture by nose or eaten by Injera.	Nasal/Oral
6	*Aloe macrocarpa* Tod, **shrub**	Aloaceae	Eret (Ay75)	Hu	Snake bite	**Sap F:** The sap of *Aloe macrocarpa* drunk.	Oral
				Hu	Impotency	**Root and sap DF:** The root of *Aloe macrocarpa* is crushed powdered by its sap and mixed with butter and tied the whole part of penis.	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
7	*Arundo donax L,***Shrub**	Poaceae	Shenbeko (Ge37)	Hu	Abortion	**Root F:** The root of *Arundo donax* and *Solanum marginatum* seed powder mixed by water and drunk it with a cup of tea for seven days.	Oral
8	*Argemone mexicana* L. **Herb**	Papaveraceae	Yahya eshoh (Ge21)	Li	Rabies	**Root D:** The dried root of *Asparagus africanus* is crushed and given with water to all animals.	Oral
9	*Asparagus africanus* Lam, **Climber**	Asparagaceae	Yeset kest (Ay10)	Hu	Gonorrhea	**Root D:** The roots of *Asparagus africanus* is, grounded and mix with honey and stay for a week then eat it in the morning before food for seven days.	Oral
				Hu	Toothache	**Root F:** The fresh root of *Asparagus africanus* is chewed during ache time.	Oral
10	*Bersama abyssinica* Fresen. **Shrub**	Milianthaceae	Azamira (Ay48)	Hu	Ascariasis	**Leaf F:** The fresh leaves of *Bersama abyssinica* are squeezed and mix with ground seed of *Cucurbita pepo,* then fused with honey and swallow the mixture.	Oral
				Hu	Eye disease	**Bark D:** The bark of *Bersama abyssinica* is grounded and mix with butter, then applies on the infected eye.	Eye

