ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

FACULTY OF LIFE SCIENCES

AN ETHNOBOTANICAL STUDY OF TRADITIONAL USE OF MEDICINAL PLANTS AND THEIR CONSERVATION STATUS IN MECHA WEREDA, WEST GOJJAM ZONE OF AMHARA REGION, ETHIOPIA

BY

GETANEH GEBEYEHU

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An Ethnobotanical Study of Traditional Use of Medicinal Plants and Their Conservation Status in Mecha Wereda, West Gojjam Zone of Amhara Region, Ethiopia

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A Thesis Presented to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Plant Biology and Biodiversity Management

Approved by Examining Board:-

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Zemede Asfaw (PhD) (Advisor)	Sileshi Nemomissa (Prof.) (Examiner)
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Sebsebe Demissew (Prof.) (Advisor)	Ensermu Kelbessa (Prof.) (Chairman and Examiner)

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ACRONYMS

FL	Fidelity Level
IBC	Institute of Biodiversity Conservation
ICF	Informant Consensus Factor
IK	Indigenous Knowledge
IUCN	International Union for Conservation of Nature and Natural Resources
MARDO	Mecha Wereda Agriculture and Rural Development Office
MWAO	Mecha Wereda Administrative Office
MWHO	Mecha Wereda Health Office
TMP	Traditional Medicinal Plant
UNESCO	United Nation Education Scientific Cultural Organization
WHO	World Health Organization

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ABSTRACT: *An ethnobotanical study on the medicinal plants was conducted in Mecha Wereda which is found in West Gojjam Zone of Amhara National Regional State. It is located about 535 km northwest of Addis Ababa. The objective of the study was to conduct an ethnobotanical investigation in order to compile and document the use and conservation status of traditional medicinal plants in the area. The study was carried out from November 23, 2010 to May 1, 2011 to obtain valuable information from 16 selected kebeles of the study area. In each sample kebele five informants that made up of a total of 80 informants were selected and interviewed. Key informants were selected by purposive random sampling whereas the other informants were selected randomly from the local people of the study area. The ethnobotanical data were gathered through interviewing local communities including local 'Merigeta', 'Debtera' religious leaders, 'Balezar', students and kebele administrators. Primary data were collected using guided field walk, group discussion, semi-structured interview and participatory observation in the field. The inhabitants of the study area used medicinal plants not only for medicinal purpose but also food, shelter, forage, construction and other cultural uses. In the study, a total of 107 medicinal plants belonging to 96 genera and 52 families were recorded and used to treat both human and livestock ailments. The largest diversity of species recorded belonged to four families including the Asteraceae (11.2%), Solanaceae (7.47%), Lamiaceae and Fabaceae (4.67%). Shrubby habits were the major growth form (41.1%) while herbaceous, tree and climbing habits accounted for 36.5%, 15.9% and 6.5% respectively. The study showed that the most frequently used plant parts for the preparation of traditional medicine were leaves (29.8%) followed by roots (22.4%) and fruits (11.2%). These medicinal plant parts were processed in various ways of which the major ones included squeezing (24.9%), powdering (16.6%) and crushing and soaking (infusion) (14.5%). The most common route of administration was oral (55.4%) followed by dermal (26.9%). The status of traditional medicinal plants encountered rarely (12.1%), occasionally (38.4%) and common (49.5%). Among these, 6 (5.7%) of medicinal plant species out of 16 species collected in the homegardens were wild cultivated primarily for the purpose of medicinal uses. The main threats to medicinal plants in the study area were agricultural expansion, firewood, construction, grazing and drought. Therefore, it is recommended that cultivation of medicinal plants should be motivated in homegardens.*

Keywords: conservation, ethnobotany, IK, Mecha Wereda, medicinal plants

1. INTRODUCTION

1.1 Background and justification

Ethnobotany is defined as the study of plants, people and their interaction with environment (Martin, 1995). It emphasizes specifically the study of the knowledge on plants and how they are used, managed, and perceived by different peoples. Indigenous people have lived close to the natural environment depending on its products for their needs as sources of food, medicine, construction and manufacture. Traditional societies throughout the world possess a wealth of traditional knowledge which they have accumulated during prolonged interactions with the natural world which remains fundamental to their physical, spiritual and social well being (Cotton, 1996).

Plants have traditionally been used as a source of medicine in Ethiopia for many centuries to combat various human and livestock ailments. Traditional medicine has in fact become an integral part of the culture in the country due to its long history. The indigenous people of different localities in the country have developed their own specific knowledge on the use, management and conservation of plant resources (Pankhurst, 1965).

The geographical diversity of Ethiopia has favored different habitats and vegetation types, that medicinal plants are also a component of these. This geographical diversity couples with multiplicity of ethnic groups with complex cultural diversity make the country the home for high diversity of traditional knowledge, practice and uses of traditional medicine (Dawit Abebe and Ahadu Ayehu, 1993; Zemede Asfaw, 2001; Miruste Giday, 2001).

The practice of traditional medicine in the country is not only concerned with curing of diseases but also with the protection and promotion of human physical, spiritual, social, mental and material wellbeing (Mekonnen Bishaw, 1991). Traditional medical practice has been in existence before the development of modern medicine in the country and still continues to be widely accepted and used in the prevention and treatment of ailments. In addition, this is accessible and affordable in many developing countries like Ethiopia (Dawit Abebe and Ahadu Ayehu, 1993; Getachew Addis *et al.*, 1999).

As in other parts of the country, indigenous people of Mecha Wereda have the knowledge on the traditional medicinal practices. Cotton (1996) described that the human tendency to categorize and organize knowledge and experience is universal. This emic classification system throughout the world shows certain structural similarities. Likewise, local communities of Mecha Wereda have the knowledge on medicinal plants which they used and practiced to combat human and livestock ailments. Traditional medicine practice existed to date in the area in a reflection of the inadequacy of modern health service coverage and the nature of some ailments, which are more preferred to be treated by communities.

Ethnobotanical studies on medicinal plants in the country are limited when one considers that the multiethnic and cultural diversity of the people, the diverse flora of the country and vital role played by traditional medicinal plants for the primary healthcare (Amare Getahun, 1976; Dawit Abebe, 1986; Mesfin Tadesse, 1986; Dawit Abebe and Ahadu Ayehu, 1993; Tesfaye Awas and Zemede Asfaw, 1999; Zemede Asfaw, 2001; Miruste Giday, 2001; Debela Hunde *et al*., 2004; Kebu Balemie *et al*., 2004; Fekadu Fullas, 2005; Fisseha Mesfin *et al*., 2009). The ethnobotanical studies of people of Mecha Wereda have remained unexplored and no documentation has been done on the medicinal plants and the associated knowledge available before this study. Therefore, this study in Mecha Wereda has been conducted to document and analyze the use and conservation status of traditional medicinal plants and their associated knowledge.

1.2 Objectives of the study

1.2.1 General objective

The overall objective of the study was to investigate the uses of traditional medicinal plants and their conservation status in the local communities of Mecha Wereda.

1.2.2 Specific objectives

- To collect data on medicinal plants and identify the species with the parts used
- To describe the indigenous knowledge on medicinal plants
- To examine the use, preparation and administration routes of medicinal plants as remedy of human and livestock ailments
- To document the indigenous knowledge of medicinal plants in the local communities
- To provide data on the use of medicinal plants for future pharmacological and phytochemical studies
- To study the distribution of medicinal plants in traditional vegetation categories
- To explore the conservation status of medicinal plants in the study area

2. LITERATURE REVIEW

2.1 Origin and development of ethnobotany

The term ethnobotany was first coined by John Harshberger in 1895 to delimit a specific field of botany as the use of plants by aboriginal peoples (Cotton, 1996). Prior to the use of the term ethnobotany, many botanists were already including the use of plants by people within their studies. However, it was Harshberger who proposed that a discipline of ethnobotany might be developed with its own definition, scope, objectives and methodologies (Cotton, 1996). As evident in Harshberger's definition the early definitions of ethnobotany restricted the field to the study of how aboriginal people used plants. The different botanists, anthropologists, explorers, missionaries and other people who traveled around the globe would see a plant, identify, classify and name the plant for the purposes of science, ask a person the name of the plant in the local language and/or list the local uses of the plant. It is interesting that ethnobotany has moved its focus from the use of plants by people to the relationship between people and plants which include use, cognition and ecology.

Although Harshberger's definition still provides the core for the science of ethnobotany, it has also been reformulated through the practice of ethnobotanists during the Twentieth Century. Over this century the field ethnobotany has moved from the natural history of plant uses by primitive peoples to a wide range of interests of plants in cultural and environmental context. A slight change in emphasis can be seen through in the various definitions given by different authors (Ford, 1994; Martin, 1995; Cotton, 1996). Yet during the centuries which had intervened, considerable attention has focused to not only how plants are used, but also how plants are perceived and managed, and on the reciprocal relationships between plants and human societies on which they depend (Cotton, 1996). Thus, ethnobotany is considered to encompass all studies which concern the mutual relationship between plants and traditional peoples. It helps to elucidate the cultural position of local people who use plants for food, medicine, shelter or clothing; provides information on the past distribution of plants; assists in the discovery of ancient trade routes; and serves to suggest new lines of manufacture (Cotton, 1996).

2.2 The scope of ethnobotany

The scope of ethnobotany has expanded enormously encompassing botanical aspects of a number of ethnoscientific fields including ethnomedicine, ethnotaxonomy and ethnoecology as well as anthropological and botanical study of material culture and subsistence mode since early ethnobotanical studies was only in aboriginal plant use (Cotton, 1996). In addition to, its theoretical significance, ethnobotany is emerging as a subject of great practical value. Its application can lead to a strengthening of cultural diversity and conservation, greater sustainability in the exploitation of plant resources, and the development of new plant products (Hamilton, 2003).

Many previous studies were focused on the descriptions and documentations of the local names and uses of plants (Cunningham, 1996). As the studies progressed for many decades in particular, ethnobotany has tended to become more analytical, quantitative, cross-disciplinary and multi-disciplinary (Phillips, 1996). Ethnobotanists are now much more engaged with questions of conservation, sustainable development, cultural affirmation, and the intellectual property rights of local and indigenous people. The scope of the subject has now expanded to include studies of modern cultures, greater interdisciplinarity and more recently, greater attention to its applications to conservation and sustainable development (Hamilton *et al*., 2003).

2.3 Indigenous knowledge and medicinal plants

In all countries of the world there exists traditional knowledge related to the health of humans and animals. It is usually unwritten and preserved in the culture through oral tradition. It refers to the knowledge system of indigenous people and minority cultures (UNESCO, 1994). In the scientific viewpoint, traditional knowledge is first and foremost a resource which is considered as a body of information and set of skills developed by a group of people over time (Nakashima, 2000). In the past studies, many researchers have expressed their appreciation of the wealth of useful information embedded in traditional knowledge and recognized the utility of integrating scientific and traditional knowledge (Martin, 1995; Cotton, 1996; Balick and Cox, 1996b). However, the integration of indigenous knowledge into science requires the extraction of relevant knowledge through a process of scientific validation and evaluation in order to identify

the useful information, objective from subjective and the indigenous science from indigenous belief (Nakashima, 2000).

The body of traditional knowledge is dynamic and practitioners make efforts to widen their knowledge exchange of information with each other or through reading of traditional pharmacopeia. Therefore, modernization including modern medicine and introduced culture are probably issues involved in changing the focus of people's educational endeavors towards indigenous knowledge. This modernization has been accompanied by the inability of people, particularly the young to recognize value in traditional ways as related to their daily lives (Dawit Abebe, 2001).

The majority of people in developing countries will continue to rely on non-Western medicine for much of their primary healthcare. In parallel ways, there will be continuing declines in traditional knowledge about medical plants and in traditional medical systems. As each generation matures, skills perceived as immediately useful are gained while others with a lesser perception of immediate value may be lost (Hamilton, 2003).

Plants have always been of central significance to human welfare. They provide food, fuel and medicine as well as materials for construction and the manufacture of crafts and many other products for indigenous people (Hamilton, 2003). All cultures from ancient times to the present day have used plants as sources of medicines. A medicinal plant is any plant, which in one or more of its organs contains active ingredients which can be used for therapeutic purposes or contain foundation compounds that can be used for the synthesis of useful drugs (Sofowora, 1982). Thus, plants have formed the basis of traditional medicine system that existed for thousands of years and continue to provide sources of remedies (Balick and Cox, 1996a). Modern medicine has its roots in ancient medicine and it is likely that many important new remedies will be discovered and commercialized in the future as it has been now by following the leads provided by traditional knowledge and experience.

2.4 Current trend

Currently, ethnobotany is recognized as an important subject for conservation and sustainable development. 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).

According to the description given in Hamilton *et al*. (2003), some of the current contributions of ethnobotanical studies that play key roles include conservation of plants and other forms of biological diversity, preservation, recovery and diffusion of local botanical knowledge and wisdom and contributions to new drug development. Therefore, its importance lies in the fact that in addition to contributing to knowledge and conservation of features of ancestral popular culture, it opens up the possibility of finding new uses for medicinal plants and can serve to discover new medicines derived from plants.

Ethnobotany has variously been seen as a mode of ascertaining conservation as the integrity of indigenous cultures or as a field of research which will require the development of novel forms of partnership between indigenous peoples and researchers (Laird, 2002). It can be applied for many practical purposes, among which are included land-use development, agriculture, forestry, cultural conservation, education and the development of the health food and herbal medicine industries. In addition to its theoretical significance, its application can lead to a strengthening of cultural diversity and conservation, greater sustainability in the exploitation of plant resources, and the development of new plant products (Hamilton, 2003).

2.5 Traditional medicine

Traditional medicine is defined as “the sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing” (WHO, 1978). Traditional medicinal practices are important part of primarily health care delivery system in most developing countries. It has maintained its popularity in all regions of the developing world. The World

Health Organization (WHO, 2003) has estimated that 80% the population of the developing countries is unable to afford pharmaceutical drugs and depend on traditional herbal medicines to sustain their primary health care needs. The greater part of traditional therapy involves the use of plant extracts or their active principles. Traditional medicine is based largely on herbs and it still supports the primary health care of more people worldwide than 'conventional' or western medicine. Herbal medicines are assumed to be of great importance in the primary health care of individuals and communities in many developing countries as the herbal medicines are comparatively safer than western medicine (Sheldon *et al*., 1997). Thus, simultaneously the need for basic scientific investigations on medicinal plants using indigenous medical systems becomes ever more relevant (Heinrich, 2000).

2.5 Traditional medicine in Ethiopia

Ethiopia has a long history on the use of traditional medicine to combat disease (Pankhurst, 1965). The ways are also as diverse as the different cultures existing in the country. Traditional medicine healing practice is not only concerned with curing of diseases but also with the protection and promotion of human physical, spiritual, social, mental and material wellbeing (Mekonnen Bishaw, 1991). The various traditional forms of therapy had been the only health care system available before introduction of biomedicine to the country in the early 1900s. The country's diverse medical traditions comprise a wide range of therapies including inoculation, thermal baths, cauterization, counter-irritation, bleeding, bone-setting, surgery, a range of spiritual and medico-religious treatments as well as the use of a wide variety of both animal and plant-derived remedies (Pankhurst, 2006).

The traditional medicinal systems in different parts of the world have some distinctive features. Like wise, traditional life is painted with the hallmark of widespread use of traditional medicinal plants with various levels of sophistication within the indigenous medicinal lore of Ethiopia. Herbalists are considered to be the biggest group that uses medicinal plants. Practitioners use in one way or the other plants and plant products in their medical practices. Some have described the traditional medical system of the country as medico-religious system (Dawit Abebe and Ahadu Ayehu, 1993) and others as magico- religious. Such description is due to close interaction of the Christian, Islamic and indigenous religions. The traditional medical system in the country

sometimes displays features related to magic, beliefs and faith in some areas. It is widely believed in the country that the skill of traditional health practitioners is related to religion and knowledge on traditional medicines is passed orally from father to a favorite child usually a son or is acquired by some spiritual procedures. Thus, traditional healing knowledge is guarded by certain families or social groups (Mekonnen Bishaw, 1991).

2.5.1 The importance of TMPs for human and livestock health care system

Traditional medicinal plants have played a vital role in the prevention and treatment of diseases since ancient times. Medicinal plants and knowledge of their uses provide a vital contribution to human and livestock health care needs. More than 95% of traditional medical preparations in the country are of plant origin (Dawit Abebe, 1986). The importance of medicinal plants to treat human and livestock ailments in most parts of Ethiopia has been stated by various studies (Dawit Abebe, 1986; Mesfin Tadesse and Sebsebe Demissew, 1992; Dawit Abebe and Ahadu Ayehu, 1993; Teshale Sori *et al*., 2004; Miruste Giday *et al*., 2007; Tilahun Tekelehaymanot and Miruste Giday, 2007; Haile Yineger *et al*., 2007; Ermias Lulekal *et al*., 2008). Traditional medicine remains the main resource for a large majority of the people in the country for treating health problems. It also provides traditional medical consultancy including the consumption of the medicinal plants which has a much lower cost than modern medical attention (Dawit Abebe and Estifanos Hagos, 1991; Getachew Addis *et al*., 2001).

Traditional medicine has remained as the most affordable and easily accessible source of treatment in the primary health care system of resource poor communities. The local therapy by practitioners is used as means of medical treatment for such communities. Thus, the value and role of these traditional health care systems will not diminish in the future because they are both culturally viable and expected to remain affordable while the modern health care service is both limited and expensive (Dawit Abebe, 2001).

Medicinal plants are an important element of indigenous medical systems in Ethiopia like other countries. They have been used as traditional medicine to treat different human ailments and livestock by the local people in different regions of the country. More than 80% of the people on the country are dependent on plants for their health service (Dawit Abebe and Ahadu Ayehu,

1993). The wide spread use of traditional medicine among both urban and rural population in the country has attributed to cultural acceptability, efficacy against certain type of diseases, physical acceptability and economic affordability as compared to modern medicine. The dependency is due to rapid increasing human population along with cultural resistances towards the use of modern medicines (Dawit Abebe, 2001), insufficient and inaccessible modern health care service of the majority of the local communities (Haile Yineger *et al*., 2008).

