



**An Ethnobotanical Study of Medicinal Plants Used by
Indigenous Local Communities in Menz Mama Midir
District, North Shewa Zone of Amhara Region, Ethiopia**

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The Department of Plant Biology and Biodiversity Management

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Biology and Biodiversity Management)

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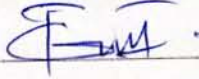
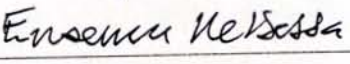
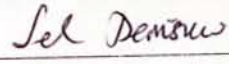
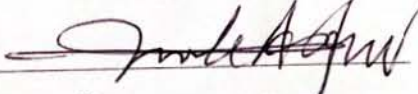
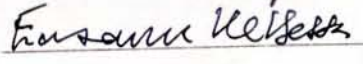
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ABSTRACT

*An ethnobotanical study was conducted in Menz Mama Midir District of North Shewa Zone, Amhara Regional State, Ethiopia. Data were collected from November 4, 2012 to January 2, 2013 by involving 60 randomly selected and 12 key informants from twelve kebeles. The main objective of this study was to document medicinal plants with the associated knowledge and to get information about the threats to the resource. Ethnobotanical data were collected using semi-structured interview, field observation and group discussions while the analyses were done by employing descriptive statistics, paired comparison, preference ranking, direct matrix ranking, and informant consensus factor (ICF). A total of 134 medicinal plants, distributed across 119 genera and 56 families, were documented. Of the total species, 89, 14 and 31 were claimed to treat respectively human, livestock and both human and livestock ailments. The most frequently utilized plant parts were leaves (40.29%) followed by roots (17.16%). Pounding is the main method used by the local healers to prepare 31.34% of the medicinal plants and these remedies were most frequently administered orally (35.82%). *Cucumis ficifolius* was indicated as the most effective medicinal plant for curing stomachache and *Withania somnifera* followed. *Euphorbia abyssinica* ranked first as the most effective medicinal plant to cure Ascariasis in humans compared to others. *Olea europaea* subspecies *cuspidata* was selected for being the most multipurpose medicinal plant in the study area. The medicinal plants that were considered effective in treating ailments related to gastro-intestinal disorders and parasitic infections scored the highest ICF value (0.86). The principal threatening factors for medicinal plants reported were agricultural expansion and drought. The information documented in this study in combination with modern science can be of use in developing management plans for conservation and sustainable use of medicinal plants in the area. Therefore, along with in-situ conservation of MPs by protecting the natural vegetation, cultivation of some in the homegardens needs to be encouraged.*

Keywords/Phrases: Ethnobotany, Indigenous Knowledge, Medicinal Plants, Menze Mama Midir District

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ACRONYMS

ABS - Access and Benefit Sharing

FAO - Food and Agricultural Organization

CSA - Central statistical Agency of Ethiopia

FL - Fidelity Level

GPS - Geographical Position System

IBC - Institute of Biodiversity Conservation

ICF - Informant Consensus Factor

IK - Indigenous Knowledge

M.A.S.L - Meter Above Sea Level

MMMW ARDO - Menz Mama Midir Wereda Agriculture and Rural Development Office

MMMWA - Menz Mama Midir Wereda Administrative Office

NMSA - National Metrological Service Agency of Ethiopia

TMP/s - Traditional Medicinal Plant/s

WHO - World Health Organization

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Plants have not only nutritional value but also, in the eyes of the local people, they have medicinal and ritual or magical values (Abbink, 1995). Medicinal plants have important contributions in the healthcare system of local communities as the main source of medicine for the majority of the rural population. These medical systems are heavily dependent on various plant species and plant based products. Since time immemorial, plants have been indispensable sources of both preventive and curative traditional medicine preparations for human beings and livestock (Dery *et al.*, 1999).

Historical accounts of traditionally used medicinal plants depict that different medicinal plants were in use as early as 5000 to 4000 BC in China, and 1600 BC by Syrians, Babylonians, Hebrews and Egyptians (Dery *et al.*, 1999). Traditional medicine refers to any ancient, culturally based healthcare practice different from scientific medicine and it is commonly regarded as indigenous, alternative or folk and largely orally transmitted practice used by communities with different cultures (Cotton, 1996). Traditional medicine has remained to be the most affordable and easily accessible source of treatment in the primary healthcare system of resource in poor communities and the local therapy is the only means of medical treatment for such communities (Haile Yineger and Delenasaw Yewhalaw, 2007).

In Ethiopia, medicinal plants have been used as traditional medicine to treat different human and livestock ailments by the local people from time immemorial. Ethiopian plants have shown very effective medicinal value for some ailments of human and domestic animals thus medicinal plants and knowledge of their use provide a vital contribution to human and livestock healthcare needs throughout the country (Endashaw Bekele, 2007). The current account of medicinal plants of Ethiopia, as documented in data base of national herbarium, shows that about 1300 identified medicinal plant species are reported in the Ethiopian Flora; however, many others are not yet identified. The greater concentrations of these plants are found in the south and south western Ethiopia following the concentration of biological and cultural diversity (Abbink, 1995;

Edwards, 2001). The major reasons why medicinal plants are demanded in Ethiopia are due to culturally linked traditions, the trust the communities have in the medicinal values of traditional medicine and relatively low cost in using them.

However, some medicinal plant species in Ethiopia have been threatened by over use and over harvesting. Environmental degradation, deforestation, agricultural expansion, over harvesting and/or indiscriminate harvesting, alarming population growth with increasing demand and consumption, cultivation of marginal lands, overgrazing and urbanization are the principal problems which aggravate the rate of extinction of medicinal plants from their habitat and consequently the loss of important resources of globally significant plant species (Tesfaye Seifu *et al.*, 2006; Endashaw Bekele, 2007). The loss of these medicinal plants is coupled with the loss of indigenous knowledge within the community on plant use for medicine. As described in Tesfaye Awas and Sebsebe Demissew (2009), the knowledge base on which the traditional medicinal system is equally threatened, as the ethnobotanical information is not documented and remaining in the memory of elderly practitioners. Detailed information on the medicinal plants of Ethiopia could only be obtained when studies are undertaken in the various parts of the country where little or no botanical and/or ethnobotanical explorations have been made.

Local communities have indigenous knowledge to use different parts of plants to prepare remedies to treat both human and livestock ailments. This knowledge is lost when the elders, who know more about medicinal plants, die without sharing their traditional knowledge to the young generation. Since the knowledge of traditional medicine is usually transferred orally from generation to generation, basic information may be lost. Basic information that could be lost by oral transfer includes how to prepare the drug, diseases treated by medicinal plants, part used and other important information may be discarded. Therefore, documentation of medicinal plants and the knowledge associated with them are very important. In addition, the plant material and the associated indigenous knowledge can be the basis for the invention of modern drugs.

Until now no one conducted ethnobotanical studies in Menz Mama Midir District. The lack of conservation actions and activities are also observed in the District, which is similar to other areas in Ethiopia. Hence, there has been a need to take appropriate conservation methods for medicinal plants and also document them with associated knowledge in collaboration with local

communities. Thus, the main aim of this study was to document key medicinal plants used to treat human and livestock ailments together with the associated knowledge of the communities in the study area.

1.2. Significance of the study

Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs. Though Ethiopia has a long history of traditional healthcare system, studies conducted on the traditional medicinal plants are limited when compared with the multiethnic, cultural and flora diversity (Fisseha Mesfin *et al.*, 2009). This study would contribute to bring the existing gap in the documentation of the ethnobotanical knowledge on medicinal plants of Menz Mama Midir District.

The people of the study area have traditional practices which they accumulated for generations to treat both human and livestock ailments. This knowledge was not documented and may be at risk of disappearance due to many factors. The finding of this study will be very significant in understanding the traditional knowledge and other cultural aspects of the community, for identifying and documenting the plants, to identify the main threats in the area and provide recommendations for sustainable conservation and management of those medicinal plants in the study area. It also raises awareness and sharing trends within the community about the importance of plants in general and also medicinal plants in particular. In addition, the documentation of the indigenous knowledge on medicinal plants can be part of the information source for those who want to conduct a further research in ethnobotany and the development of modern drugs.

1.3. Objectives

1.3.1 General objective

The general objective of this study was to investigate and document the traditional medicinal plants used by the local people in Menz Mama Midir District together with the available ethnobotanical information on their uses and management.

1.3.2. Specific objectives

- To collect, identify and document the traditional medicinal plants that people use for the treatment of both human and livestock ailments.
- To gather, analyze and document indigenous knowledge of the communities on the MPs that used and managed in the study area.
- To describe and analyze the use, preparation and administration routes of medicinal plants as remedies both for human and livestock diseases.
- To identify plant parts used for medicinal purposes.
- To find out the local methods used by indigenous people to conserve and manage medicinal plants.
- To find out the distribution patterns of medicinal plants in the study area using etic and emic vegetation categories.
- To make available further ethnobotanical database and documented information to facilitate investigations on plant products through phytochemical and biochemical studies.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Plant - people interaction and trends of ethnobotany

The People-Plant Interaction (PPI) describes the level of human interaction with plants from beginning to end of their life. This intimate connection revolves around sustainable, environmental, and social-psychological parameters. Plants provide people with food, shelter, medicines, materials for construction and the manufacture of crafts, tools and many other products like fuel, paints and poisons and also aesthetically pleasing environments. Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility including tremendous botanical expertise (Martin, 1995). The local people mostly depend on plants and their products because these plants are good sources of materials needed for their life. This implies that humans are dependent on other organisms especially; the plant kingdom is most essential to human well being for supplying the basic needs. The indispensable dependency of humans up on plants for their livelihoods was primarily started by domestication and dates back to 10,000 years (Martin, 1995).

Plant utilization is only part of the large body of environmental knowledge held by a community in any given habitat. Over centuries, indigenous people have developed their own locality specific knowledge on plant use, management and conservation (Cotton, 1996). The development of this indigenous knowledge system, which covers all aspects of life, including management of natural environment, has been a matter of survival to the people who developed the knowledge. The emergence of ethnobotany as a science has a vital role in the improvement of plants and their products. It also tries to find out how people have traditionally used plants, for whatever purposes, and how they are still doing so (Den Eynden *et al.*, 1992). Therefore, ethnobotany is an appropriate field to study indigenous knowledge and deals with direct interrelations between humans and plants used as medicines and for other application (Farnsworth, 1994; Martin, 1995). Thus, it tries to preserve valuable traditional knowledge for both future generations and other communities.

2.2. Indigenous knowledge (IK) on medicinal plants

Indigenous knowledge is basically the sum total of the knowledge on culture, nature and the physical world held by particular people living in a particular location. It is also described as 'a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (Berkes *et al.*, 2003). Accordingly Martin (1995), it is the result of many generations' long years' experiences, careful observations and trial and error experiments that helped early humans to acquire the knowledge on the utilization of plants for disease prevention and curative purposes. IK is developed by indigenous people in the processes of their interaction with their environment and the science ethnomedicine developed gradually having its origin in the indigenous medicinal practices. As a result, traditional herbal practitioners are important custodians of indigenous knowledge and are well skilled, experienced botanists on the utilization, use, managing and conserving plant resource and also locating the correct medicinal plant among the many plant species found around them. Therefore, indigenous medicinal plant knowledge has important source of information for researchers, to find out new findings for ethnopharmacological products.

The largest means of acquiring and transferring traditional knowledge is through non-formal education and local communication networks. Traditional healers should be encouraged to transfer their knowledge to interested persons in their communities as it is suggested in (Gidey Yirga, 2010a). The knowledge on medicinal plants and methods of use circulated mainly among practitioners and the beneficiaries of such practices (Pankhurst, 1990). Much of the knowledge on traditional medicinal plants in most cases is available in rural communities and mostly perpetuated by word of mouth within families and small communities in Ethiopia, which is general truth in all-rural Africa (FAO, 1986). As described by Balick and Cox (1996), research concerned with ethnobotany involves recording the knowledge on the cultural interaction of people with plants, finding out how local people have traditionally used plants for various purposes, and how they incorporate plants into their cultural tradition and religion. Therefore, the conservation of ethnobotanical knowledge as part of living cultural knowledge and practices

between communities and the environment is essential for biodiversity conservation (Martin, 1995; Cotton, 1996; Balick and Cox, 1996).

2.3. Role of ethnobotany

The term ethnobotany was for the first time mentioned orally by John Hershberger in 1895 during a public lecture (Balick, 1996; Cotton, 1996; Hamilton *et al.*, 2003). It tells about "plants used by primitive and aboriginal people". Recently, Martin (1995) defined ethnobotany as "all studies (concerning plants), which describe local people's interaction with the natural environment".

Ethnobotanical studies range across space and time, from archaeological investigations of the role of plants in ancient civilizations to the bioengineering of new crops. From the beginning of the 20th century, the field of ethnobotany was become experienced and shifts from the raw compilation of data to a greater methodological and tangible findings and changes the co-adaptation of plants and human cultures in the context of urbanization and globalization. It is expanded enormously, encompassing the botanical aspect of a number of ethnoscientific fields including ethnomedicine, ethnotaxonomy and ethnoecology as well as the anthropological and botanical study of materials, culture and subsistence mode.

It allows the knowledge, wisdom and practices of local people to involve in identifying and finding solutions to problems of conservation and sustainable development. Local peoples are involved fundamentally in the investigations so that there is a better chance to bring solutions (Hamilton *et al.*, 2003). It also encourages an awareness of the link between biodiversity and cultural diversity, as well as a mutual influence (both beneficial and destructive) of plants and humans.

Generally, the role of ethnobotany is manifold. It tries to preserve valuable traditional knowledge for both future generations and other communities. Its knowledge has many roles in the community like in indigenous food production, discovering new medicines, developing sustainable agricultural practice and biodiversity conservation. It is also applied for many practical purposes in land-use development, agriculture, forestry, cultural conservation, education and the development of the health food and herbal medicine industries (Getaneh

Gebeyehu, 2011). In addition to this it is applicable to strengthening cultural diversity and conservation, greater sustainability in the exploitation of plant resources, and the development of new plant products (Hamilton, 2003).

2.4. Traditional medicinal plants

2.4.1. Traditional medicinal plants used by the local community

The World Health Organization (WHO, 2001; WHO, 2002) defines traditional medicine as health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied separately or in combination to treat, diagnose and prevent illnesses and maintain well-being. Medicinal plants have been used in traditional healthcare systems since prehistoric times and are still the most important healthcare source for the vast majority of the population around the world (Iwu, 1993; Carvalho, 2004; Leaman, 2006; Tilahun Teklehaymanot and Mirutse Giday, 2007; Uprety *et al*, 2010). Their importance is still growing although it varies depending on the ethnological, medical and historical background of each country.

It is estimated that 70-80% of people worldwide rely on traditional herbal medicine to meet their primary health care needs (Farnsworth and Soejarto, 1991). Recently in explanatory, there has been a growing interest in Traditional medicine/Complementary and Alternative Medicine (TCAM) and their relevance to public health both in developed and developing countries (Payyappallimana, 2009). Diversity, flexibility, easy accessibility, broad continuing acceptance in developing countries and increasing popularity in developed countries, relative low cost, low levels of technological input, relative low side effects and growing economic importance are some of the positive features of traditional medicine to be preferred by local people (WHO, 2002).

2.4.2. Traditional medicinal plants used in modern medicine

Plants are used medicinally in different countries and are a source of many potent and powerful drugs. Plant cells produce two types of metabolites i.e. primary and secondary metabolites and

are used as drug itself or used as raw material or ingredient for drug production with the action of other organisms.

Besides secondary plant products, several primary metabolites exert strong physiological effects. For example, proteins are the principal compounds having such diverse functions as blood agglutinants hormones (e.g. insulin) from Fabaceae species, various snake venom poisons (ricin) from *Ricinus communis* L, and abrine and precatorine from *Abrus precatorius* (Ramawat *et al.*, 2009). Major compounds of secondary metabolites (fatty acid, aminiacid, carbohydrate...) are also synthesized via principal biosynthetic pathways to synthesis scientific drug. For example, phenolics (lignins, tannins, and quinones) and alkaloids, terpenoids are synthesis drugs obtained from secondary metabolites (Mustafa and Verpoorte, 2007)

Many pharmacologically bioactive compounds such as alkaloids, flavanoids, tannins, anthraquinones and phenolic compounds have been implicated in the antibacterial activities of many plants (Nawrot *et al.*, 2007). The morphinan alkaloids, morphine, codeine and the baine, are extracted from the root and the aerial part of opium poppy (*Papaver somniferum*) and use in modern medicine for the treatment of pain, cough and diarrhea, and *Datura stramonium* L. and *Datura innoxia* Mill. are the main sources of hyoscyamine and scopolamine respectively used as anticholinergic (Ramawat *et al.*,2009). Common antimalarial drugs derived from plants include artmisinine and quinine from *Artemisia annua* and *Cinchona* L. species (*C. ledgeriana*, *C. pubescens* and *C. officinalis*) respectively (Ramawat *et al.*, 2009; Zelalem Petros, 2011) and *Echinops kebericho* Fresen. for anti-inflammatory (Mesfin Tadesse and Brook Mesfin, 2010); *Boswellia papyrifera* use in anti-molluscicidal and methanol extracts of it also use in antibacterial activity (Abdallah *et al.*, 2009 cited in Mesfin Tadesse and Brook Mesfin, 2010). Seven plant-derived drugs currently used clinically for various types of cancers are taxol from *Taxus* species, vinblastine and vincristine from *Catharanthus roseus*, topotecan and irinotecan from *Camptotheca accuminata*, and etoposide and teniposide from *Podophyllum peltatum* (Patwardhan *et al.*, 2008). Similarly, Azadirctin is a drug from *Azadircata indica* plant used as powerful insect antifeedent as described in many studies.

2.4.3. The Integration of traditional and modern medicines

2.4.3.1. The global situation

Traditional and modern systems of medicine were developed by different philosophies. They look at health, diseases, and causes of diseases in different ways. These differences bring different attitudes ranging from complete rejection of TM by modern medical practitioners and modern medicine by traditional medical practitioners to serve in parallel with little communication over patient care (Muthuswamy, *et al.*, 2010). To integrate these two parallel ideas, ethno-pharmacology plays a highly elaborate discovery approach involving the observation, description, and experimental investigation of indigenous drugs based on botany, chemistry, biochemistry, pharmacology, and many other disciplines (Vlietink and Vanden, 1991).

Today different international conferences are carried out on the integration of traditional and modern medicines with the initiative of the University of Traditional Medicine (UTM). The World Health Organization also intends to integrate traditional medicine into national health systems globally. In an integrated system, modern and traditional medicines are combined through medical education and practice, and together take responsibility for treating the population (WHO, 2012). International agencies, non-governmental organizations and research institutions on modern and traditional medicine integration are important pillars to study, elaborate and adopt appropriate educational methods and tools for teaching of traditional practices. Globally only four countries –the People's Republic of China, the Democratic Republic of Korea, the Republic of Korea and Vietnam - have integrated traditional medicine into their national health care systems. No country in the WHO African Region has yet established this integrative system regarding the incorporation of traditional medicine into national health care systems (Muweh, 2011). Today, for example traditional Chinese medicine is taught at local medical universities and colleges with a mixed curriculum consisting of 60% teaching in traditional medicine and 40% in modern medicine (IBC, 2013). The report also show, in India, the first step towards recognition of traditional medicine was the passing of the Indian Medicine Central Council with a mandate to standardize training, establish accredited institutions for research and ensure good standards of training and practice in this type of medicine.

2.4.3.2.. The Ethiopian situation

In Ethiopia, traditional medicinal plant has played crucial role in combating multiple and complex health conditions affecting the people. This on one hand will have truly effective and affordable healthcare for low-income groups in the developing world like Ethiopia (Farnsworth, 1980). According to Akerele (1993), many of the traditionally used medicinal plants contain pharmacologically active compounds, which are used in the preparation of both traditional and modern medicines. However, the two systems are not yet equally developed and supplement each other toward achieving optimal healthcare coverage (Getachew Addis *et al.*, 2002). The modern medical practitioners believe that adequate scientific research on traditional medicine and training of traditional medical practice are important for the integration of the two services (Gemechu Feyera *et al.*, 2011).

The integration of modern health system and traditional medicine will provide a better public health service (Getu Alemayehu, 2010). The health and drug policies of the Ethiopian Ministry of health recognize the important role of medical plants and traditional health systems playing in the health care system. Unfortunately, little has been done in recent decades to enhance and develop the beneficial aspects of traditional medicine including related research and its gradual integration into modern medicine. Modern practitioners have strongly recommended the need for training of traditional healers in dosage determination and about the side effects of the remedies, hygienic preparation and administration of the medicaments as well as proper diagnosis of the health problems as crucial components in the improvement of traditional health practices (Getachew Addis *et al.*, 2002).

2.5. Traditional medicinal plants in Ethiopia

2.5.1 Overview of medicinal plants situation in Ethiopia

Ethiopians tend to rely more on traditional medicine. MPs have been used as a source of traditional medicine in Ethiopia from time immemorial to combat different ailments. Due to its long period of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people (Mirgissa Kebede, 1998). The first government run modern healthcare was established in 1906 with the opening of Menelik II Hospital in Addis Ababa.

Since then the government has taken the formal responsibility of delivering healthcare to the population and health institutions were established in the different regions of the country. However, the growth and development of modern healthcare in Ethiopia as a whole has been very stunted and to date, its coverage is less than 50% of population until recent time.

Still now, the majority of the population that lives in the rural and the poor people in urban areas rely mainly on traditional medicines to meet their primary health care needs (Fisseha Mesfine *et al.*, 2009). Since traditional medicine is culturally entrenched, accessible, and affordable, over 80% of the Ethiopian population relies on traditional remedies as a primary source of health care (Dawit Abebe, 2001). The presence of diversity of social and cultural backgrounds in Ethiopia, contributed much to the existence of rich indigenous knowledge, including managing and using medicinal plants against human and livestock ailments (Biruktayt Assefa *et al.*, 2010). Slikkerveer (1990) and Mesfin Tadesse *et al.* (2005) also described the reliance of communities on indigenous remedies for numerous socio-cultural and economic reasons.

Medicinal plants continued to be used in high demand in the healthcare system as components of modern medicine (Cunningham, 1996). Right from its beginning, the documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs so far (Fabricant and Farnsworth, 2001; Gottlieb *et al.*, 2002). This indicates the need for in-depth investigation and documentation of plants of traditional value to rationally use and conserve the plant resources and indigenous knowledge (Dawit Abebe and Ahadu Ayehu, 1993).

2.5.2 Medicinal plant diversity and distribution in Ethiopia

Different vegetation types that are found in the various agro-ecological zones of Ethiopia accommodate various types of medicinal plants. The woodlands, montane vegetation type including grasslands and forests and the evergreen scrubs and rocky areas contain more medicinal plants with higher concentrations in the woodlands (Edwards, 2001).

Even if Ethiopia has high diverse floristic regions and many species have medicinal value, the greater concentrations of these medicinal plants are found in the south and south western Ethiopia following the concentration of biological and cultural diversity (Edwards, 2001). This

indicates that the distribution of medicinal plants is linked with the diversity of agro-ecological zones, cultures and customs. The various studies made and various written records of medicinal plants are taken from central, north and northwestern parts of Ethiopia and thus shows that only a small fraction of medicinal plants present in Ethiopia have been recorded. But, study on the Bale Mountains National Park in east Ethiopia revealed that the area, as much as it is a biodiversity hotspot, also turned out to be a medicinal plant hotspot with 337 identified medicinal plant species of which 24 are endemic (Ermias Lulekal *et al.*, 2008; Haile Yineger *et al.*, 2008).

2.5. 3. The use of traditional medicinal plants in Ethiopia

2.5.3.1. Traditional medicinal plants in human healthcare system

Plant diversity remains crucial for human well-being and still provides a significant number of remedies required in healthcare. Traditional medicinal plants has remained the most affordable and easily accessible source of treatment in the primary healthcare system of resource poor communities and the local therapy is the only means of medical treatment for such communities (Haile Yineger and Delenasaw Yewhalaw, 2007). For poor people, medicinal plants represent locally available, affordable and often the only effective resources for healthcare. Due to this they played a pivotal role in the treatment of various afflictions in Ethiopia (Fekadu Fullas, 2007).

Traditional medicine is an important healthcare system in Ethiopia. Many recent reports show that 90% of the population use traditional medicine for their primary health care needs. Like any other developing and least developed nations, the available modern healthcare services of the country are not only insufficient but also inaccessible and unaffordable to the majority (Haile Yineger *et al.*, 2008). This problem along with the rapidly increasing human population and cultural resistances towards the use of modern medicines means that the majority of the people in Ethiopia are dependent on traditional medicines of mainly plant origins to manage various human ailments (Dawit Abebe, 2001). Therefore, large segments of the rural population confuse to remain being without access to modern medicine and will continue to depend on medicinal plants and traditional healthcare practices (Medhin Zewdu, 2002).

2.5.3.2. Traditional medicinal plants in ethnoveterinary medicine

Traditional medicinal practices, in various countries of the world, besides treatment of human beings have also played, and are still playing a major role in the treatment of livestock diseases. A notable feature of traditional or ethoveterinary practice is the use of medicinal plants for treatment of various ailments. This is particularly true for resource-poor farmers of developing countries and the nomadic people of the world (Mohammed, *et al.*, 2010).

In Ethiopia, like other developing countries, the available modern healthcare services are not sufficient, accessible and affordable to the majority (Haile Yineger *et al.*, 2008). As a result of this, animal diseases remain one of the principal causes of poor livestock performance, leading to an ever increasing gap between the supply of, and the demand for, livestock products (Teshale Sori *et al.*, 2004). In Ethiopia people have used traditional veterinary methods to treat livestock diseases for generations. Plants comprise the largest component of the diverse therapeutic elements of traditional livestock healthcare practices (Behailu Etana, 2010).

Even if, pharmacotherapy is one of the most important means of controlling livestock diseases, it is possible only if livestock owners can afford to cover the cost of treatments. But, most modern drugs are expensive and as a result of this, not affordable by the majority of Ethiopian farmers and pastoralists, most of them rely on their traditional knowledge practices and locally available plant materials in the control of diseases of their domestic animals (Mirutse Giday and Gobena Ameni, 2003). A practical solution to this problem is to develop socially acceptable, inexpensive and effective remedies from plants that can complement modern medicine. Knowledge of medicinal plants can empower livestock owners to solve animal health problems cost-effectively.

2.5.3.3. Traditional medicinal plants in disease vector control

Medicinal plants are also used to control vector transmitted diseases. Since ancient times, several plants and plant products have been used locally to repel or kill vectors. Plants are burned as a smoke or hanged to deter nuisance-biting insects entering or resting in houses is widespread in rural communities (Waka *et al.*, 2004).

Many medicinal plant also have repellent properties and traditionally used as repellents and insecticides in Ethiopia. Some of the indigenous plants in Ethiopia such as *Phytholaca dodocandra* can be cited as an example of plant used as a source of molluscicide in the control of Shistosomiasis. Plant-based mosquito repellents are obtained from species like *Corymbia citriodora*, *Ocimum suave*, *Ocimum lamiifolium*, *Olea europaea* and *Ostostegia integrifolia*, traditionally used in Ethiopia as protection against mosquitoes as described by (Karunamoorthi *et al.*, 2009; Fitsum *et al.*, 2011). Some of these drugs for example citronella and pyrethrum, have been commercialised and are effectively used as mosquito repellents (Curtis, 1991).