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
11	*Buddleja polystachya* Fresen, **Shrub**	Scrophulariaceae	Anfar (Ad8)	Hu	Tonsillitis	**Shoot F:** The fresh shoot of *Buddleja polystachya* with shoot of *Rumex nervosus* are crushed and mix together with water then put on center of head.	Dermal
				HL	Hemorrhoid	**Root and shoot F:** The root and shoot of *Buddleja polystachya* are crushed and grounded with bean, seed of *Lepidium satvum* by water, then applied on the affected part.	Dermal
12	*Capsicum annuum* L, **Herb**	Solanaceae	Karia (Ad41)	Hu	Malaria	**Fruit/seed FD:** The fruit/seed of *Capsicum annuum* is pounded, powdered and mixed with little water and drunk or eaten by Injera.	Oral
13	*Carissa spinarum* L, **Shrub**	Apocynaceae	Agam (Ge55)	Hu	Snake bite	**Leaf F:** Fresh leaf of *Carissa spinarum* will be crushed and chewed and 2-3 drops of the sap is taken orally.	Oral
				HL	Wound	**Root and leaf F:** The root and leaf of *Carissa spinarum* are crushed and grounded with the seed of *Lepidium sativum* by water, then applied on the affected part.	Dermal
14	*Catha edulis* (Vahl) Forssk. ex Endl,**Shrub**	Celastraceae	Chat (Ay40)	Hu	Asthma	**Leaf F:** The leaves of *Catha edulis* are crushed and mix with leaves of coffee then boiled together, after that drunk with honey	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				Hu	Snake bite	**Shoot F:** The shoot of *Catha edulis* chewed during bite.	Oral
15	*Citrus* limon Burn. f. **Tree**	Rutaceae	Lomy (Ay14)	Hu	Stomachache	The fruit juice *Citru limons* drunk.	Oral
				Hu	Athletes foot	Fruit F: The fruit of *Citrus limon* is squeezed and creamed on foot for continuous days.	Dermal
16	*Clausena anisata* Willd. Benth.**Shrub**	Rutaceae	Lmich (Ay62)	HL	Skin rash	**Leaf F:** The leafs of *Clausena anisata*, with leaf of *Grewia ferruginea* will be ground together with water and washed the affected skin.	Dermal
17	*Clematis simensis* Fresen, **Climber**	Ranunculaceae	Azoareg (Ay54)	Hu	Wound/Granule	**Root and leaf D:** The root and leaf of *Clematis simensis* is pounded, powdered and mixed with butter and creamed on the affected part until recovery.	Dermal
18	*Clerodendrum myricoides* Hochst,**Shrub**	Verbenaceae	Msirch (Ay2)	Hu	Wart	**Leaf F:** The fresh leaves of *Clerodendrum myricoides* are crushed; grounded with seed of *Lepidium sativum,* then mix with salt and apply on the affected part.	Dermal
19	*Coffea arabica* L.**Shrub**	Rubiaceae	Buna (Ay12)	Hu	Diarrhea	**Seed D:** The dried seed of *Coffea arabica* is roasted, boiled and then filtrate one cup and mixed with few drop of oil then drunk.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				Hu	Fire burn	**Seed D:** The seed of *Coffea arabica* is roasted, crushed, powdered then mix with salt and tied on wound.	Dermal
20	*Cordia africana* Lam. **Tree**	Boraginaceae	Wanza (Ay1)	Li	Eye-problem	Leaf D: The leaves of *Cordia Africana* are burned and the burnt leaves's ash is insertedinto cattle's eye with butter.	Eye
				Hu	Wound/likfit	**Leaf D:** Leaf of *Cordia africana* burned and its ash mixed with butter then creamed on the affected part.	Dermal
21	*Croton macrostachyus* Hochst. **Tree**	Euphorbiaceae	Bisana (Ge30)	Hu	Febrile Illness	**Leaf F:** Leaf of *Croton macrostachyus* and *Rosa abyssinica* are boiled and fumigated.	Oral & Nasal
				Hu	Ascariasis	**Root D:** Root of *Croton macrostachyus* is crushed and grounded, then mix with honey and swallow.	Oral
				Hu	Wart (chirt)	**Sap F:** The twig or petiole of *Croton macrostachyus* is cut and the sap is smear on the patient of the body.	Dermal
22	*Cucumis ficifolius* A. Rich. **Climber**	Cucurbitaceae	Yemdir enbuay (Ad50)	Li	Rabies	**Root D:** The dried root of *Cucumis ficifolius* and *Solanum incanum* crushed, grounded and mix with milk, then given to animals.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organismtreted	Ailments	Part used and mode of preparation of the remedies	Route of application