The indigenous people of the country have also used traditional veterinary methods to treat livestock diseases for generations. The use and application of traditional medicine to veterinary medicine is mainly concerned with folk beliefs, knowledge, skills, methods and practices which are used in the health care of animals. The knowledge varies from region to region and from community to community (Fasil Kibebew, 2001). Ethnoveternary practice comprises traditional surgical techniques, traditional immunization, magico-religious practices and the use of herbal medicines to treat livestock diseases (Tafesse Mesfine and Mekonnen Lemma, 2001). The indigenous people of the country also employed plants for the largest component of the diverse therapeutic elements of traditional livestock health care practices (Teshale Sori *et al*., 2004). It has been developed by trial and error experimentation (Asayegn Bekele and Abiy Musa, 2009).

The relationship between the use of medicinal plants in animals and humans is rather complex. However, an overlap in use of plant remedies for the same indications in animals and human beings may occur pointing to a theory that humans may have tried these remedies in animals before they used them for their own medical problems. Alternatively, humans may have used their overall arsenal of medicinal plants to treat animals, irrespective of whether or not they used the remedies themselves (Fekadu Fullas, 2010). It is estimated that about 90 % of the livestock population are treated with traditional medicines (Dawit Abebe, 1986). The dependency on the use of traditional medicine like the uses of traditional medicine for the treatment of human ailment is due to modern veterinary medicine is not well developed in the country as well as there are no modern drugs adequately available to fight livestock diseases (Mirutse Giday and Gobena Ameni, 2003).

2.5.2 The integration of modern and traditional medicine

The term traditional medicine is used to explain the traditional medical practice that has been in existence even before the advent of modern medicine. It is still widely accepted and used in prevention and treatment of physical and mental disorders as well as social imbalance. It continues to be the best alternative care available for the majority of the global population, particularly for those in the rural areas of developing countries because of its intrinsic qualities, unique and holistic approaches as well as its accessibility and affordability (Dawit Abebe and Ahadu Ayehu, 1993; Getachew Addis *et al*., 1999).

The traditional medicinal system has been foresighted very closely from the scientific angle in an attempt to make it more acceptable to systematic investigation to provide world of evidence-based medicine. Modern medicine has benefited a lot from traditional medicine looking back from its origins. The traditional uses of medicinal plants have provided key leads for the derivative of modern medicine. A large amount of modern pharmaceutical agents has been derived from such information which was eventually traced back to traditional uses of medicinal plants. Modern medicine is primarily interested in the recognition and treatment of disease whereas traditional medicine seeks to provide meaningful explanation for illness and to respond to the personal, family and community issues surrounding illness (Fekadu Fullas, 2007).

Ethiopians tend to depend on more traditional medicine in spite of modern medicine becoming more widespread in the country. Conventional medical services remain concentrated in urban areas and have failed to keep pace with the growing population. Moreover, modern medicine has become more focused on preventative measures and people seeking curative practices rely on indigenous medicine as the primary source for health care (Dawit Abebe and Ahadu Ayehu, 1993).

In Ethiopian traditional medicine, the issue of health is seen holistically and not separated into physical health and mental health. It consists of various treatment modalities but the bulk of it employs medicinal plants as part of the treatment regimens. Consistent with the prevailing thoughts of the time, many of the old treatment methods were, as can be expected, steeped in magico-religious beliefs. As time went by traditional medicine started receiving fresh

perspectives. A number of medicinal plants have survived scientific scrutiny to varying degrees. Therefore, it suggested that integration of traditional and modern health care systems can solve much of the problems by providing basic health care services for the people in developing countries particularly the underserved majority (WHO, 1978; Mwambazi, 1999).

2.7 Conservation and threats to medicinal plants

2.7.1 Conservation of medicinal plants

Conservation is defined as the management of human use of the biosphere to yield sustainable benefit to the present generation while maintaining its potential to meet the needs of future generation (IUCN, 1980). It involves a careful preservation and protection of something, especially planned management of a natural resource to prevent neglect, over-exploitation or even destruction of habitats. The vegetation of the world is being changed or destroyed at an alarming rate. Thus, plant conservation should be aimed at securing robust management systems in favor of conservation or sustainable production at the sites where the medicinal plants grow. The best means of conservation is to ensure that the populations of species of plants continue to grow and evolve in the wild in their natural habitats. In situ conservation is one of the conservation strategies of species protecting and conserving the remaining natural area where they grow (IUCN, 1993; Jarvis, 2000).

Establishment of national system of protected areas can serve as an essential antidote to habitat destruction, a major means of a reservoir of medicinal species and a means of maintaining ecosystem functions that are essential to human health. Management plans for protected areas need to provide for the appropriate use of medicinal species. Protected areas establishment can be very useful for the conservation of medicinal plants. There are many types of protected area establishments including national parks, forest reserves, strict nature reserves, etc. generally serving various purposes in addition to biodiversity conservation and with various rules applying to the conservation and collection of medicinal plants (Hamilton, 2003; Maundu *et al*., 2006).

Plant species can be found away from the sites where they naturally occur in a range of contexts, including in botanic and other types of gardens, seed banks, tissue culture units, etc. This conservation strategy is conservation of species by collecting seed to store germplsm banks or by

propagating plants in the botanical garden technique is known as ex situ conservation. Priority for ex situ conservation should be given to species whose habitats may have been destroyed or cannot be safeguarded (IUCN, 1993).

Botanic gardens can play further major roles in medicinal plant conservation through developing propagation and cultivation protocols, and undertaking programmes of domestication and variety breeding. Therefore, conservation areas around the globe provide the environmental services and harbor biological organisms important to local communities and to the world as a whole (Martin, 1995). Because of the value of these resources for local health care or income, it is believed that a focus on medicinal plants in conservation or development carries the potential to save many other types of inhabitants of those habitats which are valued for their medicinal plants. Thus, the presence and sustainable use of medicinal plants can be a key to conserving the whole habitats (Hamilton, 2008).

Human activities have greatly reduced biodiversity of the world in various ways. Habitat loss as humans develop land and water for agriculture, grazing livestock, and unsustainable use such as draining wetlands and deforestation for agricultural land and polluting the air, soil and water through unwise use of resources greatly affect biodiversity (IBCR, 2001). Bodies of indigenous knowledge are structured by systems of classification, sets of empirical observations about local environments, and systems of self management that govern resource use (Zemede Asfaw, 2001; Mirutse Giday, 2001).

Employing the traditional means of preserving biodiversity of the threatened biota is important. Traditional protection or community based protection of threatening biodiversity by limiting over exploitation and deforestation contribute a lot in conservation of biodiversity in general and medicinal plants in particular (IBCR, 2001). Effective of conservation of biodiversity can only be achieved through the sustained efforts of involving to participate the rural communities who largely depend on local biodiversity for their livelihoods (Hamilton, 2003). Thus, medicinal species are as a subset of biodiversity with particular relevance to people; deserve serious efforts to record their distributions and subsequently to monitor their status and trends (Maundu *et al*.,

2006). This is attributed to the message “saving life by saving biodiversity” which is more directly related to the life of everyone (Debela Hunde, 2007).

2.7.2 Threats to medicinal plants

Many of the threats to medicinal plant species are similar to those causing endangerment to plant diversity generally. The most serious proximate threats generally are habitat loss, habitat degradation and over-harvesting (Hamilton, 1997; Maundu *et al*., 2006). Medicinal plants can have other uses besides as sources of medicines, and the threats from over-harvesting may be due to effects of collection for purposes other than medicinal. The majority of species of plants in traditional or herbal medical treatments are harvested in the wild rather than cultivated. As a result, many plant species have become extinct and some are endangered. It is therefore necessary that systematic cultivation of medicinal plants be introduced in order to protect threatened species. As population grows, demand for traditional medicines will increase, and pressure on medicinal plant resources will become greater than ever (Hamilton, 2003).

Like other developing countries, the loss of valuable medicinal plants in Ethiopia due to population pressure, loss of habitat, agricultural expansion and deforestation is widely reported by different workers in Ethiopia (Ensermu kelbessa *et al*., 1992, Zemede Asfaw, 2001; Abebe Demissie, 2001; Medhin Zewudu, 2002; Kebu Balemie *et al*., 2004). Thus, documentation of medicinal use of plants is becoming increasingly urgent because of the rapid loss of the natural habitat for some of these plants due to anthropogenic activitie.

3. MATERIALS AND METHODS

3.1 Description of the study area

3.1.1 Geographical location of the study area

Mecha Wereda is one of the 105 Weredas of Amhara Regional State which is found in west Gojjam Zone, northwestern parts of Ethiopia. The town Merawi is the center of the Wereda administrative unit of the kebeles. It is located at about 535 km North West of Addis Ababa and 30 km south west of Bahir Dar. The altitudinal variation of the Wereda ranges from 1800-2800 m a.s.l. and it covers total surface area of 159,027 ha. It is bordered by 'Yilmana Densa' Wereda in the east, 'Bahir Dar Zuria' Wereda in the north and north east, 'Semien Achefer' in the north, 'Debub Achefer', 'Dangila' and 'Fagta Lekoma' Wereda in the west, 'Sekela' Wereda in the south. Currently, the Wereda consists of 43 kebeles of which 3 kebeles are found in Merawi town and the rest in the rural kebeles (MWAO, 2010). The Wereda lies between the coordinates of 11^0 05' to 11^0 38' N and 37^0 00' E to 37^0 23' E with an estimated area of 149.2 km^2.

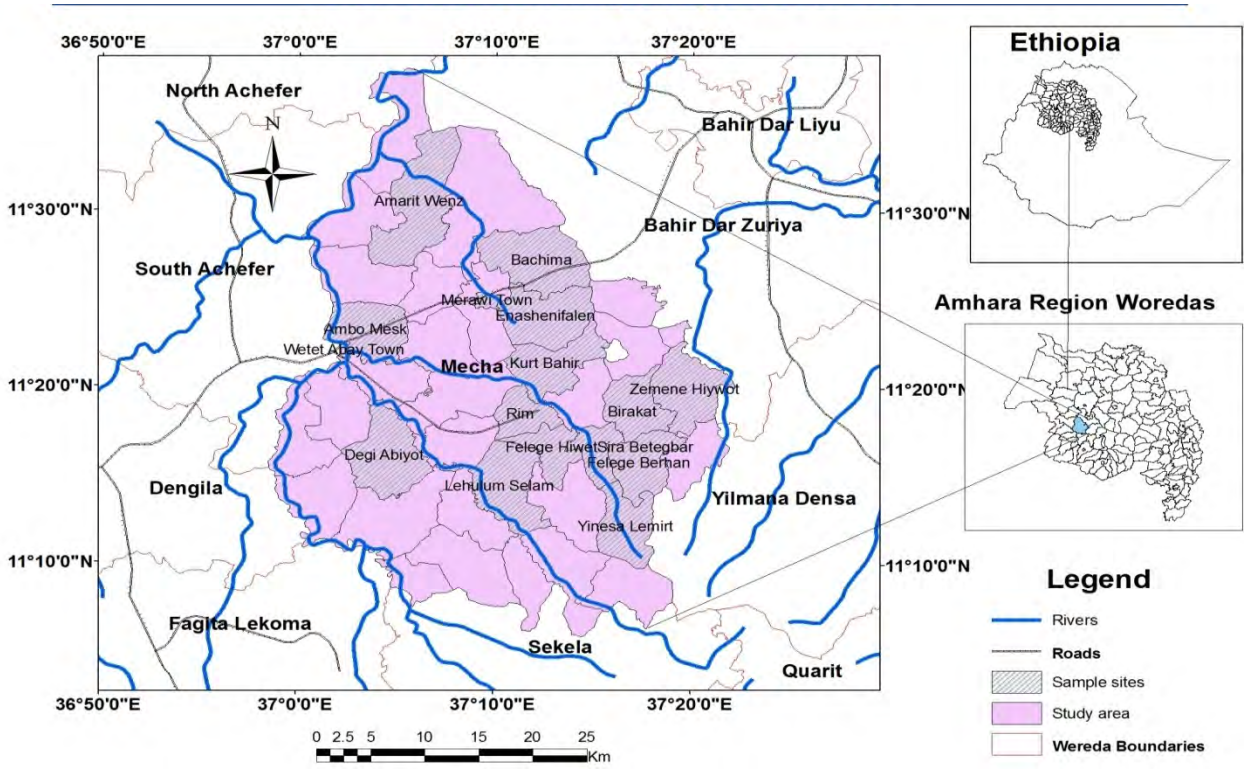

Fig. 1 Map of the study area

3.1.2 Climate and soil

The agroecology of the Wereda is classified as 'Weina Dega' (80%) and 'Dega' (20%). The altitudinal ranges cover between 1800 - 2500 m is considered 'Weina Dega' and between 2500 - 2800 m is 'Dega' (MARDO, 2010). The study area has uni-modal rainfall distribution with the highest rain falling from May to October based on the data recorded by the Ethiopian National Meteorological Service Agency for 5 years (January 2005 to December 2009). The annual rainfall is 1703 mm and the minimum, maximum and mean annual temperature is 5.7^{0}C, 30.6^{0}C and 18.8^{0}C respectively (Fig. 2).

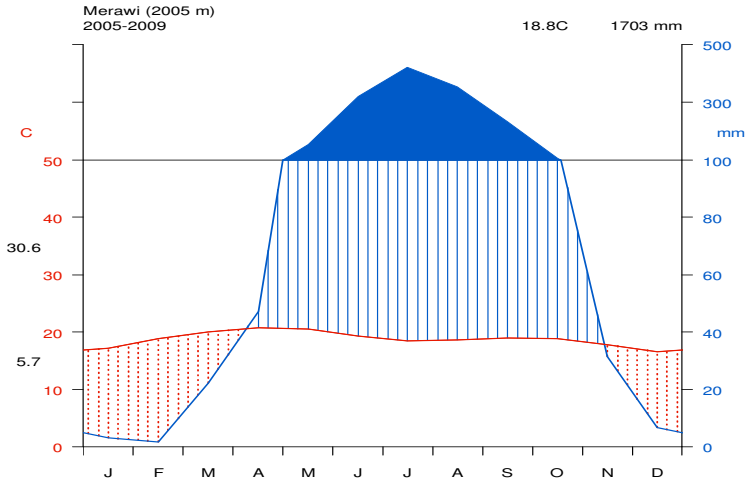

Fig. 2 Climatogram of the study area from 2005 to 2009 at Merawi Weather Station

Source: National Metrological Service Agency of Ethiopia (NMSA, 2011)

The three dominant soil types occurring in the area are red, dark brown and black soils. Among these soil types, red soil is the most abundant covering about 93% of the Wereda (MARDO, 2010). According to studies by Demel Teketay (1999), the Gonder-Wello- Gojjam- Shewa regions, Alfisols mainly the sudorder Ustalfs, Vertisols and Inceptisols types dominate in the area. The shallow soils among these are the red to light red-brown on the mountains and hillsides, red-brown to the slopes, brown to dark-brown the rolling and nearly in the lower parts. The red-brown to dark-brown soils are used for agriculture, particularly grain crops which occur all over the highlands.

3.1.3 Livelihood systems

3.1.3.1 People, population and health status

The total population of the Wereda is 248,127 of whom 126, 136 are males and 121, 991 are females. Of the total population, 244, 219 are urban dwellers while 3,908 were in town dweller (EPCC, 2007). The largest groups of people of the Wereda are Amharas who speak Amhara language. The largest inhabitants in the Wereda are followers of Orthodox Christianity (95.04%) followed by Muslims (4.86%) and Protestants (0.1%) (EPCC, 2007). The peoples of Mecha Wereda earn their livelihood in production of crops and keeping of livestock (MARDO, 2010).
The available human health services in the Wereda comprise of 11 Health centers, 30 Health ports, 20 private clinic, 11 private pharmacies (drug stores) and five diagnostic laboratory services. According to Mecha Wereda Health Office Annual Report for three consecutive years, the ten top human diseases in the Wereda are shown in table 1.

Table 1 Top ten diseases of humans reported in the Mecha Wereda (2007/2008-2009/2010 G.C.)

No.	Diseases	Number of infected individual in each year		
		2008	2009	2010
1	Malaria	10,625	15,742	16,492
2	Pneumonia	13, 736	10,367	8,378
3	Helminthes	-------	12,403	11,701
4	Dysentery	5, 653	9, 307	1,492
5	Respiratory diseases	-----	8,064	5, 097
6	Skin diseases	3,812	4,716	2,805
7	Unknown origin of fever	3,486	---	1,768
8	Gastritis and dudenitis	--------	1,552	1,968
9	Hypertrophy of tonsillitis and adenoids	--------	1,510	2,712
10	Tooth and gum	---------	-----	3,482

Source: Mecha Wereda Health Office, MWHO, 2009/10

3.1.3.2 Livestock population and their health status

Livestock population of Mecha Wereda consists of cattle (245,147), poultry, goats and sheep (156,805), equines (mule, horse and donkey (27, 695) and bees of both traditional and modern apiculture (25,862). Oxen are the highest number and comprise 31.8% of cattle populations. Bee keeping under traditional and modern system is also carried out for the production of honey for food as well as for cash income generation (MARDO, 2010).

According to Mecha Wereda Agricultural and Rural Development Office Annual Report (2009/2010), the most common livestock diseases in the Wereda based on the number of livestock infected include protozoan diseases (trypanosomiasis), endoparasites (facioliasis, paraphystomum and stronglyliasis), schistosomiasis, bacterial infection (anthrax, black leg, mastitis) and viral infection (African horse infection, rabies) and brucellosis.

3.1.3.3 Land use and agricultural systems

In terms of topography, Mecha Wereda comprises of 75% plain, 13% undulated land, 8% mountain, 4% valleys. The topography of the Wereda encourages the existence of many perennial rivers which are tributaries of 'Abay' River. The major tributary rivers in the Wereda which drain to Abay River include 'Andasa', 'Jema' and 'Koga'. Among the major rivers, 'Koga' River is now providing modern agricultural irrigation system in the study area (MARDO, 2010).