2.5.3.4. Ethnomedicinal plants research in Amhara Region

In Ethiopia, modern research and documentation on medicinal plants started only very recently (Mesfin Tadesse and Sebsebe Demissew, 1992). When compared to the country's varied flora and the socio-cultural diversity, these studies are few as compared to the medicinal plant healing systems in the country (Etana Tolosa, 2007). Today, various studies have being conducted in different parts of the country on traditional medicinal plants. However, the studies conducted, not cover the whole parts of the country and all ethnic groups and also limited when compared with the multi-ethnic cultural diversity and the diverse flora of Ethiopia.

Generally, ethnobotanical researches on traditional medicinal plants in Ethiopia have been conducted in some areas, especially in Southern Nations, Nationalities and Peoples Regional State (SNNPRS) and in some part of Oromia and Tigray Regional State. But, in Amhara Regional State, documentation on indigenous knowledge and medicinal plants is relatively limited when compared with the other regions and also with the multi-ethnic cultural diversity and the diverse flora of the Region. Some authors who have done ethnobotanical studies on traditional medicinal plant in some areas of the Region are Mohammed Adefa and Berhanu Abraha (2011) in Tehuledure district of South Wello; Tilahun Teklehaymanot and Mirutse Giday (2007) in Zegie Peninsula of West Gojjam; Biruktayet Assefa *et al.* (2010) and Eskedar Abebe (2011) in Debark of North Gonder; Getaneh Gebeyehu (2011) in Mecha of West Gojjam; Getnet Chekole (2011) and Yalew Addisie *et al.* (2011) in Libo Kemkem of North Gonder and Getu Alemayehu (2010) in Minjar Shenkora of North Shewa of area.

Thus, this study also helps to identify and document the medicinal plants and also the indigenous knowledge on the use, management and conservation in Menz Mama Midir Wereda of North Shewa Zone in Amhara Regional State. This also helps to assume that the data could be used as a basis for further studies on medicinal plants and for general conservation of plants in the study area and for future phytochemical and pharmacological studies.

2.6. Threat and conservation status of Ethiopian medicinal plants

2.6.1. Threat to medicinal plants

In spite of the fact that TMPs and the associated IK have tremendous role in having medicinal value, food value, economic value, conservation and other values. They are now under great threats mainly due to anthropogenic factors (Mirutse Giday *et al.*, 2003; Debela Hunde *et al.*, 2004; Mirutse Giday *et al.*, 2007). About 80% of the Ethiopian populations rely on traditional medicine for their health care practices. However, as time goes by, the traditional knowledge is gradually decreasing for reasons mainly attributed to environmental degradation and deforestation, which brought about the loss of some species including medicinal plants (Desalegn Desissa, 2000).

Ethiopia's traditional medicine as elsewhere in Africa is facing with problems of continuity and sustainability (Ensermu Kelbessa *et al.*, 1992). The availability of plants in general and medicinal plants in particular has been affected by a dramatic decrease in areas of native vegetation (Cunningham, 1996). The primary causes of this problem are loss of taxa of medicinal plants, loss of their habitats and loss of indigenous knowledge through various reasons (Ensermu Kelbessa *et al.*, 1992). Tewolde Berhan Gebregziabher (1991) also stated that the problem is further compounded by the fact that traditional knowledge on traditional medicinal plants of Ethiopia is also being lost at an alarming rate. Some studies also state that most of the medicinal plants utilized by people are harvested from the wild (Mirutse Giday *et al.*, 2003).

The sources of threats to medicinal plants are either human made or natural causes. Rapid increase in population and the subsequent need for fuel, urbanization, timber production, over and destructive harvesting, invasive species, commercialization, honey harvesting, degradation, agricultural expansion and habitat destruction are human caused threats to medicinal plants

(Ensermu Kelbessa *et al.*, 1992; Edwards, 2001; Sintayehu Tamene, 2011). A natural cause also includes drought, disease, pest outbreaks and bush fires (Ensermu Kelbessa *et al.*, 1992).

2.6.2. Conservation of traditional medicinal plants

Conservation refers to the care, wise use and appropriate management of the natural environment and its natural resources. So, conservation is defined as the sustainable use of biological resources. In various parts of the world, medicinal plants are mostly harvested from the wild sources either for local use or trade purposes (Large, 1997 cited in Fisseha Mesfin *et al.*, 2009). Thus, medicinal plants are considered to be at risk due to over use and destructive harvesting of roots and barks (Zemedu Asfaw, 2001).

Efforts have been made for the conservation of MPs even though not enough when compared with the speed and frequency of taxa being lost. There are some conservation actions that have been undertaken around the world designed to protect threatened medicinal plants from further damage (Cunningham, 1996). Thus, methods for the conservation of plant biodiversity (*in-situ* and *ex-situ*) can be applied in the conservation of MPs (Frankel *et al.*, 1995). In order to conserve useful plants (including medicinal plants) which are threatened due to natural or manmade factors in Ethiopia, *in-situ* and *ex-situ* conservation strategies should be implemented in a complementary manner (Abebe Demissie, 2001). Medicinal plants can also be conserved by ensuring and encouraging their growth in special places, as they have been conserved traditionally (Zemedu Asfaw, 2001). This can be possible in places of worship such as churches, graves yards, farm margins, and river banks and so on. *Ex-situ* conservation methods are also useful to conserve TMPs outside their natural habitats such as gene banks, botanical gardens and others.

CHAPTER THREE

3. METHODS AND MATERIAL

3.1. Description of the study area

3.1.1. Geographical location and landscape

Menz Mama Midir District is one of the 24 administrative units of North Shewa Zone in Amhara National Regional State. The study area lies between latitudes of 9°59'16" and 10°13'58"N' and longitudes of 39°20'21" and 39°50'21" E with total area of about 64, 777.47 hectares and an elevation range of 1600 – 3198 m a.s.l. The capital town of the District is Molale, located at about 254 kms away from Addis Ababa to the north - east and 124 kms from the Zonal capital, Debre Birhan to the North. This area is also bordered by Mojana Wedera in the south, Menz Lalo Midir in the west, Menz Gera Midir in the north, Efratana Gidim in the north east,

Kewet in the east and Termaber District in the southeast. Previously, Menz Mama Midir which was part of Lalo Mama Midir District. It is named after the district of the former Lalo Mama Midir District was divided in to two Districts (Menz Mama Midir and Menz Lalo Midir). Today, it has 19 rural and one urban Kebele administrations (MMMWA, 2012) as shown in Figure 1.

The topography of the District is characterized by diverse geomorphologic features distributed over two major agro-climatic zones, DEGA (high lands) and WEINA DEGA (mid lands) as unpublished data from the agricultural and rural development office (ARDO) indicates. The major topography of the study area is covered by plain (46.7%) and mountainous land forms (27.7%) in (Table 1).

Table 1. Topography of the study area

Land form	Area in hectares	Percentage / %
Plain	30, 251.08	46.7
Mountainous	17, 943.35	27.7
Undulated	8, 615.40	13.3
Valley	7, 967.64	12.3
Total	64, 777.47	100

Source: MMMW ARDO (20011/12)

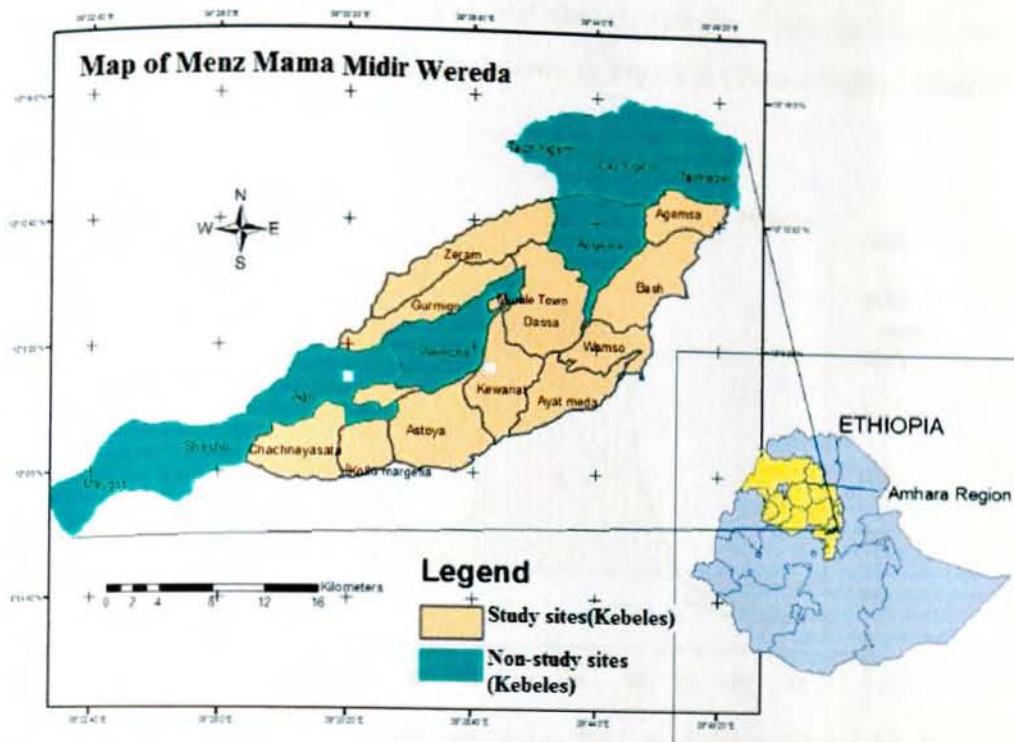


Figure 1. Map of the study area

3.1.2. Agro - climatic zone and soil

The Ethiopian traditional system uses altitude and mean daily temperature to divide the country into five climate zones (Daniel Gemachu, 1977). Menz Mama Midir District is generally divided into two agro-climatic zones, namely the mid altitude (WEINA DEGA, 1600-2500 m a.s.l), which covers 37, 570.93 ha (58%) with warm climatic condition and the remaining 27, 206.54 ha (42%) with cool climate condition which is referred to as high lands/ DEGA (> 2500 m.a.s.l) (ARDO, 2012). Another classification also done, based on rainfall distribution though the year-giving the distinction between the mono-modal, the bi-modal and a diffuse rainfall region (Tesfaye Haile and Yarotskaya, 1987). Under this classification, the Central Highlands of Ethiopia are characterised as the temperate rainy climate type, with distinct dry and wet months. As a result, the study area experiences a bi-modal rainfall type with the main rainy season from June to September, which is traditionally known as "KIREMT". However, erratic unreliable short rainy seasons occur from February to March which is also traditionally called "BELG". Generally, the analysis result shows that the range of mean annual minimum and maximum rainfall in the area 9.3 and 315.3 mm which was recorded in December and July respectively.

The average temperature of the study area for ten years is 12.8⁰C. The hottest month is June with mean maximum temperature of 20⁰C and the coolest is November with mean minimum temperature of 5⁰C as the analyzed data shows in Figure 2 (Data source: Mehal Meda Weather Station).

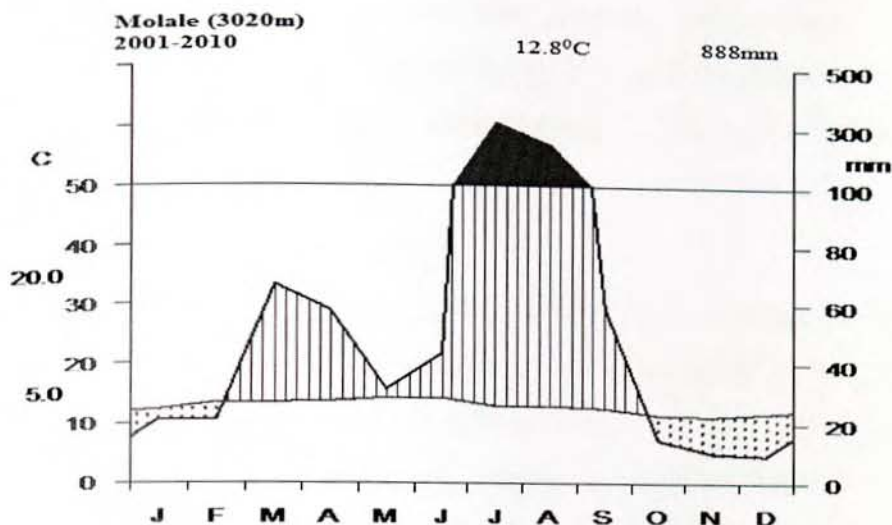


Figure 2. Climadiagram of the study area from 2001 to 2010 at Mehal Meda Weather Station, showing rainfall distribution and temperature variation

Data source: National Metrological Service Agency of Ethiopia (NMSA, 2013)

Soils of the Central Highlands of Ethiopia are characterized by two principal types, originating from the disintegration of volcanic substrates intermingled with sand and limestone. These comprise: black clay soil (Vertisols) and reddish-brown heavy loam (Red soil). The former type appears on flat plateaux and in the bottoms of valleys. The latter appears on valley slopes and in well-drained areas (Abeje Zewdie, 2006). Generally, the soil of the study area is dominated by brown soil (Eutric leptosols) which cover 55% and red (Vertic Cambisol) and black soil (Eutric vertisols) cover 35% and 10% respectively as described by Amare Hailelassie *et al.* (2011); ARDO (2012). Brown soil is the type of clay mineral that has greater importance for water storage capacity.

3.1.3. Vegetation

The natural vegetation of the study area is dominated by remnant trees like *Juniperus procera* (Cupressaceae), *Acacia abyssinica* (Fabaceae), *Ficus sur* (Moraceae), *Rosa abyssinica*

(Rosaceae), *Euphorbia abyssinica*, *Croton macrosachyus* (Euphorbiaceae), *Olea europaea* subsp.*cuspidata* (Oleaceae), *Carissa spinarum* (Apocynaceae), *Buddleja polystachya* (Buddlejaceae), *Bersama abyssinica* (Melianthaceae), *Rhus glutinosa* (Anacardiaceae), *Maytenus arbutifolia* (Celastraceae) and *Eucalyptus globulus* (Myrtaceae) among others. The presence of tree species such as *Juniperus procera*, *Olea europaea* subsp. *cuspidata*, *Acacia abyssinica*, *Croton macrostachyus* and *Olinia rochetiana* are good indications that the vegetation type of the study area belongs to the Dry Ever Green Montane Forest (Tamrat Bekele, 1993; Friis *et al.*, 2010).

3.1.4. Land use and livelihood system

The District has a total area of 64,777.47 ha (647.8 km²), of which, 23,560 ha of the land is cultivable. But, now only 19, 291 hectares is under cultivation for growing both annual and perennial crops, while the remaining 41.92% of the total land area is occupied by remnant forest, shrub, grazing and grassland, settlements, wastelands and others (Table 2).

Table 2. The land use category in the study area

Land use	Area in hectare	coverage in %
Cultivable land	23, 560	36.37
Cultivated land	19, 291	28.78
Uncultivated land	4, 269	6.59
Unproductive/waste land	4, 294	6.62
Forest land	4, 060	6.26
Natural land	3, 178	4.90
Plantations	881	1.36
Grazing land	14, 325	22.11
Bushland and shrubland	8, 380	12.93
Settlement and others	10, 160	15.68
Total	64, 777.42	100

Source: - MMMW ARDO (20011/12)

The income of the population is dependent on both crop and livestock production (use mixed system). With the exception of the people living in town, mixed farming, which encompasses both crop cultivation (Table 3) and herding, are the major means of livelihood in the Wereda.

Some alternative income generating activities such as petty trade, traditional bee keeping, hand craft, fire wood collection are practiced and working for daily employment to some extent. Despite the existing potentials, the non-farm activities are limited to very few people at very small scale, because of capital shortage, poor infrastructure and poor market development, lack of knowledge and also limited external support or awareness about other sources of income. The major crops cultivated in the District are shown in Table 3.

Table 3. Major Food crops grown in the study area

Crop categories	Scientific name	English name	Local name
Cereals	<i>Eragrostis tef</i>	Tef	Teff
	<i>Hordeum vulgare</i>	Barley	Gebss
	<i>Triticum aestivum</i>	Wheat	Sinde
Vegetables	<i>Capsicum annum</i>	Chili	Karia
	<i>Allium cepa</i>	Shallot	Keyshikurt
	<i>Lycopersicon esculentum</i>	Tomato	Timatim
	<i>Allium sativum</i>	Garlic	Nechishinkurt
	<i>Brassica oleracea</i>	Cabbage	Tiquil gomen
Fruits	<i>Citrus sinensis</i>	Orange	Birtukan
	<i>Citrus aurantifolia</i>	Lime	Lomi
Pulses	<i>Pisum sativum</i>	Field peas	Ater
	<i>Vicia faba</i>	Beans	Bakela
	<i>Lens culinaris</i>	Lentil	Mssr
Cash crop	<i>Coffea Arabica</i>	Coffee	Bunna
	<i>Saccharum officinarum</i>	Sugar cane	Shenkora
Oil crop	<i>Linum usitatissimum</i>	Lin seed/Flax	Telba
	<i>Guizotia abyssinica</i>	Niger seed	Nug
Root crop	<i>Ipomoea batatus</i>	Sweet potato	Sikuar dignch
	<i>Dacus carota</i>	Carrot	Carrot
	<i>Solanum tuberosum</i>	Potato	Dignch

Source: Modified from MMMWARDO (2001/12)

Livestock population is relatively high in the study area. However, their productivity is very low. Even though meat from highland sheep and butter production is considered relatively of good quality, the general productivity performance of the livestock, poultry and bees (milk, meat, egg, honey production) and contribution to the regional and national economy is very low. This is due to poor management, low genetic potential due to inbreeding; inadequate and low quality feed supply, the presence of long dry season and various animal diseases are the major

factor as described by ARDO (2012). The report also shows that the number of livestock in the District is 342,406 which includes: cattle 62,193; sheep 160,314; goats 36,106; chicken 69,140; pack animals 14, 653.

According to Menz Mama Midir District Agricultural and Rural Development Office Annual Report of (2011/2012), the most important animal diseases in the District include: bacterial infections (black leg, pasteurellosis, endoparasites, dictyocauliasis, GIT parasitism, fascioliasis; ectoparasites (ticks, mites, lice and insect flies, sheep ked); viral infections rabies, african horse sickness, foot and mouth disease, mange mites, sheep pox, fowl cholera and others (coenurus, ophthalmic). However, the medical service is not equally distributed all over the study area. This is due to lack of the man power, lack of lab equipment, lack of chemicals etc (personal communication with office director).

3.1.5. The people and medical services

The area has a total population of 94,399. Of these, 46, 675 are male and 47, 724 female; 8379 or 8.88% are urban inhabitants. The remaining 86,020 or 91.12% of the population are rural dwellers (MMMWA, 2012). The largest ethnic group in the study area is the Amhara (99.79%), and Amharic was spoken as a first language by 99.93%. The majority of the inhabitants are followers of Ethiopian Orthodox Christianity (99.67%) reporting that as their religion (MMMWA, 2012).

According to the Woreda Health Office annual report of 2012, the first ten top diseases in the study area are: acute febrile illness, pneumonia, acute upper respiratory infection (AURI), trauma (bone fracture), other unspecified infections and parasites, other unspecified disease, dyspepsia, urinary tract infection (UTI), diarrhea and acute bronchitis respectively. In the District, there are three health centers, two clinics, one private clinic and twenty health post offices. The health service is not equally distributed in rural and urban areas, even in rural area; there is difference from place to place. These conditions and others force people to be served by traditional health practitioners and traditional means of treatment.

3.2. Material

Plant specimens were collected by using equipment needs for collecting, pressing and drying. These include: Secateurs; plant digger; collecting bags (plastic bags); plant pressing and drying equipment with wooden frames; straps; ventilators; blotters; news papers; photographic camera; GPS and topographic maps; reference books for on spot identification of plant species; field note book. A pre-printed checklist of semi-structured questions for interviews was prepared for ethnobotanical data collection.

3.2.1. Source of data

Ethnobotanical data were collected using both primary and secondary sources. Primary source of information were obtained from the field study and informants in the study area whereas secondary sources of information were obtained from governmental offices like health offices and veterinary clinics, information from previously conducted research and published literature.

3.3. Methods

3.3.1. Reconnaissance survey

Reconnaissance survey was conducted in the study area in order to obtain information on the sampling sites, local healer's location and other facilities before data collection. The study sites were selected based on availability of medicinal plants, traditional healers identified with the assistance of local authorities and other available information on the impression of local people and informants about medicinal plants were also collected.

3.3.2. Ethical considerations

In ethnobotanical research, ethical considerations are imperative in creating and maintaining beneficial working relationships with the community (Martin, 1995). The local government authorities and informants were briefly informed regarding the purpose of the study before starting data collection. Consent was obtained from each informant before interviewing to rule out any ethical issues. As a result, most informants were volunteered to share their information. The respect of the provision of the Convention on Biological Diversity (CBD) on indigenous knowledge and the Ethiopian Access and Benefit Sharing (ABS) law were followed as guiding principles. So, involving indigenous peoples and sharing their wisdom was permitting

the co-existence of knowledge and practices, which could enhance sustainability and include ethical considerations.

3.3.3. Sampling of sites and informants

The total kebeles in Menz Mama Midir District are 20. Among these, 12 kebeles were selected for sample sites. These kebeles are Molale, Dassa, Kewariat, Astoya, Kolomargefia, Gurmign, Zeram, Chachnayasata, Bash, Wemso, Ayatmeda and Agemssa.

From each kebele, six informants (including one key informant) between the ages of 20 and above were considered. In this regard, a total of 72 informants (51 men & 21 women) were involved in the study, twelve of these were key informants (one from each site) following the choice of informant selection as recommended by Martin (1995). Key informants were selected systematically and based on the recommendations of elders, local authorities and local peoples. The rest of the 60 informants, five per kebele, were selected randomly when walking along the study site (including altitudinal variation of the site). During field walking; informants were interviewed if he/she was willing. When informants were not willing, the interview was made with the next. As described by Alexiades (1996), repeated cross-checking and replication with the same informants was made at least twice in order to determine the degree of consistency of information.

3.4. Ethnobotanical data collection methods

Ethnobotanical data were collected between November 4, 2012 to January 2, 2013 during field trips made to the sites based on the methods given by Martin (1995); Cotton (1996) and Alexiades (1996). The techniques employed for data collection were informal conversation, group discussion, semi-structured interviews and field observations carried out with informants to obtain indigenous knowledge of the local community on health and other necessary features, on use, management and conservation and threats of medicinal plants.

3.4.1. Semi-structured interview and Group discussion

Semi-structured interview checklists were prepared to conduct semi-structured interviews and group discussion with the informants. Based on the checklist of questions (Appendix 8) and objectives of this study, information was collected including informants' data, common human

and livestock ailments, local names of MPs, part of the medicinal plants used for treating those ailments, status of the medicinal plants, method of preparation and application, dosage, route of administration, other uses of the medicinal plants and the threat and conservation status by following the procedures given in Martin (1995) and Cotton (1996). The group discussion was done before and during ethnobotanical data collection with informants on medicinal plants in the area. This was typically useful to clear and elaborate the objectives of the study and to clear the validity of the information on the indigenous knowledge of medicinal plants. An appointment was made based on the interest of informants to conduct discussion at the specified time (Figure 3).



Figure 3. Group discussion with informants

3.4.2. Guided field walk and field observation

The kind of field walk was performed with the help of local guides, who were informed about all the data required for each plant. Extensive direct field observation was made to study the topography, types of vegetation, soil, habitat and habit of medicinal plants species (Figure 4). Most field observations were carried out with a single informant so that information he/she provided was kept secret. The plant species were recorded with their local names and locations using GPS.



Figure 4. Guided field walk in Agemsa Kebele of the study area

3.4.3. Specimen collection and identification

At the end of the interview, sample specimens of the plants cited for their medicinal use were collected, numbered, pressed and dried for identification. Preliminary identification was done in the field. In addition, identification of unidentified specimens as well as confirmation was done in AAU, using Flora of Ethiopia and Eritrea and also by comparison with authentic specimens, illustration and taxonomic keys and with the assistance of experts at the National Herbarium (ETH). Voucher specimens with scientific names, vernacular names, families and collection numbers for all medicinal plants recorded from the study area were stored at the National Herbarium (ETH).

3.4.4. Vegetation description

Two approaches were used in describing the vegetation of the study area. The first one was, information gathered from informants following the emic categorization technique i.e. categorization by indigenous people based on their own indigenous knowledge. On the second hand, it was described and classified through repeated curious visual observation following the etic classification technique of ethnobotany, which was done by the researcher as described in Martin (1995). In the latter case, morphological characteristics or general appearance of

vegetation such as growth and life forms of the dominant or co-dominant plants were taken into consideration.

3.5. Data analysis methods

3.5.1. Descriptive statistics

A descriptive statistical method such as percentage and frequency was employed to analyze and summarize the data on medicinal plants, use and associated knowledge. The most useful information gathered on medicinal plants reported by local people included medicinal value, application, methods of preparation, routes of application, diseases treated and parts used and habit was analyzed through descriptive statistics. Facilities in MS Excel spread sheet were utilized to make simple calculations, determine proportions and draw bar graphs.

3.5.2. Free listing and informant consensus

During ethnobotanical study, free listing of all sources of information on MPs was important, which tends to list most significant ones, by considering informants response. So, data for informant consensus can be produced by free list exercise. In order to evaluate the reliability of this data/ information during the interview, informants were given earlier same idea and then validity of the information was proved and recorded. Consequently, when the ideas of the informants deviated from the original information, it was rejected since it was considered unreliable. Only relevant ones were statistically analyzed. This method was adopted from Alexiades (1996).

3.5.3. Preference ranking

Preference ranking data were collected during the field study and later computed following Martin (1995). Seven key informants have been selected to assess the degree of effectiveness or priority of six medicinal plants against stomachache. The medicinal plant believed to be most effective to treat the illness received the highest value (5), and the one with the least effective received the lowest value (1). The value of each species was summed up and the rank for each species was determined based on the total score. This helped to indicate the most effective medicinal plants used by the community to treat the disease.

3.5.4. Paired comparison

Paired comparison is used to evaluate the efficacy and popularity of six medicinal plant species used to treat Ascariasis as described by Martin (1995). In this case, these medicinal plants were paired with each other to be chosen by eight of the key informants. Their responses were recorded, total value summarized and rank made based on the report of the informants.

3.5.5. Direct matrix ranking

Direct matrix ranking was conducted in order to compare multipurpose medicinal plants commonly reported by informants following Cotton (1996). Based on the relative benefits obtained from many plants, eight multipurpose plant species were selected and eight use diversities of these plants were listed. Six key informants were chosen to assign use values to each attribute (5 = best, 4 = very good, 3 = good, 2 = less used, 1 = least used and 0 = not used). Based on the information gathered from informants, the value of each use-diversity for a species was taken and the values of each species summed up and ranked.

3.5.6. Informant consensus factor

The Informant Consensus Factor (ICF) was calculated for each disease category to identify the agreements of the informants on the reported cures for the group of ailments. The ICF was calculated for each medicinal plant, the proportion of informants who independently reported its use against a particular disease/disease category using the formula:

$ICF = \frac{Nuc - N_s}{Nuc - 1}$ and factor provides a range of 0 to 1, where a high value acts as a good indicator

for a high rate of informant consensus as described by Trotter and Logan, (1986); Heinerich, (2000). Where: ICF - informant Consensus Factor, Nuc - number of use citation and N_s - number of species used.