				Hu	Stomachache	**Root F:** The root of *Cucumis ficifolius* is chewed with salt and swallowed.	Oral
				Hu	Hemorrhoid	**Root F:** The fresh root of *Cucumis ficifolius* will be pounded and washed on the affected part of the body.	Dermal
23	*Cucurbita pepo* L. **Climber**	Cucurbitaceae	Duba (Ay17)	Li	Expel placenta	**Fruit D:** The fruit *of Cucurbita pepo* chopped and the flesh part is boiled with water and given to cattle, goat and sheep for drinking.	Oral
				HL	Tapeworm	**Seed D:** Seeds of *Cucurbita pepo* are dried roasted and mix with honey then eaten before food (empty stomach) and stay for six hour without eat food for human, given the dried seed for animals with salt in the morning.	Oral
24	*Datura stramonium* L. **Herb**	Solanaceae	Astenagr (Ay7)	Hu	Dandruff	**Leaf F:** Fresh leaves pounded and mix with butter then creamed the affected part/head	Dermal
				Hu	Toothache	**Seed D:** The fresh seeds of *Datura stramonium* are roasted, boil with milk and fumigated the vapor during bed time.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
25	*Dodonaea angustifolia* L.f. **Shrub**	Sapindaceae	Kitkita (Ad52)	Hu	Eczema	**Leaf D:** The leaf of *Dodonaea angustifolia* is burn, pounded, powdered and mixed with butter and creamed the affected part.	Dermal
				HL	Bone fracture	**Leaf F:** The fresh leaves of *Dodonaea angustifolia* are tied on fracture bone with frame.	Dermal
26	*Dombeya torrida* Lam.**Shrub**	Sterculiaceae	Wulkefa (Ad42)	Hu	Toothache	**Root & leaf FD:** The root and leaves of *Dombeya torrid* crushed, pound together and mix with salt then apply on teeth.	Oral
27	*Dovyalis abyssinica* A. Rich. **Shrub**	Salicaceae	Koshim (Ad46)	Hu	Abdominal pain	**Fruit F:** Six to ten fruit of *Dovyalis abyssinica* are eaten before food and does not use milk for a weak.	Oral
				HL	Intestinal parasites	**Fruit F:** The fruit of *Dovyalis abyssinica* are eaten before breakfast every morning.	Oral
28	*Embelia schimperi* Vatke. **Climber**	Myrsinaceae	Enkoko (Ad80)	Hu	Tapeworm	**Seed DF:** The fruits of *Embelia schimperi* are dried grounded and drink it with tella or eat the freshly seed before food in the morning and stay for five to seven hour.	Oral
29	*Eucalyptus globulus* Labill. **Tree**	Myrtaceae	Bule bahirzaf (Ay63)	Hu	Fibril illness	**Leaf F:** The leaf and young branches are boiled in water and the steam will be inhaled during bed times.	Oral/Nasal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
30	*Euclea racemosa* Hiern. **Shrub**	Ebenaceae	Dedeho (Ge39)	Hu	Toothache	**Steam F:** The fresh stem of *Euclea racemosa* is chewed.	Oral
				HL	Tapeworm	**Leaf D:** The dried leaves of *Euclea racemosa* are crushed, grounded, soaked with water then the filtrate is drunk and given to animals.	Oral
31	*Euphorbia abyssinica* Gmel. **Tree**	Euphorbiaceae	Qulkual (Ge34)	Hu	Jaundice	**Root F:** The root of *Euphorbia abyssinica* crushed ground and immersed in water then drunk or baked with bread and eaten it before food in the morning.	Oral
				HL	Rabies	**Sap F:**The latex of *Euphorbia abyssinica* is mixed with milk and given to dog or the latex is backed and give to it.	Oral
				Hu	Hemorrhoid	**Sap F:** The latex of *Euphorbia abyssinica* is applied on the affected part.	Dermal
				Hu	Wound (kunchir)	**Sap F:** The milky fluid *Euphorbia abyssinica* is applied on the wound.	Dermal
32	*Euphorbia tirucalli* L. **Shrub**	Euphorbiaceae	Qinchib (Ad74)	Hu	Wound (kunchir)	**Sap F:** The milky fluid *Euphorbia tirucalli* is applied on the wound.	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				HL	Rabies	**Sap F:**The latex of *Euphorbia tirucalli* is mixed with milk and given to dog or the latex is backed with bread and eats it then drinks only local alcohol for two weak.	Oral
				Hu	Skin rash	**Sap F:** Sap from *Euphorbia tirucalli* creamed on affected skin.	Dermal
33	*Ficus sur* Forssk. **Tree**	Moraceae	Sholla (Ay16)	Hu	Gonorrhea	**Sap F:** The sap of *Ficus sur* together with that of root *Phytolacca dodecandra, Ficus vasta Dodonaea angustifolia,* and *Rhamnus prinoides* will be pounded and taken with tea or local alcoholic drink.	Oral