In terms of land use pattern, an estimated 43.86% of the area is cultivated and used for annual and perennial crops, while the remaining percentage of the land accounts for grazing, browsing, forests, shrubs, settlements and wetlands (Table 2).

In the land use and land cover of the Wereda, vegetations of 5.1% bushes, 6% forests and 9.3% of grasses are included (MARDO, 2010). According to Sebsebe Demissew and Friis (2009), vegetations types of *Combretum-Terminalia* woodland occurs in the northwestern and western parts of Gojjam where the upper altitudinal limit is about 1,900 m a.s.l. and the lower about 500 m a.s.l. Dry evergreen montane forest and montane grassland is also found in Gojjam region

where the lower altitudinal limit is about 1,900 m a.s.l. and the upper altitudinal limit is about 3,200 m a.s.l.

Table 2 Land use category

No.	Land situation	Area in hectare	Percentage
1	Arable land	69,759	43.86
2	Arable in the future	29,792	18.73
3	Rangeland	14,723	9.26
4	Forest coverage	9,541	6.00
5	House and road coverage	6, 517	4.09
6	Bushes coverage	8, 080	5.08
7	Others (aquatic, valleys, marshes, rocks, swamps, acidic soils)	20,615	12.96
	Total	**159, 027**	**100**

Source: MARDO, 2009/2010

The agricultural system of the area is one of the highland mixed farming systems. Crop production under this farming system is diverse and multiple cropping with limited inter-cropping is intensively employed. Traditionally, continuous cropping is exercised through crop rotation, where cereal production alternates with the production of legume crops as a means of maintaining soil fertility. The major food crop types growing in the Wereda consist of cereals (70.95%), oil crops (17.96%), pulses (5.07%), vegetables and fruits (4.85%), spices (1.02%) and others (0.14 %) (MARDO, 2010).

3.2 Reconnaissance survey

Reconnaissance survey was conducted from November 23 to December 16, 2010 in the Wereda in order to obtain an impression about medicinal plants, on the general physiognomy of vegetation and to identify sampling sites. During the survey, 16 representative sites distributed at different altitude were selected from the 43 kebeles in its Wereda. Stratification for the different altitudinal sample sites was made in the two agro-ecologic zones (Weina Dega and Dega).

3.3 Selection of informants

A total of 80 informants including 21 key informants for the indigenous knowledge on the uses and conservation of medicinal plants were selected from the ages of 20 and above among the local communities. The key informants were sampled in systematic way as Martin (1995) recommended that sampling of key informants is most commonly systematic. It means based on the recommendation and comments of elders, farmers, local traditional healer associations, local administrators, students, religious leaders and researcher's observation from the community group. Furthermore, the logistic letter and list of traditional healers operating legally in the Wereda was obtained from the chairman of traditional healers' association to interview openly with the understanding that the purposes of the study is of academic value. Later, key informants were identified, and interviewed and detailed information was recorded. On the other hand, sampling of other informants was conducted using random sampling of tossing a coin and when the head was raised up the resident of people in the village was interviewed wherever they were found in the home or working places.

3.4 Demographics of informants in the interview based survey

The demographics of informants involved in the interview based survey which comprises age group, gender, educational level, occupation, religious and marital status are presented in Table 3.

3.4.1 Gender and age group of informants

The number of informants in terms of gender is not proportional. Males were more in number (58) comprising 72.5%, compared to females (22) accounting for 27.5%. The age of informants was represented under three groups consisting of the young (20- 35), middle age (36-49) and elders (50-80). The highest number of informants was in the age group between 50 and 80 that comprised 46.3% of the informants. The average age of informants was 46 years, and the least and highest age was 20 and 76 years respectively.

3.4.2 Educational level and occupation of informants

The largest numbers (41.3%) of educational status of informants involved in the interview were the illiterate category whereas modern educational status of informants accounted for 28.8 %.

Related to the occupation, 50% of informants were farmers.

3.4.3 Marital status and religion of informants

Of all informants, 98.8% of informants were followers of Orthodox Christianity followed by Muslims Religion (1.2%). This is due to the fact that most residents are Orthodox followers. In case of marital status the highest numbers of informants (77.5%) were married people.

Table 3 Demographics of informants

Total	**Age group**	**Educational level**	**Occupation**	**Gender**	**Religious**	**Marital status**
14 (17.5%)	20 - 34	Illiterate : 2 Only read and write: 0 Church education : 0 Modern education : 12	Farmer : 5 Housewife:1 Students: 8	Male: 9 Female: 5	Orthodox : 14 Muslim**:** 0	Married: 2 Single : 12 Divorced: 0
29 (36.2%)	35 - 49	Illiterate : 18 Only read and write :4 Church education : 2 Modern education : 5	Farmer : 15 Housewife: 8 Small trader: 3 Tailor:1 'Merigeta': 0 Priest: 2	Male: 17 Female: 12	Orthodox : 29 Muslim: 0	Married: 24 Single: 1 Divorced: 4
37 (46.3%)	50 - 80	Illiterate : 13 Only read and write: 6 Church education: 12 Modern education : 6	Farmer : 20 Housewife : 4 Small trader: 2 Carpenter: 1 Teacher :1 Priest: 4 'Merigeta': 5	Male: 32 Female: 5	Orthodox :36 Muslim: 1	Married: 36 Single: 1 Divorced: 0
80		Illiterate: 33 (41.3%) Church education:14	Farmer: 40 (50%) Housewife: 13 (16.3%)	Male:58 (72.5%)	Orthodox: 79 (98.8%)	Married: 62 (77.5%)

		(17.5%) Only read and write: 10 (12.5%) Modern education: 23 (28.8%)	Small trader: 5 (6.2%) Students: 8 (10.0%) 'Merigeta': 5 (6.3%) Priest: 6 (7.5%) Teacher: 1 (1.2%) Carpenter: 1 (1.2%) Tailor : 1 (1.2%)	Female: 22 (27.5)	Muslim:1 (1.2)	Single: 14 (17.5%) Divorced: 4 (5.0%)

3.5 Data sources

Ethnobotanical data were obtained from both primary and secondary sources. The primary sources were interviews and group discussion in the field, whereas secondary data sources were based on relevant literature review. Secondary data such as geographic information like map of the Wereda and kebeles distribution in different agro-ecologic zones, ethnographic information was obtained from Wereda Administrative Offices.

3.6 Ethnobotanical data collection

The study was conducted from December 23, 2010 to May 1, 2011 based on semi-structured interview on the inhabitants of different villages under various kebeles of Mecha Wereda. Among the most basic requirements in ethnobotanical study is plant collecting (Martin, 1995). Collection was made so as to serve as voucher specimens which are permanent records of the plants recorded in a certain place of identified plant communities or plants in the study area. The information on ethnomedicinal plants of local names, sources of collection (wild/cultivated), degree of abundance (rare, abundant, common), conservation practices, ailments and disease treated, parts of plants used for treatment, methods of preparation and administration, dosage, effects of treatment and durations of treatment were obtained through interviews. The information was gathered from respondents on both the harmful and useful aspects of medicinal plants in detailed manner from the questions that local communities used in the area based on the following data collection methods:

3.6.1 Semi-structured interview

The list of questions (See Appendix 7) based on the objective of the study was presented to informants and interviews were conducted in Amharic. The interview was based on this checklist and some issues were raised depending on the responses of informants.

3.6.2 Field observation

A number of field observations were made during the feasibility study with informants. Walking in the field or in the forest with informants and listening to them, asking them about plants and collecting and taking notes on them and their uses was conducted. As most informants disliked walking in the field with other people serving as field guidance, the researcher and an informant made the field observation starting early morning. This practice is exercised by local healers in order to keep their knowledge on medicinal plants secret.

3.6.3 Group discussion

A brief group discussion was made at each site prior to make collection of important medicinal plant with all informants. Such discussion was conducted with a group of informants so as to produce a wealth of data and lead to discover the agreements of informants on the information provided. An appointment was made based on the interest of informants prior to discussion each session.

3.6.4 Mapping

The topographic areas of the major plant community categories and market survey were covered in a map. Existing maps, GPS records taken during the survey and aerial photographs represent the basic topographic information focused of the major plant association as revealed by visual observation. The latitude, longitude and altitude of the collected plant specimens were recorded using GPS.

3.6.5 Market survey

Most sub-Wereda towns in the study area including ‘Brakat’, ‘Rim’ and ‘Gerchech’ and Wereda town Merawi have markets with sections where plant products like fruits, vegetables, cereals and few medicinal plants were sold. Direct observations in the different markets and interviews on

the aspects of wild plant products were conducted to identify the medicinal plants sold in the market following the methods described by Martin (1995) and Alexiades (1996).

3.6.6 Informant consensus

Informant consensus was gathered by visiting and discussing with informants two or more times. It was conducted during interviews, discussions and collection on the actual field work with informants. This was performed to check the consistency of information provided by informants. Therefore, the responses of an informant that were not in harmony with each other were rejected since they were considered as unreliable.

3.7 Ethical consideration

The ethical consideration and consensus was made with informants. Informants were informed that the purpose of the research was for educational purpose, compiling and documenting of medicinal plants of the study area but not for commercial purposes. Ethical consideration in ethnobotanical study is a very important work on medicinal plants.

3.8 Plant specimen identification

Ethnomedicinal plant specimens were collected from various habitats of the study area. Once specimens were collected, numbered, pressed, dried and deep frozen for identification, the identification of the collected specimens was carried out at the National Herbarium (ETH), Addis Ababa University using the volumes of the modern Flora of Ethiopia and Eritrea and by comparing the specimens with authentic herbarium specimens. The plant specimens were identified to the family, genus and species levels. The voucher specimens with labels were deposited at the National Herbarium (ETH), Addis Ababa University.

3.9 Ethnobotanical data analysis

Ethnobotanical data were analyzed both qualitatively and quantitatively using analytical tools and excel spreadsheet 2007. Ethnobotanical data were entered into Excel spreadsheet and summarized using descriptive statistics. The spreadsheet data filter facility was employed to determine multipurpose uses, proportions of different variables like growth forms (habits), plant

families, degree of abundance, plant parts used and methods of preparation. The analytical tools employed for the analysis were as follows:

3.9.1 Preference ranking

Preference ranking was performed following Martin (1995) for five selected medicinal plants to determine their scarcity in the study area. The informants were asked to select the degree of scarcity of medicinal plants in their environment. Ranking was conducted to highlight local preferences on the scarcity of plant species. They were informed that the most scarcity plant will be given the score of five points and the least one was one point and finally, the values were summed up and cumulative scores and ranks were given to each plant.

3.9.2 Direct matrix ranking

Direct matrix ranking was made following Cotton (1996) on six multipurpose medicinal plants and matrix was performed to see the relative importance of those multipurpose medicinal plants and their dominant roles.

3.9.3 Informant consensus factor (ICF)

ICF was performed to establish the relative importance of each use directly from the degree of consensus in informants' responses. The ten disease categories were identified based on local explanation, causes for the diseases or conditions and symptoms treated, and the informant consensus factors were calculated for each disease categories. According to Trotter and Logan (1986) the level of homogeneity between information provided by different informants will be calculated using the Informants' Consensus Factor (ICF). It is calculated as:

ICF = Nur – Ns / (Nur – 1) Where,

Nur is the number of use reports from informants for a particular plant-usage category and

Ns are the number of species that are used for that plant usage category for all informants.

3.9.4 Fidelity level

The fidelity level was calculated for those frequently reported diseases by informants so as to identify the most important species. It is calculated by using the formula as:

FL = Ni/NX100 where,

Ni is the number of informants that claim 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. It is designed to quantify the importance of the species for a particular given purpose (Friedman 1986: cited in Alexiades, 1996).

3.10 Vegetation description

The vegetation of the study area was described using two approaches. The first approach was gathered information from informants following emic categorization technique based on the indigenous knowledge. The second approach was based on ethnobotany technique as described by Martin (1995) that the vegetation of the study area was described and classified through visual recognition following etic classification technique including careful observations, identification and focusing on the dominant or associated co-dominant plant type.

4. RESULTS

4.1 Indigenous categorization of units of the local environment

4.1.1 Indigenous landscape classification

The indigenous people in the study area classified the landscape based on topography of the land. Based on their knowledge on the landscape classification, four types of landscapes were identified including 'Medama', 'Wotageba', 'Terrarra', and 'Shelleko' (Table 4).

Table 4 IK on landscape classification

Emic classification	Ethnobotanical classification
Medama or Deldala	Plain
Wotageba	Undulated land or up and down
Terrarama	Mountain
Shelleko	Valley

4.1.2 Indigenous soil classification

The indigenous classification system on the soil was based on the color of soils. There were three types of soils identified in the study area. These were 'Key afer' or 'Borebor' (Red soil), 'Tikur afer' or 'Walka' (Black soil), and 'Bunnama' (Dark brown) (Table 5).

Table 5 IK on soil classification

Emic classification of soils	Etic classification of soils
Key afer or borebor	Red soil
Tikur afer	Black soil
Bunnama	Dark brown

4.1.3 Indigenous vegetation classification

The indigenous people of the area classify the vegetation as 'Sarrama', 'Chaka', 'Kutkuato' for natural vegetations based on the density of plants growing in the area while plantation is named 'Tikl den' (Table 6).

Table 6 Emic categorization of vegetation with etic categories

No.	Emic category	Etic category
1	Sarrama	Grassland
2	Chaka	Forests
3	Kutkuato	Bushland
4	Tikl den or chigh	Plantation

4.2 Plant community types and their distribution of medicinal plants

Plant community types in the study area were recognized based on the dominant plant species growing in the different habitats taking carful observation, collection and identification of plants. Based on dominant plant species, the following plant communities were visually identified:

A. Plant community dominated by *Prunus africana* and *Schefflera abyssinica*

This is a degraded vegetation type derived from clearing of dry evergreen Afro-montane vegetation type. The community has two parts. The one part of the forest is dominated by the single dominant species of *Prunus africana* and the second part of the forest is dominated by *Schefflera abyssinica* and *Croton macrostachyus.* Moreover, the plantation of *Arundinaria alpina* is common around the area which characterizes the community. It is located at altitudinal range of between 2,450-2,750 m a. s. l. Agricultural activities around the area are high and there is deforestation of the remaining vegetation. The community contains many useful plants including medicinal plants. These medicinal plants contain many trees, shrubs and herbs. The medicinal woody species identified in this plant community are *Ficus sur, Croton macrostachyus, Olea europaea* subsp. *cuspidata,* and *Hagenia abyssinica.* The most common shrub in the community includes *Rosa abyssinica*, *Asparagus scaberulus, Phytolacca dodecandra, Embelia schimperi and Maesa lanceolata* whereas herb species were *Leonotis*

ocymifolia and *Laggera tomentosa*. Some of the medicinal plants like *Laggera tomentosa, Maesa lanceolata* and *Hagenia abyssinica,* which were not found in other plant community types, were collected in this community.

Fig. 3 *Prunus africana* and *Schefflera abyssinica* dominated plant community type at 'Chenek' forest (Photo taken by Getaneh Gebeyehu, 2011 G.C.)

B. Plant community dominated by *Juniperus procera* and *Acacia abyssinica*

This community is the degraded part of the dry evergreen Afromontane forest. It occurs between altitudinal ranges of 2,200 – 2,450 m a. s. l. in the study area. The area is highly exposed to erosion due to agriculture expansion. The area is dominated by tree species of *Juniperus procera* and *Acacia abyssinica* on the major parts of the forest whereas the edge of the forest and under canopy is dominated by shrub, climbers and herb including *Clausena anisata, Calpurnia aurea, Acanthus polystachius, Stephania abyssinica*, *Dipsacus pinnatifidus, Clutia lanceolata* subsp. *lanceolata, Kalanchoe* sp., *Acacia pilispina, Buddleja polystachya, Cucumis ficifolius, Gardenia ternifolia, Solanum dasyphyllum* and *Solanum incanum* are collected in the site. This site contains many useful plant species including medicinal plants.

Fig. 4 *Juniperus procera* and *Acacia abyssinica* dominated plant community type at 'Samsi Terrarra' (Photo taken by Getaneh Gebeyehu, 2011 G.C.).

C. Plant community dominated by *Carissa spinarum* and *Pterolobium stellatum*

This is a degraded type of dry evergreen montane forests. It is found between altitudinal ranges of about 2,100 – 2,200 m a. s. l. in the study area. The community contains scattered tree species of like *Maytenus senegalensis, Steganotaenia araliacea* and *Schrebera alata* that grow with densely populated shrub and climbers. The dominant shrubby species are *Carissa spinarum* and *Pterolobium stellatum.* Some herbs are also found under densely populated bushes. The community contains mostly useful medicinal plants of shrubs and climbers whereas herbs are rarely found under canopy vegetation. *Rubia cordifolia* and *Aloe macrocarpa* are the scattered herbaceous species found in the under canopy. The remaining medicinal plants collected in the site consists of shrubs and climbers including *Bersama abyssinica, Brucea antidysenterica, Periploca linearifolia, Jasminum grandiflorum, Momordica foetida, Rhus vulgaris, Rubus apetalus, Otostegia integrifolia, Ximenia caffra, Osyris quadripartita, Rhamnus prinoides* and *Clematis simensis*. The plant community contains rare species like *Ximenia caffra, Steganotaenia araliacea* and *Periploca linearifolia.*

Fig. 5 *Carissa spinarum* and *Pterolobium stellatum* dominated plant community at 'Konnen Terrara' (Photo taken by Getaneh Gebeyehu, 2011 G.C.)