3.5.7. Fidelity level

The fidelity level index was calculated for those frequently reported diseases by informants so as to identify the degree of the most important MP species. The fidelity level (FL), the percentage of informants claiming on the use of a certain plant for the same major purpose, was calculated for the most frequently reported diseases or ailments as:

$$FL (\%) = \left(\frac{N_i}{N} \right) \times 100$$
 Where N_i - is the number of informants that claim a 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 (Alexiades, 1996).

CHAPTER FOUR

4. RESULTS

4.1. Medicinal plants in the study area

4.1.1. Taxonomic diversity and source of medicinal plants

A total of 134 species of medicinal plants were collected from the study area. They are distributed in 119 genera and 56 families (54 angiosperms and 2 gymnosperms) (Appendix 1). The most popular family was Asteraceae, which contributed sixteen (11.94%) species in 14 genera followed by Lamiaceae with thirteen (9.7%) species in 10 genera, Solanaceae with ten (7.46%) species in 7 genera and Fabaceae with six (4.48%) species in 6 genera (Table 4). thirteen endemic species of the Flora area were also recorded in the study area; 10 of them are endemic to Ethiopia while three are also found in Eritrea (Table 5, Appendix 2). About 87 (64.93%) of the total medicinal plants were collected from the wild and 40 (29.85%) from Homegardens. The remaining seven (5.22%) from farmlands (Appendix 2).

Table 4. Distribution of the medicinal plants among plant families

Family	No of genera	No of species	Percentage (%)
Asteraceae	14	16	11.94
Lamiaceae	10	13	9.70
Solanaceae	7	10	7.46
Fabaceae	6	6	4.48
Apiaceae	5	5	3.73
Euphorbiaceae	4	4	2.99
Asclepidiaceae	4	4	2.99
Cucurbitaceae	4	4	2.99
Polygonaceae	2	4	2.99
Other 47 families	63	68	50.75
Total	119	134	100

Table 5. Medicinal plants of the study area endemic to Ethiopia

Botanical Name	Family
<i>Aloe pulcherrima</i>	Aloaceae
<i>Aloe debrana</i>	Aloaceae
<i>Echinops kebericho</i>	Asteraceae

<i>Gomphocarpus purpurascens*</i>	Asclepiadaceae
<i>Impatiens rothii</i>	Balsaminaceae
<i>Inula confertiflora</i>	Asteraceae
<i>Laggera tomentosa</i>	Asteraceae
<i>Leucas stachydiformis</i>	Lamiaceae
<i>Millettia ferruginea</i>	Fabaceae
<i>Solanecio gigas</i>	Asteraceae
<i>Solanum marginatum*</i>	Solanaceae
<i>Thymus schimperi*</i>	Lamiaceae
<i>Urtica simensis</i>	Urticaceae

*=Medicinal plants endemic to Flora area (shared between Ethiopia and Eritrea)

4.1.2. Diversity in medicinal plants growth habit

Regarding the diversity of habits of ethnomedicinal plants in the study area, herbs constitute the largest category, with 56 (41.79%) species followed by shrubs with 51 (38.06%) species. Trees and climbers accounted for 16 (11.94%) and 11 (8.21%) species respectively.

4.1.3. Parts of medicinal plants used

The study showed that the plant parts widely used for the preparation of the remedies in the study area were 54 (40.29%) leaves followed by 23 (17.16%) roots (Table 6, Appendix 3).

Table 6. Proportion of plant parts used for preparation of medicines

Plant part used	No of preparations	Percentage of the total	Plant part used	No of preparations	Percentage of the total
Leaves only	54	40.29	Roots and flower	2	1.49
Roots only	23	17.16	Roots and fruit	2	1.49
Roots and leaves	14	10.45	Stem bark and latex	2	1.49
Whole part	9	6.72	Roots and stem bark	2	1.49
Seeds only	7	5.22	Leaves and seed	1	0.75
Fruits and leaves	4	2.98	Leaves and stem	1	0.75
Fruits only	4	2.98	Roots and latex	1	0.75
Stem only	2	1.49	Latex	1	0.75
Stem bark	2	1.49	Roots, leaves, flower, and latex	1	0.75
Bulb	2	1.49	Total	134	100%

4.1.4. Formulation and condition of use of plant parts

In the collection of data concerning the preparation of medicine, informants reported various skills associated with herbal preparations. The results showed that most remedies were prepared from single plants (74.15%) and the remaining 25.85% were prepared from combined plant species. The study also revealed that the majority of the remedies were prepared from fresh material of the plants which accounted for 85 (63.43%) of the species and the remaining preparations were distributed in dried and fresh / dried conditions as shown in Figure 5 and Appendix 3.

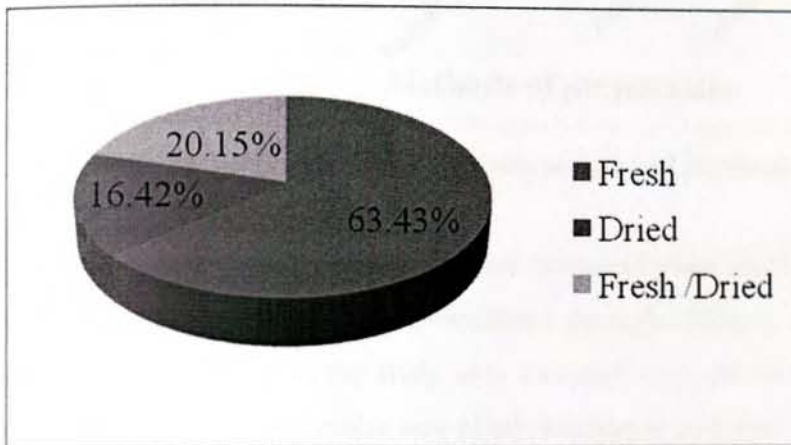


Figure 5. Proportions and conditions of preparation of remedies

The major methods employed in the study area for plant remedy preparations were pounding, which accounted for 42 (31.34%) species, followed by pounding and squeezing with water in the cases of 23 (16.42%) species, powdering 13 (9.7%) species, pounding and boiling 13 (9.7%) species and chewing 6 (4.48%) species and the remaining proportion is accounted by methods like, powdering and boiling, roasting and powdering, crushing, squeezing, pounding and collecting milky latex and others as shown in Figure 6.

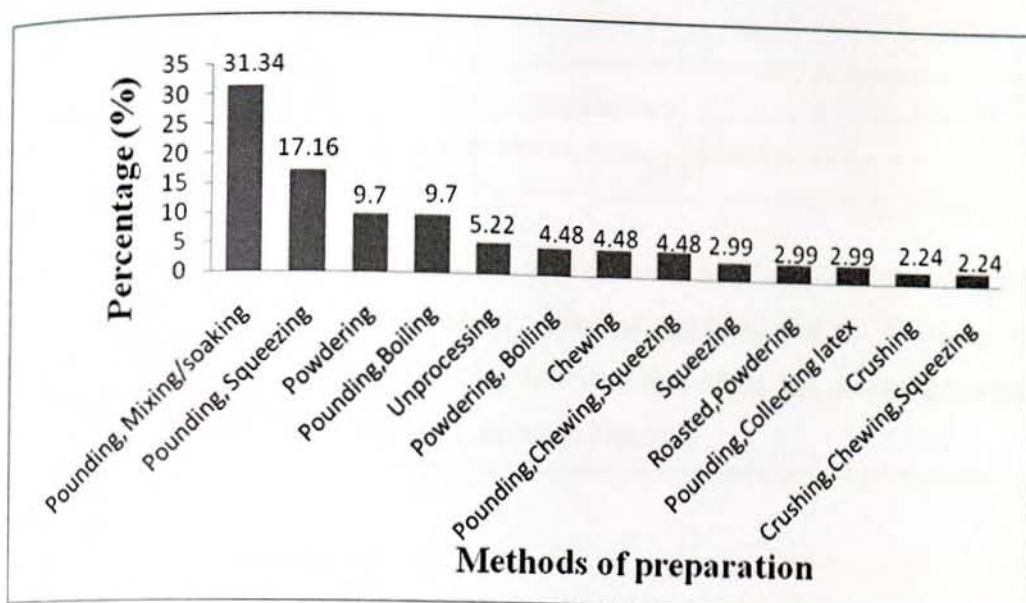


Figure 6. Methods of medicine preparation for both human and livestock remedies

4.1.5. Mode of administration, application and dosage of plant medicines

Traditional medicine preparations are administered through different modes of administration. The modes of administration in the study area included: oral, dermal, nasal, anal, ocular and others. In this study, the most popular way of administration of herbal medicine was oral which accounted for 48 (35.82%) species followed by dermal for 37 (27.61%) species, both oral and dermal for 20 (14.93%) species and others as listed in Table 7 and Appendix 3.

Table 7. Routes of administration of prepared medicine

Route of administration	No. of plants	Percent (%)
Oral	48	35.82
Dermal	37	27.61
Oral and dermal	20	14.93
Oral and nasal	5	3.73
Nasal	5	3.73
Dermal, oral and nasal	5	3.73
Oral, dermal and eye	3	2.24
Eye and dermal	2	1.49
Oral, dermal and ear	2	1.49
Eye and oral	2	1.49
Eye	2	1.49

Ear	1	0.75
Oral, nasal and eye	1	0.75
Oral, nasal, dermal and eye	1	0.75
Total	134	100

These prepared traditional medicines are applied by a number of modes of application, like drinking, eating, smearing, tied on, adding, inhaling, applying and etc. Drinking accounted for the largest mode of application (38.14%), followed by tied on and smearing /painting, (16.1%) and (8.89%) respectively and others as shown in Figure 7.

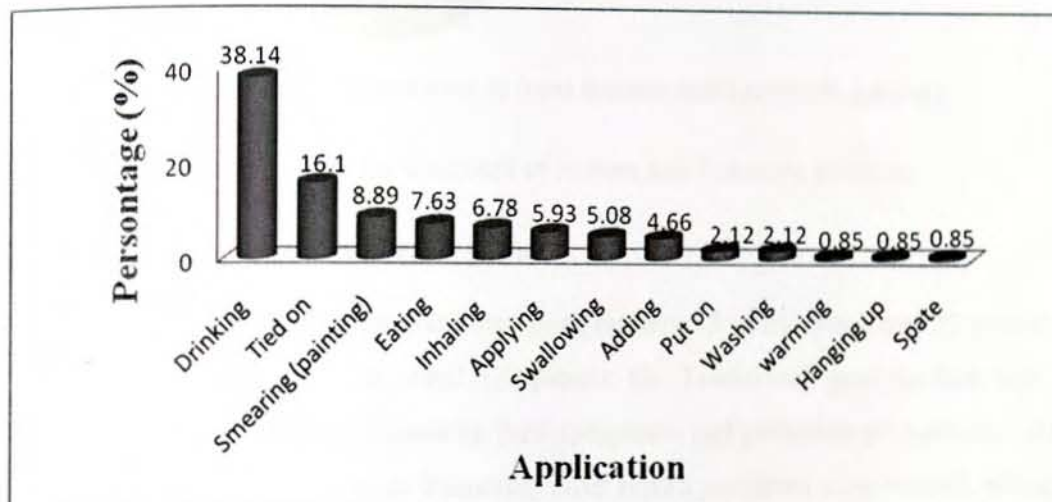


Figure 7. Graph showing ways of application of plant remedies

Local healers provide the traditional medicines to patients by estimating the dosage using local units such as finger length for root and stem; different measuring materials (e.g., spoon, coffee cup, tea cup and glass and tin cans) for powders and liquids and numbers for leaves, seeds, fruits, bulbs, flowers and latex). They depend on the age, type and exact site of ailment, physical fitness, stage of illness, the infected part, presence or absence of diseases other than the diseases to be treated and duration of disease.

4.1.6. Ethnomedicinal plants used to treat human and livestock ailments

Out of the total of 134 species of medicinal plants collected and documented from the study area, 89 (66.42%) species were noted to treat only human ailments, while the rest of the species (45)

were used to treat livestock ailments, and both human and livestock ailments as shown in Figure 8 and Appendix 5.

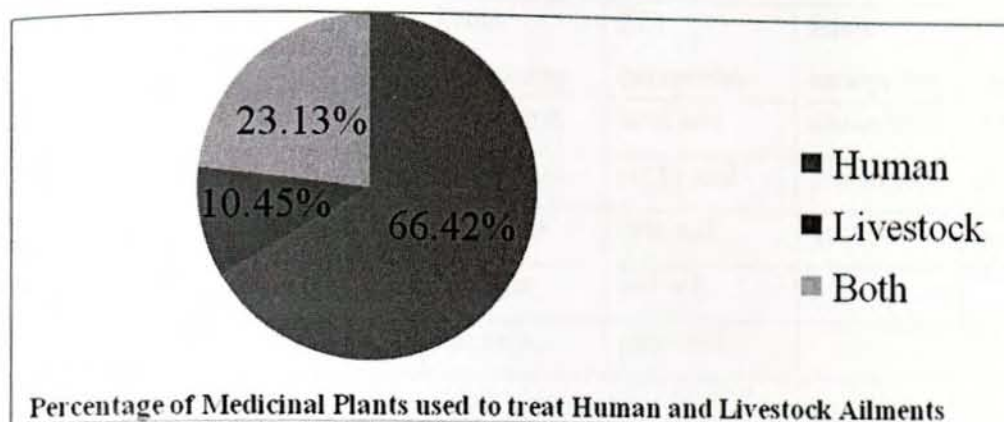


Figure 8. Medicinal plants used for treatment of human and livestock ailments

4.1.7. Ailments treated with medicinal plants

In this study, a total of 80 different ailments (56 of human, 12 of livestock and 12 of both human and livestock ailments) were recorded (Appendix 6). Traditional practitioners had a good knowledge to distinguish these diseases by their symptoms and provision of medicinal plants that are effective to treat them. The most frequently cited health problems were wound, stomachache, skin infections, anthrax, acute sickness, evil eye, and others.

4.2. The ethnomedicinal and ethnoecological knowledge of the local indigenous people

4.2.1. Classification of landscapes, soils and vegetation by local indigenous people

Local people in the study area, especially elders and knowledgeable community members identified the landscape, soil and vegetation by reflecting their deep knowledge. As a result, they identified three vegetation types based on density of plant species and type of plant species present; five landscape types, based on the topography of the land and five soil types based on color and texture (Table 8).

Table 8.Emic and etic categorization of landscape, soil and vegetation

No	Landscape categorization		Soil categorization		Vegetation categories	
	Emic categories	Etic categories	Emic categories	Etic categories	Emic categories	Etic categories
1	meda	plain	ashewama	sand soil	chaka/den	forest
2	terara	mountain	korekonch	rocky soil	gitosh/sar	grass land
3	weta geba	undulating land	tikur afer	blak soil	qutquato	bushland
4	sheleqou	valley	key afer	red soil		
5	gedel	cliff	mererie	clay soil		

4.2.2. Distribution of medicinal plants in plant community types

Plant community types in the study area were recognized based on the dominant plant species growing in the different habitats taking careful observation, collection and identification of plants. As a result of both etic and emic categorization, six community types were recognized, which was done by visual sorting of the vegetation, and also the distribution of medicinal plants were indicated (Table 9). Based on dominant plant species, the following plant communities were visually identified:

1. Plant community dominated by *Dodonaea angustifolia* and *Rumex nervosus*

This is a community type locally called qutquato (Bushland) that is degraded with shrubby vegetation derived from the clearing of dry montane forests. The dominant species are *Dodonaea angustifolia* and *Rumex nervosus*. This community type is common in Dassa and Kewariat study sites with altitudinal ranges of 2,520 – 2,865 m.a.s.l. This community is composed of a number of useful plant species including medicinal plants. The common shrubby medicinal plants in this community include; *Clerodendrum myricoides*, *Dodonaea angustifolia*, *Dovyalis abyssinica*, *Myrsine africana*, *Olinia rochetiana*, *Osyris quadripartita* and *Rumex nervosus*. The community also includes herbaceous MPs including *Ferula communis*, *Echinops kebericho*, *Hypoestes forskaolii*, *Impatiens rothii* and climbers including *Clematis simensis* and *Zehneria scabra*.

2. Plant community dominated by *Euphorbia abyssinica* and *Croton macrostachyus*

Common woody plant species dominated by *Euphorbia abyssinica* and *Croton macrostachyus* (Figure 9). This community is commonly found in and around few churches in the study area and highly dominated in valleys of “Astoya” Kebele”. It is locally named chaka and church compound vegetation, which is located at altitudinal range of between 2,343- 2,650 m.a.s.l. *Croton macrostachyus*, *Myrica salicifolia* and *Euphorbia abyssinica* are the tree species and *Maesa lanceolata*, *Premna schimperii*, *Withania somnifera*, *Ocimum lamiifolium*, *Solanum incanum*, *Asparagus africanus* and *Gomphocarpus purpurascens* are shrubs. *Brassica nigra*, *Rumex abyssinicus*, *Verbena officinalis*, *Artemisia abyssinica* and *Stephania abyssinica* are herbs in this community type.



Figure 9. *Euphorbia abyssinica* and *Croton macrostachyus* dominated plant community (Photo: Hintsete Woldedawit, 2011)

3. Plant community dominated by *Juniperus procera* and *Olea europaea* subsp. *cuspidata*

This community is found in remnant parts of the Dry Evergreen Afromontane Forest and locally called DEN. It encompasses two kebeles, Agemsa and Dassa. The location of this community type ranges from 2490- 2675 m. This is dominated by tree species of *Juniperus procera* in the upper side and *Olea europaea* subsp. *cuspidata* in the lower part. It also dominates around churches, on slightly slope land and reverine side (Figure 10). This community contains many important medicinal plant including trees, shrubs and herbs. Tree species include

Olea europaea subsp. *cuspidata*, *Podocarpus falcatus*, *Prunus africana*, *Dombeya torrida*; shrubs like *Carissa spinarum*, *Rhus retinorrhoea*, *Rosa abyssinica*, *Calpurnia aurea*, *Clusia abyssinica*, *Euclea racemosa*, *Grewia ferruginea*, *Heteromorpha arborescens*; herbs like *Conyza stricta*, *Nidorella resedifolia*, *Achyranthes aspera*, *Silene macrosolen* and climber like *Jasminium abyssinicum* and *Momordica foetida*.



Figure 10. *Juniperus procera* and *Olea europaea* subsp. *cuspidata* dominated plant community (Photo: Hintsete Woldedawit, 2011)

4. Plant community dominated by *Eucalyptus globulus*

This type of community is recorded in almost all study sites and dominated by a single species *Eucalyptus globulus*. It is locally called Ye-Bahrzaf Zaf chaka/ Tikl den and the under canopy plants include shrubs, herbs and grasses. *Erica arborea* and *Thymus schimperi* are dominant under the canopy. This community type includes important medicinal plants just like other community types. The only tree species in this community is *Eucalyptus globulus* (Figure 11) and *Erica arborea* and *Solanum marginatum* are shrubs. *Aloe pulcherrima*, *Aloe debrana*, *Argemone mexicana*, *Datura stramonium*, *Dichrocephala integrifolia*, *Haplocarpha schimperi*, *Rumex nepalensis*, and *Thymus schimperi* are also herbs in the community.



Figure 11. *Eucalyptus globulus* dominated plant community (Photo: Hintsete Woldedawit, 2011)

5. Plant community dominated by Riverine, farmland and other disturbed lands

This type of community include vegetation, locally called Yewenz Dar (riverine), Yetementer meret (disturbed land) and Yersha meret zuria (edge of farm lands), which contains important medicinal plants collected from riverine, stream sides, farmland, road side and other disturbed areas without specific plant species dominating. It is located mainly in Agemsa, Ayat-meda, Kollomargefia, Kewariat and others. It contains 15.67% of the total plant species. The major species observed in this type of community are trees, shrubs and herbs. *Ficus vasta*, *Cordia africana*, *Ficus sur* and *Combretum molle* are trees and *Calotropis procera*, *Toddalia asiatica*, *Maytenus arbutifolia* and *Ocimum gratissimum* are shrubs. *Hordeum vulgare*, *Carthamus tinctorius*, *Chenopodium album*, *Cicer arietinum*, *Trigonella foenum-graecum*, *Linum usitatissimu*, *Anemone thomsonii*, *Pentarrhinum insipidum* and *Periploca linearifolia* are herbs.

6. Plant community dominated by homegarden plants

The local communities in the study area obtain many services from homegardens (Yeguaro-ersha) and cultivate some medicinal plants in and around the homegarden. Medicinal plants were collected from homegardens in the study area and grouped into two sub-community types.

a. Community dominated by *Rhamnus prinoides*

This community contains more medicinal plants than the second type homegarden. Mostly, it is located between 2595-2850 m. The dominant species is *Rhamnus prinoides*, which is mostly located in Ayat-meda, Dassa and Kewariat. Tree species collected from this community type are

Acacia abyssinica and *Hagenia abyssinica*. Shrubs and herbs are dominant in the community which include *Buddleja polystachya*, *Rhamnus prinoides*, *Discopodium penninervium*, *Phytolacca dodecandra*, *Solanum benadirensis*, *Justicia schimperiana*, *Vernonia amygdalina*, *Vernonia bipontini*, *Saccharum officinarum*, *Leonotis ocymifolia* var. *raineriana*, *Verbascum sinaiticum*, *Allium sativum*, *Allium cepa*, *Lepidium sativum*, *Urtica simensis*, *Foeniculum vulgare*, *Apium graveolens*, *Anthriscus sylvestris*, *Urera hypselodendron*, *Malva verticillata*, *Solanecio gigas*, *Leucas stachydiformis*, *Acmella caulirhiza* and *Tagetes minuta* (Figure 12).



Figure 12. *Rhamnus prinoides* dominated community (Photo: Hintsete Woldedawit, 2011)

b: Community dominated by *Citrus aurantifolia* and *Capsicum frutescens*

This type of homegarden community is recorded in two sites in the study area i.e Agemsa and Kolomargefia. The dominant species in this community are *Citrus aurantifolia* and *Capsicum frutescens*. Medicinal plants that were collected from these sites are *Capsicum frutescens*, *Citrus aurantifolia*, *Coffea arabica*, *Ehretia cymosa*, *Lycopersicon esculentum*, *Cucumis ficifolius*, *Myrtus communis* and *Lagenaria abyssinica* (Figure 13).



Figure 13. *Citrus aurantifolia* and *Capsicum frutescens* dominated plant community (Photo: Hintsete Woldedawit, 2011)

Table 9. Summary of community types and distribution of medicinal plants

No	Community type	No. of MPs	Key medicinal plants of the community
1	<i>Dodonaea angustifolia</i> and <i>Rumex nervosus</i>	24	<i>Clerodendrum myricoides</i> , <i>Dodonaea angustifolia</i> , <i>Dovyalis abyssinica</i> , <i>Myrsine africana</i> , <i>Osyris quadripartita</i> , <i>Rumex nervosus</i> , <i>Echinops kebericho</i> , <i>Impatiens rothii</i> , <i>Clematis simensis</i> , <i>Zehneria scabra</i> .
2	<i>Euphorbia abyssinica</i> and <i>Croton macrostachyus</i>	16	<i>Croton macrostachyus</i> , <i>Myrica salicifolia</i> , <i>Euphorbia abyssinica</i> , <i>Maesa lanceolata</i> , <i>Withania somnifera</i> , <i>Ocimum lamiifolium</i> , <i>Solanum incanum</i> , <i>Gomphocarpus purpurascens</i> , <i>Verbena officinalis</i> subsp. <i>africana</i> ,
3	<i>Juniperus procera</i> and <i>Olea europaea</i> subsp. <i>cuspidata</i>	19	<i>Olea europaea</i> subsp. <i>cuspidata</i> , <i>Carissa spinarum</i> , <i>Rhus retinorrhoea</i> , <i>Rosa abyssinica</i> , <i>Calpurnia aurea</i> , <i>Clutia abyssinica</i> , <i>Euclea racemosa</i> , <i>Grewia ferruginea</i> , <i>Achyranthes aspera</i> , <i>Silene macrosolen</i> , <i>Jasminium abyssinicum</i>
4	<i>Eucalyptus globulus</i>	14	<i>Eucalyptus globulus</i> , <i>Erica arborea</i> , <i>Solanum marginatum</i> , <i>Aloe pulcherrima</i> , <i>Aloe debrana</i> , <i>Datura stramonium</i> , <i>Rumex nepalensis</i> , <i>Thymus schimperi</i>

Riverine, farm land and other disturbed lands	21	<i>Ficus vasta, Cordia africana, Ficus sur, Combretum molle, Ocimum gratissimum, Hordeum vulgare, Carthamus tinctorius, Cicer arietinum, Trigonella foenum-graecum, Linum usitatissimu, Anemone thomsonii, Periploca linearifolia</i>
Homegarden plants (<i>Rhamnus prinoides, Capsicum frutescens</i> and <i>Citrus aurantifolia</i>)	40	<i>Hagenia abyssinica, Capsicum frutescens, Citrus aurantifolia, Cucumis ficifolius, Lycopersicon esculentum, Allium cepa, Allium sativum, Buddeleja polystachya, Rhamnus prinoides, Discopodium penninervium, Phytolacca dodecandra, Solanum benadirensense, Justicia schimperiana, Vernonia amygdalina, Vernonia bipontini, Saccharum officinarum, Lepidium sativum, Leonotis ocymifolia, Verbascum sinaiticum, Urtica simensis, Apium graveolens, Solanecio gigas,</i>
Total	134	

4.2.3. Traditional plant use knowledge transfer

The indigenous knowledge on medicinal plants was mainly transmitted orally from generation to generation, and now, it has declined when compared to the previous generation. In the study area, as explained by most informants the most frequently cited sources of knowledge were from family 43 (59.72%), followed by observation from others healers and religious institutions 13 (18.05%) and 6 (8.33%) respectively (Appendix 7). This knowledge is threatened due to the death of healers, lack of written document, influence of modernization and other factors.

4.3. Informant consensus on medicinal use of plants

Some medicinal plants are more popular than others, which are well known by the local people/healers in the study area and cited repeatedly as remedy for the treatment of different diseases. Based on this informant's consensus, certain species which were independently cited by many of the informants for their medicinal uses against different human and livestock ailments are shown in Table 10.

Table 10. List of most common medicinal plants with high informant's consensus

No	Scientific name	No. of citation (frequency)	Informant consensus (%)
1	<i>Cucumis ficifolius</i>	58	80.55
2	<i>Verbascum sinaiticum</i>	56	77.78
3	<i>Allium sativum</i>	48	66.67

4	<i>Achyranthes aspera</i>	46	63.89
5	<i>Withania somnifera</i>	45	62.50
6	<i>Inula confertiflora</i>	41	56.94
7	<i>Rumex nervosus</i>	30	41.67
8	<i>Solanum marginatum</i>	28	38.89
9	<i>Osyris quadripartite</i>	26	36.11
10	<i>Rhamnus prinoides</i>	25	34.72
11	<i>Leonotis ocymifolia</i>	23	31.94
12	<i>Jasminium abyssinicum</i>	20	27.78

4.4. Most important medicinal plants

4.4.1. Local community preferences for specific medicinal plants

The results show that in the study area, 17 medicinal plants were used to treat stomachache and among these, six medicinal plants with the highest informant consensus were selected and seven key informants ranked them based on their perception of the degree of priority. Accordingly, *Cucumis ficifolius* stood first followed by *Withania somnifera* (Table 11).