34	*Ficus vasta* Forssk **Tree**.	Moraceae	Warca (HE79)	Hu	Fibril illness	**Leaf F:** The fresh leaves of *Ficus vasta* is boiled and fumigated during bed time.	All body
35	*Foeniculum vulgare* Miller. **Herb**	Apiaceae	Ensilal (Ay10)	Hu	Cough	**Leaf F:** The fresh leaves of *Foeniculum vulgare* is boiled with tea and drink.	Oral
				Hu	Asthma	**Leaf and stem F:** Leaf and stem are crushed,boiled together with milk and drunk.	Oral
				Hu	Urinary Retention	**Root F:** The root of *Foeniculum vulgare* is chewed and swallowed the solution.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
36	*Grewia ferruginea* Hochst.ex.A Rich **Shrub**	Malvaceae	Lenquata (Ay43)	Hu	Dandruff	**Bark F:** Washed the hair by the bark of *Grewia ferruginea* with water.	Dermal
				Li	Expel placenta	**Bark F:** The insider part of the bark *Grewia ferruginea* is pilled and given to animals.	Oral
				Li	Rabies	**Root D:** The dried root of *Grewiaferruginea* with the root of *Rumex nervosus* and*Acanthus sennii* grounded together and mix with milk then given to dog.	Oral
37	*Hibiscus macranthus* Hochst. Rich. **Shrub**	Malvaceae	Nacha (Ad47)	Hu	Syphilis	**Root D:** The root is pounded and mixes with oil or Vaseline and applied on the affected part of the body.	Dermal
38	*Jasminum grandiflorum*L . **Shrub**	Oleaceae	Tenbelel (Ad9)	Hu	Jaundice	**Leaf F:** The fresh leaves are crushed, grounded with water then take one glass for a weak before food in the morning.	Oral.
				Hu	Rheumatism	**Leaf and root F:** Root and leaf of *Jasminum abyssinicum* will be mixed with leaves of lemon then boiled in water and drink.	Oral
				Hu	Wound (Liffee)	**Leaf F:** fresh leaves and young bud are crushed, mix with butter then applied on the affected body part.	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
39	*Juniperus procera* Hochst ex. Engl. **Tree**	Cuppressaceae	Yeabeshatid (Ay57)	Hu	Wound	**Leaf F**: fresh leaves of *Juniperus procera* are sequenzed and applied on to the wound.	Dermal
40	*Justicia schimperiana* (Hochst. ex Nees) T.Anders. **Shrup**	Acanthaceae	Smiza (Ge64)	HL	Rabies	**Root and Leaf D**: Root and leaf of *Justica schimperiana* will be pounded together and mixed with water and drunk.	Oral
				Hu	Gonorrhea	**Root F:** Root of *Justica schimperiana* together with leaf of *Lepidium sativum* pounded and drunk the solution with water.	Oral
				Hu	Wound (Gormit)	**Leaf F:** fresh leaves of *Justicia schimperiana are* Crushed and pounded and mix with salt then creamed on wound until recovery.	Dermal
				HL	Diarrhea	**Leaf F:** Leaves of *Justicia schimperiana* smashed with water and the juice is consumed by human and animal in the morning before food.	Oral
41	*Kalanchoe laciniata* L. **Herb**	Crassulaceae	Andawula (Ay27)	Hu	Nasal bleeding	**Root and Leaf D:** Root and leaf of *Kalanchoe Petitiana* are powdered and sniffed.	Nasal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				Li	Body swelling(limsha)	**Steam F:** The steams are heated by fire and as soon as applied on swell part of cattle.	Dermal
				Hu	Leg swelling	**Steam F:** Fresh Steam *Kalanchoe laciniata* is inserted in to the fire and the hot steam put on the affected part.	Dermal
42	*Lepidium sativum* L.**Herb**	Brassicaceae	Feto (Ge38)	Hu	Bellyache	**Seed D:** seed of *Lepidium sativum* is grounded, mix with honey and drink by water.	Oral
				Hu	Malaria	**Seed D:** The seed of *Lepidium sativum* with bulb *Allium sativum* is pounded together and mixed with little water and drunk with water or eaten by Injera.	Oral
				Hu	Wound	**Seed D:** the seeds are grounded and mix with water then tied on the wound.	Dermal
				HL	Cough	**Seed D:** Dried seed crushed and mix with honey then drink by water for human and given with water for cattle.	Oral
43	*Linum usitatissimum.* L **Herb**	Linaceae	Telba (Ge49)	Hu	Hibiscus	Seed D: Dried seed of *Linum usitatissimum* is inserted in to the eye when dust particle inter in to the eye.	Eye