D. Plant community dominated by *Croton macrostachyus* and *Vernonia auriculifera*

The community is found in degraded parts of dry evergreen montane vegetation type. It is located between altitudinal ranges of 1,800-2,100 m a. s. l. The common trees found around the area include *Ficus vasta* and the *Croton macrostachyus*. The area is commonly provided for grazing for underground vegetation. Some of the medicinal plants that were collected in community include *Clerodendrum myricoides, Rumex nervosus, Xanthium strumarium, Sida schimperiana, Trichodesma zeylanicum, Saliva merjamie, Plantago lanceolata, Lantana trifolia, Cynoglossum coeruleum* subsp. *johnstonii, Plectocephalus varians, Verbascum sinaiticum, Gnidia involucrata* and *Cyphostemma molle.* The community contains endemic species of *Plectocephalus varians* and *Cyphostemma molle* and rare species of *Gnidia involucrata* and *Clerodendrum myricoides.*

Fig. 6 *Croton macrostachyus* and *Vernonia auriculifera* dominated plant community at 'Bachima Gewocha' (Photo taken by Getaneh Gebeyehu, 2011G.C)

E. Riverine plant community type

It is the part of upland riverine forest which is dominated by *Syzygium guineense* and *Salix mucronata*. It is located between altitudinal ranges of 1,940 – 2,185 m a.s.l. It is common around rivers and small streams. Medicinal plants collected from such type of community were *Salix mucronata, Stereospermum kunthianum. Vernonia amygdalina, Syzygium guineense, Merremia pterygocaulos, Lagenaria abyssinica, Kanahia laniflora, Ficus carica, Echinops kebericho, Capparis tomentosa, Grewia ferruginea* and *Millettia ferruginea.* This type community contains the endemic species of *Echinops kebericho* and *Millettia ferruginea* in the study area.

F. Plant community dominated by *Eucalyptus* plantation

This type of plant community is dominated by a single species *Eucalyptus camaladulensis*, throughout the study area. The major plant species available in the undergrowth canopy are herbs and small shrubs. The common herb medicinal plants occur in under growing are *Laggera crispata, Physalis peruviana* and *Chenopodium opulifolium*.

Fig. 7 *Eucalyptus* plantation dominated near Merawi town (Photo taken by Getaneh Gebeyehu, 2011G.C).

4.3 Diversity and sources of medicinal plants

A total of 107 ethnomedicinal plant species belonging to 96 genera and 52 families were collected, identified and documented in the study. Asteraceae was found to be the most dominant family that contains 12 species under nine genera followed by Solanaceae having eight species with five genera. Next to Solanaceae, Fabaceae and Lamiaceae were equally dominant (five species with five genera, five species with five genera respectively) (Appendix 5). Among the

cited ethnomedicinal plant species in study area, 14.9% of the totals were found in the homegardens. The remaining percentage of medicinal plants accounted for the natural habitats (Table 7).

Table 7 Sources of medicinal plants

Plant community type	**Number of medicinal plants**	**Percentage**
Carissa spinarum and *Pterolobium stellatum*	22	20.6
Croton macrostachyus and *Vernonia auriculifera*	16	14.9
Homegardens	16	14.9
Juniperus procera and *Acacia abyssinica*	14	13.1
Riverine plant community type	12	11.2
Prunus africana and *Schefflera abyssinica*	10	9.3
Eucalyptus plantation	3	2.8
Others (around farmlands, roadsides, churches, waste places, grazing lands)	14	13.1
Total	**107**	**100**

4.4 Traditional medicinal plant use knowledge transfer

Most of the traditional knowledge on medicinal plants in the study area is known to be transmitted along the family line from parents (72.2%) followed by observation (18.4%) to the next generation (Fig.8).

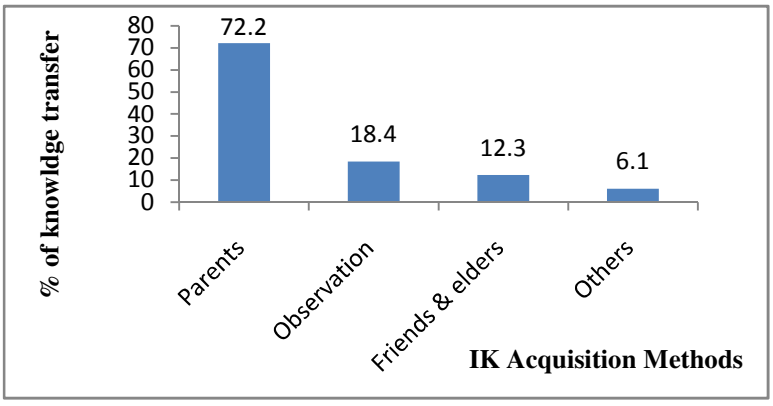

Fig. 8 IK Acquisition method in the study area

4.5 Ethnomedicinal plants in the study area

4.5.1 Ethnomedicinal plants used to treat human and livestock ailments

A total of 107 traditional medicinal plants that belong to 96 genera and 52 families were collected. Out of the collected and identified medicinal plants, 84 species (78.5%) are used for treatment of human ailments only and five species (4.7%) are used for treatment of livestock ailments only. A total of 18 species (16.8%) are used to treat both livestock and human ailments (Fig. 9).

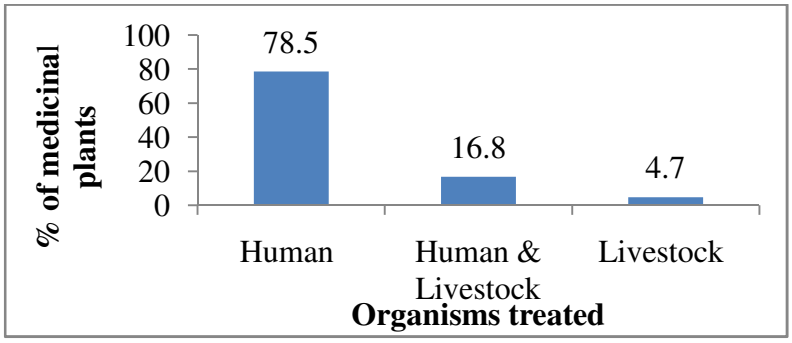

Fig. 9 Medicinal plants used for treatment of human and livestock ailments

4.5.2 Most commonly known medicinal plants

Among the total traditional medicinal plants, the top ten traditional medicinal plants are commonly known by the local communities in the study area and have greater than 25% of informants' agreements (Table 8).

Table 8 Top ten commonly known traditional medicinal plant species

No.	Scientific name	Informants' agreements	Percentage
1	*Embelia schimperi*	56	70.0
2	*Justicia schimperiana*	52	65.0
3	*Allium sativum*	48	60.0
4	*Cynoglossum coeruleum*	35	43.8
5	*Croton macrostachyus*	33	41.3
6	*Glinus lotoides*	31	38.8

7	*Lepidium sativum*	29	36.3
8	*Ruta chalepensis*	24	30.0
9	*Plantago lanceolata*	22	27.5
10	*Rumex nervosus*	22	27.5

4.5.3 Diversity of habits

The diversity of habits of ethnomedicinal plants (Fig.10) revealed that shrubs constitute the highest category with 44 species (41.1%) followed by herbs with 39 species (36.5%). Trees and climbers accounted for 17 species (15.9%) and seven species (6.5%) respectively.

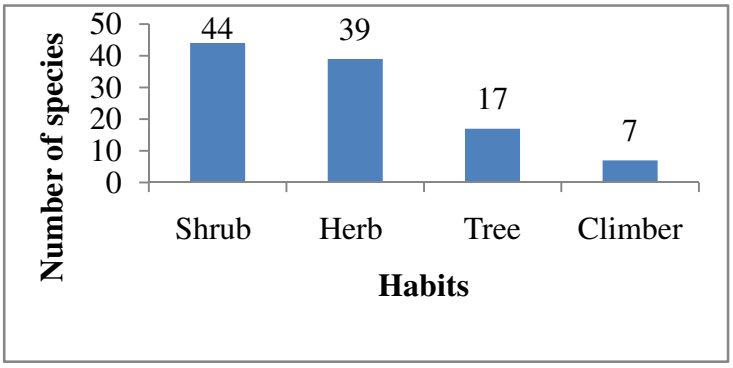

Fig. 10 Proportion of habits of ethnomedicinal plants

4.5.4 Plant parts used

The study on ethnomedicinal plants in the study area revealed that the plants parts that are used substantially treat ailments are leaves (29.8 %) followed by roots (22.4 %) (Table 9).

Table 9 Proportion of plant parts used for preparation of medicines

Plants parts	**Total plant parts**	**Percentage**
Leaf only	48	29.8
Root only	36	22.4
Fruit only	18	11.2
Stem bark only	12	7.5
Branches	8	5.0
Whole plant	7	4.3

Fruits and leaf	6	3.7
Seed only	4	2.5
Latex only	4	2.5
Root and leaf	3	1.9
Latex and leaf	2	1.2
Shoot and leaf	2	1.2
Leaf and stem bark	2	1.2
Shoot	2	1.2
Flower	2	1.2
Rhizome	2	1.2
Bulb	1	0.6
Stem only	1	0.6
Fibers of bark	1	0.6
Total	**161**	**100**

4.5.5 Conditions on preparation of ethnomedicinal plants for remedy

The majority (50.3%) of medicinal plants were cited to be used in the fresh form preparation of remedies. Comparatively, the least percentage of (9.3%) medicinal plants were cited to be used in dried and fresh remedy while the remaining 40.4% of ethnomedicinal plants were reported to be prepared in dried forms of remedy (Fig. 11).

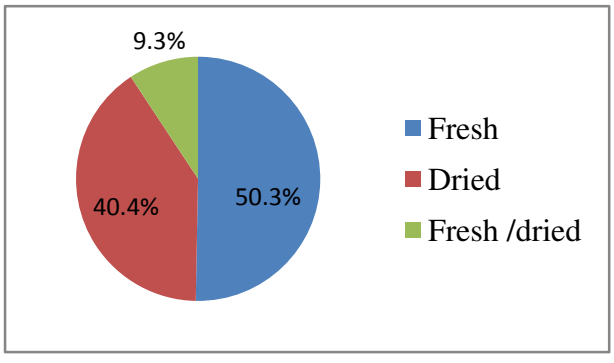

Fig. 11 Proportions of conditions on preparation

4.5.6 Types of preparation and application of prepared remedies

4.5.6.1 Preparation

The preparation of ethnomedicinal plants to treat ailments in the area revealed that the highest parts of preparation of ethnomedicinal plants employed is by squeezing (24.9%) followed by powdering (16.6%) (Table 10).

Table 10 Types of preparation for remedy

Type of Preparation	**Number of plant parts**	**Percentage**
Squeezing	48	24.9
Powdering	32	16.6
Crushing and soaking (infusion)	28	14.5
Decoction	17	8.8
Crushing	14	7.3
Fumigating	12	6.2
Boiling	9	4.7
Chewing	8	4.1
Poultice	6	3.1
Concoction	4	2.1
Latex collection	4	2.1
Unprocessed	11	5.6
Total	**193**	**100**

4.5.6.2 Application of prepared remedies

The largest parts of prepared remedies are applicable by drinking (45.1%) followed by creaming (15.5%) (Table11).

Table 11 Types of application of prepared remedy

Application	**Frequency**	**Percentage**
Drinking	87	45.1

Creaming (ointment)	30	15.5
Pasted on	21	10.9
Dropping	13	6.7
Eating	12	6.2
Inhaling /Sniffing	12	6.2
Sucking	8	4.1
Drinking & bathing	2	1.0
Swallowing	2	1.0
Others	6	3.1
Total	**193**	**100**

4.5.7 Dosage and route of administration

Dosages were estimated using cups (‘Sini ’ or ‘ Finjal ’), Can (‘ Tassa ’ or ‘ Tiwa ’), Glasses, bottle, (‘Birchiko’, or ‘Gizaza’,‘Termus.) for liquids to be administrated, and for powders as spoon (‘Mankia’), numbers or in some cases handful (‘Efeign’) for seed and fruits, and for roots (‘Atik’), or small figure (‘Tinish tat’). The most favoured route of administration is oral (55. 4%) followed by dermal (26.9 %) (Table 12)

Table 12 Route of administration of remedies

Route of administration	**Frequency**	**Percentage**
Oral	107	55.4
Dermal	52	26.9
Oral and nasal	13	6.7
Nasal	11	5.7
Eye	4	2.1
Ear	2	1.1
Oral and dermal	2	1.1
Anal	1	0.5
Vaginal	1	0.5
Total	**193**	**100**

4.5.8 Marketable medicinal plants of the study area

Market survey was conducted in the study area to assess the medicinal plants used in the treatment of human and livestock ailments that are sold openly in the local markets. During the interview, informants also recommended that there are some medicinal plants that are sold for the purposes of medicinal uses. As a result, it was conducted repeatedly to identify medicinal plants sold in the local market of 'Brakat', 'Gerchech', 'Rim' and 'Merawi' of the study area. Among the market areas, the two common medicinal plants were dried fruits of *Embelia schimperi* and *Glinus lotonoides* that are sold purposely for medicinal value in the market with the low price (Fig.12).

Fig.12 Marketable medicinal plants at 'Rim' market

4.5.9 High ranked scarce ethnomedicinal plants in the study area

Preference ranking was performed on six of the most scarce medicinal plants provided by most informants during the interview to set priority for conservation these plants. Therefore, six medicinal plants were provided to seven informants to show their views about scarcity of medicinal plants in their environment. The results indicated that *Echinops kebericho* was the most scarce medicinal plants. The least scarce species was *Millettia ferruginea* (Table 13).

Table 13 High ranking scarce TMP in the study area (R 1-7 = Respondents 1-7)

Scientific name of species	Respondents (R_1-R_7)							Score	Rank
	R1	R2	R3	R4	R5	R6	R7		
Steganotaenia araliacea	3	4	5	5	3	4	3	27	2nd
Clerodendrum myricoides	5	3	1	4	2	3	2	20	5th
Echinops kebericho	4	5	4	4	4	5	4	30	1st
Solanecio gigas	4	2	3	3	2	2	5	21	4th
Millettia ferruginea	2	3	2	3	3	4	2	19	6th
Gnidia involucrata	5	4	2	4	3	2	4	24	3rd

4.5.10 Use diversity ranking on medicinal plants species

Average score for direct matrix ranking of six medicinal plants with use diversity (Use values given from 0 to 5: 5 = Excellent, 4 = Very good, 3 = Good, 2 = Less, 1= Least and 0 = No use) (Table 14). The use diversity for all medicinal plants listed by informants is presented in the Appendix 2.

Table 14 Average score for direct matrix ranking of TMP with use diversity

Main uses	*Cordia africana*	*Croton macrostachyus*	*Rhus vulgaris*	*Syzygium guineense*	*Ficus sur*	*Rosa abyssinica*
Firewood	5	5	4	4	4	5
Medicine	4	4	3	5	4	4
Construction	5	4	5	5	5	4
Charcoal	4	4	3	4	5	2
Forage	3	0	5	2	4	2
Edible fruit	4	0	3	2	2	1
Total	25	17	23	22	24	18
Rank	1st	6th	3rd	4th	2nd	5th

4.6 Informant consensuses and fidelity Level

4.6.1 Informant consensus factor

Informant consensus factor was calculated on the identified ten disease categories. It is calculated as: **ICF = Nur – Ns / (Nur – 1)**. Therefore, the highest ICF value was obtained from diseases related to dermatological problems (0.85) and the least ICF was associated with genitourinary diseases (0.43) (Table 15).

Table 15 ICF for the given diseases category (Key: Ns- number of species, Nur- number of use report)

Category of diseases	Ns	Nur	ICF
Dermatological problems - scabies, dandruff, ringworm, eczema, herpes zoster, wound, burns, cut, circumcision, boils, Tinea nigrea, Tinea versicolor, leprosy and wart	29	183	0.85
Gastrointestinal disorder and parasites infection - Stomachache, gastritis, diarrhea, dysentery, loss of appetite, vomiting, helminthes (tapeworm, ascariasis and hook worm), giardia and amoeba, typhoid	24	142	0.84
Febrile illness ('Mich'), evil eye, emergency ('Kurba') and ("Likifit")	17	96	0.83
Livestock diseases- Emaciation, coccoides, dysentery, stomach disorder, leech infestation, eye injuries, skin injuries, swelling, bloating, body lice	23	119	0.81
Rabies and internal diseases- Malaria, hemorrhoids, rheutematim	14	63	0.79
Snake bite	2	5	0.75
Throat and respiratory diseases - Tonsillitis, dry cough, common cold, asthma and lung T.B.	19	61	0.70
Swelling, donkey's wart, and tumor	9	23	0.61
Organ diseases such as teeth, ear, eye, liver, kidney	22	49	0.56
Genitourinary problems- Diuretic, gonorrhea and impotency	8	14	0.43

4.6.2 Fidelity level (FL)

The fidelity level was calculated on those frequently reported diseases by informants so as to identify the most important species. The most frequently occurred diseases reported by informants with their number of citation includes coccoides (80), malaria (72), water borne disease (giardia and ameba) (54), febrile (53), tonsillitis (42), wound (37), gastritis (34), tuberculosis (28) and dysentery (26). The traditional practitioners employed their indigenous knowledge to manage these frequently diseases and important medicinal plants species are identified for those diseases (Table 16).

Table 16 Fidelity value of TMP for the most frequently occurring diseases (Key: Ni is the number of informants that claim 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	**Scientific name**	**Ni**	**N**	**Ni / N**	**FL=Ni/NX100 (%)**
Coccoides	*Justicia schimperiana*	31	57	0.54	54
	Clausena anistata	12	16	0.75	75
Gastritis	*Aloe macrocarpa*	7	21	0.33	33
	Acacia pilipisia	3	3	1.0	100
Tonsillitis	*Rhamnus prinoides*	4	11	0.37	37
	Plumbago zeylanica	8	13	0.62	62
Febrile	*Ocimium lamiifolium*	11	11	1.0	100
	Cynoglossum coeruleum	35	35	1.0	100
Giardia and ameba	*Vernonia amygdalinia*	6	17	0.35	35
	Calpurnia aurea	9	18	0.5	50
	Rhus vulgaris	12	16	0.75	75
	Acanthus polystachius	7	13	0.54	54
Wound	*Ficus carica*	19	19	1.0	100
	Dodonaea angustifolia	10	21	0.48	48
Malaria	*Clerodendrum myricoides*	4	4	1.0	100
	Justicia schimperiana	18	57	0.32	32
	Gnidia involucrata	4	5	0.8	80
Dysentery	*Verbena officinalis*	6	6	1.0	100
	Rhus vulgaris	4	16	0.25	25
Tuberculosis	*Cucumis ficifolius*	3	7	0.43	43
	Rumex abyssinica	2	5	0.4	40

4.7 Conservation status of ethnomedicinal plants

4.7.1 Wild cultivated and domesticated medicinal plants in the homegardens

The result of the study shows that medicinal plants can be categorized as wild, wild cultivated and domesticated plant species. Thus, the finding shows that six (5.7%) of the medicinal plant species out of 16 species collected in the homegardens are wild cultivated primarily for the purpose of medicinal uses whereas other six of medicinal plants are domesticated plant species in the study area (Table 17).