Table 11. Preference ranking of medicinal plants used to treat stomachache (R stands for respondents)

Plant species	Respondent							Total	Rank
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇		
<i>Cucumis ficifolius</i>	3	5	3	4	4	5	5	29	1 st
<i>Nidorella resedifolia</i>	4	5	3	3	2	1	3	21	4 th
<i>Achyranthes aspera</i>	3	1	4	2	2	3	2	17	6 th
<i>Withania somnifera</i>	5	4	4	3	3	4	2	25	2 nd
<i>Verbascum sinaiticum</i>	3	3	4	2	2	3	2	19	5 th
<i>Allium sativum</i>	4	4	5	2	4	3	2	24	3 rd

4.4.2. Comparative preferences of the local communities' for specific medicinal plants

Paired comparison was made among six medicinal plants that were identified by the informants to be used in treating Ascariasis. For this, eight key informants were requested to give ranks according to their priority of effectiveness. As a result of this, *Euphorbia abyssinica* stood first and followed by *Maesa lanceolata* (Table 12).

Table 12. Paired Comparison of Medicinal plants used to treat Ascariasis

Name of medicinal plants	List of respondents (R ₁ -R ₇)									
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈	Total	Rank
<i>Podocarpus falcatus</i>	3	3	1	2	5	2	5	1	22	4 th
<i>Maesa lanceolata</i>	3	2	5	3	4	2	3	4	26	2 nd
<i>Plectranthus cylindraceus</i>	2	3	2	1	1	2	2	4	19	6 th
<i>Ficus vasta</i>	1	5	4	2	1	3	3	4	23	3 rd
<i>Euphorbia abyssinica</i>	5	3	2	4	4	3	4	4	29	1 st
<i>Leonotis ocymifolia</i>	1	1	3	4	4	2	4	1	20	5 th

4.4.3. The basis for preferences of local people for specific medicinal plants

In the study area, many medicinal plants were used for different purposes other than their medicinal value. The local community perform preference ranking on these plants in multiple dimension, basically in multiple use of the plants. Direct matrix ranking result revealed that, *Olea europaea* subsp. *cuspidata* stood first followed by *Cordia africana* and *Eucalyptus globulus* in the 2nd and 3rd levels respectively. Result of direct matrix ranking of eight medicinal plants by respondents with eight use diversity is given in (Table 13).

Table 13. Direct matrix ranking for multiple uses of medicinal plants.

Uses	<i>Juniperus procera</i>	<i>Hagenia abyssinica</i>	<i>Eucalyptus globules</i>	<i>Olea europaea</i> subsp. <i>cuspidata</i>	<i>Ficus vasta</i>	<i>Cordia africana</i>	<i>Croton macrostachyus</i>	<i>Acacia abyssinica</i>
Fire wood	18	15	29	27	19	23	21	24
Construction	28	20	30	20	20	25	20	12
Fodder	0	0	3	12	0	8	11	11
Furniture	29	17	15	15	21	30	18	14
Medicine	11	23	13	18	18	19	15	3
Charcoal	10	3	11	30	12	13	7	28
Farming tool	0	0	22	30	7	17	23	18
Fence	19	9	25	24	11	20	17	27
Total	115	87	148	176	108	155	132	137
Rank	6 th	8 th	3 rd	1 st	7 th	2 nd	5 th	4 th

4.4.4. Informant consensus factor and fidelity level

4.4.4.1. Informant consensus factor

The diseases in the study area have been grouped into nine different categories based on the symptoms of the diseases, part of the body affected by the disease and way of treatment similarity.

The medicinal plants that were presumed to be effective in treating certain disease categories had higher ICF values, which indicated that those diseases were more common (Table 14).

Table 14. Informant consensus factor by categories of diseases in the study area

Diseases	Ns	Nuc	ICF
Gastrointestinal disorder and parasites infection: Gastritis, Dysentery, Constipation/enema, Stomachache, Hernia, Diarrhea, Bloating, Ascariasis, Tape worm, Intestinal parasites	45	305	0.86
Dermatological problems: Dandruff, Tinea capitis, Eczema, Itching/Scabies, Leprosy, Leschmaniasis, Pityriasis versicolor, Ring worm, Wart /heamorroid, Wet Tinea capitis, Skin infections/ disease, Measles	48	256	0.82
Acute sickness, Evil spirit and emergency: Arthritis /Rheumatic pain, Stabing pain, Fever illness, Headache, Epidemic, Hypertension, diabetes, Epistaxis, Malaria, Evil eye	40	211	0.81
Livestock diseases: African horse sickness, Anal allergic, Anthrax, Cloudiness of eye, Colic, Leech, Lice infestation, Mange mites, Mechanical injury of eye, Nerve problems, Strangle, Continuous bouine pelectru pneumonia(CBPP)	35	159	0.78
Throat and respiratory diseases: Tonsillitis, Tuberculosis, Uvilitis, Pneumonia, Common cold, Cough	27	101	0.74
Organ diseases: Deafness, Ear lesion, eye disease, Hepatitis, Heart disease, Trachoma, toothacheae, Urinary retention, Anal prolepses	21	55	0.63
Others: Poison/snake bite, Rabies	8	17	0.56
Wound healing: Bone fracture, Wound, Fire burn, Haemorrhage/bleeding, Circumcision, Swelling, Tumor	30	63	0.53
Sexual and delivery problem: Syphilis, Gonorrhoea, Impotency, Prolonged labour/delivery difficult, Rh-disease, Placenta retention, Abdominal cramp, Abortion, post partum haemorrhage, Excessive/Continuous flow of menstruation	21	31	0.33

4.4.4.2. Fidelity level

The fidelity level was calculated on those frequently reported diseases by informants so as to identify the most important species among those listed for treatment of a particular disease. The disease that informants reported were stomachache, evil eye, skin infections, hepatitis, uveitis, snake bite/poison, diarrhea and malaria for human and anthrax for livestock. The traditional practitioners employed their indigenous knowledge to manage these frequently reported diseases by identifying the most important medicinal plant species among those listed to treat the same disease categories (Table 15).

Table 15. Fidelity value of TMPs for the most frequently occurring diseases (Key: Ni is the number of informants that claimed use of a plant species to treat a particular disease and N is the number of informants that use the plant as a medicine to treat any given disease).

Disease treated	Medicinal plants	Ni	N	$\frac{Ni}{N}$	$\left(\frac{Ni}{N}\right) \times 100$ (%)
Stomachache	<i>Cucumis ficifolius</i>	27	31	0.87	87
	<i>Withania somnifera</i>	21	26	0.81	81
	<i>Allium sativum</i>	20	28	0.71	71
Evil eye	<i>Clerodendrum myricoides</i>	5	5	1.00	100
	<i>Carrisa spinarum</i>	5	5	1.00	100
	<i>Artemisia abyssinica</i>	5	7	0.71	71
	<i>Vernonia amygdalina</i>	1	3	0.33	33
Skin infection	<i>Jasminium abyssinicum</i>	9	11	0.82	82
	<i>Osyris quadripartita</i>	11	15	0.73	73
	<i>Asparagus Africana</i>	2	3	0.66	66
Hepatitis	<i>Justicia schimperiana</i>	4	4	1.00	100
	<i>Anthriscus sylvestris</i>	2	2	1.00	100
	<i>Ferula communis</i>	1	2	0.5	50
	<i>Myrica salicifolia</i>	2	6	0.33	33
Uveitis	<i>Kalanchoe lanceolata</i>	3	5	0.6	60
	<i>Rhamnus prinoides</i>	11	13	0.85	85
	<i>Clematis simensis</i>	3	6	0.5	50
Anthrax	<i>Impatiens tinctoria</i>	2	3	0.66	66
	<i>Croton macrostachyus</i>	4	7	0.57	57
	<i>Achyranthes aspera</i>	25	25	0.84	84

Diarrhea	<i>Salvia schimperi</i>	5	6	0.83	83
	<i>Verbena officinalis</i>	3	5	0.60	60
	<i>Linum usitatissimum</i>	2	5	0.40	40
Snake bite/ Poison	<i>Polygala rupicola</i>	2	2	1.00	100
	<i>Verbascum sinaiticum</i>	25	31	0.81	81
	<i>Aloe pulcherrima</i>	2	3	0.67	67
	<i>Hypoestes forskalii</i>	2	3	0.67	67
Malaria	<i>Plectranthus punctatus</i>	3	4	0.75	75
	<i>Dodonaea angustifolia</i>	2	3	0.67	67

4.5. Threats and Conservation status of medicinal plants in the study area

4.5.1. Threats of medicinal plants

Anthropogenic factors such as agricultural expansion, drought, over grazing, cutting trees down for fire wood, charcoal and construction are the major threatening factors in the study area. To rank these factors according to their degree of damage, eight informants were selected to give the value '6' to the most threatening factor and '1' to the one which is the least threatening. As a result, agricultural expansion was the most threatening factor in the study area scoring 39, followed by drought and over grazing scoring 37 and 35 respectively (Table16).

Table 16. Threatening factors of medicinal plants in the study area

Threatening factors	Respondents								Total	Rank
	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈		
Over grazing	6	5	3	4	6	5	5	3	35	3 rd
Drought	6	5	5	5	3	4	5	4	37	2 nd
Agricultural expansion	4	6	3	6	6	5	5	4	39	1 st
Fire wood	5	4	1	1	3	2	4	5	25	5 th
Charcoal	4	6	2	1	1	6	4	5	29	4 th
Construction	1	4	3	2	2	5	5	2	24	6 th

4.5.2. Conservation status of medicinal plants in the study area

Members of the community and also Wereda Administration offices have started conserving medicinal plants through *in-situ* (in original/natural habitat) and *ex-situ* (outside the natural habitat) methods. The results of the study showed that medicinal plants can be categorized as

cultivated, wild- cultivated and wild plant species. Thus, the finding shows, out of 40 species collected in the Homegardens, seven are wild but occasionally cultivated by some people in their homegarden for primary purpose of medicinal uses whereas other 22 medicinal plants are domesticated plant species in both homegarden and farm land in the study area (Table 17).

Table 17. List of some cultivated and wild but occasionally cultivated medicinal plants

Cultivated species	Wild but occasionally cultivated plant species
<i>Allium cepa</i>	<i>Discopodium penninervium</i>
<i>Allium sativum</i>	<i>Foeniculum vulgare</i>
<i>Apium graveolens</i>	<i>Leonotis ocyimifolia</i>
<i>Capsicum frutescens</i>	<i>Phytolacca dodecandra</i>
<i>Citrus aurantifolia</i>	<i>Solanecio gigas</i>
<i>Coffea Arabica</i>	<i>Solanum benadirens</i>
<i>Lagenaria abyssinica</i>	<i>Vernonia amygdalina</i>
<i>Lepidium sativum</i>	
<i>Lycopersicon esculentum</i>	
<i>Myrtus communis</i>	
<i>Rhamnus prinoides</i>	
<i>Ruta chalepensis</i>	
Others and farm land crops	

CHAPTER FIVE

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1. Discussion

5.1.1. Diversity of medicinal plants and their distribution patterns in the study area

Medicinal plant species documented from the study area, claimed by the local people as valuable for the treatment of human and livestock ailments, are 134 and this could be an indication of the key role of herbal remedies in addressing the primary healthcare needs of the people. This further indicates that, there is strong acceptance of traditional herbal medicine, especially in the treatment of ailments like bone fracture, rabies, hepatitis, eczema, as reported by some informants. This may also be related to the limited access to modern health facilities and low socio-economic status of the people. This situation probably contributed to the continued reliance on plant-based traditional local pharmacopoeia in the area.

The diversity of medicinal plants in the study area has shown that, the families Asteraceae, Lamiaceae and Solanaceae were represented by high numbers of medicinal plant species than the other families and this could probably be attributed to the overall species richness of these families in the area following the general pattern of the Flora of Ethiopia. Asteraceae and Lamiaceae were represented by 16 and 13 species respectively. Asteraceae with 440 species (Mesfin Tadesse, 2004) and Lamiaceae with 170 species (Ryding, 1985) are among the most represented dicotyledonous families in the Flora of Ethiopia and Eritrea. Other study findings, conducted elsewhere in the country (Mirutse Giday and Gobena Ameni, 2003; Mesfin Tadesse *et al.*, 2005; Endalew Amenu, 2007; Mirutse Giday *et al.*, 2009) also agree with this finding which clearly indicates the considerable contribution of these families to the Ethiopia medical flora.

According to Tesfaye Awas and Sebsebe Demissew (2009), medicinal plants are among the diverse categories of useful plants, of which significant proportion of them are collected from the wild. The findings of Etana Tolassa (2007) and Fisseha Mesfin *et al.* (2009) also showed that, the majority of the medicinal plants were collected from the wild which accounted for 72.94% and 71% respectively even though some are collected from homegardens in their study

sites. The findings of this study also showed that, the majority of medicinal plants (64.92%) in the study area, were collected from wild (around farmlands, churches, grazing lands, along roads sides, in riverine forest, bushland and edge of remnant dry evergreen montane forest. So, the wild vegetation is homed repository of MPs in both enclosed and unenclosed habitats, except communities 5 & 6. Even though higher proportion of medicinal plants were collected from the wild, the rest 40 (29.85%) and seven (5.22%) of the medicinal plants species were collected from homegardens and farm lands respectively.

Many, homegarden grown medicinal plants are not primarily used for medicinal value, but used mainly for other purposes like shade, live fence, food, cash income, spice and other economic roles of the local communities. This is also true as reported in other ethnobotanical studies conducted in different parts of the country including by Endalew Amenu (2007); Etana Tolosa (2007); Haile Yineger and Delenasaw Yewhalaw (2007); Ermias Lulekal *et al.* (2008); Tesfaye Hailemariam *et al.* (2009) and Getaneh Gebeyehu (2011).

In the study area, all plant growth forms are not equally used as remedies. This is because of the difference in abundance and distribution among the growth forms of the medicinal plants. Mostly, this leads to the wide use of shrubs and herbs for medicine. The majority of medicinal plants collected in the area were herbs and shrubs which contain 41.76% and 38.06% of the total medicinal species respectively. This result indicated that people rely more on herbs and shrubs because they are relatively common in the area compared to tree and climbing species. The findings of this study are similar with other research results carried out in other parts of the country (Endalew Amenu, 2007; Tilahun Teklehaymanot and Miruste Giday, 2007; Miruste Giday *et al.*, 2003, 2009; Tesfaye Awas and Sebsebe Demissew, 2009; Tesfaye Hailemariam *et al.*, 2009). However, in some ethnobotanical studies of medicinal plants in the country, shrubs are used dominantly in remedy preparations as described in the studies done by Bayafers Tamene (2000); Mirutse Giday and Gobena Ameni (2003); Debela Hunde *et al.* (2004); Ermias Lulekal *et al.* (2008); Fisseha Mesfin *et al.* (2009).

5.1.2. Local people's knowledge on medicinal plants, their use and management

In Ethiopia, the traditional practitioners are the best sources of information about the knowledge of the medicinal plants. There is a wealth of indigenous knowledge on the use and management of traditional medicinal plants by the local people in the study area. This indigenous knowledge was obtained from various acquisition methods like from family members, from known practitioners, from observation of the works of other healers and transferred orally through generations even within the family.

In the study area, the highest medicinal plant knowledge acquisition was from family (59.72%) by oral means. This result also revealed that the traditional mode of acquisition of the knowledge regarding medicinal uses of plants from previous generations to the present one, went on alarmingly declining and consequently, the traditional knowledge may be lost forever. This is due to the fact that most healers keep their knowledge of MPs secret even from family members. Modernization, sudden death of the knowledgeable person before the transfer of knowledge and negative image on practitioners contributes to the threat. The second method of transferring of knowledge was learning from other practitioners (18.05%). This is the preferable method to reduce loss of indigenous knowledge by sharing the knowledge outside the family.

The documenting of 134 ethnomedicinal plants in this study as being used by the local people to treat 80 different types of human and livestock ailments is a good indication of the deep rooted culture of MP use in the study area. Out of these, more number of medicinal plants (89) were used for treatment of human ailments. This result shows that the local communities have more indigenous knowledge and give emphasis to the uses of medicinal plants to treat human ailments than livestock diseases. This result is similar with other results which were documented in other study sites of Ethiopia (Tesfaye Awas and Sebsebe Demissew, 2009; Mirutse Giday *et al.*, 2009; Moa Megersa, 2010; Getaneh Gebeyehu, 2011).

Plants contain active chemical constituents in their leaves, roots, seeds, stems, barks, fruits, and other parts, which produce a defined curing physiological response in the treatment of various ailments in humans and livestock. The study shows that, the most sought plant part for the

preparations of remedy in the area were leaves, which accounted for 54 (40.29%) species followed by roots for 23 (17.16%) species. This indicates that, collecting leaves does not pose a great danger to the existence of an individual plant when compared with the collection of roots, whole part and other plant parts. This finding agrees with the sets of work that were carried out previously in other studies in Ethiopia, which showed that leaves followed by roots are the most frequently used plant parts for remedy preparations (Bayafers Tamene, 2000; Haile Yineger and Delenasaw Yewhalaw, 2007; Gidey Yirga, 2010a; Nugussie Amsalu, 2010; Eskedar Abebe, 2011). On the other hand, as described in many studies, using roots in remedy preparation is the main threat for MPs loss. Dawit Abebe and Ahadu Ayehu (1993) also suggest that, the popular use of roots, bulbs, stems, barks has grave consequences from both an ecological point of view and survival of the species.

These plant parts are used as remedies in different conditions. Plant composition (whether single or combined); condition of plant material used (fresh, dry or both form); type and the site of the ailment and methods of preparation are considered during preparation. Most remedies were prepared from single plant (74.15%) and the remaining 25.85% were prepared from combined plant species. The analyzed result on the condition of plant part used also indicated that 85 (63.43%) herbal remedies were prepared using fresh material and 22 (16.42%) in the dried form. This shows that fresh materials are more required by the general medicinal plant user community and healers. The frequent use of freshly processed remedies could indicate the availability of plant materials in the vicinity to be picked when desired and this might also be an attempt not to lose the volatile oils, the concentration of which could deteriorate on drying (Mirutse Giday *et al.*, 2009). On the other hand 27 (20.15%) species were used as fresh or dry plant material. This indicates that those medicinal plants used in both fresh and dried forms, increase the chance of using them. Using in dried form is important to preserve plant material, in the form of powder, especially for plants that users could not find in dry season of the year. Mengistu Gebrehiwot (2010) also described that, dried form of remedy is important to some professional traditional healers to sell their plant medicines in the market and also store the dried plant medicines in different containers in their homes. This finding goes along the same line with a study conducted by Teshale Sori *et al.* (2004); Mirutse Giday *et al.* (2009).

Local communities employ various methods of preparation of traditional medicines for different types of ailments. Traditional healers also reported to process remedies mainly through pounding, the major remedy preparation method, which accounted for 31.34%, followed by pounding and squeezing with water (16.42%), powdering (9.7%) and others. This finding is similar with the finding of ethnobotanical study conducted by Behailu Etana (2010). But it differs from Fisseha Mesfin's (2009) finding, in which 46 (37.4%) preparations were made by the process of powdering followed by 42 (34.1%) for crushing and pounding.

The route of administration of those prepared remedies depends on the nature of ailments to be treated, given both internally and externally. The processed remedies were mostly administered orally (35.82%), followed by dermal. It is possible that this is related to the high prevalence of internal ailments. Dawit Abebe and Ahadu Ayehu (1993) also indicated oral as the main route of administration used in northern Ethiopia. The result of this study agreed with various ethnobotanical researches conducted elsewhere in Ethiopia (Ermias Lulekal, *et al.* 2008; Fisseha Mesfin, 2009; Gidey Yirga, 2010b and Gidey Yirga and Samuel Zeraburk, 2011). The intake of remedies orally could be applied by drinking, eating, inhaling, swallowing and others, with mixing of additives like water, sugar, butter, salt, milk, honey, injera, tea, local beverages like 'TELLA' and 'AREKIY'. Mixing of these additives during the preparations or administration help to improve the intake safety of remedies. In a similar way, because of the high occurrence of external infectious disease and other problems, dermal route was the second way of administration. In this case remedies were also applied by tied on (16.1%), smearing (8.89%), put on and washing equally (2.12%) and others. This finding is in agreement with other findings of ethnobotanical studies in Ethiopia (Alemayehu Kefyalew, 2010; Eskedar Abebe, 2011).

Accordingly to Etana Tolosa (2007), the local communities use different traditional units of measurement (finger length, numbers, measuring materials) and also duration of the administration to estimate and fix the amount of medicine. Gidey Yirga (2010a) finding also indicated that, there were variations in the unit of measurement, duration and time at which remedies were taken and prescribed by healers for the same kind of health problems. The finding of this study also shows that, dose determination is depend on the age, physical fitness,

stage of illness, the infected part, presence or absence of any disease other than the disease to be treated, time taken, duration of disease and also to some extent it varies from healer to healer.

The traditional healers believe in the effectiveness of the medicines but do not consider the exact amount of medicine or the dosages are not standardized. In the study area, the imprecision for dosage of remedies that were administered both internally and externally have problems according to most traditional practitioners and have significant effects on the users. For example, some medicinal plants like *Euphorbia abyssinica* and *Clematis simensis* were used for dermal related problems such as leishmaniasis, leprosy, eczema, uveitis and *Phytolacca dodecandra* and *Cucumis ficifolius* which were also used internally, especially in abortion and rabies, were poisonous in higher dosages. For instance, pregnant women and babies are not allowed to take the drug. The dosage and side effect of these medicinal plants were also described in other studies, conducted elsewhere in the country including by Moa Megerssa (2010) and Gidey Yirga (2010a). Several studies on the standardization and lack of precision of traditional medicinal uses were also recognized and documented by others as a drawback (Amare Getahun, 1976; Dawit Abebe, 1986; Tilahun Teklehaymanot and Mirutse Giday, 2007). Traditional healers also use some antidotes like 'milk' and 'chicken meat' for reducing side effect of these medicinal plants.

5.1.3. The most sought medicinal plants

As shown by the results of the study, some medicinal plants were known than others by members of the community regarding their abundance, effective treatment and also multiple use values. Among medicinal plants documented in the area, *Cucumis ficifolius* took the lead having been cited by 58 (80.55%) of the informants for its medicinal value and *Verbascum sinaiticum* by 56 (77%) informants. *Allium sativum*, *Achyranthes aspera* and *Withania somnifera* were ranked 3rd, 4th and 5th level by having 48 (66.67%), 46 (63.89%) and 45 (62.50%) citation of informants respectively. Popularity of these medicinal plants according to key informants were due to the wide range of diseases they treat, their abundance and prevalence for effective treatment.

Preference ranking, paired comparison and direct matrix ranking were made to know the degree of importance of the medicinally most popular plants in the area. The local community had long

experienced knowledge that they use to differentiate the effectiveness of medicinal plants to treat local ailments. The results showed that some medicinal plants were preferred more than the others by the community than the others. Based on this, in the study area 17 MPs were used by communities for stomachache treatment. The result of preference ranking indicated that, out of these species, six were more known and people showed more preference of one over the rest (Five). *Cucumis ficifolius* stood first followed by *Withania somnifera*, *Allium sativum*, *Nidorella resedifolia*, *Verbascum sinaiticum* and *Achyranthes aspera* 2nd, 3rd, 4th, 5th and 6th respectively (Table 11).

The paired comparison of six medicinal plants used to treat Ascariasis was done based on the rank given by informants, which indicated that *Euphorbia abyssinica* stood first and *Maesa lanceolata*, *Ficus vasta*, *Podocarpus falcatus*, *Leonotis ocymifolia* and *Plectranthus cylindraceus* respectively come in the 2nd, 3rd, 4th, 5th and 6th position (Table 12). Direct matrix ranking was also conducted to know the various uses of eight medicinal plants. As Table 13 shows, the results of the direct matrix ranking revealed that *Olea europaea* subsp. *cuspidata* stands first followed by *Cordia africana*, *Eucalyptus globulus*, *Acacia abyssinica*, *Croton macrostachyus*, *Juniperus procera*, *Ficus vasta* and *Hagenia abyssinica* respectively. This result also shows that to determine threats caused by over harvesting of these plants which leads to some species becoming threatened. For example, *Cordia africana* and *Juniperus procera* were among damaged species in the area due to their over use for construction and furniture making. This finding is similar with other ethnobotanical researches conducted in Minjar District of Amhara Region, Ethiopia by Getu Alemayehu (2010).

The medicinal plants that are presumed to be effective in treating certain diseases have higher ICF values (Trotter and Logan, 1986). The results of this study shows that, the highest ICF value (0.86) was associated with diseases related to the disease category of gastrointestinal and parasitic problems followed by problems associated with dermatological (0.82) conditions, Acute sickness, evil spirit and emergency (0.81), throat and respiratory disease (0.74) and others (Table 14). The incidence of such diseases was also relatively high in Zegie Peninsula of northwestern Ethiopia as described by Tilahun Teklehaymanot and Mirutse Giday (2007). This

may indicate high occurrence of these types of diseases in the area, possibly due to the generally poor socio-economic and sanitary conditions of the people as observed during the field work. The highest ICF value being related to internal problems indicates that the most frequently used route of administration was oral and also the diseases are more common in the area. It also indicated that there was high agreement in the use of plants in these ailments among the other categories. On the other hand, the least ICF value was 0.33 associated with sexual and delivery problems. This finding is in disagreement with the findings of Alemayehu Kefalew (2010) and Getaneh Gebeyehu (2011), which showed high ICF value corresponding to febrile illness (0.90) and dermatological problems (0.85).

The medicinal plants that are widely used by the local people have higher FL values than those that are less popular. As many plant species may be used in the same use category, it is interesting to determine the most preferred species used in treatment of particular ailment (Friedman *et al.* 1986). Medicinal plants with higher FL value need to be seriously considered for further ethnopharmacological studies (Tsfaye Hailemariam, 2009). In the study area, some medicinal plants were used in the treatment of various ailments and others were for single ailment. This shows that, medicinal plants that are known as remedies of a single ailment have 100% fidelity level than those that are used as remedies for more than one type of ailment, which indicate that a well defined selection of MPs. This is also true in other ethnobotanical research findings (Tilahun Teklehaymanot and Mirutse Giday, 2007; Alemayehu Kefalew, 2010). For example, the most preferred species *Clerodendrum myricoides* and *Carrisa spinarum* for evil eye, *Justicia schimperiana* and *Anthriscus sylvestris* for hepatitis and *Polygala rupicola* for snake bite/ poisons treatment, which used each MP with FL value 100%.

5.1.4. Endemic and rare medicinal plants in the study area

Endemic plant species of Ethiopia and their level of threat have been given in Ensermu Kelbessa *et al.* (1992) and Vivero *et al.* (2005). The study area is also an important reservoir of endemic plants. Among twelve endemic medicinal plants of the Flora area that we collected from the study area, 10 are endemic to Ethiopia but the three (*Gomphocarpus purpurascens*, *Solanum marginatum* and *Thymus schimperi*) are shared with Eritrea. As, Asteraceae is the dominant

family in the area, it also contains three endemic species followed by Aloaceae with two and the rest contain one endemic species each. This indicates that, the area could serve for the purpose of biodiversity conservation. Ethiopia has about 40 species of Aloe where the sap of some species is used for medicinal, food and cosmetic application and is widely used internationally (Sebsebe & Gilbert, 1997). Among these two of them (*Aloe debrana* and *Aloe pulcherrima*) are found in the study area. *Millettia ferruginea*, *Solanecio gigas*, *Aloe pulcherrima* and *Gomphocarpus purpurascens* are nearly threatened species given in the Red List of Endemic Trees and Shrubs of Ethiopia as described by Vivero *et al.* (2005). *Echinops kebericho* is also an endemic as well as rare medicinal species, mainly due to overexploitation of the roots for medicine. Generally, a serious attention is needed to conserve endemic medicinal species of the Flora area, particularly those that are restricted to Ethiopia. On the other hand, due to over exploitation for different purposes combined with medicinal uses, non-endemic medicinal species were also seen to be very rare in the area. For example: *Combretum molle*, *Pentarrhinum insipidum*, *Calotropis procera*, *Podocarpus falcatus*, *Prunus africana*, *Ficus vasta*, *Cordia africana*, *Urera hypselodendron*, *Solanum benadirensis*, *Vernonia amygdalina* and *Withania somnifera* are rare species in the area as many informants reported. Among these species, *Vernonia amygdalina* and *Solanum benadirensis* are cultivated in homegardens. Similarly, in Getaneh Gebeyehu (2011) finding, some wild medicinal plants also cultivated in homegardens.