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				Hu	Gastritis	**Seed D:** Dried seeds are grounded, boiled then it will be eaten with Injera as *wot*.	Oral
44	*Lippia abisinica* Koch.**Shrub**	Verbenaceae	Kesiy (Ay29)	Hu	Impotency for men	**Root D:**Grinding the root and mix with butter, then applying on the penis.	Dermal
				Hu	Fibril illness	**Leaf F:** The freshly leaf and immature stem of the plant is pounded and mixed with small amount of coffee and then drunk.	Oral
				Hu	Headache	**Leaf F:** Fresh leaves of *Lippia adoensis* is sequenced with water and drunk.	Oral
45	*Lupines albus .L* **Herb**	Fabaceae	Gibto (Ad77)	Hu	Hypertension	**Seed D:** The dried seed of *Lupines albus* is roasted and one spoon of the flour mixed with one glass of water then drunk during pain.	Oral
46	*Solanumlycopersicum* L.**Herb**	Solanaceae	Timatim (Ay25)	Hu	Hemorrhoid	**Fruit F:** the fruit is crushed into piece and held or tied on the pain area.	Anal
				Hu	Leech	**Leaf DF:** The leaf of *Lycopersicones cul antum* is ground with salt and added though nose.	Nasal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
47	*Malva verticillata* L.**Herb**	Malvaceae	Tult (Ad78)	Hu	Diarrhea	**Root F:** Fresh root of *Malva verticillata* is ground with the seed of *Lepidium sativum* then drunk the solution with water.	Oral
48	*Maytenusseneg alensis* Rich. Wilczek. **Shrup**	Celastraceae	Atat (Ad73)	Hu	Kidney problem	**Root F/D:** The root of *Maytenussene galensis* with *Croton macrostachyus* are crushed mixed with milk and one cup drunk every morning before food until recovery.	Oral
49	*Mimusops kummel* Benth . **Tree**	Sapotaceae	Eshe (Ad72)	Hu	Diarrhea	**Fruit F:** Freshly fruit of *Mimusops kummel* will be eaten.	Oral
50	*Myrsine africana* L.**Shrup**	Primulaceae	Kechemo (Ge36)	Hu	Tapewor m	**Fruit D:** Dried fruit is pound and mix with water then drink in the morning before food after that stay for six to seven hour without food.	Oral
51	*Myrica salicifolia* Hochst. ex A. Rich **Tree**.	Myrsinaceae	Shinet (Ge51)	Hu	Tonsilliti s	**Bark D:** Dried bark will be crushed, mix with water and drunk.	Oral
				Li	Epilepsy (kumegn a)	**Bark D:** Dried Bark of *Myrica salicifolia* is pounded and mix with water and given to cattle through nose.	nasal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
52	*Ocimum gratissimum* Koth. **Shrup**	Lamiaceae	Damakesy (Ad70)	Hu	Febrile illness	**Leaf D:** dried leaves of *Ocimum urticifolium* are powdered with coffee and drink before food in the morning.	Oral
53	*Olea europaea L.* **Tree**	Oleaceae	Woira (Ad67)	Hu	Hemorrhoid	**Bark F:** The bark of *Olea europaea* will be heated on fire and held on the pain area.	Dermal
				Hu	Epilepsy	**Leaf D:** the dried leaves apply on the fire and the smoke will be inhaled.	Nasal
54	*Osyris quadripartita* Benth. **Shrub**	Santalaceae	Keret (Ge65)	Hu	Wound (Lifee)	**Leaf and root FD:** the leaves and root are crushed roasted together then mix with butter after that apply on the affected body part.	Dermal
55	*Otostegia integrifolia* Benth. **Shrub**	Lamiaceae	Tunjut (Ge59)	Hu	Nasal bleeding (nesr)	**Leaf F:** Fresh leaves are squeezed and inhaled through nasal opening.	Nasal
				Hu	Stomachache	**Steam and leaf F:** Steam and leaf of *Otostegia integrifolia* are given for chewing and swallow the solution.	Oral
				Hu	Diarrhea	**Root F:** Root of *Otostegia integrifolia* is chewed with salt and swallowed the solution.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
56	*Phoenix reclinata* Jacq. **Shrub**	Arecaceae	Seniel (Ay20)	HL	Intestinal parasite	**Root F:** The fresh root juice of *Phoenix reclinata* is mixed with water and given tohuman and livestock.	Oral
57	*Persea americana* Mill. **Tree**	Lauraceae	Avocado (Ay15)	Hu	Kidney infection	**Leaf FD:** The leaves of *Persea Americana* are boiled and the liquid portion is drunk until recovery.	Oral
58	*Phytolacca dodecandra* L'Herit. **Climber**	Phytolaccaceae	Endod (Ay19)	Hu	Gonorrhea	**Root FD:**Roots of *Phytolacca dodecandra* and *Croton macrostachyus* are powdered together and drunk with coffee.	Oral
				HL	Rabies	**Root D:** Dried root of *Phytolacca dodecandra* will be grounded and the powder drunk with locally made alcohol (*tella*) for human or the leaves are Crushed, mixed withmilk then given to dog in order to avoid contamination.	Oral
				Hu	Anthrax	**Leaf FD:** The leaves of *Phytolacca dodecandra* is crushed and mixed with water then drunk	Oral
59	*Plantago lanceolata* L. Herb	Plantaginaceae	Worteb (Ay33)	Hu	Wound and Bleeding	**Leaf F:** The leaves of *Plantago lanceolata* are crushed and the powder tied or mix with water wash until recovery.	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				Hu	Coccidosis	**Leaf FD:** The leaves of the *Plantago lanceolata* are crushed and the powder mix with water then drunk.	Oral
60	*Pterolobium stellatum* Forsk. Brenan. **Climber**	Fabaceae	Kentafa (Ay53)	Hu	Epilepsy	**Root FD:** Root of *Pterolobium stellatum* and root of *Ruta chalepensis* are powdered together and sniffed.	Nasal
				Hu	Jaundice	**Root D:** Root of *Pterolobium stellatum* isdried, powdered and one spoon of the powder is mixed with half cup of local alcohol and consumed it.	Oral
61	*Rhamnus prinoides* L**Shrub**	Rhamnaceae	Gesho (Ay22)	Hu	Snake bite	**Root F:** The fresh root of *Rhamnus prinoides is* chewed during pain time.	Oral
					Wound (kufign)	**Seed FD:** The seeds of *Rhamnus prinoides* are grounded and applied to the affected area.	Dermal
62	*Rhus retinorrhoae* Krauss. **Tree**	Ancardaceae	Telem (Ge45)	Hu	Jaundice	**Leaf D:** The leaves of *Rhus retinorrhoae* are crushed, grounded and boiled with water then drunk with local alcohol (*arekie*) after cooled.	Oral
63	*Ricinus communis* L. **Shrub**	Euphorbiaceae	Chakima/ Gulo (Ay32)	Hu	Scabies	**Seed D:** Seed of *Ricinus communis* is crushed and mix with butter then creamed on the skin.	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
					Hemorrhoid	**Leaf F:** The leaves will be crushed, chopped and mix with butter after that applies on the affected part.	Dermal
				Hu	Stomachache	**Fruit F:** The fresh fruit of *Rosa abyssinica* are chewing and swallowed the decoction.	Oral
65	*Rumex abyssinicus* Jacq. **Herb**	Polygonaceae	Mekimeko (Ge6)	Hu	*yewurch*	**Root D:** Root of *Rumex abyssinica* and *Trichodesma zeylanicum* arecrushed and ground together. Then stay the powder in one litter of local alcohol (*Arekie*) for seven days. After that half of cup or one *melekiya* will be drunk until it will be finished before food.	Oral
66	*Rumex nervosus* Vahl. **Shrub**	Polygonaceae	Enbuacho (Ay11)	HL	Rabies	**Root D:** The root of *Rumex nervosus* and *Phytolacca dodecandra* are pounded together then mix with milk and consumed it.	Oral
				Hu	Snake bite	**Leaf F:** The leaf of *Rumex nervosus* is chewing and swallowing the solution during time of bite.	Oral
				Hu	Itching	**Leaf F:** The leaf of *Rumex nervosus* is, crushed and pounded then creamed on wounded part with salt.	Dermal