Table 17 List of wild cultivated and domesticated medicinal plant species

No.	**Wild cultivated plant species**	**Occurrence of wild cultivated**	**Domesticated plant species**
1	*Withania somnifera*	Cultivated only	*Allium sativum*
2	*Solanecio gigas*	Cultivated only	*Cucurbita pepo*
3	*Solanum dasyphyllum*	Cultivated and wild	*Ruta chalepensis*
4	*Verbena officinalis*	Cultivated and wild	*Myrtus communis*
5	*Plumbago zeylanica*	Cultivated only	*Prunus persica*
6	*Clerodendrum myricoides*	Cultivated and wild	*Rhamnus prinoides*

4.7.2 Abundance of medicinal plants

The result shows that current status of medicinal plants in the study area are rare (13 species, 12.1%), occasional (41species, 38.4%) and common (53 species, 49.5%) based on the degree of abundance as perceived by informants and field observation (Fig. 13).

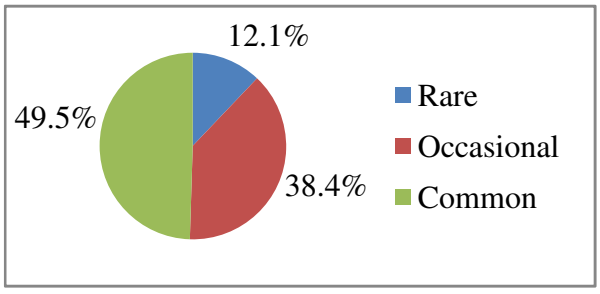

Fig.13 Degree of abundance of medicinal plants in the study area

4.7.3 Use diversity of medicinal plants

Multiple uses diversity analysis shows that the highest exploitation of ethnomedicinal plants other than medicinal value reported was for the purpose of firewood (25.7 %) while the least exploitation was reported for charcoal production (4.2 %) (Fig.14).

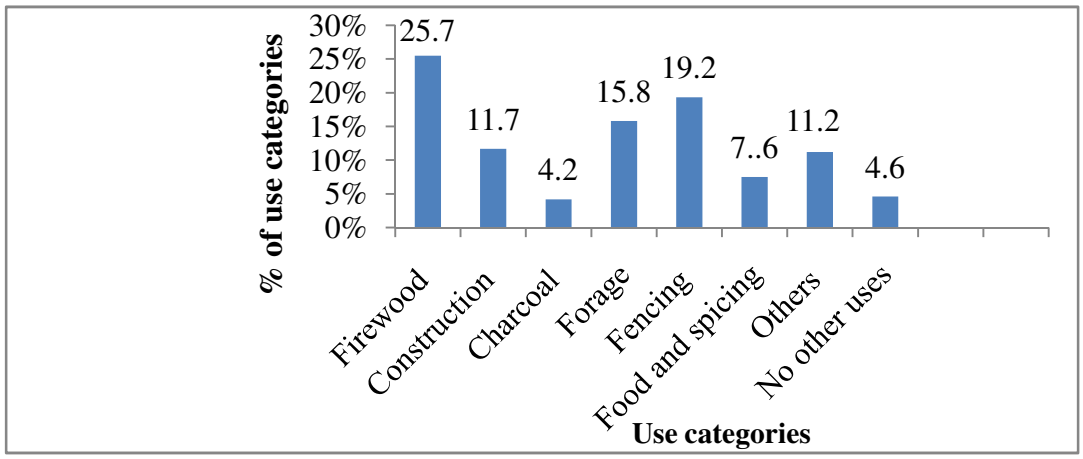

Fig.14 Proportions of other uses for ethnomedicinal plant species

4.8 Threats to medicinal plants in the study area

The main threats to ethnomedicinal plants were agricultural expansion (24.5%) that ranked first followed by firewood collection (22.9%). The least threats to medicinal plants as perceived by informants was drought (13.8%) (Table 18).

Table 18 Ranking of threats to TMP (R1-10 = Respondents 1-10)

Major Threats	Respondents										Total	Percentage	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10			
Agricultural expansion	5	5	5	4	4	5	5	4	5	4	46	24.5	1st
Grazing	4	3	3	3	4	2	3	5	2	3	32	17.0	4th
Construction	4	4	3	5	5	3	4	4	5	4	41	21.8	3rd
Drought	3	3	2	1	2	4	3	2	3	3	26	13.8	5th
Firewood	4	5	4	5	5	4	4	3	4	5	43	22.9	2nd

5. DISCUSSION

5.1 Acquisition, transfer and threats to indigenous knowledge on medicinal plants

Indigenous knowledge on medicinal plants was obtained from various acquisition methods in the study area. The highest medicinal plant knowledge acquisition from the local communities was from parents (72.2%). This was due to the secrecy of knowledge transfer between family members. Casual observation and practice appeared to be the second main sources of knowledge acquisition which accounted for 18.4%. It means knowledge gained living closest to the nearest of knowledgeable persons and observation of species and practice. The third knowledge acquisition was from friends and elders (12.3%) outside the family line. This type of knowledge acquisition was performed by learning from outside the family line from knowledgeable elder and friends.

As a result, there is a wealth of indigenous knowledge on the use of traditional medicinal plants by the local people of the Wereda as documented elsewhere in Ethiopia (Tesfaye Awas and Zemede Asfaw, 1999; Mirutse Giday, 2001). However, most of the indigenous knowledge acquisition from the local community is in secret manner and transferred orally between family members. Therefore, the transferring system becomes threatened for the loss of indigenous knowledge. Moreover, modernization, sudden death of parents, religious leaders and people image on practitioners are also threats on indigenous knowledge.

5.2 Medicinal plants used to treat human and livestock ailments

A total of 107 ethnomedicinal plants were recorded and were used to treat 67 human and livestock ailments (Appendix 6). Out of these, more number of medicinal plants (78.5 %) was reported to be used for treatment of human ailments. It appeared that local communities have more indigenous knowledge and give emphasis the uses of medicinal plants to treat human ailments than livestock diseases. Similar results were documented in other study sites of Ethiopia (Tesfaye Awas and Sebsebe Demissew, 2009; Mirutse Giday *et al.*, 2009).

The recorded medicinal plants of the local communities of Mecha Wereda are also crosschecked with the results of other studies. This indicated that most of the medicinal plant species collected

and identified in this study were also used in other parts of Ethiopia. Of 107 species recorded in the study area, 35 species were already documented by Tilahun Teklehaymanot and Mirutse Giday (2007), six species were reported by Haile Yineger *et al*. (2008), 18 species were documented by Tesfaye Hailemariam *et al*. (2009), seven species were documented by Mesfin Tadesse *et al*. (2009), eight species by Teferi Flatie *et al*. (2009). Other medicinal plants may not be reported due to the few numbers of studies have been conducted in the country.

The analysis of results showed that the local communities used ethnomedicinal plants for treatment of ailments in various ways. A single plant species is employed for the treatment of two or more types of diseases. Some of the species including *Dodonaea angustifolia, Justicia schimperiana* and *Croton macrostachyus* are reported to have been employed for the treatment of several ailments. For the same type of ailment different plant species are also used for their treatment (Appendix 1).

In other cases, the same type of species with the same parts is employed for the treatment of both human and livestock ailments. For example, the leaf of *Dodonaea angustifolia* is used to treat the ailments of wound for human and livestock, the leaf of *Calpurnia aurea is* used for the treatment of malaria for human and dysentery for animals (Appendix 1). As a result, the indigenous knowledge on the uses of medicinal plants as treatment of ailments was very diverse in the study area.

In the study area, some of the species were commonly known and recognized as effective remedies. These include *Embelia schimperi*, *Cynoglossum coeruleum, Justicia schimperiana, Glinus lotoides, Lepidium sativum, Allium sativum, Croton macrostachyus, Plantago lanceolata, Rumex nervosus* and *Ruta chalepensis* (Table 8). The fact that these medicinal species were much known and used is related to the availability of the species and the nature of ailments treated by them. Parts of some species such as fruits of *Embelia schimperi* and *Glinus lotoides* are marketable (Fig.12) and this made them commonly known in the community. Similarly, they are also reported for different ethnomedicinal uses in other studies of the country (Amare Getahun, 1976; Tilahun Teklehaymanot and Mirutse Giday, 2007). *Cynoglossum coeruleum* was commonly known due to the ailment treated by it. It was reported as being used in the treatment of febrile illness. This disease occurs suddenly and everybody openly employed it to treat this

suddenly occurring ailment. *Croton macrostachyus* and *Plantago lanceolata* were reported more commonly for the treatment of cuttings on the skin. This was because the life of local communities depends on agriculture and living with farming that result in injuries like cut so that local communities are practiced to treat such accidental injuries using their indigenous knowledge. *Allium sativum* and *Ruta chalepensis* are commonly used in the area as sources of food and local communities are also practiced their medicinal uses. Similarly, they are reported in different studies of the country as being used as food, spice and medicinal crop since antiquity (Nigist Asfaw and Sebesebe Demissew, 2009). *Lepidium sativum* is commonly known in the study area for medicinal uses in the treatment of stomach disorder for humans and livestock. It is easily available to practice their indigenous knowledge to treat ailments. Similarly, it is reported to have various medicinal uses in different parts of Ethiopia (Amare Getahun, 1976). *Rumex nervosus* is another commonly known medicinal plant used to treat circumcision and eye diseases.

5.3 Conditions, plant parts used and mode of preparation

The parts of plants used for the preparation of remedy were reported to prepare in fresh (50.3%) form followed by dried (40.4%) and combination of the two (9.3%) (Fig.11). The common use of freshly processed remedies in the area might indicate the availability of fresh medicinal plants in their residence. It also appeared that the common use of fresh remedies might provide the chance of active ingredients. Therefore, users may obtain active ingredients in the fresh form to treat ailments than dried forms. Other studies conducted elsewhere in the country also indicated the wider use of fresh remedies (Tesfaye Hailemariam *et al*., 2009; Mirutse Giday *et al.*, 2009).

Conditions for preparation of remedies depend on the types of diseases. Some medicinal plants are prepared in fresh form or dried form or both depending on the conditions of the diseases. For example, the leaf of *Dodonaea angustifolia* is used in fresh form to treat dysentery while the dried form is used for the treatment of wounds. The root of *Malva verticillata* is prepared in fresh form to treat vomiting while dried form is used to treat dysentery (Appendix 1).

The analysis of the result showed that the local people of the study area use various parts of medicinal plants. Leaves contribute about 29.8% followed by roots (22.4%), fruits (11.2%) and stem barks (7.5%) (Table 9). Use of leaf parts in the preparation of many remedies may be due to

the relative safety to use them than other parts of plants because informants asserted that leaves are relatively less powerful to use as a remedy than other plant parts. This was also indicated in other ethnobotanical studies in the country (Tesfaye Hialemariam *et al*., 2009; Haile Yineger and Delenasaw Yewhalaw, 2007; Haile Yineger *et al*., 2008; Tesfaye Awas and Sebsebe Demissew, 2009; Mirutse Giday *et al*., (2009) that leaf was the largest plant part employed for the preparation of remedies. Other research findings also argued that roots are widely used followed by leaves in their study sites (Tilahun Teklehaymanot and Mirutse Giday, 2007).

Most of the plant remedies are prepared by squeezing different parts (24.9%) followed by powdering (16.6%), infusion (14.5%) and decoction (8.8%) (Table 10). However, some specific herbal preparations were taken by cooking with 'Wot' (concoction, 2.1%). Thus, preparation methods of remedies depend on the types of ailments. Some medicinal plants need to be boiled while some need to be applied directly (Appendix 1).

5.4 Route of administration and dosage of prepared remedies

The results of the study indicated that the route of administration depends on the nature of ailments to be treated, given both internally and externally. The largest administration routes were oral (55.4%) followed by dermal (26.9%). The fact that remedies prepared by Mecha local communities were administrated orally is related to the high prevalence of internal ailments in the area. The intake of remedies orally could be applied in the form of drinking (45.1%) swallowing (1.0%), sucking of juices (4.1%) and eating (6.2%). The remedies were taken with water, sugar, butter, salt, milk, honey, injera, 'Bessso', tea, local alcohols like 'Tella' and 'Arekiy'. These additives are mixed from the preparations to improve the intake of remedies. In a similar way, because of the high incidence of external infectious and others, dermal route was the second way administration.

The measurements used for prepared remedies were estimated by various locally available materials like cups, glasses, bottles, cans and spoons for medication applied internally. In the study, it was found that for medication applied externally almost always it was with a little bit of imprecise. The imprecision for dosage of remedies that were administrated externally at household level by traditional practitioners have limited problems accordingly healers but may

have significant effects on the users. Several studies on the standardization and lack of precision of traditional medicinal uses were also documented by others such as Tilahun Teklehaymanot and Mirutse Giday (2007).

In the study, it is known that some remedies have side effects. For example, use of *Bersama abyssinica* for the treatment of ascariasis, *Embelia schimperi* for the treatment of tapeworm infection*, Croton macrostachyus* for the treatment of malaria were reported to be potent and with some side effects if not taken properly. Moreover, in administrating some medicinal plants special care is needed. For example, the root of *Momordica foetida* for the application of toothache has needed special care to avoid contact for other mouth parts. Other medicinal plants side effects were not reported.

5.5 Habits and sources of medicinal plants

The results of the study showed that the majority of medicinal plants used are shrubs (41.1%) followed by herbs (36.5%) (Fig.10). This finding agrees with the findings of these researchers (Bayafers Tamene *et al*., 2000; Mirutse Giday and Gobena Ameni, 2003; Debela Hunde *et al*., 2004; Ermias Lulekal *et al*., 2008; Fisseha Mesfin *et al*., 2009) described that shrubs are the most widely used medicinal plants in their study sites. The reasons for the wide usage of shrubs than herbs are the availability of shrubs throughout the year and herbs mainly during wet seasons. On the other hand, the findings of other studies in other parts of the country (Miruste Giday *et al*., 2003; Endalew Amenu, 2007; Tilahun Teklehaymanot and Miruste Giday, 2007; Mirutse Giday *et al*., 2009; Tilahun Teklehaymanot *et al*., 2009; Tesfaye Awas and Sebsebe Demissew 2009; Tesfaye Hailemariam *et al*., 2009) revealed that herbs are commonly used medicinal plants.

In this study the majority of medicinal plants, approximately 86% of medicinal plants were collected from wild (around farmlands, churches, on farmlands, grazing lands, around roads, upland forests or Riveral forest, evergreen bushes, edge of ever green montane forest and ever green montane forest and dry Afromontane forests). This is also true that ethnobotanical studies conducted in different parts of the country (Tesfaye Awas and Zemede Asfaw, 1999; Miruste Giday, 2001; Ermias Lulekal *et al*., 2008, Tesfaye Hailemariam *et al*., 2009).

Though the majority of medicinal plants were collected in the wild, 14% of medicinal plants were collected from homegardens in the study area. Homegardens grown medicinal plants are used as food and spice, and they play other economic roles for the local communities.

5.6 Diversity and distribution of medicinal plants

The diversity of medicinal plants in the study area shows that Asteraceae is the largest family containing 12 species (11.2%) followed by Solanaceae eight species (7.47%) and Lamiaceae five species (4.67%) and Fabaceae five species (4.67%). Cucurbitaceae, Euphorbiaceaee and Rosaceae consisting of 4 species each, Boraginaceae, Myrtaceae, Moraceae, Olaceae and Polygonaceae consist of 3 species each, Anacardiaceae, Acanthaceae, Apiaceae, Asclepiadaceae, Convoluvulaceae, Malvaceae, Myrsinaceae, Rubiaceae, Rutaceae and Verbenaceae consist of 2 species while the rest 30 families contain one species each (Appendix 5). This finding is a good indicator of the existence of considerable diverse sources of medicinal plants in the study area.

According to Edwards (2001), the woodlands, montane vegetation including grasslands and forests and the evergreen scrubs and rocky areas contain more medicinal plants compared with other vegetation types in Ethiopia. The distribution of medicinal plants in visually recognized community types within the dry evergreen Afromontane forest showed that *Carissa spinarum* and *Pterolobium stellatum* (20.6%), *Croton macrostachyus* and *Vernonia auriculifera* (15.9%) and *Acacia abyssinica and Juniperus procera* (13.1%) accounted for the largest sources of medicinal plants in the study area. Shrubs and climbers were mostly distributed in forests while herbs are distributed on the grazing lands, plantation sites, edge of farmlands and forests.

5.7 Medicinal plant species use values

The medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values (Trotter and Logan, 1986). Diseases that were found to be prevalent in the area were treated by a variety of medicinal plants. The fidelity level of these species showed that their importance to treat the most frequently occurring diseases.

5.7.1 Dermatological problems

Dermatological problems have the highest numbers of remedies prepared to treat them (29 species with ICF = 0.85). The skin diseases were also reported in the ten top diseases as analyzed by the Wereda Health Office. The reason of the large number of dermatological problems could be exposure to external injuries, scratches, parasitic, fungal and bacterial infections. Among the dermatological infections, wound was reported as the most frequency occurring disease in the area and it is treated by nine medicated species. The important medicinal plant species for treating wound perceived by informants' consensus and fidelity value were *Ficus carica* (FL= 100 %) and *Rhus vulgaris* (FL = 75%).

In addition, *R. vulgaris* is also used in the treatment of lung tuberculosis whereas *F. carica* was reported only for the treatment of wound. In other ethnobotanical study of the country by Fisseha Mesfin *et al*. (2009), *R. vulgaris* is reported for its different ethnomedicinal uses. Therefore, further study of the pharmacological uses of the species and isolation of bioactive compounds from such medicinal plants could contribute to the discovery of modern medicine.