5.1.5. Options for conserving the medicinal plants of the study area

Many of the threats to medicinal plant species are similar to the general endangerment of plant diversity. According to Ensermu Kelbessa *et al.* (1992), Ethiopia's traditional medicine, as elsewhere in Africa, is faced with problems of continuity and sustainability primarily due to loss of taxa, habitat of medicinal plants and other threats categories. The main threats to medicinal plants in the study area as ranked by key informants are agricultural expansion due to over growth of population, which dictates the young farmers to fetch their own agricultural land, followed by drought, due to low and erratic distribution of rainfall. Although over harvesting of medicinal plant species for various purposes is considered to be a threatening factor. For example, the use of *Olea europea* subsp. *cuspidata*, *Cordia africana*, *Podocarpus falcatus*, *Prunus africana*, *Acacia abyssinica* and *Juniperus procera* for construction, furniture and charcoal and harvesting of plant parts of MPs before their maturation, especially the use roots

has severe effect on their survival. For instance, the use of root is the main threat in *Cucumis ficifolius*, *Withania somnifera* and *Vernonia amygdalina*. Generally, these threats are similar to the threats in Mana Angetu and Seru Districts of Oromia Region, Ethiopia as described by Ermias Lulekal *et al.* (2008) and Mengistu Gebrehiwot (2010) respectively. Due to these factors some medicinal plants especially those which grow in the wild and with high preventive role are not easily available and some practitioners who sold the prepared remedy travel including outside the district to collect them.

The conservation of medicinal plants in the study area was limited except in *Eucalyptus-Juniperus* dominated plantation vegetation areas. During field observation certain plant species were also observed in the church compound, in valley and in areas not suitable for farming, but not found in the surroundings. This clearly shows that church and other protected areas that are inaccessible to human and domestic animals have great role in conserving and protecting medicinal plant species in *in-situ*. Even if relatively small number of medicinal plants were collected from *Juniperus procera* - *Olea europaea* subsp. *cuspidata* dominated community type, the plants are at relatively better conservation status when compared to the other community types. The natural resource protection office of the Wereda had a positive influence in protecting such natural vegetation areas. Due to this, now the majority of the informants had good knowledge on the conservation of plants as a whole and medicinal plant when compared to the past time. The results of the study also indicated that, even the effort made by the community to conserve medicinal plants is not satisfactory, some practitioners know the importance of conserving medicinal plants using both *in-situ* and *ex-situ* conservation methods. Homegardens are important sites for the conservation of medicinal plants and for transferring of the indigenous knowledge from older to the younger generation. Some traditional practitioners have started cultivating medicinal plants in homegardens. According to Zemedu Asfaw (2001), cultivation for medicinal value accounted for 6% of the plants maintained in homegardens in Ethiopia. Similarly, the results of the current study showed that, some traditional practitioners have started cultivation of wild plants in the homegardens primarily for medicinal purposes. It accounts for seven species (5.22%) of the total collected medicinal plants in the study area.

5.2. Conclusions and Recommendations

5.2.1. Conclusions

The ethnobotanical study of medicinal plants in Menz Mama Midir District showed that there is high diversity of medicinal plants used by a large number of the population and it is the most important means of primary health treatment for human and livestock ailments. A total of medicinal plant species (134) were collected, identified and recorded from the study area, used by informants to treat 80 different ailments. As the traditional medicinal plants are central to the cultural activities of the rural community, communities are knowledgeable about them. This indigenous knowledge somehow contributed to the sustained use, management and conservation of medicinal plants. However, it is the transfer of knowledge from one generation to the next that is transmitted orally within the family and could be lost by the influence of modern education, cultural modification and attitude of community due to modernization. Traditional medicinal plants were harvested mostly from the wild vegetation followed by homegardens. Herbs were found to be dominant traditional medicinal plant remedies in the study area followed by shrubs, trees and climbers. Leaves were also found to be the most harvested plant parts for the preparation of the remedies followed by roots as described in various studies. Traditional medicine preparation mostly involves single plant; the mode of administration is mainly internal in which oral administration is the common route. Some medicinal plants are more preferable than the others in the study area to cure the ailments like hepatitis, stomachache, skin infection, snake bite, evil eye, malaria, uveitis, diarrhea and anthrax. Beside their medicinal value many medicinal plants are also used for different purposes like charcoal, firewood, construction, household tools and others.

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

A complementary *In-situ* and *Ex-situ* conservation strategy is very vital in plant life persistence. As the results of this study showed, cultivation of plant species in and around homegardens for different purposes, protecting some areas for spiritual and other purposes, educating people

about plant use, transferring indigenous knowledge to the new generation, avoiding use of plants before maturation and others have great contribution to the conservation of medicinal plants and the associated knowledge.

5.2.2. Recommendations

Based on the results and the conclusions given above the following recommendations are forwarded:

- ❖ Many medicinal plant species are reported and observed to be rare in the area. So, an urgent attention is needed to conserve these rare plants both *in-situ* and *ex-situ*, in order to optimize their use in the primary healthcare system and also other uses. Priority species with this regard are *Prunus africana*, *Withania somnifera*, *Cordia africana*, *Millettia ferruginea* and *Podocarpus falcatus*. So, promoting the establishment of *in-situ* conservation measures especially for those medicinal plants which are only found growing in the wild and this should be encouraged as most medicinal plants are collected from wild habitats.
- ❖ The governmental offices need to raise awareness of the community and establish conservation measures to ensure the sustainable use of multipurpose plants and widely used medicinal plants as most medicinal plants are obtained from the wild. This can be achieved by :
 - Encouraging the people to grow medicinal plants in homegardens, mixing with crops in farmlands and as live fences.
 - Raising awareness of the community to prevent human induced threats to plants.
 - If possible, establishing local botanical garden at least at the Wereda level.
 - Training the local community to plant indigenous plant seedling.
- ❖ Government agencies need to encourage the conservation of medicinal plants and provide incentives to the people for cultivation of medicinal plants to ensure that conservation issues are taken carefully.
- ❖ Encourage the local herbal medicine practitioners to enhance the use of traditional herbal medicine and to establish their own medicinal plants garden.

- ❖ There is loss of indigenous knowledge in the Wereda. So, Wereda administration office should provide education and awareness raising to encourage traditional healers to transfer their indigenous knowledge on medicinal plants to the next generation.
- ❖ The Wereda administration in collaboration with health office and healers also needs to coordinate the modern practitioner and the traditional healers, and raise awareness to work together about the medicinal value, use, management of dose and conservation of traditional herbal medicine.
- ❖ Raising awareness of traditional healers to develop replantation methods.
- ❖ The distributions of plants in the study area vary from place to place and important medicinal plants were collected from different community types. Generally, homegardens, *Dodonaea angustifolia*- *Rumex nervosus* and *Juniperus procera*- *Olea europaea* subsp. *caspidata* plant community types contain large number of medicinal plants with good distribution when compared to the other community types and this area needs good conservation measures for continued existence. In contrast, other community types need more protection to recover from damages.

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APPENDICES

Appendix 1. List of medicinal plants collected in the study area: scientific names with authority, family, local name, habit, geographical location (in GPS), altitude (in masl) and collection number.

No	Scientific name	Family	Local name (in Amharic)	Habit	Geographical Location (GPS)	Altitude (masl)	Coll.no
1	<i>Acacia abyssinica</i> Hochst. ex Benth.	Fabaceae	Girar	T	10°05'34"N,39°41'29"E	2640 m	HW 10
2	<i>Achyranthes aspera</i> L.	Amaranthaceae	Telenj	H	10°05'18"N, 39°41'47"E	2495 m	HW2
3	<i>Acmella caulirhiza</i> Del.	Asteraceae	Yemdir-berbere	H	10°03'35"N,39°44'40"E	2885 m	HW 114
4	<i>Allium cepa</i> L.	Alliaceae	Key-shinkurt	H	10°02'35"N,39°35'50"E	2376 m	HW 46
5	<i>Allium sativum</i> L.	Alliaceae	Nech-shinkurt	H	10°07'35N,39°41'31"E	3028 m	HW 47
6	<i>Aloe pulcherrima</i> Gilbert & Sebsebe	Aloaceae	Set- eret	S	10°05'34"N,39°41'29"E	2847 m	HW 119
7	<i>Aloe debrana</i> Christian	Aloaceae	Wendie- eret	H	10°08'45N,39°37'46"E	3014 m	HW 45
8	<i>Anemone thomsonii</i> Oliver.	Ranunculaceae	Wenz-ayate	H	10°07'31"N,39°39'28"E	3011 m	HW 130
9	<i>Anthriscus sylvestris</i> (L.) Hoffm.	Apiaceae	Kereshashimbo	H	10°05'35"N,39°41'29"E	2640 m	HW 11
10	<i>Apium graveolens</i> L.	Apiaceae	Shorba kitel	H	10°02'34"N,39°39'28"E	2855 m	HW 124
11	<i>Argemone Mexicana</i> L.	Papaveraceae	Dendro	H	10°07'10"N,39°31"E	3023 m	HW 115
12	<i>Artemisia abyssinica</i> Sch. Bip.Ex A.Rich.	Asteraceae	Chikugn	H	10°01'50"N,39°36'11"E	2603 m	HW 52
13	<i>Asparagus africanus</i> Lam.	Asparagaceae	Kestencha	S	10°01'56"N,39°36'07"E	2649 m	HW 56
14	<i>Buddleja polystachya</i> Fresen.	Loganiaceae	Anfar	S	10°01'34"N,39°39'14"E	2850 m	HW 66
15	<i>Brassica nigra</i> (L.) Koch.	Brassicaceae	Sinafich	H	10°01'50"N,39°36'11"E	2645 m	HW 55
16	<i>Calotropis procera</i> (Ait.) Ait.f.	Asclepiadaceae	Kembo	S	10°11'22"N,39°35'10"E	2176 m	HW136
17	<i>Calpurnia aurea</i> (Ait.) Benth.	Fabaceae	Digta	S	10°11'06"N,39°49'03"E	2563 m	HW 91

18	<i>Capsicum frutescens</i> L.	Solanaceae	Mitimita	H	10°10'17"N,39°49'35"E	1941 m	HW 84
19	<i>Carisa spinarum</i> L.	Apocynaceae	Agam	S	10°05'15"N,39°41'48"E	2495 m	HW 5
20	<i>Carthamus tinctorius</i> L.	Asteraceae	Suff	H	10°11'17"N,39°49'35"E	1945 m	HW 79
21	<i>Chenopodium album</i> L.	Chenopodiaceae	Amedmado	H	10°04'25"N,39°44'49"E	2960 m	HW 107
22	<i>Cicer arietinum</i> L.	Fabaceae	Shimbra	H	10°01'31"N,39°32'28"E	2718 m	HW 44
23	<i>Citrus aurantifolia</i> (Ouistm.)Swingle	Rutaceae	Lommi	Sh	10°11'16"N,39°49'35"E	1946 m	HW 87
24	<i>Clematis simensis</i> Fresen.	Ranunculaceae	Azo-hareg	Cl	10°05'39"N,39°41'55"E	2637 m	HW 13
25	<i>Clerodendrum myricoides</i> (Hochst.) Vatke	Lamiaceae	Missrich	S	10°05'25"N,39°41'31"E	2529 m	HW 17
26	<i>Clutia abyssinica</i> Jaub. & Spach.	Euphorbiaceae	Fiyele-fej	Sh	10°05'15"N,39°41'49"E	2496 m	HW 3
27	<i>Coffea arabica</i> L.	Rubiaceae	Bunna	S	10°11'17"N,39°49'35"E	1941 m	HW 71
28	<i>Combretum molle</i> R.Br. ex G.Don.	Combretaceae	Aballo	T	10°11'25"N,39°49'32"E	2097 m	HW 93
29	<i>Conyza stricta</i> Willd.	Asteraceae	Kumcha-fej	H	10°11'09"N,39°48'01"E	2608 m	HW100
30	<i>Cordia africana</i> Lam.	Boraginaceae	Wanza	T	10°11'25"N,39°49'13"E	2096 m	HW33
31	<i>Croton macrostachyus</i> Del.	Euphorbiaceae	Bisana	T	10°01'14"N,39°36'13"E	2353 m	HW 69
32	<i>Cucumis ficifolius</i> A.Rich.	Cucurbitaceae	Yemidir-embouy	Cl	10°11'17"N,39°49'35"E	1946 m	HW 64
33	<i>Datura stramonium</i> L.	Solanaceae	Atsefaris	H	10°07'07"N,39°39'31"E	3028 m	HW120
34	<i>Dichrocephala integrifolia</i> L.f. Kuntze	Asteraceae	Yekuntarit medhanit	H	10°08'35"N,39°37'31"E	3011 m	HW 123
35	<i>Discopodium penninervium</i> Hochst.	Solanaceae	Amraro	S	10°02'34"N,39°39'14"E	2847 m	HW 41
36	<i>Dombeya torrida</i> (J.F.Gmel.) P.Bamps	Sterculiaceae	Wulqefa	T	10°11'05"N,39°49'24"E	2568 m	HW 134
37	<i>Dodonaea angustifolia</i> L.f.	Sapindaceae	Kitkita	Sh	10°05'15"N,39°41'44"E	2566 m	HW 8

38	<i>Dovyalis abyssinica</i> (A. Rich.) Warb.	Flacourtiaceae	Koshim	S	10°02'36"N,39°39'19"E	2848 m	HW 42
39	<i>Echinops kebericho</i> Mesfin	Asteraceae	Kebericho	H	10°02'44"N,39°39'16"E	2840 m	HW65
40	<i>Echinops hispidus</i> Fresen.	Asteraceae	kosheshilia	H	10°01'24"N,39°32'41"E	2730 m	HW 80
41	<i>Ehretia cymosa</i> Thonn.	Boraginaceae	Game	S	10°11'17"N,39°49'35"E	1946 m	HW 88
42	<i>Epilobium hirsutum</i> L.	Onagraceae	Wenz-adimk	H	10°01'25"N,39°32'37"E	2734 m	HW 129
43	<i>Erica arborea</i> L.	Ericaceae	Asta	S	10°11'21"N,39°47'42"E	3075 m	HW 128
44	<i>Eucalyptus globulus</i> Labill.	Myrtaceae	Nech-bahirizaf	T	10°02'34"N,39°39'14"E	2847 m	HW 36
45	<i>Euclea racemosa</i> Murr.	Ebenaceae	Dedeho	S	10°11'06"N,39°49'03"E	2563 m	HW 131
46	<i>Euphorbia abyssinica</i> G.F.Gmel.	Euphorbiaceae	Kulkual	T	10°01'50"N,39°36'11"E	2643 m	HW 30
47	<i>Ferula communis</i> L.	Apiaceae	Dog	H	10°02'43"N,39°39'16"E	2843 m	HW 72
48	<i>Ficus palmata</i> Forssk.	Moraceae	Belese	S	10°02'14"N,39°39'28"E	2593 m	HW 73
49	<i>Ficus sur</i> Forssk.	Moraceae	Sholla	T	10°01'50"N,39°32'10"E	2613 m	HW133
50	<i>Ficus vasta</i> Forssk.	Moraceae	Warka	T	10°11'24"N,39°4'03"E	2135 m	HW 89
51	<i>Foeniculum vulgare</i> Miller	Apiaceae	Ensilal	H	10°05'34"N,39°41'29"E	2640 m	HW 76
52	<i>Gomphocarpus purpurascens</i> A.Rich.	Asclepiadaceae	Tifrindo	Sh	10°00'42"N,39°35'50"E	2376 m	HW 43
53	<i>Grewia ferruginea</i> Hochst. ex A. Rich.	Tiliaceae	Lenkuwata	S	10°11'67"N,39°49'03"E	2648 m	HW 81
54	<i>Hagenia abyssinica</i> (Bruce) J. F. Gmel.	Rosaceae	Kosso	T	10°02'36"N,39°39'14"E	2848 m	HW 70
55	<i>Haplocarpha schimperi</i> Sch. Bip. Beauv.	Asteraceae	Getine	H	10°08'06"N,39°38'15"E	3005 m	HW 126
56	<i>Hordeum vulgare</i> L.	Poaceae	Gebss	H	10°04'25"N,39°44'49"E	2929 m	HW 111
57	<i>Helichrysum aff. Schimperi</i> Sch. Bip. ex A. Rich.) Moeser	Asteraceae	Nechillo	S	10°02'34"N,39°39'14"E	2850 m	HW 67
58	<i>Heteromorpha arborescens</i> (Spreng.) Cham. & Schlecht.	Apiaceae	Yegib-mirkuz	S	10°11'67"N,39°48'07"E	2653 m	HW 102
59	<i>Hypoestes forskoolii</i> (Vahl) R.Br.	Acanthaceae	-	H	10°02'38"N,39°39'11"E	2862 m	HW 37

60	<i>Impatiens rothii</i> Hook.f.	Balsaminaceae	Gishilt	H	10°02'35"N,39°39'18"E	2740 m	HW 62
61	<i>Inula confertiflora</i> A.Rich.	Asteraceae	Weynagift	S	10°02'34"N,39°39'14"E	2850 m	HW 68
62	<i>Juniperus procera</i> L.	Cupressaceae	Tid	T	10°11'06"N,39°48'04"E	2568 m	HW 97
63	<i>Jasminium abyssinicum</i> Hochst. ex DC.	Oleaceae	Tenbelel	Cl	10°05'15"N,39°41'48"E	2495 m	HW 4
64	<i>Justicia schimperiana</i> (Hochst. ex Nees) T. Anders.	Acanthaceae	Sense/Simiza	S	10°02'39"N,39°40'02"E	2500 m	HW 116
65	<i>Kalanchoe lanceolata</i> Forssk.	Crassulaceae	Endehohla	H	10°02'34"N,39°39'14"E	2847 m	HW 38
66	<i>Lagenaria abyssinica</i> (Hook f.) C.Jeffrey	Cucurbitaceae	Qil	Cl	10°10'17"N,39°49'35"E	1941 m	HW 85
67	<i>Laggera tomentosa</i> (Sch.Bip ex A.Rich.) Oliv. & Hiern	Asteraceae	Keskesso	Sh	10°05'27"N,39°41'20"E	2657 m	HW 28
68	<i>Lantana camara</i> L.	Verbenaceae	Yeregna-kollo	S	10°11'31"N,39°41'28"E	2087 m	HW122
69	<i>Leonotis ocyimifolia</i> (V.S) Iwarsson	Lamiaceae	Ras-kimir	H	10°02'34"N,39°39'13"E	2857 m	HW 31
70	<i>Lepidium sativum</i> L.	Brassicaceae	Feto	H	10°07'07"N,39°39'31"E	3026 m	HW 78
71	<i>Leucas stachydiformis</i> (Hochst. ex Benth.)	Lamiaceae	Changer	H	10°04'25"N,39°44'49"E	2963 m	HW 105
72	<i>Linum usitatissimu</i> L.	Linaceae	Telba	H	10°05'55"N,39°40'48"E	3039 m	HW 24
73	<i>Lycopersicon esculentum</i> Mill.	Solanaceae	Timatim	H	10°11'17"N,39°49'35"E	1944 m	HW 77
74	<i>Maesa lanceolata</i> Forssk.	Myrsinaceae	Kelewa	S	10°01'14"N,39°36'08"E	2346 m	HW 59
75	<i>Maytenus arbutifolia</i> (A. Rich.) Wilczek	Celastraceae	Atat	S	10°01'24"N,39°32'41"E	2730 m	HW 110
76	<i>Malva verticillata</i> L.	Malvaceae	Lit	H	10°04'25"N,39°44'49"E	2960 m	HW 108
77	<i>Milletia ferruginea</i> (Hochst.) Bak.	Fabaceae	Brbrra	T	10°04'19"N,39°49'09"E	2112 m	HW 132
78	<i>Momordica foetida</i> Schumach.	Cucurbitaceae	kura-hareg	Cl	10°11'10"N,39°49'03"E	2608 m	HW 92
79	<i>Myrica salicifolia</i> A.Rich.	Myricaceae	Shinet	T	10°01'16"N,39°36'09"E	2367 m	HW 57
80	<i>Myrsine africana</i> L.	Myrsinaceae	Kechemo	Sh	10°05'35"N,39°41'37"E	2593 m	HW 27
81	<i>Myrtus communis</i> L.	Myrtaceae	Adess/Barsenet	S	10°11'17"N,39°49'35"E	1941m	HW104

82	<i>Nepeta azurea</i> R. Br. ex Benth.	Lamiaceae	-	H	10°04'25"N,39°44'49"E	2962 m	HW 106
83	<i>Nicotiana tabacum</i> L.	Solanaceae	Tinbaho	H	10°02'34"N,39°39'14"E	2847 m	HW 35
84	<i>Nidorella resedifolia</i> DC.	Asteraceae	Merarcho	H	10°11'06"N,39°48'04"E	2568 m	HW 98
85	<i>Ocimum gratissimum</i> L.	Lamiaceae	--	S	10°11'24"N,39°4'03"E	2133 m	HW 90
86	<i>Ocimum lamiifolium</i> Hochst. ex Benth.,	Lamiaceae	Damakesse	S	10°01'09"N,39°36'03"E	2343 m	HW 60
87	<i>Olea europaea</i> (Wall. ex G. Don) Cif.	Oleaceae	Weyra	T	10°05'15"N,39°41'49"E	2495 m	HW 7
88	<i>Olinia rochetiana</i> A.Juss.	Oliniaceae	Tife	S	10°05'41"N,39°41'44"E	2566 m	HW 12
89	<i>Osyris quadripartita</i> Decn.	Santalaceae	Keret	Sh	10°05'41"N,39°41'44"E	2565 m	HW 15
90	<i>Otostegia integrifolia</i> Benth.	Lamiaceae	Tinzuit	Sh	10°01'35"N,39°32'31"E	2361m	HW 49
91	<i>Pentarrhinum insipidum</i> E. Mey.	Asclepiadaceae	Asekush	Cl	10°03'31"N,39°41'28"E	2681m	HW 109
92	<i>Periploca linearifolia</i> Quart. - Dill. & A. Rich.	Asclepiadaceae	Moider- hareg	Cl	10°03'35"N,39°43'47"E	2692 m	HW 113
93	<i>Phytolacca dodecandra</i> L'Herit.	Phytolaccaceae	Endod	S	10°02'34"N,39°39'14"E	2844 m	HW 40
94	<i>Plantago lanceolata</i> L.	Plantaginaceae	Gorteb	H	10°08'45"N,39°37'46"E	3014 m	HW 127
95	<i>Plantago palmata</i> Hook.f.	Plantaginaceae	-	H	10°05'55"N,39°41'31"E	3020 m	HW 125
96	<i>Plectranthus cylindraceus</i> Hochst. ex Benth.	Lamiaceae	Tiwutiwa	H	10°05'39"N,39°41'55"E	2637 m	HW 26
97	<i>Plectranthus punctatus</i> (L. f.) L'Her.	Lamiaceae	Ayderkush	H	10°05'29"N,39°41'16"E	2721 m	HW 19
98	<i>Podocarpus falcatus</i> (Thunb.) R. B. ex. Mirb.	Podocarpaceae	Zigba	T	10°05'17"N,39°41'47"E	2506 m	HW 1
99	<i>Polygala rupicola</i> A. Rich.	Polygonaceae	Etse-lbona	H	10°05'25"N,39°41'31"E	2533 m	HW 16
100	<i>Premna schimperi</i> Engl.	Lamiaceae	Checho	S	10°00'42"N,39°35'49"E	2374 m	HW 61
101	<i>Prunus africana</i> (Hook. f.) Kalkm.	Rosaceae	Tikur enchet	T	10°11'06"N,39°48'04"E	2568 m	HW 112
102	<i>Rhamnus prinoides</i> L' Herit.	Rhamnaceae	Gesho	S	10°05'31"N,39°41'28"E	2624 m	HW 20
103	<i>Rhus retinorrhoea</i> Oliv.	Anacardaceae	Tilem	S	10°11'06"N,39°48'04"E	2568 m	HW 96

104	<i>Ricinus communis</i> L.	Ephorbiaceae	Gulo	S	10°11'21"N,39°49'33"E	2123 m	HW 83
105	<i>Rosa abyssinica</i> Lindley	Rosaceae	Kega	S	10°11'67"N,39°48'07"E	2653 m	HW 82
106	<i>Rubia cordifolia</i> L.	Rubiaceae	Shakara-hareg	Cl	10°11'17"N,39°49'35"E	1943 m	HW 99
107	<i>Rumex abyssinicus</i> Jacq.	Polygonaceae	Mekmeko	H	10°01'50"N,39°36'11"E	2603 m	HW 51
108	<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Tult	H	10°05'49"N,39°40'48"E	3000 m	HW 23
109	<i>Rumex nervosus</i> Vahl.	Polygonaceae	Emboacho	S	10°02'34"N,39°39'14"E	2847 m	HW 22
110	<i>Ruta chalepensis</i> L.	Rutaceae	Tenadam	H	10°08'40"N,39°47'23"E	2833 m	HW 103
111	<i>Saccharum officinarum</i> L.	Poaceae	Shenkora-ageda	S	10°05'31"N,39°41'28"E	2624 m	HW 29
112	<i>Salvia schimperi</i> Benth.	Lamiaceae	Debrik	H	10°05'33"N,39°41'30"E	2656 m	HW 18
113	<i>Salvia nilotica</i> Jacq.	Lamiaceae	Hulgeb	H	10°05'35"N,39°41'29"E	2640 m	HW 9
114	<i>Sida schimperia</i> Hochst. ex A.Rich.	Malvaceae	Chifrg	S	10°02'33"N,39°39'17"E	2817 m	HW75
115	<i>Silene macrosolen</i> A. Rich.	Caryophyllaceae	Wegert	H	10°11'06"N,39°48'04"E	2582 m	HW101
116	<i>Solanecio gigas</i> (Vatke) C.Jeffrey	Asteraceae	Yeshkoko-gomen	H	10°07'09"N,39°39'27"E	3025 m	HW 95
117	<i>Solanum benadirens</i> Chiov.	Solanaceae	Derenkus-enchet	S	10°02'39"N,39°40'02"E	2501 m	HW 74
118	<i>Solanum anguivi</i> L.	Solanaceae	Zerch-embway	Sh	10°02'37"N,39°39'11"E	2861 m	HW 34
119	<i>Solanum marginatum</i> L.f.	Solanaceae	Geber-embway	S	10°07'08"N,39°39'32"E	3030 m	HW 118
120	<i>Solanum incanum</i> L.	Solanaceae	Embway	S	10°01'13"N,39°36'31"E	2346 m	HW 53
121	<i>Stephania abyssinica</i> (Dill. & A. Rich.) Walp.	Menispermaceae	Engochit-hareg	Cl	10°01'50"N,39°36'11"E	2645 m	HW 54
122	<i>Tagetes minuta</i> L.	Asteraceae	Adar-gemagn	H	10°05'34"N,39°41'29"E	2640 m	HW 21
123	<i>Tephrosia interrupta</i> Hochst. & Steud.ex Engl.	Fabaceae	Kuakucha	H	10°01'24"N,39°32'41"E	2730 m	HW121
124	<i>Thymus schimperi</i> Ronnign.	Lamiaceae	Tosign	H	10°11'21"N,39°47'42"E	3051 m	HW 32
125	<i>Toddalia asiatica</i> (L.) Lam.	Rutaceae	Gumero	S	10°11'15"N,39°49'25"E	2110 m	HW 94
126	<i>Trigonella foenum-graecum</i> L.	Fabaceae	Abish	H	10°02'31"N,39°39'28"E	2839 m	HW 48

127	<i>Urera hypselodendron</i> (A. Rich.) Wedd.	Urticaceae	Lankuso	CI	10°04'25"N,39°44'48"E	2960 m	HW 39
128	<i>Urtica simensis</i> Steud.	Urticaceae	Sama	H	10°08'12"N,39°38'11"E	3015 m	HW 117
129	<i>Verbascum sinaiticum</i> Benth.	Scrophulariaceae	Ketetina /Ye'ahiya joro	H	10°05'35"N,39°41'29"E	2640 m	HW 25
130	<i>Verbena officinalis</i> R. Fernandes & Verdc.	Verbenaceae	Atuch	H	10°01'50"N,39°36'11"E	2603 m	HW 50
131	<i>Vernonia amygdalina</i> Del.	Asteraceae	Girawa	S	10°21'39"N,39°40'02"E	2367 m	HW 63
132	<i>Vernonia bipontini</i> Vatke	Asteraceae	Wishgn/yaset-lib	S	10°05'34"N,39°41'29"E	2640 m	HW 14
133	<i>Withania somnifera</i> (L.) Duna	Solanaceae	Gizewa	S	10°01'16"N,39°36'09"E	2367 m	HW 58
134	<i>Zehneria scabra</i> Linn. f.) Sond.	Cucurbitaceae	Hareg resa/Etse sabek	CI	10°05'31"N,39°41'28"E	2625 m	HW 6

Appendix 2. Medicinal plants with their habitat: (Nh – natural habitat, Hg - home garden, Nh /Hg – both natural and home garden habitat, Rs – road side, Fl – farm land, Rv- riverine), their abundance and uses other than medicine.