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
67	*Ruta chalepensis* L.**Herb**	Rutaceae	Tenadam (Ay31)	Hu	Stomachache	**Leaf F:** The leaf of *Ruta chalepensis* Squeezed and drunk the juice during ach.	Oral
				Hu	Epilepsy	**Seed and leaf F:** The seed and leaf of *Ruta chalepensis* with *Allium sativum* mix and pounded together then sniffed at the sickness time.	Nasal
				Hu	Headache	**Leaf F:** The leaf of *Ruta chalepensis* Squeezed and drunk with coffee.	Oral
68	*Schefifera abyssinica* Hochst. ex A. Rich.**Tree**	Araliaceae	Getem (Ay18)	Li	External parasites	**Leaf F:** Fresh leaves of *Schefifera abyssinica* are pounded and the powder mixed with butter and creamed on affected skin.	Dermal
69	*Sida tenuicarpa* Vollesen. **Shrub**	Malvaceae	Chifirg (Ge60)	Hu	Bone tumors	**Root and leaf FD:** The leaf and root of *Sida schimperi* is pounded and the powder then applied on the affected part.	Dermal
70	*Solanum marginatum* L.**Herb**	Solanaceae	Gebre enbuay (Ay13)	Hu	Tonsillitis	**Fruit F:** The Fruit liquid of *Solanum marginatum* and bulb of *Allium sativum* are pounded together and given to human with honey for 2-3 days.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				Hu	Abortion	**Root F:** The *Solanum marginatum* seed and root of *Arundo donax* crushed and grounded together then mixed by water and drunk it with a cup of tea for seven days.	Oral
71	*Solanum incanum* L.**Herb**	Solanaceae	Enbuay (Ay68)	Hu	Itching	**Fruit F:** The fruit juice of *Solanum incanum* is squeezed between palms and the latex is applied on the wound. After five to seven hour the wound is washed with water until recovery.	Dermal
72	*Syzygium guineense* Willd. **T**	Myrtaceae	Dokima (Ay56)	Li	Bloating	**Leaf F:** The leaves *Syzygium guineense* is crushed, pounded and given with water.	Oral
73	*Terminalia schimperiana* Willd. **Tree**	Combretaceae	Abalo (Ay66)	Hu	Eczema	**Root and Leaf F:** The fresh Root and leaves of *Terminalia schimperiana* are pounded and mixed with butter and applied on the wound.	Dermal
74	*Trichodesma zeylanicum*.**Herb**	Boraginaceae	Yewusha milas/Ay3	Hu	*yewurch*	**Root D:** Root of *Trichodesma zeylanicum* and *Trichodesma zeylanicum* are crushed and ground together. Then stay the powder in one litter of local alcohol (*Arekie*). After that half of cup or one *melekiya* will be drunk until it will be finished before food.	Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
75	*Urera hypselodendron* (Hochst.) ex A. Rich. **Climber**	Urticaceae	Lankuso (Ay23)	Hu	Epilepsy	**Root D:** The dried root of *Urera hypselodendron* is grounded *and* one spoon of the powder is mixed with half cup of local alcohol and given to human.	Oral
76	*Verbena officinalis* L. **Herb**	Verbenaceae	Atuch (Ay58)	Hu	Stomachache, diarrhea	**Root F:** Root of *Verbena officinalis* is Chewed and swallowed the solution.	Oral
77	*Vernonia amygdalina* Del. **Tree**	Astraceae	Girawa (Ay4)	HL	Anthrax	**Leaf F:** Leaf of *Vernonia amygdalina* together with bulb of *Allium sativum* grounded and cooked then eaten with Injera before food.	Oral
				Li	Eye disease	**Root F:** The root of *Vernonia amygdalina* are pounded and the liquid part added into the eye.	Through the eye.
78	*Ximenia americana* L. **Shrub**	Olacaceae	Enkoy (Ay44)	Li	Granule	**Stem bark FD:** The bark of *Ximenia Americana* is crushed, ground and creamed on the affected part.	Dermal
79	*Zehneria scabra* (Linn. f.) **Cliber**	Cucurbitaceae	Hareg resa (Ad76)	Hu	Fibril illness	**Above ground part F:** Above ground part of *Zehneria scabra* is boiled with water and fumigated the vapor during bed time.	Nasal/ Oral