5.7.2 Gastrointestinal infectious

Gastrointestinal infectious accounted for the second largest numbers of remedies prepared (24 species with ICF = 0.83). The reason for gastrointestinal diseases could also be prevalence due to lack of sanitation associated with drinking with food preparation and storage. The most frequently occurring diseases reported were dysentery, gastritis and water born diseases (Giardia and amoeba). These diseases are also reported among the ten top diseases occurring in the Wereda according to the Wereda Health Office. Water born diseases (Giardia and amoeba) were reported to be treated by two medicinal plant species of *Vernonia amygdalina* (FL=35%) *and Calpurnia aurea* (FL=50%). The reason for less fidelity value for the two species was that they have multipurpose medicinal uses. *Calpurnia aurea* is reported to treat the diseases of water born disease (Giardia and amoeba), malaria, diarrhea and body lice. Other studies by Tilahun Teklehaymanot and Mirutse Giday (2007), Tesfaye Hailemariam *et al*. (2009), and Fisseha Mesfin *et al*. (2009) show its multipurpose ethnomedicinal uses. *Vernonia amygdalina* is also reported in the study for the treatment of wounds, stomach disorder and water born diseases. This is also reported by Tilahun Teklehaymanot and Mirutse Giday (2007).

Dysentery was another frequently occurring disease in the study area and the most important species used to treat the disease was *Verbena officinalis* (FL=100%). The third frequently occurring disease in the category was gastritis. It was treated by the most important species of *Aloe macrocarpa* (FL=33%).

5.7.3 Livestock ailments

Livestock ailments including coccoides, emaciation, bloating, eye injuries, leech infestation and stomach disorder were also the third largest remedies treated by 23 species (ICF= 0.81). Although livestock diseases were not reported by Wereda Health Offices as prevalent, informants indicated as most frequently occurring diseases in the Wereda. *Clausena anistata* (FL=75%) is one of the important medicinal species reported to treat newcassttle (coccocoide) followed by *Justicia schimperiana* (FL= 56%).

5.7.4 Febrile illness ('Mich'), evil eye, emergency ('Kurba',) and 'Likifit'

Febrile illness ('Mich'), evil eye, emergency ('Kurba',) and ('Likifit') were also the fourth largest remedies prepared to treat the disease (17 species with ICF= 0.83). Although the agents of these disease categories were not specified and not reported in the top ten diseases of the Wereda Health Office, local communities largely reported the prevalence nature of the diseases. During the study, the nature of the diseases and symptoms were highly explored from informants. The highest fidelity level from the most frequently occurring disease in the categories showed for the species of *Ocimium lamiifolium* (FL= 100%) and *Cynoglossum coeruleum* (= 100 %) to treat febrile. The study of this result showed *Ocimium lamiifolium* was only reported for febrile ('Mich') whereas other studies conducted in different parts of the country by Tilahun Teklehaymanot and Mirutse Giday (2007) and Fisseha Mesfin *et al*. (2009) reported it multiple ethnomedicinal uses. *Cynoglossum coeruleum* is also reported only for the treatment of' Mich' and it is commonly known by most informants.

5.7.5 Malaria, rheutematim, rabies and hemorrhoids

Malaria, rheutematim, rabies and hemorrhoids were reported to be treated by 14 species (ICF= 0.79). Malaria was the most prevalent disease that occurs in the area being reported as one of the

top ten diseases of the Wereda as well as by informants. Due to the high occurrence of the disease, local communities use about eight species (Appendix 6). The most important species identified was *Clerodendrum myricoides* (FL = 100%) followed by *Gnidia involucrata* (Fl= 80%) and *Justicia schimperiana* (FL= 32%).

5.7.6 Throat and respiratory diseases

Throat and respiratory diseases were reported to be treated by 19 species with ICF= 0.70. Respiratory diseases were also reported in the study area as prevalent in the top ten diseases according to Wereda Health Office. Among the diseases, tonsillitis and lung tuberculoses were the most prevalent. The most widely used species for the treatment of lung tuberculosis are *Cucumis ficifolius* (FL= 43%), *Rumex abyssinica* (FL=40%) and *Rhus vulgaris* (FL= 25%) whereas tonsillitis was treated by *Acacia pilispina* (FL=100%), *Plumbago zeylanica* (FL=62%) and *Rhamnus prinoides* (FL=37%). Therefore, further study of the pharmacological uses of the species and isolation of bioactive compounds from such important medicinal plants could contribute to the discovery of modern medicine.

5.8 Use diversity and effects on conservation

Indigenous people in the study area depend on plant sources for their livelihood. These source uses are for firewood, construction, charcoal, fencing, food and forage in addition to their medicinal uses. Uses for firewood (25.7%), fencing (19.2%) and forage (15.8%) have 1st, 2nd and 3rd ranked respectively. Use diversity ranking exercises performed on six medicinal revealed that medicinal plants are exploited in large amounts for other uses in the area such as construction, firewood, medicine, charcoal, forage and edible fruits are ranked as 1st, 2nd, 3rd, 4th, 5th, and 6th respectively (Table 14). Thus, as use diversity ranking indicates, the scarcity of medicinal plants also occurred due to over harvesting for not only medicinal but also for other uses.

Preference ranking for five selected medicinal plants out of 13 scarce medicinal plants (Fig.13) in their environments showed that *Echinops kebericho, Steganotaenia araliacea, Gindia involucrata, Solanecio gigas, Clerodendrum myricoides* and *Millettia ferruginea* are ranked 1st, 2nd, 3rd, 4th, 5th and 6th respectively (Table 13). The exploitations of these medicinal plants for multipurpose uses in addition to medicinal uses including firewood, charcoal and construction, forage and fencing purposes were indicators for the causes of the scarcity of those medicinal

plants in the area. Medicinal plants can have uses other than as sources of medicines, and the threats from over-harvesting may be due to effects of collection for purposes other than medicinal uses (Hamilton, 2003). Similarily, in the study area, these medicinal plants are overexploited for multipurpose uses. Thus, conservation action is needed in the area to save species from further reduction in their number.

Use of plants for firewood is an important factor and accounted about 25.7% among the use diversity. This indicated that the local communities heavily depend on firewood for domestic uses.

Fencing homesteads and enclosing crop fields account for 19.2%. Thus a number of medicinal plants are removed from the wild for the purpose of fencing.

Forage accounts for 15.8% usage by local communities. Plants used as forage are either directly consumed by livestock or collected by local communities. The consumption of medicinal plants directly by livestock damages the medicinal plants in the wild and could also result in overgrazing. This activity causes depletion of medicinal plants.

Construction accounts for 11.7% of the usage by the local community. Plant use for construction traditionally has a high significance in the study area. Local communities used medicinal plants for traditional house construction (huts), construction of ceilings, for making different furniture and house hold utensils, for making traditional agricultural tools and for rope making. This indicated that local communities still dependent on plant resources for different purposes.

Charcoal is the least use diversity employed in the community accounting for 4.2%. This was because the largest numbers of medicinal plants reported were shrubs and herbs. These species might provide less production of charcoal than trees. Moreover, eucalypt plantation is the dominant artificial plantation seen in the area and has preference to use the species that lessen the dependence on charcoal production from medicinal plants.

Food is another use diversity of medicinal plants accounting for 7.6%. The indigenous people of the study area consume plants as a food from different plant parts (leaves, fruits, roots and seeds for the purpose of directly feeding on or as use as to flavor foods).

The existence and utilization of medicinal plants for such diverse uses imply the impacts on the conservation of medicinal plants in the area unless sustainable uses of there are practiced. However, sustainable uses of medicinal plants are not being practiced and there is low conservation efforts observed. The local practitioners depend on wild sources for medicinal plants (86%) compared to only 14% homegardens. There is a need for efforts on the use of resources on a sustainable manner. Otherwise their resources will be lost for local communities.

5.9 Endemic, rare and wild cultivated medicinal plants in the study area

Endemic species were found in the study area in the families of Asteraceae with four species, Fabaceae and Vitaceae with one species each. The medicinal plants recorded as endemic are *Solanecio gigas, Echinops kebericho, Laggera tomentosa, Plectocephalus varians* (Asteraceae), *Millettia ferruginea* (Fabaceae) and *Cyphostemma molle* (Vitaceae), which account for 5.7% (Six species) of the medicinal plants. Out of these, *Millettia ferruginea, Laggera tomentosa* and *Solanecio gigas* are nearly threatened species (Vivero *et al*., 2005). Similarly, these species are very rare in the study area except *Laggera tomentosa*. The reason for their scarcity in the area is due to overexploitation for the different purposes combined with medicinal uses. *Solanecio gigas* in the area is reported to be found only in homegardens. *Laggera tomentosa* is an endemic but not reported as rare. *Millettia ferruginea* is an endemic as well as rare medicinal plant in the area because of overexploitation for different purposes. *Echinops kebericho* is also an endemic as well as rare medicinal species. Because the roots of this species are used for medicine, it is becoming rare due to overexploitation in the area. It is approaching almost an extinction level. *Plectocephalus varians* is an endemic plant but not reported as rare. It might be due to the growth of species and it is not known to have multipurpose uses. *Cyphostemma molle* is also an endemic as well as rare medicinal plant in the area because of depletion of habitats. It is reported that it is most commonly growing in the scrublands of the study area as observed during the fieldwork.

The other non-endemic but rare species in the study area include *Clerodendrum myricoides, Gnidia involucrata, Lantana trifolia, Merremia pterygocaulos, Periploca linearifolia, Plumbago zeylanica, Steganotaenia araliacea, Verbascum sinaiticum* and *Withania somnifera.* These medicinal plants are reported as rare because of overexploitation for medicinal purposes. Among the species, *Clerodendrum myricoides, Plumbago zeylanica* and *Withania somnifera* are wild

cultivated plant species by some practitioners' in their homegardens but the status of cultivation is not sufficient enough to make them available as sources of medicine. The plants are reported for medicinal purposes with parts used (roots, stem barks or the whole parts) are shown in appendix 1. Employing the use of medicinal plants without sustainable bases could cause the depletion of these resources. Conservationists recognize that natural populations particularly popular medicinal plants, primarily these valued for their root parts and their bark, often tend to be the most threatened from over-exploitation (Sheldon *et al*., 1997). Thus, overexploitation of medicinal plants causes the scarcity of plants in the area. Cultivation of medicinal plants can be the best way to provide the plant materials needed for medicine. Consequently, cultivation of medicinal plants in the study area should be promoted.

5.10 Conservation, management and threats to medicinal plants in the study area

The loss of biodiversity in Ethiopia in general and in the study area in particular is a serious problem. It is caused by both anthropogenic and natural factors. The loss of medicinal plants as part of biodiversity are caused by environmental degradation, deforestation, agricultural expansion, over exploitation and population growth, which are the principal threats to medicinal plants in Ethiopia (Ensermu Kelbessa *et al*., 1992, Zemede Asfaw, 2001; Medhin Zewudu, 2002; Kebu Balemie *et al*., 2004). Similarly, Mecha Wereda has serious problems on the loss of medicinal plants due to anthropogenic factors such as agriculture expansion (24.5%) and deforestation for the different purposes of construction (21.8%), grazing (17.0%), firewood (22.9%) and natural factors such as drought (13.8%) that contributed to loss of biodiversity in general and medicinal plants in particular.

Conservation efforts of medicinal plants in the study area have started in small scale around the homegardens and farmlands but this has to be scaled up and strengthened. According to Zemede Asfaw (2001), cultivation for medicinal value accounts 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 and around farm lands primarily for medicinal purposes. It accounts for six species (5.7%) of the total collected medicinal plants in the study area (Table 17). This cultivation of medicinal plants in the area could contribute to the conservation of biodiversity. Similar results were obtained by Ermias

Lulekal *et al*. (2008) and Teferi Flatie *et al.* (2009) that small scales of medicinal plants are cultivated in the homegardens.

Many species in homegardens have multiple uses as food, medicinal, ornamental and other useful plants (Martin, 1995). Species including *Allium sativum, Prunus persica, Ruta chalepensis, Cucurbita pepo* and *Rhamnus prinoides* are domesticated in the homegardens. The purpose of domestication of these plants species are primarily for food and flavor. *Myrtus communis* is also a domesticated plant species for the purposes of perfume. *Feoniculum vulgare* is wild planted species for the purpose of spice for alcohol preparation. Others such as *Ricinus communis* for firewood, fencing and for leather softening; *Cordia africana* and *Eucalyptus globulus* for construction are grown in the homegardens for such purposes. Thus, conservation of plant resources is crucial for the maintenance of the livelihoods of local communities.

Though conservation of medicinal plants in the study area has started in homegardens, the majority of medicinal plants in the study were collected in the natural habitats (86%). Conservation effort in these natural habitats was very little. This has resulted in wild plants being scarce in the wild.

The major threats to medicinal plants in the area are agricultural expansion, firewood, construction, charcoal production and fencing. This was due to utilization of these medicinal plants for various purposes, intentionally neglecting medicinal uses and low awareness. Thus, strong efforts should be made to protect the existing wild flora even on the fragmented habitats.

6. CONCLUSION AND RECOMMENDATIONS

Mecha Wereda has diverse medicinal plants and 107 medicinal plants are documented in the present study. Out of 107 medicinal plants recorded, 84 species were used only to treat human ailments, 5 species were used only to treat livestock ailments and 18 species were used to treat both human and livestock ailments. The medicinal plant species were collected from both the natural habitats and homegardens. However, a significant proportion of these medicinal plants were collected from the wild (approximately 86%) and about 14% from homegardens (of which six species were found wild cultivated primary for medicinal purposes).

Medicinal plants have great contribution to the people in Mecha Wereda. A number of traditional medicinal plants are still used by traditional practitioners. Traditional medicine is practiced by the local communities. The ailments in this study are indicated by the informants. In the study a total of 67 human and livestock ailments were reported to be managed by traditional practitioners.

The status of all medicinal plants was recorded as common, occasional and rare to identify their conservation status as well as the major threats. The major threats to medicinal plants in the area were caused by agricultural expansion, firewood, construction, grazing, charcoal production and fencing. Among these agricultural expansion was the most visible one. This was due to utilization of these medicinal plants for various purposes or commodities as food, forage, shelter, and other cultural uses forgetting medicinal uses of the species. Conservation effort on the wild habitats in the Wereda is meager, although being initiated.

The associated traditional knowledge system has declined in the area in that the knowledge transfer is oral; less acceptable by the younger generation to gain the knowledge, condemnation by religious leaders and modern education. Under such situations, the use of plants for medicinal purposes as well as their conservation will also decline and consequently the once effective traditional health care system as well as importance medicinal plants will be reduced, if not lost altogether in the area.

Based on the results the following recommendations are forwarded:

- Raising awareness about the need for the conservation of medicinal plants in the wild (in- situ conservation) and associated ethnobotanical knowledge.
- Strengthening homegardens conservation of medicinal plants in the community.
- Further phytomedicine study should be conducted to investigate new medicinal products and for the scientific validation of traditional medicinal plants documented in the study.
- Encourage practitioners to cultivate medicinal plants in the homegardens through provision of motivating mechanisms by the Wereda.
- Provide priority for the cultivation of rare medicinal plant species in the area by providing appropriate cultivating sites to save them from local extinction.

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8. APPENDICES

Appendix 1 List of traditional medicinal plants used to treat human and livestock health problems with parts used, ailment type, route of administration, preparation, application and dosage (Key to abbreviations: Hb- habits, S – shrub, T- tree, H- herb, Ci – climber, Pp-plant parts used, R – root, L- leaf, Sb – stem bark, Fl – flower, Fr – fruit, Sd –seed, Sh – shoot, Rh – rhizome, Bu – bulb, Fi – fiber, Lat – latex, Uf- used for, Hu – Human, Ca – cattle, Chi – chickens, Li – livestock, Ra – route of administration, O – oral, Dm – dermal, Na – nasal, Ey – eye, E – ear, An – anal, V- vaginal, Cp – condition of preparation, F- fresh, D- dry).

No	Scientific name	Family	Local name(Amharic)	Hb	Pp	Uf	Ailment type	Ra	Cp	Preparation, Application and Dosage
1	*Acanthus polystachius*	Acanthaceae	Koshisheliе	S	R	Hu	Trachoma	O	F	The root is crushed, squeezed with water and one cup is taken orally at night and then sleeping is recommended.
					L		Wound	Dm	D	The leaf is crushed, powdered mixed with butter pasted on the wound and exposed to sunlight for few minutes.
2	*Acacia abyssinica*	Fabaceae	Girar	T	R	Hu	Evil eye	Na	D or F	The root is crushed with garlic, squeezed in water and then few droplets of juices are taken through the nose.
					Sb		Wound	Dm	D	The stem bark is roasted, powdered, and powders sprayed on the wound.

3	*Acacia pilispina*	Fabaceae	Cheba	S	Fi	Hu	Tonsillitis	O	F	Chewing of fresh fibers and sucking the juices.
4	*Achyranthes aspera*	Amaranthaceae	Telenji	H	L	Hu	Wound	Dm	D	The leaf is crushed, powdered and mixed with butter and creamed on the wound then exposing to the sunlight for few minutes.
					St		Removal of retained placenta	O	F	The stem is crushed, squeezed with water and one cup is taken orally.
5	*Acmella caulirhiza*	Asteraceae	Yemidir berberie	H	Fl	Hu	Toothache	O	F	Two flowers are chewed and kept on the tooth when the pain is felt.
					Wh	Ca	Eye injury	Ey	F	The whole part is crushed, squeezed with water and juices are dropped to the eye.
6	*Aloe macrocarpa*	Aloaceae	Eret	H	Lat	Hu	Gastritis	O	F	Latexes collected, mixed with honey and one glass is taken in the morning continuously.
					L	Ca	Emaciation	O	F	The leaf is cut into pieces, mixed with salt and with leaf of caster is given orally.