Scientific name	Source	Abundance	Other uses
<i>Acacia abyssinica</i>	Hg	Medium	Fence, fire wood, charcoal, building, farming tool,
<i>Achyranthes aspera</i>	Nh	Common	Fodder,
<i>Acmella caulirhiza</i>	Hg	Common	Fodder
<i>Allium cepa</i> *	Hg	Common	Spice, food
<i>Allium sativum</i> *	Hg	Common	As spice,
<i>Aloe pulcherrima</i> ^E	Nh	Rare	Soil erosion prevention, fire wood, as fodder
<i>Aloe debrana</i> ^E	Nh	Common	Soil erosion prevention, fire wood, as fodder, as fumigant
<i>Anemone thomsonii</i>	Rv	Common	Fodder
<i>Anthriscus sylvestris</i>	Hg	Common	Fodder
<i>Apium graveolens</i> *	Hg	Rare	-
<i>Argemone mexicana</i>	Rs	Common	-
<i>Artemisia abyssinica</i>	Nh	Common	Fire wood,
<i>Asparagus africanus</i>	Nh	Common	Fire wood, as tooth cleaner, washing pot
<i>Buddleja polystachya</i>	Hg	Common	Fire wood, cleaning house , washing pot
<i>Brassica nigra</i> *	Fl	Medium	As food,
<i>Calotropis procera</i>	Nh	Rare	Fire wood,
<i>Calpurnia aurea</i>	Nh	Medium	Fire wood, fence, construction,
<i>Capsicum frutescens</i> *	Hg	Medium	As food
<i>Carisa spinarum</i>	Nh	Common	Firewood, charcoal, fence, fodder, food , farming tool
<i>Carthamus tinctorius</i> *	Fl	Medium	As food, fire wood
<i>Chenopodium album</i>	Fl	Common	Fodder
<i>Cicer arietinum</i> *	Fl	Common	As food, fodder
<i>Citrus aurantifolia</i> *	Hg	Medium	As food, fire wood
<i>Clematis simensis</i>	Nh	Common	Fodder,
<i>Clerodendrum myricoides</i>	Nh	Common	Firewood, fodder,
<i>Clusia abyssinica</i>	Nh	Common	Firewood, fence
<i>Coffea arabica</i> *	Hg	Very rare	As food, fence,
<i>Combretum molle</i>	Nh	Very rare	Fire wood, fence, construction,
<i>Conyza stricta</i>	Nh	Common	-
<i>Cordia africana</i>	Nh	Very rare	Construction, furniture, charcoal, firewood, fence , food, fodder , farming tool

Appendix 2 cont...

<i>Croton macrostachyus</i>	Nh	Common	Fire wood, building, furniture, charcoal, fence, farming tool
<i>Cucumis ficifolius</i>	Hg	Common	Fodder,
<i>Datura stramonium</i>	Rs	Common	-
<i>Dichrocephala integrifolia</i>	Hg	Common	-
<i>Discopodium penninervium</i>	Hg	Common	Firewood, fence, washing pot, making bread
<i>Dombeya torrida</i>	Nh	Medium	Fire wood, fodder,
<i>Dodonaea angustifolia</i>	Nh	Common	Fence, firewood, charcoal, as funnel during starvation of fuel, farming tool
<i>Dovyalis abyssinica</i>	Nh	Common	Firewood, fence, as food
<i>Echinops kebericho</i> ^E	Nh	Rare	Fumigate
<i>Echinops hispidus</i>	Nh	Common	Fooder, fire wood
<i>Epilobium hirsutum</i>	Rv	Common	-
<i>Erica arborea</i>	Nh	Medium	Fence, firewood,
<i>Eucalyptus globulus</i> *	Hg	Common	Firewood, construction, farming tool, charcoal, fence
<i>Euclea racemosa</i>	Nh	Medium	Fire wood, fence,
<i>Euphorbia abyssinica</i>	Nh	Common	Construction, furniture, firewood, fence
<i>Ferula communis</i>	Nh	Common	Firewood,
<i>Ficus palmata</i>	Nh	Medium	Fence, fire wood, fodder
<i>Ficus sur</i>	Nh	Common	Construction, firewood,
<i>Ficus vasta</i>	Nh	Rare	Construction, furniture, fire wood, farming tool
<i>Foeniculum vulgare</i> **	Hg	Medium	-
<i>Gomphocarpus purpurascens</i> ^E	Nh	Rare	Fire wood
<i>Grewia ferruginea</i>	Nh	Medium	Firewood , fence,
<i>Hagenia abyssinica</i>	Nh	Common	Furniture, fire wood, farming tool
<i>Haplocarpha schimperi</i>	Nh	Common	Fodder
<i>Hordeum vulgare</i> *	Fl	Common	As food, fooder
<i>Helichrysum aff. schimperi</i>	Nh	Common	Fire wood
<i>Heteromorpha arborescens</i>	Nh	Medium	Fire wood,
<i>Hypoestes forskalii</i>	Nh	Common	Fodder
<i>Impatiens rothii</i> ^E	Nh	Common	Fodder,
<i>Imula confertiflora</i> ^E	Nh	Common	Fire wood, washing milk pot
<i>Juniperus procera</i>	Nh	Medium	Furniture, fire wood, fence, construction, charcoal
<i>Jasminium abyssinicum</i>	Nh	Common	Construction, fodder, fire wood
<i>Justicia schimperiana</i>	Hg	Common	Fire wood, construction, fodder, fence
<i>Kalanchoe lanceolata</i>	Hg	Common	-

Appendix 2 cont...

<i>Lagenaria abyssinica</i> *	Hg	Medium	-
<i>Laggera tomentosa</i> ^E	Nh	Common	Fire wood,
<i>Lantana camara</i>	Nh	Medium	Fire wood, fence
<i>Leonotis ocymifolia</i> **	Hg	Common	-
<i>Lepidium sativum</i> *	Hg	Common	-
<i>Leucas stachydiformis</i> ^E	Hg	Common	Fire wood, house cleaner
<i>Linum usitatissimum</i> *	Fl	Common	Food
<i>Lycopersicon esculentum</i> *	Hg	Common	Food
<i>Maesa lanceolata</i>	Nh	Common	Fire wood, making bread,
<i>Maytenus arbutifolia</i>	Nh	Common	Fence, fire wood,
<i>Malva verticillata</i>	Hg	Common	Fodder
<i>Milletia ferruginea</i> ^E	Nh	Rare	Fire wood, fence, construction
<i>Momordica foetida</i>	Nh	Common	Fodder
<i>Myrica salicifolia</i>	Nh	Medium	Fire wood,
<i>Myrsine africana</i>	Nh	Common	Fire wood, construction, fence
<i>Myrtus communis</i> *	Hg	Common	Spice,
<i>Nepeta azurea</i>	Hg	Common	-
<i>Nicotiana tabacum</i> *	Hg	Common	-
<i>Nidorella resedifolia</i>	Nh	Common	Fodder
<i>Ocimum gratissimum</i>	Nh	Common	Fire wood
<i>Ocimum lamiifolium</i>	Nh	Common	Fire wood,
<i>Olea europaea</i>	Nh	Medium	Construction, fence, fire wood, farming tool, charcoal
<i>Olinia rochetiana</i>	Nh	Common	Farming tool, fire wood,
<i>Osyris quadripartita</i>	Nh	Common	Farming tool, fire wood,
<i>Otostegia integrifolia</i>	Nh	Common	Fire wood
<i>Pentarrhinum insipidum</i>	Nh	Very rare	-
<i>Periploca linearifolia</i>	Nh	Medium	-
<i>Phytolacca dodecandra</i> **	Hg	Common	Fence, washing cloth, fire wood
<i>Plantago lanceolata</i>	Nh	Common	Fodder
<i>Plantago palmata</i>	Nh	Common	Fodder
<i>Plectranthus cylindraceus</i>	Nh	Common	-
<i>Plectranthus punctatus</i>	Nh	Common	-
<i>Podocarpus falcatus</i>	Nh	Very rare	Construction, furniture, firewood, fence, charcoal
<i>Polygala rupicola</i>	Nh	Medium	-
<i>Premna schimperii</i>	Nh	Common	Fence, charcoal, firewood,

Appendix 2 cont...

<i>Prunus africana</i>	Nh	Rare	Furniture , construction, fire wood, fence, charcoal
<i>Rhamnus prinoides</i> *	Hg	Common	Making tella, fire wood
<i>Rhus retinorrhoea</i>	Nh	Common	Charcoal, fodder, fire wood, fence
<i>Ricinus communis</i> ***	Hg	Common	Fire wood, fodder, softing of leather
<i>Rosa abyssinica</i>	Nh	Common	Fire wood, food, fodder, fence
<i>Rubia cordifolia</i>	Nh	Common	Fodder
<i>Rumex abyssinica</i>	Nh	Common	-
<i>Rumex nepalensis</i>	Nh	Common	Fodder
<i>Rumex nervosus</i>	Nh	Common	Fodder, fire wood,
<i>Ruta chalepensis</i> *	Hg	Common	-
<i>Saccharum officinarum</i> *	Hg	Common	As food, fodder
<i>Salvia schimperi</i>	Nh	Common	-
<i>Salvia nilotica</i>	Hg	Common	Fodder
<i>Sida schimperiana</i>	Nh	Common	Fire wood
<i>Silene macrosolen</i>	Nh	Common	Fumigate
<i>Solanecio gigas</i> ^E **	Hg	Very rare	Fire wood, fodder
<i>Solanum benadireense</i> **	Hg	Rare	Fire wood
<i>Solanum anguivi</i>	Nh	Medium	Fire wood
<i>Solanum marginatum</i> ^E	Rs	Common	Fire wood, fence
<i>Solanum incanum</i>	Nh	Common	Fence
<i>Stephania abyssinica</i>	Nh	Common	-
<i>Tagetes minuta</i>	Hg	Common	Fodder
<i>Tephrosia interrupta</i>	Nh	Common	Fire wood
<i>Thymus schimperi</i> ^E	Nh	Common	Fodder
<i>Toddalia asiatica</i>	Nh	Medium	Fire wood, fence
<i>Trigonella foenum-graecum</i> *	Fl	Common	As spice
<i>Urera hypselodendron</i>	Hg	Rare	Fence, fire wood,
<i>Urtica simensis</i> ^E	Hg	Common	Fodder, as food
<i>Verbascum sinaiticum</i>	Hg	Common	Fire wood
<i>Verbena officinalis</i>	Nh	Medium	-
<i>Vernonia amygdalina</i> **	Hg	Rare	Fire wood, fence
<i>Vernonia bipontini</i>	Hg	Common	Fire wood
<i>Withania somnifera</i>	Nh	Very rare	Fire wood
<i>Zehneria scabra</i>	Nh	Common	Fodder

*cultivated species in home garden and farm land; * wild cultivated species; *** species scape from cultivated; ^E- endemic species

Appendix 3. List of medicinal plants used to treat human and livestock ailments, their parts used, preparation, condition of preparation, ailments type, route of administration and application. (Key to abbreviations: Hb- habits; S – shrub; T- tree; H- herb; Cl – climber; Pp-plant parts used; R – root; L- leaf; St- stem; Sb – stem bark; Rb-root bark; Fl – flower; Fr – fruit; Se –seed; Sh – shoot; Rh – rhizome; Bu – bulb; Wh - whole plant; La – latex; Uf- used for; Hu – Human; Li – livestock; Bo –both for Hu and Li; Ra – route of administration; O – oral; Dr – dermal; Na – nasal; Ey – eye; Er – ear; An - anal Ne-neck; Cp – condition of preparation; F- fresh; D- dried; F/D-fresh or dried,

Botanical name	Pp	Uf	Ailment type	Ra	Cp	Preparation and Application
<i>Acacia abyssinica</i>	L	Hu	Wet Tinea capitus	Dr	D	Dried leaves powdered, mixed with <i>Jasminium abyssinica</i> leaves and tied on the head with butter.
<i>Achyranthes aspera</i>	R	Li	Eye mechanical injury	Ey	F	Roots chewed and applied/spat into the infected eye.
			Anthrax	O	F	Fresh roots of this species pounded together with <i>Salvia schimperi</i> roots, soaked with water and drunk.
			Colic	O	F	Roots mixed with the leaves of <i>Verbena officinalis</i> and <i>Urtica simensis</i> , pounded together, mixed with boiled water and
	R	Hu	Tonsillitis, Diarrhea, Stomachache	O	F	Roots of this species pounded together, mixed with water and drunk ½ of coffee cup.
	L	Hu	Fever illness	O	F	Leaves squeezed and the juice drunk with coffee.
	R	Hu	Heamorroid	Dr	F	Fresh roots pounded and applied on the infected part.
<i>Acmella caulirhiza</i>	L	Li	Eye mechanical injury	Ey	F	Flowers chewed and dropped/spat into the injured eye.
<i>Allium cepa</i>	Bu	Hu	Hypertension	O	F	Underground bulbs pounded, mixed with water and drunk a glass of liquid at every morning.
<i>Allium sativum</i>	Bu	Bo	Stomachache	O	F	Underground bulbs pounded with seeds of <i>Lepidium sativum</i> ; then mixed with water and drunk.
		Hu	Evil eye	O	F	Bulbs mixed with <i>Ruta chalepensis</i> powder and <i>Carisa spinarum</i> fruits, and then pounded, mixed with little water and drunk.

		Hu	Malaria	O	F	Bulbs crushed, mixed with <i>Ruta chalepensis</i> powder and <i>Capsicum annum</i> fruits and eaten.
		Bo	Bloating	O	F	Bulbs pounded with <i>Lepidium sativum</i> seeds, soaked with hot water and given to drunk.
<i>Aloe pulcherrima</i>	L	Hu	Eye disease	Ey	F	The juice from the internal part of the leaves squeezed and droplets of latex applied into the eye.
			Impotency	Dr	F	Used to improve the problem of Impotency by preparing and applying in various ways.
			Snake bite	O	F	The fresh leaf eaten.
<i>Aloe debrana</i>	L	Hu	Evil eye	Na	D	The dried leaf is put on fire, and then inhales the vapour.
		Hu	Malaria	O	F	Leaf part of this plant crushed with <i>Allium sativum</i> bulb, <i>Lepidium sativum</i> and <i>Sesamun orientele</i> seeds; then soaked with water, left over night and drunk.
	R	Hu	Rh-factor	O	D	Dried roots crushed together with the roots of <i>Pennisetum sphacelatum</i> , then added with their food and eaten for several days.
<i>Anemone thomsonii</i>	L	Hu	Leschmaniasis	Dr	F	Seven leaves crushed, then massage the affected part and also tied on it.
<i>Anthriscus sylvestris</i>	R	Hu	Hepatitis	Dr	F	Fresh roots pounded together with the root of <i>Kalanchoe lanceolata</i> and tied on the head.
<i>Apium graveolens</i>	Wh	Hu	Diabetes	O	F	The whole parts of <i>Apium graveolens</i> pounded, boiled with water and drunk several time.
<i>Argemone mexicana</i>	Lax	Hu	Wound, Ring worm	Dr	F	Latex of <i>Argemone mexicana</i> squeezed and smeared on the infected part.
<i>Artemisia abyssinica</i>	L	Hu	Common cold, Cough	O	F	Leaves boiled in water and the liquid drunk with sugar or honey or the steam inhaled.
			Evil eye	Na	D	Dried leaves put on fire and inhale the smoke.
		Li	Skin infection	Dr	F	Leaves pounded and then smear the whole part.

<i>Asparagus africana</i>	L	Hu	Skin infection	Dr	F	Leaves chewed, mixed with honey, and then spat on the skin.
	R	Bo	Placenta retention	O	F	Seven apexes of the roots crushed, squeezed and then drunk the juice.
<i>Budeleja polystachya</i>	L	Li	Leech	O	F	Seven leaves of this plant pounded together with fruits of <i>Phytolaca dodecandra</i> , mixed with salt, then soaked with water and given to drunk.
<i>Brassica nigra</i>	Fr	Hu	Skin infection/ disease	Dr	D	Dried seeds powdered, mixed with little water, and then smeared on the whole part of the body.
<i>Calotropis procera</i>	L	Hu	Wound	Dr	F	Fresh leaves squeezed, and then smeared the juice on the wound.
<i>Calpurnia aurea</i>	L	Li	Lice infestation	Dr	F	Leaf parts of this species pounded, squeezed with little water and smeared the infected part.
<i>Capsicum frutescens</i>	Wh	Hu	Wound	Dr	F	Fresh part mixed with <i>Allium sativum</i> bulb, then pounded together and tied on the wound for a day.
<i>Carrisa spinarum</i>	L	Hu	Itching	Dr	F	Leaves crushed together with <i>Eragrostis tef</i> , then mixed with yolk of egg and tied on the infected part by covering <i>Ricinus communis</i> leaf.
	R,L	Hu	Evil eye	Na	F/ D	Leaves and roots of this plant put on the fire and inhale the smoke.
<i>Carthamus tinctorius</i>	Se	Hu	Cough, Common cold	O	D	Seeds powdered with <i>Guizotia abyssinica</i> , mixed with water and boiled; then drunk continuously for days.
<i>Chenopodium album</i>	L	Hu	Wound	Dr	F	Leaves roasted, powdered, mixed with butter and applied on the affected part until the wound is healed.
			Intestinal Parasite	O	D	Leaves powdered, mixed with hot water and Areke; then drunk a cup of in the morning for 4-6 days.
	Se	Hu	Bone fracture	O	D	Seeds powdered, mixed with water and prepare it as bread, then eating.
			Malaria	O	D	Seeds soaked in water until germination, then mixed with <i>Ruta chalepensis</i> powder and eating.

<i>Citrus aurantifolia</i>	Fr	Hu	Itching/Scabies	Dr	F	Juice of the fruit squeezed and smeared the affected part.
<i>Clematis simensis</i>	L	Hu	Eczema, Leprosy	Dr	F	Leaves pounded and tied on the affected parts.
			Uvilitis	Dr	F	Leaves pounded, mixed with butter and tied on the head.
<i>Clerodendrum myricoides</i>	R	Hu	Snake bite	Dr	F	Seven young roots pounded and tied with a piece of cloth to the affected parts.
	Wh	Hu	Stomach ache	O	F	Whole parts of the plant pounded with the leaf of, <i>Croton macrostachyus</i> and roots of <i>Solanum marginatum</i> then squeezed with little water and drunk the juice.
	R	Hu	Evil eye	Na	D	Dried roots pounded and put on fire, and then the smoke inhaled.
<i>Clutia abyssinica</i>	R	Hu	Wart/ heamorroid	Dr	F	Roots pounded and tied on the sore or affected part.
	L	Hu	Wound	Dr	F	Leaves pounded together with the seed of <i>Linum usitatissimu</i> and salt, and then tied on the wound.
<i>Combretum molle</i>	Fr,L	Hu	Leprosy, Eczema	Dr	D	Dried fruits and leaves powdered and put on the wound.
<i>Conyza strieta</i>	L	Hu	Fever illness, cough	O	F	Leaves of this plant is mixed with leaf of <i>Lippia adoensis</i> , then pounded, mixed with water and finally drunk or massage the whole body.
<i>Cordia africana</i>	Sb	Hu	Continous flow of menstruation	O	F /D	Bark pounded, mixed with water and drunk with one coffee cup it for three Consecutive days.
			Arthritis/Rheumatic pain	O	F	Bark boiled together with honey and drunk.
			Haemorrhage/ Bleeding	Dr	F	Fresh leaves pounded and applied to the bleeding part.
<i>Croton macrostachyus</i>	Sb	Li	Anthrax	O	F	Bark of the stem pounded, soaked with water and given to drunk.
		Hu	Haemorrhage/ Bleeding	Dr	F	Fresh bark pounded and tied to the affected part/wound.
	Lax	Hu	Ring worm	Dr	F	Collect the juice and apply to the skin.

<i>Cucumis ficifolius</i>	R	Hu	Stomachache	O	F/D	Roots chewed and the juice swallowed or Root pounded, squeezed with water, and then drunk.
			Hepatitis	O	F/D	Roots pounded, soaked with water overnight, and then drunk in the morning with local Beer “tella” before eating food.
			Hernia, Retained placenta	O	D	Dried roots pounded, soaked with water and drunk the liquid.
			Gonorrhoea	O	D	Dried roots mixed with <i>Cyphostemma adenoculace</i> roots, pounded, mixed with honey and eaten. After that chicken fat consumed and milk drunk to reduce the toxicity.
		Bo	Rabies	O	F/D	Root pounded with <i>Budeleja polystachya</i> and <i>Solanum anguvi</i> roots, soaked with water and drunk.
		Li	Anthrax	O	F/D	Roots pounded, soaked with water, and then drunk.
<i>Datura stramonium</i>	Fr, L	Hu	Tinea capitis	Dr	D	Dried fruits and leaves powdered, mixed with water and wash the head.
<i>Dichrocephala integrifolia</i>	L	Hu	Wart	Dr	F	Fresh leaves of this plant pounded and tied on the infected part.
<i>Discopodium penninervium</i>	L	Hu	Hernia	O	F	Apex of leaves pounded with <i>Laggera tomentosa</i> leaves and then boiled with honey and drunk before eating food.
<i>Dombeya torrida</i>	R	Hu	Wound	Dr	F	Roots pounded, mixed with water and then wash the wound with it.
<i>Dodonaea angustifolia</i>	Fr	Hu	Malaria	O	D	Dried fruit pounded and mixed with honey, then eaten.
	L	Hu	Eczema	Dr	F	Leaves pounded and tied with a piece of cloth on the affected part.
	L	Li	Bone fracture	Dr	F	Fresh leaflets arranged on the affected parts and covered by cloth and <i>Arundo donax</i> then tied.
<i>Dovyalis abyssinica</i>	Fr	Hu	Intestinal parasite	O	F	Fruit eaten raw or roasted.

<i>Echinops kebericho</i>	R	Hu	Epidemic, Evil eye, Common cold	Na	D	Dried roots pounded, put on fire and the smoke inhaled.
<i>Echinops hispidus</i>	R	Hu	Arthritis	Dr	F	Roots wrapped on a piece of leather or cloth, then hang up on the neck.
			Pneumonia	O	F	Fresh roots pounded, soaked with water then drunk.
<i>Ehretia cymosa</i>	L	Hu	Snake bite / Poison	Dr	F	Leaf mixed with the roots of <i>Verbascum sinaiticum</i> , then pounded and tied on the affected part.
	R& L	Hu	Toothache	O	D	Leaves and roots of <i>Ehretia cymosa</i> with the seed of <i>Datura stramonium</i> pounded together and put on the affected part or teeth.
<i>Epilobium hirsutum</i>	Wh	Li	Lice infestation	Dr	F	Whole parts of the plant are pounded, mixed with water and squeezed, then smeared to the whole body.
<i>Erica arborea</i>	L	Hu	Circumcision	Dr	F	Fresh leaf mixed with leaves of <i>Verbascum sinaiticum</i> and <i>lichen</i> , then pounded together and powder put on affecting part.
<i>Eucalyptus globulus</i>	L	Bo	Emergency, Bloating	O	F	Leaves pounded, boiled with water and honey then drunk.
		Hu	Common cold	O	F	The young leaves are boiled with water and inhale the steam.
<i>Euclea racemosa</i>	R	Hu	Epidemic	O	F	Fresh roots pounded with the roots of <i>Premna schimperi</i> and <i>Laggera tomentosa</i> and boiled, then drunk a coffee cup for seven days consecutively.
<i>Euphorbia abyssinica</i>	Lax	Hu	Leshimaniasis	Dr	F	Milky latex collected and smeared on the affected part.
	Lax	Hu	Ascariasis	O	F	Milky latex collected seven droplets of it added on hot "Engera" and eaten in the morning before food and milk drunk to reduce toxicity.
	F	Hu	Tumor, Leprosy	Dr	F	Fresh flower pounded, mixed with honey, and then pasted on the affected part.
	L	Li	Strangle	Na	D	Dried leaves put on fire, the smoke inhaled for three days.

	R	Bo	Rabies	O	F/D	Roots pounded, soaked with water and drunk ½ of tea cup for human, 1-2 glasses for cattle.
<i>Ferula communis</i>	R	Hu	Hepatitis	Dr	F	Roots pounded and mixed with butter; then tied on the head.
		Li	Anthrax	O	F	Roots pounded with <i>Allium sativum</i> bulb, then mixed with "Areke" and drunk.
<i>Ficus palmata</i>	R	Hu	Tubererculosis	O	F	Young roots pounded, mixed with honey and milk, boiled and drunk.
	Lax	Hu	Ring worm, Wart	Dr	F	Simply collect the milky latex, then smeared on the affected part.
	Lax	Hu	Ear lesion	Er	F	Milky latex collected and added into the ear.
<i>Ficus sur</i>	Sb	Hu	Heart disease	O	D	Dried bark powdered, boiled with water and drunk as tea continuously.
<i>Ficus vasta</i>	R	Hu	Ascariasis	O	F	Young roots pounded, mixed with water then drunk a cup of it.
	Sb	Hu	Eczema	Dr	F, D	Either the fresh or dried bark pounded, mixed with butter, and then tied on the infected part.
<i>Foeniculum vulgare</i>	Wh	Bo	Urinary retention	O	F	The whole parts of the plant pounded together, boiled with water, then decanted and drunk.
<i>Gomphocarpus purpurascens</i>	Lax	Hu	Eczema	Dr	D	Latex collected and applied on the infected part.
	Sb	Hu	Wet Tinea capitus	Dr	F	Fresh bark of the stem pounded, mixed with butter and tied on the wound.
<i>Grewia ferruginea</i>	L	Li	Placenta retention	O	F	Leaves pounded, mixed with water then given it to drunk for cattle.
	L&St	Li	CBPP (continuous bouinepele)	O	F	The stem and leaves of this plant are mixed with the seed of <i>Linum usitatissimu</i> , pounded together and mixed with water; then given to drunk.
<i>Hagenia abyssinica</i>	F	Hu	Tape worm	O	D	Flowers powdered, soaked with milk or Tella then drunk 1 glass before eating food.
	R	Li	Rh-factor	Dr	F	Fresh root of this plant sewed with a piece of cloth and hang up on the neck.