Table1: Continued

No	Botanical name and plant habit	Family name	Local name and No of collaction	Organism treated	Ailments	Part used and mode of preparation of the remedies	Route of application
				HL	Skin rash	**Above ground part F:** Above ground part is immersed in hot water and rubbed to the affected skin of human animals.	Dermal
80	*Zingiber o cinale* Rosc. Herb	Zingiberaceae	Zingibl (Ay35)	Hu	Common cold	**Tuber FD:** The tuber of *Zingiber o cinale* is crushed boiled with coffee and drunk.	Oral

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Appendix Table2**:** Habitat of medicinal plant species in the study area

Species	Habitat	Species	Habitat	Species	Habitat
Acacia abyssinica	Forest	*Acanthus sennii*	Forest	*Achyranthes aspera*	Forest
Acokanthera schimperi	Forest	*Allium sativium*	Home garden	*Aloe macrocarpa*	Forest
Arundo donax	Home garden	*Argemone Mexicana*	Grazing land	*Asparagus africanus*	Forest
Bersama abyssinica	Forest	*Buddleja polystachya*	Forest	*Capsicum annuum*	Agricult ural field
Carissa spinarum	Forest	*Catha edulis*	Home garden	*Citrus aurantifolia*	Home garden
Clausena anisata	Forest	*Clematis simensis*	Forest	*Clerodendrum Myricoides*	Forest
Coffea arabica	Home garden	*Cordia africana*	Agricult ural field	*Croton macrostachyus*	Agricult ural field
Cucumis ficifolius	Forest	*Cucurbita pepo*	Home garden	*Datura stramonium*	Agricult ural field
Dodonaea angustifolia	Forest	*Dombeya torrid*	Forest	*Dovyalis abyssinica*	Forest
Embelia schimperi	Forest	*Eucalyptus globules*	Agricult ural & Road side	*Euclea racemosa*	Forest
Euphorbia abyssinica	Forest	*Euphorbia tirucallia*	Road side	*Ficus vasta*	Forest
Foeniculum vulgare	Around home	*Grewia ferruginea*	Forest	*Hibiscus macranthus*	Forest
Jasminum abyssinicum	Forest	*Juniperus procera*	Forest	*Justicia schimperiana*	Road side
Kalanchoe laciniata	Grazing land	*Lepidium sativum*	Agricult ural field	*Linum usitatissimum*	Agricult ural field
Lippia adoensis	Forest	*Lupines albus*	Agricult ural field	*Lycopersicumescul antum*	Home garden
Malva verticillata	Grazing land	*Maytenussenega lensis*	Forest	*Mimusops kummel*	River side
Myrsine Africana	Forest	*Myrica salicifolia*	Forest	*Ocimum urticifolium*	Forest
Olea europaea	Agricult ural field	*Osyris quadripartita*	Forest	*Otostegia integrifolia*	Forest
Phoenix reclinata	River side	*Persea Americana*	Home garden	*Phytolacca dodecandra*	Forest

Table2:Con,d

Species	**Habitat**	**Species**	**Habitat**	**Species**	**Habitat**
Plantago lanceolata	Agricultural field	*Pterolobium stellatum*	Forest	*Rhamnus prinoides*	Home garden
Rhus retinorrhoae	Forest	*Ricinus communis*	Agricultural field	*Rosa abyssinica*	Forest
Rumex abyssinicus	Forest	*Rumex nepalensis*	Grazing land	*Rumex nervosus*	Forest
Ruta chalepensis	Home garden	*Schefifera abyssinica*	Forest	*Sida tenuicarpa*	Grazing land
Solanum marginatum	Forest	*Solanum incanum*	Forest	*Syzygium guineense*	River side
TerminaliaSchimperiana	Forest	*Trichodesma zeylanicum*	Agricultural field	*Urera hypselodendron*	Forest
Verbena officinalis	Grazing land	*Vernonia amygdalina*	Agricultural field	*Ximenia americana*	Forest
Zehneria scabra	Home garden	*Zingiber o cinale*	Home garden	*Euphorbia abyssinica*	Around home

Appendix Table3: Health problems treated by traditional medicinal plants in the study area