7	*Allium sativum*	Alliaceae	Nechishin kurti	H	Bu	Hu	Common cold	O	F	The bulb is crushed and smelling the aroma.
							Irritation of eye	Ey	D	Rubbing with crushed tip parts of bulbs.
							Typhoid	O	D or F	The bulb mixed with bulb of *Allium cepa* and *Nigella sativa* ('Tikur azmud') are crushed, soaked in water for overnights, decanted and one glass is taken continuously in the morning on an empty stomach.
8	*Asparagus scaberulus*	Asparagaceae	Yesiet kest	S	R	Hu	Toothache	O	F	Chewing of the root and sucking juices.
					Br		Fire accident	Dm	F	The branch is crushed and pasted on injured part.
9	*Bersama abyssinica*	Melianthaceae	Azamir	S	L	Hu	Ascariasis	O	F	The leaf is boiled in milk or potato tuber and one cup is taken orally. But over dosage has reported to have powerful effects.

10	*Brucea antidysenterica*	Simaroubaceae	Abalo	S	Fr	Hu	Eczema	Dm	D	Fruits are grounded, powdered, mixed with butter and creamed wound then exposing to the sunlight for few minutes.
					R		Hookworm	O	D	The 'Atik' size of the root is cut, crushed together with the root of *phytolaca dodecandra* powdered, homogenizing in water and one glass is drunk.
					Fr		Tinea nigra	Dm	D	The fruit is crushed together with the dried leaf of *Cucumis ficifolius*, powdered, mixed with butter and creamed injured part.
					L	Li	Removal of retained placenta	O	F	The leaf is crushed, squeezed in water and one bottle is given orally.
					Fr		Rabies	O	F	Seven fruits are directly given with injera.

11	*Buddleja polystachya*	Loganiaceae	Amfar	S	L	Hu	Scabies/itching	Dm	D	The leaf is crushed, powdered, mixed with butter and creamed wound then exposing on the sunlight for few minutes.
12	*Calpurnia aurea*	Fabaceae	Digita or Zigita	S	Sd	Hu	Giardia and amoeba	O	D	One spoonful powder of grounded seeds mixed with honey is taken orally in the morning. But over dosage has reported to cause more blood shortage.
					L		Malaria	O	F	The leaf is mixed with bulbs of garlic, leaf and fruits of rue are crushed, soaked in the water for overnight, decanted and one cup is taken orally during night and sleeping.
					L	Ca, Ga, Shp	Diarrhea	O	F	The fresh leaf is crushed, soaked in water for 2-3 hrs, decanted and one glass is administrated orally.
					L	Ca	Body lice	D	F	The leaf is crushed, soaked in water and bathing the body.

13	*Capparis tomentosa*	Fabaceae	Gemero	S	Sb	Ca	Epidemic	O & Na	D	The bark is crushed and placed on the red hot charcoal and is used to fumigate smokes.
14	*Chenopodium opulifolium*	Chenopodiacea e	Sinin	H	L	Hu	Toothache	O	F	The leaf is squeezed with water and one cup of juice is taken orally.
15	*Carissa spinarum*	Apocynaceae	Agam	S	R	Hu	Stabbing pain	O	F	The root is crushed, squeezed in the water and one cup of juice is taken orally.
							Evil eye	Na	D or F	The root is crushed with bulbs of garlic, squeezed in water and droplets are taken through the nose, and the remaining parts tied with clothes and smelling.
16	*Clematis simensis*	Ranunculaceae	Yeazoareg	Cl	L	Hu	Swelling	D	F	The leaf is dressed swells tied with clothes until swell burst then the leaf is squeezed with water and juices are creamed.
17	*Clerodendrum myricoides*	Lamiaceae	Misrich	S	Fr & L	Hu	Malaria	O	D	The leaf and fruits, bulb of garlic, fruits and leaf of rue are mixed, crushed, powdered and soaked in honey for one day (24 hours) and one glass is taken continuously.

18	*Clausena anisata*	Rutaceae	Limich	S	R	Hu	Emergency	O	F	The root is crushed & squeezed in water and one cup is drunk. Additionally, the root is tied with neck.
					L	Chi	Coccoides	O	F	The leaf is crushed, squeezed with water and given mixing with injera.
19	*Clutia lanceolata* subsp. *lanceolata*	Euphorbiaceae	Fiyelefeg	S	L	Hu	Hemorrhoid	O	D	The leaf is crushed, powdered, homogenizing with water and one glass is taken continuously and with leaf caster push inwards through the anal.
					Fr		Etching	Dm	D	The fruit is grounded, powdered, mixed with butter and creamed injured part of skin and exposing to the sunlight for few minutes.
20	*Convolvulus steudneri*	Convolvulaceae	Flasot	H	Wh	Hu	Stomachache	O	D	The whole part is crushed, powdered, mixed with honey and one cup is taken orally.
					L		Swelling	Dm	D	The leaf is crushed, powdered, mixed with butter and creamed the injured parts.

21	*Cordia africana*	Boraginaceae	Wanza	T	Lat Sd Sb	Hu	Gastritis	O	F	One glass of latex collected is taken orally on an empty stomach.
							Urine flow at night	O	D	Ripened dried seed is grounded, powdered, homogenizing in water and one cup is drunk.
							Jaundices	O	D	The stem bark mixed with stem bark of *Croton macrostachyus* are crushed, powdered, boiled in milk and one glass is taken orally 5-7 days.
22	*Croton macrostachyus*	Euphorbiaceae	Misana	T	Sh Sh Sb	Hu	Ringworm	Dm	F	The shoot is crushed and squeezed in water then directly dropping the juices on injured parts.
							Cut	Dm	D	The shoot is crushed, powdered and mixed with butter and creamed injured parts until healing.
							Malaria	O	D	The stem bark is crushed, powdered, soaked in honey and one glass is taken orally. But it was reported that it has powerful effect for over dosage.

23	*Cucumis ficifolius*	Cucurbitaceae	Yemdir embouy	H	R	Hu	Removal of retained placenta	O	F	The size of 'Atik' of root is cut, crushed and squeezed with the water and one cup is taken orally.
							Emergency	O	F	The root is crushed, squeezed with water and one cup is taken orally.
					F		Lung tuberculosis	O	D	The fruit mixed with the root of *Gnidia involucrata* and bulb of garlic are crushed and soaked 7 days in local "Tella" and one cup is taken for five days.
24	*Cucurbita pepo*	Cucurbitaceae	Duba	H	Sd	Hu	Tapeworm	O	D	The seeds are eaten on an empty stomach for pregnancy women.
					Fl		Ear lesion	Er	F	Flowers are crushed and spread through the ear.
25	*Cyphostemma molle*	Vitaceae	Ese zewie	H	R	Hu	Snake bite	O	F	Chewing of fresh root.
26	*Cynoglossum coeruleum*	Boraginaceae	Shemigegi t	H	L	Hu	Febrile illness	Dm	F	Squeezed leaf with water is dressed on injured parts of the body.
27	*Datura stramonium*	Solanaceae	Astenager	H	L	Hu	Dandruff	Dm	F	Squeezed leaf is dressed on wounds of heads.
					Sd		Toothache	O	D orF	Boiled seeds are fumigated to prevent toothache.

28	*Dipsacus pinnatifidus*	Dipsacaceae	Kelem	H	R	Ca	Eye injury	Ey	F	The root is crushed and squeezed juices are dropped on the eye.
29	*Dodonaea angustifolia*	Sapindaceae	Kitkita	S	L	Ca	Bone fracture	Dm	D	Powders of crushed leaf are pasted on the wounds.
					L	Hu	Wound	Dm	D	The leaf is crushed, powdered, mixed with butter and creamed wound.
					L		Dysentery	O	F	The leaf is crushed, soaked in water with sugar, decanted and one can is taken orally.
					L & Fr		Malaria	O	D	The leaf and fruits mixed with ¼ of bulb of garlic, fruits and leaf of rue are crushed, powdered, soaked in honey and one glass is taken continuously.
					R		Rabies	O	D	The root is crushed, powdered, soaked in milk then one cap is drunk.
30	*Echinops kebericho*	Asteraceae	Kebericho	H	Rh	Hu	Epidemic	O & Na	D or F	Crushing and smelling or fumigating.
						Equ	Epidemic	O & Na	D or F	The rhizome is crushed and burnt placing it on red-hot charcoal is used to fumigate.

31	*Embelia schimperi*	Myrsinaceae	Enkoko	S	Fr	Hu	Tapeworm	O	D	Fruits are crushed, soaked in local 'Tella' and one can is taken orally for human but overdosage reported its effects.
						Li	Tapeworm	O	D	Fruits are crushed, mixed with injera and given to eat.
32	*Eucalyptus globulus*	Myrtaceae	Nech bahir zaf	T	L	Hu	Common cold	O & Na	F	Steams from boiled the leaf is inhaled to relieve common cold.
33	*Euphorbia platyphyllos*	Euphorbiaceae	Anitrfa	H	La	Hu	Tumor	Dm	F	Milky latex is pasted on the injured parts.
34	*Feoniculum vulgare*	Apiaceae	Ensillal	H	L & sh	Hu	Diuretic	O	D	The leaf and shoot is crushed, mixed in the water and one cup is taken orally.
					L		Dry cough	O	F	The leaf is crushed, soaked in milk and one glass is drunk continuously.
35	*Ficus carica*	Moraceae	Quotle bele (beles)	S	L & La	Hu	Wound	Dm	D or F	The leaf is crushed, powdered and pasted on the wound then; fresh milky latex is also pasted on injured parts.
36	*Ficus sur*	Moraceae	Sholla	T	L	Hu	Donkey's wart	Dm	F	The leaf is boiled in the water with sugar, and one glass is taken in the morning continuously.

37	*Ficus vasta*	Moraceae	Warka	T	Sb	Ca	Diarrhea	O	D	The bark is crushed, powdered, mixed with salt and given to eat.
38	*Gardenia ternifolia*	Rubiaceae	Gambillo	S	R & Sb	Hu	Evil eye	O & Na	D	The stem bark and root mixed with bulbs of garlic is crushed, powdered, homogenized in water and one cup is drinking and small droplets are also administrated through the nose.
39	*Glinus lotoides*	Molluginaceae	Amikin	H	Fr	Hu	Tapeworm	O	D	Fruit is crushed, powdered and mixed with noug is eaten in the morning.
40	*Gnidia involucrata*	Thymelaeaceae	Boto (Yezngero telba)	H	R & L	Hu	Malaria	O	D	The root and leaf is crushed, soaked in Local 'Tella'overnight for one day and one glass is drunk continuously.
					R		Rheutematim pain	O	D	The root is crushed with the leaf and root of *Plumbago zeylanica,* boiled in the water, decanted and one glass is drunk continuously.

41	*Grewia ferruginea*	Tiliaceae	Lenquata	S	L	Hu	Constipation	O	D	Powders of leaves are homogenizing in water and one glass is drunk.
					La	Ca	Dysentery	O	F	The leaf is crushed, soaked in the water with egg yolk and salt and one can is given orally.
							Expel retained placenta	O	F	One bottle of latex collected from fibers and leaf is given orally.
42	*Guizotia schimperi*	Asteraceae	Adey abeba	H	Wh	Hu	Diabetes	O	D	The whole part is crushed with whole part of *Cucumis ficifolius,* boiled in the water and one glass is taken orally until recovery.
43	*Hagenia abyssinica*	Rosaceae	Kosso	T	Fr	Hu	Tapeworm	O	D	Powder of fruits are cooked with 'Shirowot' and eaten.
					Fr & fl		Hypertension	O	F	Flowers and fruits are crushed, soaked with 'katikala' and one cup is drunk.
44	*Jasminum grandiflorum*	Oleaceae	Tembelel	Cl	R	Hu	Boils	Dm	D	Powders of roots are pasted on the wounds until recovery.
							Common cold	O& Na	D	Steams are inhaled from boiled of roots.

45	*Justicia schimperiana*	Acanthaceae	Simiza	S	L & Sh R L	Hu	Malaria	O	D	The leaf and shoot is crushed, boiled in the water with salt, butter and one glass is taken continuously.
							Emergency	O	F	Fresh root is crushed and squeezed in water and one cup is drunk.
						Chi	Coccoides	O	F	The leaf is crushed and squeezed with water and given with injera.
46	*Kalanchoe* sp.	Crassulaceae	Endahula	H	L R	Hu	Swells	Dm	F	The leaf is squeezed with water and creaming swells.
							Toothache	O	F	The root is crushed and squeezed with water and put on the mouth in the pain feeling parts of teeth.
							Tonsillitis	O	F	The root is crushed, squeezed in the water and one cup is taken orally.
47	*Kanahia laniflora*	Asclepiadaceae	Arust/yew uha tifrena	S	Lat & L Wh	Hu	Tumor	O & Dm	F	The leaf is squeezed with water, put on the wounds and milky latex is taken orally.
							Donkey's wart	Dm	D or F	The whole part is crushed, powdered and mixed with butter then creamed wounds.
48	*Laggera crispata*	Asteraceae	Kes bedeji	H	L	Hu	Asthma	Na	F or D	The leaf is crushed, soaked in fresh juices of its leaf then placed in closed container for 7 days and 3

										droplets are given on the nose during relapsing of disease.
49	*Laggera tomentosa*	Asteraceae	Gmie	S	L R	Hu	Common cold	Na & O	F	Steams from boiled leaf are inhaled.
							Emergency	O	F	The root is crushed, squeezed with water and one cup is taken orally.
50	*Lagenaria abyssinica*	Cucurbitaceae	Yekil enbouy	Cl	Fr	Ca	Leech infestation	Na	F	The fruit is pierced with sharp objects and juices are administrated on the nose to expel the leech.
51	*Lantana trifolia*	Verbenaceae	Yeregna kollo	S	Fr & L F	Hu	Sight problem of eye	Ey	D	The fruit and leaf are roasted, powdered and mixing with 'Kul' then creaming the eye.
							' Heart tired	O	D	Fruits are grounded, powdered, homogenizing in water and one cup is drunk.
52	*Leonotis ocymifolia*	Lamiaceae	Feres zeng	S	L & F	Hu	Diarrhea	O	D	Dried leaf and fruits are crushed, powdered, mixed with honey and one glass is taken orally.
53	*Lepidium sativum*	Brassicaceae	Feto	H	Fr	Hu	Stomachache	O	D	Ground seeds mixed with water are given orally.
						Li	Stomach disorder			Fruits are directly mixed with fruits of barely and are given to eat.

54	*Maesa lanceolata*	Myrsinaceae	Kllaba	S	L	Hu	Leprosy	Dm	D or F	The leaf is crushed with the leaf of *Clematis simensis,* powdered, mixed with butter and creamed skin.
55	*Malva verticillata*	Malvaceae	Yewusha nacha	H	R	Hu	Vomiting	O	F	The 'Atik' size of root is crushed, squeezed, mixed with "Zebib" and two cups are taken orally.
							Dysentery	O	D	The root mixed with the root of *Calpurnia aurea* are crushed, soaked in water and one cup is taken orally.
56	*Maytenus senegalensis*	Celastraceae	Koba	T	Sb	Hu	Sexual organ wound	Dm	D	The bark is roasted, powdered, mixed with butter and creamed on the wounds.
							Impotency in men	O	D	The bark is crushed, powdered and cooked with 'Dorowot' and eating with injera.
57	*Merremia pterygocaulos*	Convolvulaceae	Sostegna libawit	Cl	Wh	Hu	Unspecified diseases ('likifit')	Dm	F or D	The whole part is crushed, soaked in the water for few minutes and bathing the body.
58	*Millettia ferruginea*	Fabaceae	Birbira	T	Fr	Hu	Chigger	Dm	D	Powder of grounded fruits mixed with butter is pasted on injured part of skin by parasites.

59	*Momordica foetida*	Cucurbitaceae	Yekura hareg (enquriy)	Cl	R Wh L	Hu	Toothache	O	F	The root is caught on feeling parts of teeth when pain is felt but care needs not contact to other mouth parts.
							Cough	O & Na	F	The whole part is boiled and steams inhaled to relieve cough.
							Fire accident	Dm	F	The leaf is crushed and pasted on injured parts.
60	*Myrtus communis*	Myrtaceae	Ades	S	L	Hu	Scabies	Dm	D	The leaf is crushed, powdered, mixed with butter and creamed wounds.
61	*Nicotiana tabacum*	Solanaceae	Tinbaho	H	L	Hu	Ear lesion	E	F	The leaf is squeezed with healthy man urine; juices are dropped with syringe at night for three days.
							Common cold	Na	F	The leaf is squeezed with water and juices are dropped through the nose.
						Ca	Leech infestation	Na	F	The leaf is squeezed in water and juices are dropped on the nose.
							Bloating	O	F	The leaf is squeezed with water and one glass of juice is given orally.

62	*Ocimium lamiifolium*	Lamiaceae	Dama kessie	S	L	Hu	Febrile illness	O & Na	F	One cup of squeezed leaf in the water is taken orally and the remaining creamed injured parts.
63	*Olea europaea* subsp. *cuspidata*	Oleaceae	Woira	T	Sh	Hu	Irritation of eye (‘Tenbir’)	Ey	F	The small finger size of shoot is crushed, squeezed in water and juice is dropped on the eye with cotton.
					Fr		Brain tumor	Na	D	The fruit is mixed with fruit of *Embelia schimperi* are grounded, powdered, homogenized in water for 24 hrs and droplets are dropped through nose in the morning continuously.
64	*Osyris quadripartita*	Santalaceae	Keret	S	L	Ca	Injury of skin	Dm	D	The leaf is crushed, powdered and pasted on the injuries.
65	*Otostegia integrifolia*	Lamiaceae	Tnjut	S	L	Hu	Common cold	O	F	Chewing of the leaf and sucking juices.
					R		Stomachache	O	F	Chewing of roots and sucking of juices.
					L & Sh		Malaria	O	F	The leaf and shoot is crushed with garlic, rue and soaked in honey for one day and one glass is taken at night continuously.