<i>Haplocarpha schimperi</i>	L	Hu	Haemorrhage/Bleeding	Dr	F	Fresh leaves pounded, squeezed and tied on the bleeding parts.
<i>Hordeum vulgare</i>	Se	Hu	Gastric,ulcer, Bone fracture	O	D	Seeds slightly roasted, powdered to make "Besso" or porridge, and then eaten.
<i>Helichrysum aff. schimperi</i>	L	Li	Bone fracture	Dr	F	Young leaves arranged in parallel to the broken part, covered by <i>Arundo donax</i> and then tied until the broken part improves.
		Bo	Menorrhagia, Retained placenta, Prolonged labour/delivery difficult	O	F	Seven young leaves of this plant pounded together with the leaves of <i>Vernonia leopoldii</i> , soaked with water and then given to drunk 1 glass for human, 2 or 3 glasses for cattle.
<i>Heteromorpha arborescens</i>	R	Li	Cloudiness of eye	Ey	F	The young roots tips pounded, squeezed, and then 2-3 droplets of the juice added into the eye for continuously until the illness decrease.
<i>Hypoestes forskalii</i>	Wh	Hu	Wound,snake bite	Dr	F	The whole parts of this plant pounded and tied on the wound.
<i>Impatiens rothii</i>	R	Hu	Abortion	O	F	Roots pounded, squeezed and then drunk the juice.
		Li	anthrax	O	F	The roots of this plant pounded together with the roots of <i>Salvia schimperi</i> , <i>Solanum marginatum</i> , <i>Leonotis ocymifolia</i> , soaked with water and drunk.
<i>Inula confertiflora</i>	L	Li	Cloudiness of Eye	Ey	F	Young leaves pounded, squeezed the juice and add the juice in to the eye.
		Hu	Uvulitis	O	F	Leaves pounded, squeezed with little water and drunk.
		Hu	Tooth ache	O	F	Seven leaves pounded together with five leaves of <i>Zehmeria scabra</i> and applied on the infect teeth.
			Pityriasis Versicolor	Dr	F	Seven leaves pounded, squeezed and the discolored part smeared with juice.

<i>Juniperus procera</i>	L	Li	Strangle	Na	F	Fresh leaves pounded together with leaves of <i>Rumex nervosus</i> ; squeezed, the juices mixed with honey and then added it into the nose.
<i>Jasminium abyssinicum</i>	L	Hu	Cough	Na	D	Seven leaves crushed, dried and put on fire and inhale the smoke through mouth and nose.
			Skin rash	Dr	F	Seven leaf tips chewed and spat on the skin.
			Eye disease	Ey	F	Leaves crushed, mixed with little water, then squeezed and applied 2 droplets into the eye.
	L,R	Hu	Stomachache	O	F	The tip of roots chewed and the liquid swallowed.
<i>Justicia schimperiana</i>	L	Hu	Hepatitis	O	F	Seven young leaves of this species pounded together with leaves of <i>Croton macrostachyus</i> , mixed with butter and paste on Enjera and eaten continuously.
<i>Kalanchoe lanceolata</i>	R	Hu	Uvilitis	O&Na	F	Seven young roots pounded, squeezed and drunk with a cup or added a droplet through nose.
	L	Hu	Wound	Dr	F	The leaf warmed on fire and the wound warmed by it.
<i>Lagenaria abyssinica</i>	L	Hu	Ear lesion	Er	F	Leave pounded, squeezed and 2 or 3 droplets of the juice added in to the ear.
<i>Laggera tomentosa</i>	R	Li	Anthrax	O	F	Root pounded with roots of <i>Solanum marginatum</i> , <i>Impatient rothii</i> , <i>Rumex nervosus</i> and soaked with water, then given to drunk.
<i>Lantana camara</i>	L	Li	Leech	O, Na	F	Leaves pounded, squeezed, mixed with water, drunk and/or added through nose.
<i>Leonotis ocymifolia</i>	L	Hu	Eye disease	Ey	F	Fresh leaves squeezed and 2 or 3 droplets of juice added into the eye.
			Ascariasis	O	F	Fresh leaves pounded, soaked with one glass of water and then drunk before eating food.
<i>Lepidium sativum</i>	Se	Hu	Dysentery	O	D	Dried seeds powdered, boiled with milk especially with "yogurt" and drunk until the disease are treated.
<i>Leucas stachyiformis</i>	L	Hu	Fever illness, Headache	O	F	Leaves mixed with the leaves of <i>Achyranthes aspera</i> and <i>Laggera tomentosa</i> , then pounded, squeezed and then smeared the body.

<i>Linum usitatissimu</i>	Se	Hu	Dandruff	Dr	D	Dried seeds powdered, soaked in water and then painted the affected part.
			Constipation/ Enema	O	D	Seeds boiled in water, decanted and the liquid drunk.
			Diarrhea	O	D	Seeds of this species and seed of <i>Salvia shimperi</i> powdered, mixed with a powder of <i>Eraginostic tef</i> or <i>Hordeum vulgare</i> , then bread prepared and
			Wound, swelling	Dr	D	Seeds powdered, mixed with honey and then tied on the affected part.
<i>Lycopersicon esculentum</i>	L	Hu	Urinary retention	O	F	Leaves boiled with water and drunk 1 glass for humans and 2or 3 glasses for cattle.
		Li	Leech	O	F	Leaves pounded, soaked with water, then give for cattle to drunk or add through nose.
<i>Maesa lanceolata</i>	Fr	Hu	Ascariasis	O	F	Fruit pounded, boiled with water and drunk 1glass of it.
			Tape worm	Dr	F	The ripe fruits cooked as “stew” and eaten with Enjera.
			Itching/Scabis	Dr	F	Fruits boiled in water and washed the infected parts.
<i>Maytenus arbutifolia</i>	R	Hu	Pain	O	F	Fresh roots chewed and the juice swallowed.
<i>Malva verticillata</i>	L	Hu	Menorragia, Hypertension	O	D	Dried leaves of the plant together with the leaves of <i>Solanum marginatum</i> and powdered, mixed with honey, then eaten. And also the product tied on
<i>Milletia ferruginea</i>	R	Hu	Eczema	Dr	F	Roots pounded and tied to the infected part.
<i>Momordica foetida</i>	L	Hu	Swelling, Wet tinea capitus	Dr	F	Leaves pounded, mixed with honey and tied on the swollen part and head.
<i>Myrica salicifolia</i>	Sb	Hu	Tonsillitis	O	F/ D	Barks powdered, boiled in water, then drunk and the liquid retained in the mouth for a few minutes before swallowed.
			Epistaxis	Na	D	Dried bark powdered and put on the hollow part of <i>Arundo donax</i> stem, then smlle through the nose.

	R	Hu	Hepatitis	O	F	Fresh root pounded, boiled with water, when cooled, mixed with "Tella" and then drunk.
	Sb	Li	Mechanical injury of eye	Ey	D	Barks slightly roasted, powdered, and then added the powder into the eye.
<i>Myrsine africana</i>	L	Hu	Skin infection	Dr	F	Leaves of this species together with the leaves of <i>Maytemus arbutifolia</i> pounded, soaked with water and then the infected skin smeared.
<i>Myrtus communis</i>	L	Hu	Eviel eye	O	F	Leaves of this plant together with the leaves of <i>Carissa spinarum</i> and <i>Ruta chalepensis</i> , pounded, soaked with water then drunk.
<i>Nepeta azurea</i>	L	Li	Anthrax	O	F	Leaves pounded, soaked with water, and then drunk.
<i>Nicotiana tabacum</i>	L	Li	Leech	O/ Na	F	Leaves pounded, squeezed with water, 1-2 glasses of liquid is give to drunk for cattle and add some of it through oral.
<i>Nidorella resedifolia</i>	R	Hu	Stomachache	O	F/ D	Roots chewed and the juice swallowed or Roots together with the roots of <i>Cucumis ficifolius</i> , <i>Solanum anguivi</i> and <i>Withania somnifera</i> , powdered, soaked with water and drunk.
<i>Ocimum gratissimum</i>	L	Hu	Fever illness,	O	F	Fresh leaves pounded, squeezed with water; and then drunk.
<i>Ocimum lamifolium</i>	L	Hu	Fever illness, Headache, Measle,Cough	O, Dr	F/ D	Fresh or dried leaves pounded, mixed with water, and then give to the patient to drunk and/ or massage the whole part of the body.
<i>Olea europaea</i>	L	Hu	Trachoma	Ey	F	Leaves pounded, squeezed with little water and droplet of juice added into the eye.
			Skin infection	Dr	F	Leaves pounded with leaves of <i>Podocarpus falcatus</i> , mixed with little water and then the skin painted with juice.
<i>Olinia rochetiana</i>	L	Hu	Eczema, Leprosy	Dr	F	Fresh leaves pounded together with leaves of <i>Inula confertiflora</i> or <i>Clematis simensis</i> , mixed with butter, then tied on the infected part.
			Itching	Dr	D	Dried leaves pounded, mixed with butter and smeared the infected parts.

<i>Osyris quadripartita</i>	R	Hu	Evil eye	Na	D	Roots of this species together with roots of <i>Carissa spanarum</i> , pounded, dried and put on fire, then inhale the smoke.
	L	Hu	Post partum Haemmorrhage	O	F	Fresh leaves pounded, mixed with water and then drunk it.
			Skin infection	Dr	F	Leaves pounded, mixed with water then smeared the infected skin.
<i>Ostostegia integrifolia</i>	R	Hu	Stomachache	O	F	Young roots chewed and the juice swallowed.
<i>Pentarrhinum insipidum</i>	R	Hu	Gonorrhoea	O	D	Dried roots of plants together with roots of <i>Cucumis ficifolius</i> , pounded, mixed with honey, then eaten. To reduce toxicity, milk drunk and chicken fat eaten.
<i>Periploca linearifolia</i>	St	Hu	heamorroid	Dr	F	Young stem put on fire, warmed, then the swollen part warmed by it.
<i>Phytolacca dodecandra</i>	R	Bo	Rabies	O	D	The roots of this species mixed with the root of <i>Euphorbia ampliphylla</i> and <i>Dovyalis abyssinica</i> , pounded, soaked with water. For man, it is mixed with honey/sugar and drunk ¼ of the coffee cup. For cattle, it is soaked by three glasses of water and ½ of "Tella" then retain it for three days. After that give for cattle through mouth and noise within three days gap.
	R, L	Hu	Malaria	O	F	Roots and leaves pounded together, mixed with water and drunk in the morning for three consecutive days.
	R	Hu	Abortion	O	F	Fresh roots pounded, soaked with water, decanted and then drunk.
<i>Plantago lanceolata</i>	L	Hu	Wound	Dr	D	Dried leaves powdered and applied on the wound.
<i>Plantago palmate</i>	L	Hu	Ring worm	Dr	F	Leaves pounded, squeezed and smeared the juice on the infected skin.
<i>Plecranthus cylindraceus</i>	L	Hu	Common cold, Epidemic	Dr/ Na	F	Leaves pounded and then massage the whole part of the body.
			Ascariasis	O	F	Leaves pounded, boiled with water and drunk continuously for three days.
	Li	CBPP	O	F	Fresh leaves pounded, mixed with water then drunk.	

<i>Plantago palmate</i>	L	Hu	Ring worm	Dr	F	Leaves pounded, squeezed and smeared the juice on the infected skin.
<i>Plecranthus cylindraceus</i>	L	Hu	Common cold, Epidemic	Dr/ Na	F	Leaves pounded and then massage the whole part of the body.
			Ascariasis	O	F	Leaves pounded, boiled with water and drunk continuously for three days.
	Ca	CBPP	O	F	Fresh leaves pounded, mixed with water then drunk.	
<i>Plectranthus punctatus</i>	L	Hu	Uvilitis, Fever illness, Malaria	O	F	Seven fresh leaves pounded together with leaves of <i>Leonotis ocymifolia</i> , squeezed with water, then drunk. Retain the liquid in the mouth for few seconds for Uvilitis.
<i>Podocarpus falcatus</i>	R	Hu	Tuberculosis, Diarrhea, Ascariasis	O	D	Young dried roots washed, powdered, boiled with honey and drunk as tea for continuous days.
<i>Polygala rupicola</i>	R	Hu	Stomachache	O	F	Root chewed and the liquid swallowed or root pounded, soaked with water and drunk.
	Wh	Hu	Snake bite/ Poison	Dr	F	Whole parts of the plant pounded, mixed with honey, and then tied on the infected parts.
<i>Premna schimperi</i>	L	Li	Mechanical injure of eye	Ey	F	Seven young leaves of this plant together with seven leaves of <i>Croton macrostachyus</i> and <i>Datura stramonium</i> , pounded, squeezed with urine, and droplets of the juice added into eye.
	R	Hu	Tonsillitis	O	F	Young roots chewed and the juice swallowed.
<i>Prunus africana</i>	L	Ca	Leech	O	F	Leaves pounded with the fresh leaves of <i>Ruta chalepensis</i> and <i>Phytolacca dodecandra</i> , and then add into the water to kill leeches.
<i>Rhamnus prinoides</i>	L	Hu	Uvilitis	O	F	Young leaflets pounded, squeezed with water and drunk.
	Fr	Hu	Dandruff	Dr	D	Dried fruits pounded and the powder tied on the head.

<i>Rhus retinorrhoea</i>	L	Hu	Hepatitis	O	F/ D	The leaves are mixed with the roots of <i>Rumex abyssinica</i> and pounded, soaked with "Tella"; then drank it before eating food.
<i>Ricinus communis</i>	L	Hu	Anal prolepses	Dr	F	The upper part of leaf washed, mixed with fresh butter, warmed on sun, and then pasted the anus with leaf and pushe until the original anus return original place.
<i>Rosa abyssinica</i>	L	Hu	Skin rash/ infection	Dr	F	Leaves pounded together with the leaves of <i>Olea europia sub.caspidata</i> , mixed with water and washed continuous-lly for several days.
<i>Rubia cordifolia</i>	R	Hu	Cough	O	F/ D	Roots pounded, boiled with coffee and butter and then drunk during the evening before sleep continuously for a number of days.
<i>Rumex abyssinicus</i>	R	Hu	Wart / hemorroid	O	F	Roots pounded, boiled with water, and drunk in every morning with honey or sugar.
		Li	Africanhors sickness	O	F	Roots pounded, mixed with water and given to drunk.
<i>Rumex nepalensis</i>	R	Bo	Stomachache, Arthritis	O	F	Fresh roots chewed and the juice swallowed.
		Li	Anthrax	Dr	F	Roots chewed, inserted the juice through the hole of the front leg (upper part) of the cattle.
<i>Rumex nervosus</i>	St	Hu	Fire burning	Dr	D	Stem roasted, crushed and applied on the affected parts.
	St	Hu	Abdominal cramp	O	F	Young stem chewed and juice swallowed.
	L		Haemmorrhage	Dr	F	Leaves crushed and put on the bleeding part.
Epistaxis			Na	F	Seven apices of leaf squeezed and the juice sniffed through nose.	
<i>Ruta chalepensis</i>	L	Hu	Epistaxis	Na	F	Fresh leaves pounded and the juice sniffed through nose.
<i>Saccharum officinarum</i>	St	Hu	Cough, Gastritis	O	F	Stem pounded, boiled with water, then drunk it or peel the epidermal layer, chew the inner part and swallowed the juice.

<i>Salvia schimperi</i>	Se	Hu	Diarrhea, Abdominal cramp, post partum haemorrhage	O	D	Seeds powdered, mixed with a powder of <i>Hordeum vulgare</i> and water, bread or juice prepared, and then eaten.
	L	Li	Bone fracture	Dr	F	Fresh leaflets arranged in parallel on the affected parts and covered by cloth and <i>Arundo donax</i> , then tied.
<i>Salvia nilotica</i>	L	Hu	Fever illness, Headache	O	F	Fresh leaves mixed with the leaves of <i>Eucalyptus globules</i> and <i>Artemisia abyssinica</i> , pounded, soaked with water and drunk.
<i>Sida schimperiana</i>	R	Hu	Syphlis	O	D	Roots of this plant together with roots of <i>Solanum anguivi</i> , powdered, mixed with honey and then eaten.
<i>Silence macrosolen</i>	R	Hu	Tape worm	O	D	Dried roots mixed with seeds of <i>Guizotia abyssinica</i> , powdered together and eaten.
<i>Solanecio gigas</i>	L	Li	Diarrhea	O	F	Leaves pounded, soaked with water for three or more days, and then drunk the sheep continuously.
<i>Solanum benadirensense</i>	Wh	Bo	Epidemic, African horse sickness	Na	F, D	Whole parts of the plant put on fire and fumigate the smoke at the home and surrounding.
<i>Solanum anguivi</i>	R	Hu	Uvilitis	O	F	Roots pounded, squeezed with little of water, and drunk <i>half of the cup</i> .
	Fr	Hu	Itching/scabies	Dr	F	Sup of the fruit squeezed and smeared/ painted on the affected part or skin.
	R	Hu	Skin infection	Dr	F	Root pounded, mixed with water and the infected part washed.
<i>Solanum marginatum</i>	Fr	Li	Mange mites	Dr	F	Fluid of the fruit smeared on the affected parts.
	R	Bo	Bloating	O	F	Root pounded, mixing with water, then drunk.
	Fr	Hu	Tuberculosis	O	D	Dried fruit pounded, boiled with butter and drunk continuously as tea.
	R	Hu	Toothache	O	F	Roots chewed and the liquids swallowed.
<i>Solanum incanum.</i>	R	Hu	Stomachache, Acute sickness (emergency)	O	F	Roots chewed and the juice swallowed during pain.

<i>Stephania abyssinica</i>	Wh	Li	Skin disease	Dr	F	Tied it on the neck of the cattle.
<i>Tagetes minuta</i>	L	Hu	Emergency, Bleeding	Dr	F	The leaves pounded together with the leaves of <i>Vernonia leopoldii</i> , then squeezed with water and drunk or tied.
<i>Tephrosia interrupta</i>	L	Hu	Wound	Dr	D	Dried leaves roasted, powdered, mixed with butter then tied.
<i>Thymus schimperi</i>	L	Hu	Hypertension	O	D	Leaves boiled in water just like tea, and then drunk continuously.
<i>Toddalia asiatica</i>	R	Hu	Evil eye	Na	D	Roots mixed with cat hair and put on fire, then inhale the smoke.
<i>Trigonella foenum-graecum</i>	Se	Hu	Swelling	Dr	D	Seeds mixed with <i>Faba bean</i> and Goat dung powdered, soaked with water then tied on the swollen part.
<i>Urera hypselodendron</i>	L	Bo	Retained placenta	O	F	Leaves pounded, squeezed with little water, and then the juice drunk.
<i>Urtica simensis</i>	L	Hu	Gastritis	O	F/ D	Leaves boiled, added Barley powder then “stew” prepared and eaten.
		Bo	Stomachache	O	F	Roots together with leaves of <i>Leonotis ocyimifolia</i> pounded, mixed with water then drunk.
<i>Verbascum sinaiticum</i>	R	Li	Nerve problems	Dr	F	Fresh roots pounded, mixed with ‘fresh’ butter, put on fire and inhale the smoke through nose.
		Hu	Haemmorrhage	Dr	F	Leaves pounded and tied on the bleeding part.
			Snake bite	Dr	F	Root pounded and tied on the bitten part or roots chewed and the juice swallowed.
			Eye disease	Ey	F	Fresh roots pounded, squeezed and droplet of liquid added into the eye, and then the eye open to the wind.
	L	Hu	Skin infection	O	F	Leaves together with the leaves of <i>Osyris quadripartita</i> , pounded and painted on the skin.
	Uvilitis		Dr	F	Leaves pounded and tied on the head for 30 minutes.	

			Bleeding	Dr	F	The leaves pounded and tied on the bleeding.
	R	Hu	Stomachache, emergency	O	F	Fresh roots chewed together with the fruit of <i>Lepidium sativum</i> and the juice swallowed.
<i>Verbena officinalis</i>	R	Hu	Diarrhea, Stomachache	O	F	Roots pounded, mixed with water then drunk.
	L		Deafness	Er	F/ D	Leaves pounded together with the leaves <i>Guizotia abyssinica</i> , mixed with 'goat butter', heated on sun and then droplets added into the ear.
			Tonsillitis	O/ Dr	F	Leaves pounded, squeezed with water, and then drunk. Retained the juice in the mouth for 1-3 minute before swallowed. The juice smear to the external part of the neck.
<i>Vernonia amygdalina</i>	L	Hu	Stomachache, Emergency	O	F	Fresh leaves pounded, squeezed and the juice drunk.
	R		Evil eye	Na	D	Dried roots put on fire and inhale the smoke.
	R	Bo	Emergency	O	F	Root of <i>Vernonia amygdalina</i> chewed together with the leaves of <i>Ruta chalepensis</i> and the juice swallowed.
<i>Vernonia bipontini</i>	L	Hu	Stomachache	O	F	Leaves pounded, squeezed with little water, and then drunk the liquid.
		Li	Anthrax	O	F	Leaves of this plant together with the leaf of <i>Buddleja polystachya</i> pounded, mixed with little water, squeezed and drunk the liquid for cattle.
<i>Withania somnifera</i>	L	Bo	Bloating, stomachache, Emergency	O & D	F	Leaves pounded, soaked with water, and then the juice drunk and also massage the abdomen three times.
		R	Li	CBPP	O	F
		Li	Nerve problem	O	F	Leaves pounded, soaked with water and given to drunk for three or five days.
<i>Zehneria scabra</i>	L	Hu	Tania capitus	Dr	F	Leaves pounded, squeezed and then the juice painted on the affected part.
			Bloating	O	F	Mixture of the leaves of this plant together with leaves of <i>Leonotis ocyimifolia</i> and <i>Artemisia abyssinica</i> pounded, squeezed with little water and drunk.

Key= see appendix 1 for family, local name and habit of the MPs

Appendix 4. The number of genera and MP species use for both human and livestock in each families

No	Family	Number of genera	%	Number of species in each families				%
				Human	Livestock	Both	Total	
1	Asteraceae	14	11.76	8	3	5	16	11.94
2	Lamiaceae	10	8.40	9	1	3	13	9.70
3	Solanaceae	7	5.88	5	1	4	10	7.46
4	Fabaceae	6	5.04	5	1	-	6	4.78
5	Apiaceae	5	4.20	2	1	2	5	3.73
6	Asclepiadaceae	4	3.36	4	-	-	4	2.99
7	Cucurbitaceae	4	3.36	3	-	1	4	2.99
8	Euphorbiaceae	4	3.36	2	-	2	4	2.99
9	Polygonaceae	2	1.68	2	-	2	4	2.99
10	Moraceae	1	0.84	3	-	-	3	2.24
11	Rosaceae	3	2.52	1	1	1	3	2.24
12	Rutaceae	3	2.52	3	-	-	3	2.24
13	Acanthaceae	2	1.68	2	-	-	2	1.49
14	Alliaceae	1	0.84	1	-	1	2	1.49
15	Aloaceae	1	0.84	2	-	-	2	1.49
16	Boraginaceae	2	1.68	2	-	-	2	1.49
17	Brassicaceae	2	1.68	2	-	-	2	1.49
18	Malvaceae	2	1.68	2	-	-	2	1.49
19	Myrsinaceae	2	1.68	2	-	-	2	1.49
20	Myrtaceae	2	1.68	1	-	1	2	1.49
21	Oleaceae	2	1.68	2	-	-	2	1.49
22	Plantaginaceae	1	0.84	2	-	-	2	1.49
23	Poaceae	2	1.68	2	-	-	2	1.49
24	Ranunculaceae	2	1.68	2	-	-	2	1.49
25	Rubiaceae	2	1.68	2	-	-	2	1.49
26	Urticaceae	2	1.68	-	-	2	2	1.49
27	Verbenaceae	2	1.68	1	1	-	2	1.49
28	Amaranthaceae	1	0.84	-	-	1	1	0.75
29	Anacardaceae	1	0.84	1	-	-	1	0.75
30	Apocynaceae	1	0.84	1	-	-	1	0.75
31	Asparagaceae	1	0.84	-	-	1	1	0.75
32	Caryophyllaceae	1	0.84	1	-	-	1	0.75
33	Celastraceae	1	0.84	1	-	-	1	0.75

Appendix 4 cont...

No	Family	Number of genera	%	Number of species in each families				%
				Human	Livestock	Both	Total	
34	Chenopodiaceae	1	0.84	1	-	-	1	0.75
35	Combretaceae	1	0.84	1	-	-	1	0.75
36	Crassulaceae	1	0.84	1	-	-	1	0.75
37	Cupressaceae	1	0.84	-	1	-	1	0.75
38	Ebenaceae	1	0.84	1	-	-	1	0.75
39	Ericaceae	1	0.84	1	-	-	1	0.75
40	Flacourtiaceae	1	0.84	1	-	-	1	0.75
41	Linaceae	1	0.84	1	-	-	1	0.75
42	Loganiaceae	1	0.84	-	1	-	1	0.75
43	Menispermaceae	1	0.84	-	1	-	1	0.75
44	Myricaceae	1	0.84	-	-	1	1	0.75
45	Oliniaceae	1	0.84	1	-	-	1	0.75
46	Onagraceae	1	0.84	-	1	-	1	0.75
47	Papaveraceae	1	0.84	1	-	-	1	0.75
48	Phytolaccaceae	1	0.84	-	-	1	1	0.75
49	Podocarpaceae	1	0.84	1	-	-	1	0.75
50	Rhamnaceae	1	0.84	1	-	-	1	0.75
51	Santalaceae	1	0.84	1	-	-	1	0.75
52	Sapindaceae	1	0.84	-	-	1	1	0.75
53	Scrophulariaceae	1	0.84	-	-	1	1	0.75
54	Balsaminaceae	1	0.84	-	-	1	1	0.75
55	Sterculiaceae	1	0.84	1	-	-	1	0.75
56	Tiliaceae	1	0.84	-	1	-	1	0.75
	Total	119	100	89	14	31	134	100

Appendix 5. List of medicinal plants used and type of ailments treated by each species

No	Species name	Family	Human disease treated	Livestock disease treated
1	<i>Acacia abyssinica</i>	Fabaceae	Wet Tinea capitus	-
2	<i>Achyranthes aspera</i>	Amaranthaceae	Tonsillitis, Amoebiasis, Hemorrhoid, fever illness	Eye mechanical injury , Anthrax, Colic
3	<i>Acmella caulirhiza</i>	Asteraceae	-	Eye mechanical injury
4	<i>Allium cepa</i>	Alliaceae	Hypertension	
5	<i>Allium sativum</i>	Alliaceae	Stomachache, evil eye, malaria, bloating	Stomachache, bloating
6	<i>Aloe pulcherrima</i>	Aloaceae	Eye infection, Impotency, Snake bite	-
7	<i>Aloe debrana</i>	Aloaceae	Evil eye, malaria, Rh-factor	-
8	<i>Anemone thomsonii</i>	Ranunculaceae	Leschmaniasis	-
9	<i>Anthriscus sylvestris</i>	Apiaceae	Hepatitis	-
10	<i>Apium graveolens</i>	Apiaceae	Diabete	-
11	<i>Argemone mexicana</i>	Papaveraceae	Wound, Ring worm	-
12	<i>Artemisia abyssinica</i>	Asteraceae	Common cold, cough, Evil eye,	Skin infection/allergic
13	<i>Asparagus africanus</i>	Asparagaceae	Skin infection/rash, placenta retention	placenta retention
14	<i>Budeleja polystachya</i>	Loganiaceae	-	Leech
15	<i>Brassica nigra</i>	Brassicaceae	Skin allergic, Rash	-
16	<i>Calotropis procera</i>	Asclepiadaceae	Wound	-
17	<i>Calpurnia aurea</i>	Fabaceae	-	Lice infestation
18	<i>Capsicum frutescens</i>	Solanaceae	Wound	-
19	<i>Carisa spinarum</i>	Apocynaceae	Itching, evil eye	-
20	<i>Carthamus tinctorius</i>	Asteraceae	Common cold, cough	-
21	<i>Chenopodium album</i>	Chenopodiaceae	Wound, intestinal parasite	-
22	<i>Cicer arietinum</i>	Fabaceae	Bone fracture	-
23	<i>Citrus aurantifolia</i>	Rutaceae	Itching/ Scabies	-
24	<i>Clematis simensis</i>	Ranunculaceae	Uvilitis, Eczema, Leprosy	-
25	<i>Clerodendrum myricoides</i>	Lamiaceae	Snake poison, Stomachache, Evil eye	-
26	<i>Clutia abyssinica</i>	Euphorbiaceae	Wart/ heamorroid, wound	-
27	<i>Coffea arabica</i>	Rubiaceae	Wound ,fire burn	

Appendix 5 cont...