English name	Local Name	English name	Local Name
Stomachache	Yehodkurtet	Common cold	Gunfan
Insect bite	Yebab niksha	Impotency	Ywsibdikmet
Rabies	Yewsha beshita	Abortion	Shotelay
Wound	Liffe	Gonorrhea	Chebt
Bleeding	Yesewnet Medmat	Toothache	Tirs kurtimat
Liver Problem	Gubet	Ascariasis	Wosfat
Malaria	Weba	Tonsillitis	Tonsil
Hibiscus	Kontir	Diarrhea	Tekimat
Hemorrhoid	Kintarot	Fire burn	Yesat makatel
Wound	Kusil	Herpes	Almaze balchera
Asthma	Asm	Febrile Illness	Mich
Athletes foot	Yegir meshitet	Expel placenta	Yengdelj sizegey
Skin rash	**Chifee**	Tapeworm	Kosso
Granule	Bigr	Dandruff	Forefor
Wart	Chirt	Eczema	Chiffe
Abdominal pain	Yehodhimem	Syphilis	Kitegn
Intestinal parasites	Yeanjet beshita	Rheumatism	Kurtmat
Jaundice	Yewofitu	Wound	Gormit
Wound	Kunchir	Nasal bleeding	Nesir
Cough	Sal	Body swelling	Limsha
Urinary Retention	Shintemat	Leg swelling	Yegir ebtet
Gastritis	Chenguara	Cold disease	Yewurch
Hypertension	Yedemgifit	Itching	Ekek
Leech	Alikt	Bone tumors	Nekersa
Kidney problem	Yekulali himet	Bloating	Yehode menifat
Anthrax	Kurba	Ache	Kufign
Epilepsy	Yemitl himem	Scabies	Kerkir

7.2.Questionairsfor Ethno Botanical Data Collection

The following questionnaire has only research purpose. The outcome of this research will be the conservation and utilization of medicinal plant in wisely and properly. Therefore, I kindly request the respondent to fill this questionnaire.

7.2.1: Respondents' Background

1. Date_____

2. Name of respondent _____ Sex. M_____ F_____ Age _____

Kebele _____ Phone_____

2.1. Occupation _____ 2.2 Marital Status_____

2.3 Religion: A. Orthodox B. Protestant C. Muslim D. Others

2.4 For how long have you lived in this area?

A. Since birth,

B. For last 20 years,

C. For 15 years,

D. For less than 15 years

2.5. Level of education A. Illiterate B. Elementary C. High School D. College E. University

7.2.2: Questionnairefor Traditional Healers

1. What are the most common diseases of humans that can be treated with medicinal plant in your area?

NO	Major human diseases treated	Local Name of the plant	Plant parts used	Plant habitat	Plant habit
1					
2					
3					
4					
5					
6					

2. Application; Used alone or mixed with other materials, drink/decoction, others----------

3. Does the dose differ among males, females, children, elders?

4. What are the most common diseases of animals in your area?

5. Plants used to treat animal diseases

A. Local name of the plant_____

B. Disease treated_____

C. Parts used A. Stem B. Root C. Fruit D. Leaf. E. Flower F. Barks G. Seed H. Others----

D. Habit A. Tree B. Shrub C. Climber D. Herb E. other

E. Habitat forest/reverie/home garden/road side//rocky area/agricultural field/grazing land?;

F. Antidotes.

6. How can you determine the dosage of the medicinal plants for your patient?

A. By considering the age of the patients

B. By considering the fatality of the disease

C. By considering the type of the disease

D. If any other specify_____

7. Which methods of preparation you use to make medicinal plant parts to the user?

A. Squeezing B. Crushing C. Burning D. Chewing E. Powdering F. Other mechanism

8. How can you identify the disease of your patients?

A. Simply observing of the body

B. By asking the types of symptom of the disease

C. By allowing going to hospital

D. If any other specify_____

9. Is there any side effect to the users that take medicinal plants? Yes-----, No------

10. If your answer for question number 9 is yes what you advise your patients after taken your medicine to reduce this side effects?

11. Where do you get such experience in medicinal plant practice?

12. Are you volunteer to transfer this indigenous knowledge to the future generation?

A. Yes B. No

13. If your answer for question number 10 is not what the reason is?

14. What is your level of satisfaction in practicing of these medicinal plants?

A. High B. medium C. low

15. Are there restrictions in collecting and utilization of some medicinal plants in the locality?

16. Are medicinal plants marketable?

17. What are threatening factors of medicinal plants in your area? For medicinal _____, Food_____, Firewood_____, Charcoal_____, Fence_____, Construction_____, Furniture_____, Edible fruit_____

18. How do the local people manage and conserve these medicinal plant species through theirtraditional indigenous knowledge?

19. How is the knowledge of traditional medicine passed to a family member/younger generation?

20. Is the plant currently cultivated in your locality?

21. Form of the medicinal plant used

A. In fresh form

B. In dry form

22. Are the medicinal plants easily accessible? If not why?

23. How does modernization interfere with traditional medicinal knowledge?

24. Which season preferred for collection of medicinal plants in your area?

Wet season_____, Dry season_____, All the year round _____

25. How are the prepared remedies taken by the patient(s)/ route of administration?

Dermal (D), Oral (O), Nasal (N), Ear (E), Anal (A), Vaginal (V)……

(*THANK YOU*)