28	<i>Combretum molle</i>	Combretaceae	Leprosy	
29	<i>Conyza stricta</i>	Asteraceae	Fever illness, Cough	-
30	<i>Cordia africana</i>	Boraginaceae	Continuous flow of menstruation, Arthritis /Rheumatic pain,	-
31	<i>Croton macrostachyus</i>	Euphorbiaceae	Ring worm, Bleeding	Anthrax
32	<i>Cucumis ficifolius</i>	Cucurbitaceae	Stomachache, Hepatitis, Hernia, Retained placenta Gonorrhoea, Rabies	Anthrax, Rabies
33	<i>Datura stramonium</i>	Solanaceae	Tinea capitis	-
34	<i>Dichrocephala integrifolia</i>	Asteraceae	Wart	-
35	<i>Discopodium penninervium</i>	Solanaceae	Hernia	-
36	<i>Dombeya torrida</i>	Sterculiaceae	Wound	-
37	<i>Dodonaea angustifolia</i>	Sapindaceae	Malaria, Eczema	Bone fracture
38	<i>Dovyalis abyssinica</i>	Flacourtiaceae	Intestinal parasite	-
39	<i>Echinops kebericho</i>	Asteraceae	Epidemic, Evileye, Common cold	-
40	<i>Echinops hispidus</i>	Asteraceae	Arthritis, Pneumonia	-
41	<i>Ehretia cymosa</i>	Boraginaceae	Poison, Toothache	-
42	<i>Epilobium hirsutum</i>	Onagraceae	-	Lice infestation
43	<i>Erica arborea</i>	Ericaceae	Circumcision	-
44	<i>Eucalyptus globulus</i>	Myrtaceae	Bloating, emergency, common cold	Bloating, emergency
45	<i>Euclea racemosa</i>	Ebenaceae	Epidemic	-
46	<i>Euphorbia abyssinica</i>	Euphorbiaceae	Leshimaniasis, Ascariasis, Tumor, Leprosy, Rabies	Strangle, Rabies
47	<i>Ferula communis</i>	Apiaceae	Hepatitis	Anthrax
48	<i>Ficus palmata</i>	Moraceae	Tubererculosiis, Ring worm, Wart, Ear lesion	-
49	<i>Ficus sur</i>	Moraceae	Heart disease	-
50	<i>Ficus vasta</i>	Moraceae	Ascariasis, Eczema	-
51	<i>Foeniculum vulgare</i>	Apiaceae	Urinary retention	Urinary retention
52	<i>Gomphocarpus purpurascens</i>	Asclepiadaceae	Eczema, Wet Tinea capitis	-
53	<i>Grewia ferruginea</i>	Tiliaceae	-	Placenta retention, CBPP (Continuous Bouine Pelectru)

Appendix 5 cont

54	<i>Hagenia abyssinica</i>	Rosaceae	Tape worm	Rh-factor
55	<i>Haplocarpha schimperi</i>	Asteraceae	Bleeding	-
56	<i>Hordeum vulgare</i>	Poaceae	Gastritis, Ulcer, Bone fracture	-
57	<i>Helichrysum aff. schimperi</i>	Asteraceae	Menorrhagia, Retained placenta, Prolonged labour/delivery difficult	Bone fracture, Menorrhagia, Retained placenta, Prolonged labour/delivery difficult
58	<i>Heteromorpha arborescens</i>	Apiaceae	-	Cloudiness of eye
59	<i>Hypoestes forskalii</i>	Acanthaceae	Wound/sore, Snake bite	-
60	<i>Impatiens rothii</i>	Balsaminaceae	Abortion,	Anthrax
61	<i>Inula confertiflora</i>	Asteraceae	Uvulitis, Toothache, Pityriasis versicolor	Cloudiness of Eye,
62	<i>Juniperus procera</i>	Cupressaceae	-	Strangle
63	<i>Jasminium abyssinicum</i>	Oleaceae	Cough, Skin infection, Eye infection, Stomach ache	-
64	<i>Justicia schimperiana</i>	Acanthaceae	Hepatitis	-
65	<i>Kalanchoe lanceolata</i>	Crassulaceae	Uvulitis, Wound	-
66	<i>Lagenaria abyssinica</i>	Cucurbitaceae	Ear lesion	-
67	<i>Laggera tomentosa</i>	Asteraceae	-	Anthrax
68	<i>Lantana camara</i>	Verbenaceae	-	Leech
69	<i>Leonotis ocymifolia</i>	Lamiaceae	Eye infection, Ascariasis	-
70	<i>Lepidium sativum</i>	Brassicaceae	Dysentery	-
71	<i>Leucas stachydiformis</i>	Lamiaceae	Fever illness, Headache	-
72	<i>Linum usitatissimum</i>	Linaceae	Dandruff, constipation/ena, Amoebiasis, Wound/swelling	-
73	<i>Lycopersicon esculentum</i>	Solanaceae	Urinary retention	Leech
74	<i>Maesa lanceolata</i>	Myrsinaceae	Ascariasis, Tape worm, Itching/scabies	-
75	<i>Maytenus arbutifolia</i>	Celastraceae	Stabbing pain	-
76	<i>Malva verticillata</i>	Malvaceae	Menorrhagia, Hypertension	-
77	<i>Milletia ferruginea</i>	Fabaceae	Eczema	-
78	<i>Momordica foetida</i>	Cucurbitaceae	Swelling	-

Appendix 5 cont...

79	<i>Myrica salicifolia</i>	Myricaceae	Tonsillitis, Epistaxis, Hepatities	Mechanical injury of eye
80	<i>Myrsine africana</i>	Myrsinaceae	Skin Rash/ infection	-
81	<i>Myrtus communis</i>	Myrtaceae	Evil eye	-
82	<i>Nepeta azurea</i>	Lamiaceae	-	Anthrax
83	<i>Nicotiana tabacum</i>	Solanaceae	-	Leech
84	<i>Nidorella resedifolia</i>	Asteraceae	Stomachache	-
85	<i>Ocimum gratissimum</i>	Lamiaceae	Fever illness	-
86	<i>Ocimum lamiifolium</i>	Lamiaceae	Fever illness, Headache, Measles, Cough	-
87	<i>Olea europaea</i>	Oleaceae	Trachoma, Skin rash	-
88	<i>Olinia rochetiana</i>	Oliniaceae	Eczema, Leprosy, Itching	-
89	<i>Osyris quadripartita</i>	Santalaceae	Evil eye, skin infection, post partum haemorrhage	-
90	<i>Otostegia integrifolia</i>	Lamiaceae	Stomachache	-
91	<i>Pentarrhinum insipidum</i>	Asclepiadaceae	Gonorrhoea	-
92	<i>Periploca linearifolia</i>	Asclepiadaceae	Wart /heamorroid	-
93	<i>Phytolacca dodecandra</i>	Phytolaccaceae	Rabies, Malaria, Abortion	Rabies
94	<i>Plantago lanceolata</i>	Plantaginaceae	Wound	-
95	<i>Plantago palmata</i>	Plantaginaceae	Ring worm	-
96	<i>Plectranthus cylindraceus</i>	Lamiaceae	Common cold, Epidemic, Ascariasis ,	CBPP
97	<i>Plectranthus punctatus</i>	Lamiaceae	Uvilitis, Fever illness	-
98	<i>Podocarpus falcatus</i>	Podocarpaceae	Tuberculosis, Amoebiasis, Ascariasis	-
99	<i>Polygala rupicola</i>	Polygonaceae	Stomach ache, Poison	-
100	<i>Premna schimperi</i>	Lamiaceae	Tonsillitis	Mechanical injure of eye
101	<i>Prunus africana</i>	Rosaceae	-	Leech
102	<i>Rhamnus prinoides</i>	Rhamnaceae	Uvilitis, Dandruff	-
103	<i>Rhus retinorrhoea</i>	Anacardaceae	Hepatities	-
104	<i>Ricinus communis</i>	Ephorbiaceae	Anal prolepses	-
105	<i>Rosa abyssinica</i>	Rosaceae	Skin allergic	-
106	<i>Rubia cordifolia</i>	Rubiaceae	Cough	-
107	<i>Rumex abyssinicus</i>	Polygonaceae	Wart /heamorroid	African horse sickness
108	<i>Rumex nepalensis</i>	Polygonaceae	Stomachache, Arthritis	Anthrax

09	<i>Rumex nervosus</i>	Polygonaceae	Fire burning, Haemorrhage, Epistaxis, Abdominal cramp	-
10	<i>Ruta chalepensis</i>	Rutaceae	Epistaxis	-
11	<i>Saccharum officinarum</i>	Poaceae	Cough, Gastritis	-
12	<i>Salvia schimperi</i>	Lamiaceae	Diarrhea, Abdominal cramp	Bone fracture
13	<i>Salvia nilotica</i>	Lamiaceae	Fever illness, Headache	-
14	<i>Sida schimperiana</i>	Malvaceae	Syphilis	-
15	<i>Silene macrosolen</i>	Caryophyllaceae	Tape worm	-
16	<i>Solanecio gigas</i>	Asteraceae	-	Amoebiasis
17	<i>Solanum benadirensis</i>	Solanaceae	Epidemic	Epidemic, African horse sickness
18	<i>Solanum anguivi</i>	Solanaceae	Uveitis, Itching/scabies, Skin infection	-
19	<i>Solanum marginatum</i>	Solanaceae	Bloating, Tuberculosis, Toothache	Mange mites, Bloating
20	<i>Solanum incanum</i>	Solanaceae	Stomachache, Acute sickness	-
21	<i>Stephania abyssinica</i>	Menispermaceae	-	Skin disease
22	<i>Tagetes minuta</i>	Asteraceae	Bleeding	-
23	<i>Tephrosia interrupta</i>	Fabaceae	Wound/megagna	-
24	<i>Thymus schimperi</i>	Lamiaceae	Hypertension	-
25	<i>Toddalia asiatica</i>	Rutaceae	Evil eye	-
26	<i>Trigonella foenum-graecum</i>	Fabaceae	Oedema/swelling	-
27	<i>Urera hypselodendron</i>	Urticaceae	Retained placenta	Retained placenta
28	<i>Urtica simensis</i>	Urticaceae	Gastritis, stomachache	Stomachache
29	<i>Verbascum sinaiticum</i>	Scrophulariaceae	Haemorrhage, Snakebite, Eye disease, Skin infection, Uveitis, Bleeding, Stomachache	Nerve problems
30	<i>Verbena officinalis</i>	Verbenaceae	Amoebiasis, Deafness, Tonsillitis	-
31	<i>Vernonia amygdalina</i>	Asteraceae	Stomachache, Evil eye, Emergency	Emergency
32	<i>Vernonia bipontini</i>	Asteraceae	Stomachache	Anthrax
33	<i>Withania somnifera</i>	Solanaceae	Bloating, stomachache, Emergency	Bloating, stomachache, emergency, Nerve problem, CBPP
34	<i>Zehneria scabra</i>	Cucurbitaceae	Tania capitis, Bloating	-

Appendix 6. List of ailments of human and livestock, their local name and number of MPs used to treat each ailment.

No	Disease treated(in English)	Local name of disease (in Amharic)	NMP	%
1	Abdominal cramp	Marat	2	1.49
2	Abortion	Wurjja	2	1.49
3	Anal prolepses	Fintita mewutat	1	0.74
4	Arthritis /Rheumatic pain	Kurtmat	3	2.24
5	Ascariasis	Wesfat	6	4.48
6	Circumcision	Girzat	1	0.74
7	Common cold	Gunfan	5	3.73
8	Continuous flow of menstruation	Ye-wer abeba alemakom	1	0.74
9	Constipation /enema	Dirket	1	0.74
10	Cough	Sal	7	5.22
11	Dandruff	Forefor	3	2.24
12	Deafness	Ye-joro alemesmat	1	0.74
13	Diabetes	Sikuar beshita	1	0.74
14	Dysentery	Dem yalewu tekimat	1	0.74
15	Ear lesion	Ye-joro memgel	2	1.49
16	Eye disease	Ayne himem	4	2.98
17	Eczema	Chife	7	5.22
18	Epistaxis	Nesr	3	2.24
19	Evil eye	Buda	9	6.72
20	Fever illness	Mich	7	5.22
21	Fire burn	Esat katelo	3	2.24
22	Gastritis/Ulcer	Cheguara beshita	3	2.24
23	Gonorrhoea	Chebt	2	1.49
24	Haemorrhage/bleeding	Dem mefises	6	4.48
25	Headache	Eras mitat	3	2.24
26	Heart disease	Lib himem	1	0.74
27	Hepatitis	Ye-wef/gubet beshita	6	4.48
28	Hernia	Buka	2	1.49
29	Hypertension	Dem gifit	3	2.24
30	Impotency	Ye-bl t memot (in men)	1	0.74
31	Intestinal parasite	Ye-anjet tige gna	1	0.74
32	Itching/ Scabies	Ekek	5	3.73
33	Leprosy	Ye-sga dewe beshita	4	2.98
34	Leschmaniasis	Ye-afincha kunchire/shahy	2	1.49
35	Malaria	Weba	6	4.48
36	Measles	Kufign	1	0.74
37	Menorrhagia	Ye-wer abeba mebzat	2	1.49
38	Pneumonia	Ye-samba mich	1	0.74
39	Oedema/swelling	Ebtet	3	2.24

Appendix 6 cont...

40	Pityriasis Versicolor	Kuakucha	1	0.74
41	Post partum haemorrhage	Ke-welid behuala dem mefses	2	1.49
42	Ring worm	Chirt	4	2.98
43	Snake bite/ Poison	Ye-ebab mendef/ Merz	5	3.73
44	Stabbing Pain	Wugat	1	0.74
45	Syphlis	Kiting	1	0.74
46	Tape worm	Ye-kosso beshita	3	2.24
47	Tinea capitus	Korekore	2	1.49
48	Toothache	Ye-tirs himem	3	2.24
49	Tonsillitis	Ye-gurero himem	4	2.98
50	Trachoma	Ye-ayn trackoma	1	0.74
51	Tuberculosis	Samba beshita	3	2.24
52	Tumor	Nekersa	1	0.74
53	Uvilitis	Entil mewured	7	5.22
54	Wart /heamorroid	Kuntarot	7	5.22
55	Wet Tinea capitus	Frato	3	2.24
56	Wound	Kusil	11	8.21
	Livestock			
57	African horse sickness	Ye-gama kebtotch beshita	2	1.49
58	Anal allergic	Efugnt	1	0.74
59	Anthrax	Aba-gorba	9	6.72
60	Cloudiness of eye	Ye-ayne gum mesrat	2	1.49
61	Colic	Hod emem	1	0.74
62	Continuous bouine pelectru pneumonia(CBPP)	Ye-samba mich	3	2.24
63	Leech	Alkite	5	3.73
64	Lice infestation	Kicham/tebay	3	2.24
65	Mange mites	Errt	1	0.74
66	Mechanical injury of eye	Ye ayn memetat	4	2.98
67	Nerve problems	Kentr	2	1.49
68	Strangle	Furo	2	1.49

Appendix 6 cont...

Human and livestock				
69	Acute sickness (emergency)	Dingetegna	6	4.48
70	Diarrhea	Tekmat	6	4.48
71	Bloating	Hod menfat	5	3.73
72	Bone fracture	Atnt sibrat	5	3.73
73	Epidemic	Wershign	4	2.98
74	Placenta retation	Engde lij alwerd malt	5	3.73
75	Prolonged labour/delivery difficult	Ye-mit chigr/merzem	1	0.74
76	Rabies	Ye-wusha beshita	3	2.24
77	Rh-disease	Ye-shotely	2	1.49
78	Stomach ache	Hod kurtet	17	12.68
79	Skin infection/ skin disease ,	Yekoda beshita	9	6.72
80	Urinary retention	Yeshint mekelkel	2	1.49

Appendix 7. List of informants in the study area

No	Name of informants	Sex	Age	Marital status	Education status	Residence kebel	Occupation	Source of knowledge
1	Tafess Temenagn	M	38	Married	7 th	01	Farming	Family
2	Hailemariam Seyife	M	37	Married	5 th and church	01	Shopkeeper	Learn from others
3	Tesfaye Gebre	M	32	Single	9 th and church	01	Dikuna	Family
4	Wendafrash Kura	M	49	Married	12 th	01	Urban plan	Learn from others
5	Gebremariam W/mariam*	M	53	Married	12 th	01	Civil service	Observation
6	Mammo Aweke	M	51	Married	12 th	01	Firdibet grad	Learn from others
7	Hailegebriale Hailu	M	30	Married	10	08	Farming	Learn from others
8	Shewamene Beteraw	M	65	Married	Church	08	Farming	Church
9	Awgchaw Kifelew *	M	65	Married	Church	08	Farming	Family
10	Weleteyes Hailu	M	35	Married	11 th	08	Housewife	Family
11	Emshaw weldemedhn	F	28	Single	5 th	08	Farming	Family
12	Birhanu Sahle	M	67	Married	No	08	Farming	Family
13	Endashash Anchawo	M	41	Married	No	09	Housewife	Family
14	Birhanu Mammo*	F	43	Married	3 th	09	Farming	Learn from others
15	Hailu Eshete	M	70	Married	No	09	Farming	Family
16	Eshete Manbenegeru	M	67	Married	No	09	Farming	Family
17	Zeytu Haile	M	55	Married	No	09	Farming	Family
18	Aynalem Abebe	M	30	Married	No	09	Housewife	Learn from others
19	Mammo G/meskel*	F	57	Married	Church	06	Farming	Church
20	Sable G/yohannis	M	50	Married	No	06	Housewife	Family
21	Assalf Mammo	F	39	Married	Church	06	Farming	Church
22	Engida Tayebrhan	M	51	Married	4 th	06	farming	Family
23	Yeshi Negash	M		Married	Church	06	Farming	Family
24	Getahun Admke	M	6	Married	No	06	Farming	Learn from others
25	Werku Mammo	M	26	Single	12 th	013	Student	Learn from others
26	Adelahu G/tsadik*	M	60	Married	Church	013	Farming and debtera	Church and Learn from others
27	Gashaw Amare	M	30	Single	4 th and Church	013	Farming and diakon	Learn from others
28	Ehte W/giorgis	F	52	Married	No	013	House wife	Family
29	Ayelech Hailu	F	45	Married	5 th	013	House wife	Family
30	Sium Kidane	M	43	Married	7 th	013	Farming	Family
31	Getachew sefalew*	M	51	Married	No	012	Farming	Family
32	Belayhun G/tsadik	M	40	Married	12 th	012	Teachers	Learn from others

Appendix 7 cont...

33	Fetene Eshete	M	18	Single	8 th	012	Student	Family
34	Amarech Kidane	F	45	Married	3 th	012	House wife	Family
35	Zewdnesch Birhanu	F	37	Married	No	012	House wife	Family
36	Yeshiwaget Debebe	F	31	Married	12 th	012	Shopkeeper	Family
37	Kefele Sahle	M	58	Married	No	011	Farming	Natural gift
38	Yekte Woldemariam	F	55	Married	No	011	Housewife	Family and observation
39	Begashaw H/meskel*	M	57	Married	Church	011	Farming	Family
40	Astatike G/yohannis	M	31	Married	9 th	011	Farming	Family
41	Gebre Eshete	M	30	Married	12 th	011	Teacher	Family
42	Abebech Beshah	F	55	Married	No	011	Housewife	Family and observation
43	Kefelew Lemma*	M	45	Married	6 th	010	Farming	Family
44	Tibebu Tadesse	M	34	Married	12 th	010	Teacher	Family
45	Tirngo G/egiziabhair	F	24	Single	10 th	010	Student	Family
46	Abtemariam G/silasse	M	60	Married	No	010	Farming	Family
47	Zewude Sharew	M	48	Married	No	010	Farming	Family
48	Girma Belete	M	53	Married	Church	010	Farming	Family and observation
49	Emshawu Gebeyehu	M	42	Married	6 th	04	Farming	Learn from others
50	Engdasew Hailu	M	42	Married	4 th and church	04	Farming	Family and observation
51	Tibelch Weldemerhn	F	57	Married	No	04	Housewife	Family
52	Tsiye Lidete	F	36	Married	No	04	Housewife	Family
53	Yilma W/aregay*	M	70	Married	No	04	Farming	Family and observation
54	Gashawu Temtime	M	63	Married	Church	04	Farming	Learn from others
55	Sharew H/mariam	M	48	Married	No	03	Farming	Family and observation
56	Tibebe Wube	M	35	Married	Church	03	Farming and kess	Church
57	Ammene Lakew*	M	60	Married	Church	03	Farming	Church
58	Etaferahu T/yohannis	F	55	Married	No	03	Housewife	Family
59	Nigusse Gebre	M	32	Married	5 th	03	Farming	Family
60	Etaferahu Sharew	F	50	Married	No	03	Housewife	Family
61	Gizawu Tefera	M	65	Married	No	024	Farming	Family and observation
62	Niguse G/tsadik	M	50	Married	2 th	024	Farming	Family
63	Yeshi Alemu	F	42	Married	No	024	Farming	Family
64	Gibibachewu Teramedewu	F	65	Married	No	024	Housewife	Learn from others
65	Yeshidagna Alemu	M	47	Married	9 th	024	Farming	Family and observation
66	Mogess Denku *	M	60	Married	No	024	Farming	Family
67	Yishamu Engidashet	F	33	Single	7 th	023	Student	Family
68	Molugeta Tizta	M	40	Married	9 th	023	Farming	Family
69	Shiferawu W/meskel *	M	52	Married	No	023	Farming	Family and observation

Appendix 7 cont...

70	Ayewu Engidashet	M	25	Single	8 th	023	Student	Observation
71	Birke G/tsadik	F	43	Married	No	023	Housewife	Family
72	Tigist Tibebe	F	27	Married	No	023	Housewife	Family

Key - * key informants

Merigeta-- Who is believed to be knowledgeable and skilled man in Church education.

Kesse and Dikuna ---type of rank in church

Kebeles - 01- Molale

03 - Gurmgn

04- Zeram

06 - Dassa

08- Kewariat

09- Astoya

010- Wemso

011- Ayat meda

012- Bash

013- Agemsa

023- Kollomargefia

024- Chachnayasata

Appendix 8. Checklist of semi-structured questions used for interviewee with informants to collect Ethnobotanical data

1. Name _____ Sex _____ Age _____ Kebele _____
 _____ Village _____ Religion: Orthodox _____ Islam _____ Protestant _____
 _____ Others _____ Marriage Status: Married _____ Unmarried _____
 _____ Educational Status _____ Occupation _____

2. Health status and use of traditional medicinal plants

- 2.1 What are the human diseases in this area?
- 2.2 What are the live stock diseases in this area?
- 2.3 What are the major human and livestock disease in this area?
- 2.4 What are the symptoms of these diseases that you know so far?
- 2.5 How do you prevent and control these diseases?
- 2.6 What types of traditional medicines do you use? For what type of disease is use it? For how many times did you use it?

3. About the traditional plant medicines

- 3.1 List the traditional medicine plants used to treat humans?
- 3.2 Which traditional medicinal plants are used to treat livestock ailments?
- 3.3 Which medicinal plants are used to treat both human and livestock ailments?

No	Types of medicinal plants	Disease treated			Locality
		Human	Livestock	Both	

- 4. Where do the medicinal plants grow? (From where you get?)
- 4. Which part of the plant is used as remedy? (Leaf, stem, root, flower, bark, fruit, seed, latex, or whole plant)
 - 5.1. What is the method of preparation of the medicine? (Crushed and pounded, powdered, concoction, infusion, used alone or mixed with others)
- 6. Form of the medicinal plant used
 - 6.1. In fresh form or in dry form or
 - 6.2. In both form
- 7. Is there difference in dosage among age or sex groups? If yes, state for each.
- 8. Is the way of administration internal or external? If internal how?? Oral, nasal? If external how?

- 9 Have you ever heard any danger of using traditional medicine? If you say yes, where, when and how did the problem happen? What measurement you take for this?
- 10 Which group of the community use the traditional medicines most and why?
- 11 List other uses of a particular medicinal plant other than its medicinal value?
- 12 Is the medicinal plant marketable?
- 13 Are the medicinal plants easily accessible? If not why?
- 14 How does modernization interfere with the use of traditional medicinal knowledge?
- 15 How do you judge the price of the traditional medicine with comparing of that of the modern medicine?
- 16 How do you conserve the traditional medicinal plant in your locality?
- 17 Is there any restriction in collection of medicinal plants?
- 18 Do you use your indigenous knowledge as a source of income, or to help the patients or for both reasons? Where did you get this knowledge?
- 19 What are the ways of transferring of this knowledge to the next generation?
- 20 Can you tell me the traditionally categories of vegetation, soil and landscape type in your area? What are the criteria for these categories?
- 21 Do the communities believe that traditional medicine has more effective value than the modern to treat the diseases?
- 22 Do the modern health professionals give support to the traditional healer?
- 23 Are the traditional medicinal plants easily available?
- 24 Do the traditional healers use only a single traditional medicinal plant or more to prepare single remedies?
- 25 At what time do the patients take the traditional medicine?
- 26 What are the threats to the medicinal plants?
- 27 What are the conservation measures that you use? Do you plant them?
 - Do you protect them or tolerate them by using sustainable harvesting techniques?
- 28 What are your plans for finding out areas or localities/ vegetation type by using etic and/or emic categories where the medicinal plants are found? Which area or vegetation type in the study area should receive conservation priority?
29. Any other additional information?