66	*Periploca linearifolia*	Asclepiadaceae	Moider	Cl	R	Hu	Unspecified disease (‘Likifit’)	O	D	The root is crushed, powdered, mixed in milk and one cup is taken orally.
						Ca	Devil sickness	O & Na	D	The root is crushed and placing on the red hot charcoals with animal dung and smoking to fumigate.
67	*Physalis peruviana*	Solanaceae	Nechi awut	H	Fr & L	H	Gastritis	O	F	The leaf is boiled with tea and one glass is taken orally then ripen fruit are eaten directly.
68	*Phytolaca dodecandra*	Phytolaccaceae	Mehan endod	S	R	Hu	Emergency	O	F	One cup of crushed and squeezed root with water is taken orally.
					R & L		Rabies	Dm	D or F	The root and leaf are crushed, soaked in honey and one cup is drunk per day for five days.
					L	Ca	Bloating	O	F	The leaf is crushed, soaked in water for one day, decanted and one bottle juice is given.
69	*Plantago lanceolata*	Plantaginaceae	Gorteb	H	L	Hu	Cut	Dm	F	Squeezed fresh leaf and juices are pasted on the cut surface of the body.

70	*Plectocephalus varians*	Asteraceae	Este yohannaes	H	Wh R	Hu	Tumor	Dm	F	The leaf is squeezed in water, juices are creamed on the injured part, then tied with leaf covered by clothe.
							Hemorrhoid (‘Bulad’)	O& Na	F	The root is crushed, squeezed with water and one cup of juice is dropped through nose and one cup is drunk continuously.
71	*Plumbago zeylanica*	Plumbaginaceae	Amira	H	Br L	Hu	Tumor inside stomach	O	F	The branch is boiled with butter or tea and one cup is drunk in the morning until recovery.
							Tonsillitis	O	F or D	The leaf is boiled in water with sugar for few minutes and one glass is taken orally.
72	*Prunus persica*	Rosaceae	Kok	T	L	Hu	Swelling	O	D	The leaf is crushed, powdered, cooked with “Wot” and is eaten with injera.
73	*Pterolobium stellatum*	Fabaceae	kentefa	S	B	Hu	Asthma	O & Na	D	The bark is crushed, powdered and cooked with “Doro wot” then eating with injera and some powders smoked like cigarette.

74	*Rhamnus prinoides*	Rhamnaceae	Gesho	S	L Fr & Sh	Hu	Scabies	Dm	D	The leaf is crushed, powdered, mixed with butter and creamed wounds and exposing the sunlight for few minutes.
							Tonsillitis	Na	F	Three fruits and shoots are crushed with three fruits of malt barley, squeezed and droplets of juice are taken through the nose.
75	*Rhus vulgaris*	Anacardiaceae	Kammo	S	L Fr	Hu	Wounds	Dm	D	The leaf is crushed, powdered, mixed with butter and creamed Wounds.
							Lung T.B.	O	D	Grounded fruits are mixed with honey and one glass is drunk on empty stomach until recovery.
76	*Ricinus communis*	Euphorbiaceae	Kachima or gulo	H	R	Hu	Emergency	O	F	The 'Atik' amount of root is crushed, squeezed with water and one cup is taken orally.
							Toothache	O	F	Chewing of root and sucking juices.
77	*Rosa abyssinica*	Rosaceae	Keka	S	Fr	Hu	Tapeworm	O	F	Handful of ripened fruits is eaten.

78	*Rubia cordifolia*	Rubiaceae	Minchirir	H	R	Hu	Epitasis in delivery	O	D	The root is crushed, homogenized in water and one cup is taken orally.
79	*Rubus apetalus*	Rosaceae	Enjory	S	L & Fr	Hu	Gastritis	O	D	Mixed of fruits and leaf are crushed and soaked in water and one glass is taken orally during relapsing.
80	*Rumex abyssinicus*	Polygonaceae	Mekemeko	H	Rh	Hu	Tinea Versicolor	Dm	D	The rhizome is crushed, powdered, mixed with butter and creamed wound.
							Lung tuberculosis	O	D	The rhizome is crushed, mixed with fresh flowers of *Calpurnia aurea,* boiled in water and one glass is taken orally until recovery.
81	*Rumex nepalensis*	Polygonaceae	Yewushamlas or tult	H	R	Hu	Stomachache	O	F	Mixed roots with ginger are crushed and boiled in water and one cup is taken orally.
							Retained placenta	V	F	The root is inserted in the vagina and waiting for few minute.
					L		Wart	Dm	F	The leaf is crushed with leaf of *plantago lanceolata*, squeezed with water and creamed injured parts.

82	*Rumex nervosus*	Polygonaceae	Embacho	S	L	Hu	Eye diseases	Ey	F	Squeezed the leaf and juices are dropped on eyelash with cotton.
							Circumcision	Dm	F	The leaf is squeezed, mixed with boiled butter and creaming wounds with feathers of hen 1 per day for 3-5 days.
83	*Ruta chalepensis*	Rutaceae	Tenadam	H	Br	Hu	Common cold	O & Na	F	The branches are crushed, soaked in boiled coffee or tea and one cup is taken continuously.
							Malaria	O	D or F	The branches are boiled with rhizome of zinger and bulb of garlic in the tea and one cup is taken continuously.
84	*Salix mucronata*	Salicaceae	Shunshun a	S	Sb	Hu	Jaundices	O	D	Barks are crushed, powdered and boiled in water up to the remaining of 1/3 water and one glass is drunk about 3-7 days.
85	*Saliva merjamie*	Lamiaceae	Jawula	H	R	Ca	Body swelling	O	F	The root is crushed and boiled in water and one bottle of juice is given orally.
					Wh	Hu	Gastritis	O	F	The whole part is boiled in water, decanted and one glass is taken orally.

86	*Schinus molle*	Ancardiaceae	Kundober berie	T	Fr	Hu	Jaundices	O	D	The fruit mixed with fruit and leaf of *Solanum nigrum,* are crushed, soaked in milk and one glass is taken orally.
87	*Schrebera alata*	Oleaceae	Estemese wor (kessie)	T	L	Hu	Unspecified diseases (‘Amenimin’)	O	F	The leaf is crushed, soaked in honey on the pure small pot for seven days and made as a tablet then swallow for seven days at night.
88	*Sida schimperiana*	Malvaceae	Chifreg	S	L	H	Eye problem (‘Chinkur’)	Ey	F	Squeezing of leaf with water and juices are dropped on the injured parts until recovery.
89	*Solanecio gigas*	Asteraceae	Boz or Habezamta	S	R	Hu	Unfit position of fetus (‘Tsnis cizor’)	O	F	The root is cut, crushed, soaked in honey for one day and prepared as tablet is swallowed to fit position of fetus normal.
					L & Sb	Ca	Epidemic	O	D	The leaf and stem barks are crushed, powdered, mixed with salt and then with leaf of caster are given.
90	*Solanum anguivi*	Solanaceae	Zerch embouy	S	L & Sb	Hu	Birth control	O	D	Dried leaf and barks are crushed, powdered, homogenized in water and on cup is drunk once.

91	*Solanum dasyphyllum*	Solanaceae	Gebre embouy	S	Fr R Fr	Hu	Dry cough	O	D	Grounding of seven dried fruits and powders are mixed with 'Besso' and one glass of juices is taken continuously in the morning.
							Snake bite	O	F	Chewing roots and sucking of juices.
						Ca	Leech infestation	Na	F	Fruits are pierced with sharp object and juices are dropped on the nose.
92	*Solanum incanum*	Solanaceae	Embouy	S	Fr	Hu	Chigger	Dm	F	Fruit is pierced with sharp objects and juices are dropped on the injured parts by parasites.
93	*Solanum nigrum*	Solanaceae	Tikur awut	H	Wh L	Hu	Herpes zoster	Dm	D	The whole part is roasted, crushed with dried hyena feces, powdered, mixed in butter and creamed wounds.
							Eye disease ('Chinkur')	Ey	F	The leaf is squeezed with water and creamed injured parts until recovery.
94	*Steganotaenia araliacea*	Apiaceae	Nechillo	T	B	Hu	Paralysis ('Guaya sibirat')	O & D	D	The bark is crushed, soaked in very cold water with lemon juices and one glass is taken orally. Additional, washing of the body soaking the powders with very cold water.

95	*Stephania abyssinica*	Menispermaceae	Yet areg(este eyesus)	Cl	L	Hu	Stomachache	O	F	The leaf is boiled in milk and one cup is taken orally.
					L & R		Rabies		F	A crushed of leaf and root are soaked in honey for one day, decanted and one cup of juices is taken orally.
96	*Stereospermum kunthianum*	Bignoniaceae	Zana	T	B	Hu	Gonorrhea	Dm	D	The bark is crushed, powdered, mixed with butter and creamed on the affected part.
97	*Syzygium guineense*	Myrtaceae	Dokima	T	L	Hu	Leprosy	Dm	D	The leaf is roasted, powdered, mixed with honey and creamed skin continuously
98	*Tagetes minuta*	Asteraceae	Awulesh agbi	H	Br	Hu	Common cold	Na & O	F	Branches are crushed, boiled in water and steams are inhaled.
99	*Trichodesma zeylanicum*	Boraginaceae	Amera	H	Wh	Hu	Loss of appetites	O	D	The whole part is crushed, powdered, boiled in water and one glass is taken orally.

100	*Verbascum sinaiticum*	Scrophulariaceae	Ketetina	H	R	Hu	Emergency	O	F	The root is crushed, squeezed in water and one cup is taken orally.
						Ca	Swelling	Dm	D	The root is roasted, powdered and pasted on injured parts.
101	*Verbena officinalis*	Verbenaceae	Atuch	H	Wh R	H	Dysentery	O	F	The whole part is crushed, mixed in honey or boiled in the tea and one glass is taken orally.
							Stomachache	O	F	Chewing of fresh root and sucking juices.
102	*Vernonia adoensis*	Asteraceae	Ras kimir	S	R	Hu	Kidney diseases	O	D	The root is crushed, boiled in water and one glass is taken orally in the morning for five days.
							Impotency	O	D	The root is crushed, powdered and mixed in honey and one glass is drunk.
103	*Vernonia amygdalina*	Asteraceae	Grawa	S	L	Hu	Wound	Dm	D	One spoonful powder of crushed leaf is dressed on the wound.
							Ameba and Giardia	O	D or F	The leaf is crushed, soaked in honey and one cup is taken continuously.
						Ca	Stomach disorder	O	F	The leaf is crushed, soaked in the water for one day and one bottle is given.

104	*Vernonia auriculifera*	Asteraceae	Dangorita	S	L	H	Eye diseases ('Chinkur')	Dm	F	The leaf is squeezed with the leaf of *Momordica foetida* in the water and creamed injured parts of eye until recovery.
105	*Withania somnifera*	Solanaceae	Githewa	S	L & Fr	H	Kidney disease	O	F	The leaf and fruits are crushed, soaked in water, decanted and one cup is taken orally for seven days.
					R		Evil eye	Na	D or F	The 'Atik' size of root is cut, crushed with garlic, squeezed droplets and tied with a piece of cloth and smelling.
					L & St		Headache	O	F	The leaf and stem are crushed, squeezed with water and one cup is drunk.
106	*Xanthium strumarium*	Asteraceae	Este stehay	H	L	H	Hemorrhoid	O	F	The leaf is boiled in water and one cup is taken orally for three consecutive days in the morning.
							Tinea versicolor	Dm	F	The leaf is squeezed with water and creamed on the injured parts.
107	*Ximenia caffra*	Olacaceae	Enkoy	S	Sb	Hu	Herpes zoster	Dm	D	The bark is crushed, powdered, mixed with fresh butter and creamed injured parts.

Appendix 2 List of multiple uses of medicinal plants other than medicinal uses

No.	Scientific name	Local name (Amharic)	Habit	Family	Other uses
1	*Acanthus polystachius*	Koshishelie	Shrub	Acanthaceae	Firewood , flowers juice for food of children and fences
2	*Acacia abyssinica*	Girar	Tree	Fabaceae	Firewood, traditional agriculture tools making, traditional house construction, leaves for forage , fibers for rope making , charcoal , Fences
3	*Acacia pilispina*	Cheba	Shrub	Fabaceae	Fibers for rope making, leaves for forage, traditional agriculture tool making , firewood , traditional house construction , charcoal , fences
4	*Achyranthes aspera*	Telenji	Herb	Amaranthaceae	-
5	*Acmella caulirhiza*	Yemidir berberie	Herb	Asteraceae	Forage
6	*Aloe macrocarpa*	Eret	Herb	Aloaceae	------
7	*Allium sativum*	Nechishinkurti	Herb	Alliaceae	Food as spice
8	*Asparagus scaberulus*	Yesiet kest	Shrub	Asparagaceae	Firewood and roots for food of during fasting, especial consumed by people living in the monastery
9	*Bersama abyssinica*	Azamir	Shrub	Melianthaceae	Fire wood , fences
10	*Brucea antidysenterica*	Abalo	Shrub	Simaroubaceae	Firewood , fences
11	*Buddleja polystachya*	Amfar	Shrub	Loganiaceae	Firewood , fences, magical

12	*Calpurnia aurea*	Digita or zigita	Shrub	Fabaceae	Firewood, fences, traditional house construction
13	*Capparis tomentosa*	Gemero	Shrub	Capparidaceae	Shade , firewood, fences
14	*Carissa spinarum*	Agam	Shrub	Apocynaceae	Fences, firewood, house construction, traditional agriculture tool making, forage , edible of fruits
15	*Chenopodium opulifolium*	Sinin	Herb	Chenopodiaceae	Forage , leaves and fruits for washing of clothes
16	*Clematis simensis*	Yeazoareg	Climber	Ranunculaceae	Firewood, roots for alcohol taste making good
17	*Clerodendrum myricoides*	Misrich	Shrub	Lamiaceae	Shade, fences, firewood
18	*Clausena anisata*	Limich	Shrub	Rutaceae	Firewood, fences Traditional agriculture tool making, Tooth brushing
19	*Clutia lanceolata* subsp. *lanceolata*	Fiyelefeg	Shrub	Euphorbiaceae	Firewood, traditional house construction , fences, forage
20	*Convolvulus steudneri*	Flasot	Herb	Convolvulaceae	Forage
21	*Cordia africana*	Wanza	Tree	Boraginaceae	Edible fruits, firewood, traditional house construction , furniture making, traditional agriculture tool making, fruits latex collection for color making, leaves for forage , charcoal making , fences , household tool making, leaves for washing of household utensils
22	*Croton macrostachyus*	Misana	Tree	Euphorbiaceae	Firewood ,charcoal, traditional agriculture tool making, house construction, household tool making, fences
23	*Cucumis ficifolius*	Yemdir embouy	Herb	Cucurbitaceae	Forage, leaves for washing of milk container

24	*Cucurbita pepo*	Duba	Herb	Cucurbitaceae	Fruits for food, forage
25	*Cynoglossum coeruleum*	Shemigegit	Herb	Boraginaceae	forage
26	*Cyphostemma molle*	Ese zewie	Herb	Vitaceae	-
27	*Datura stramonium*	Astenager	Herb	Solanaceae	-
28	*Dipsacus pinnatifidus*	Kelem	Herb	Dipsacaceae	Firewood, form making 'kelem'
29	*Dodonaea angustifolia*	Kitkita	Shrub	Sapindaceae	Firewood, fences , forage ,traditional agriculture tool making , edible leaves to prevent fatigue and thirsty
30	*Echinops kebericho*	Kebericho	Herb	Asteraceae	Firewood
31	*Embelia schimperi*	Enkoko	Shrub	Myrsinaceae	Firewood, fences, forage , leaves used for washing for traditional jewelries
32	*Eucalyptus globulus*	Nech bahir zaf	Tree	Myrtaceae	Firewood , charcoal ,fences, traditional house construction
33	*Euphorbia platyphyllos*	Anitrfa or avydem	Herb	Euphorbiaceae	-
34	*Feoniculum vulgare*	Ensillal	Herb	Apiaceae	For alcohol making good taste
35	*Ficus carica*	Quotle bele (beles)	Shrub	Moraceae	Firewood, fences, traditional house construction
36	*Ficus sur*	Sholla	Tree	Moraceae	Fences, edible fruits, firewood, traditional house construction, household tool making, forage
37	*Ficus vasta*	Warka	Tree	Moraceae	Fences, firewood , house construction, household tool making, traditional agricultural tool making , fibers for rope making
38	*Gardenia ternifolia*	Gambillo	Shrub	Rubiaceae	Charcoal, firewood , construction , forage , fence , edible fruits

39	*Glinus lotoides*	Amikin	Herb	Molluginaceae	---
40	*Gnidia involucrata*	Boto	Herb	Thymelaeaceae	Firewood , traditional house construction, forage
41	*Grewia ferruginea*	Lenquata	Shrub	Tiliaceae	Forage , firewood ,washing of household utensil washing of cloths , fibers for rope making, fences
42	*Guizotia schimperi*	Adey abeba	Herb	Asteraceae	Forage
43	*Hagenia abyssinica*	Kosso	Tree	Rosaceae	Firewood, house construction ,forage , fences
44	*Jasminum grandiflorum*	Tembelel	Climber	Oleaceae	Firewood ,forage ,fences , for spiritual purpose
45	*Justicia schimperiana*	Simiza	Shrub	Acanthaceae	Firewood, fences, traditional house construction, forage
46	*Kalanchoe* sp.	Endahula	Herb	Crassulaceae	--
47	*Kanahia laniflora*	Arust/yewuha tifrena	Shrub	Asclepiadaceae	Firewood
48	*Lagenaria abyssinica*	Dinbushbush/yekil enbouy	Climber	Cucurbitaceae	-
49	*Laggera crispata*	Kes bedejie	Herb	Asteraceae	Firewood
50	*Laggera tomentosa*	Koskoso (gmie)	Herb	Asteraceae	Firewood
51	*Lantana trifolia*	Yeregna kollo	Shrub	Verbenaceae	Edible fruits, firewood , fences
52	*Leonotis ocymifolia*	Feres zeng	Shrub	Lamiaceae	Firewood
53	*Lepidium sativum*	Feto	Herb	Brassicaceae	Forage
54	*Maesa lanceolata*	Kllaba	Shrub	Myrsinaceae	Firewood, fences
55	*Malva verticillata*	Yewusha nacha	Herb	Malvaceae	Firewood , fibers for rope making
56	*Maytenus senegalensis*	Koba	Tree	Celastraceae	Firewood , fences , traditional household tool making,

					forage
57	*Merremia pterygocaulos*	Geste seb	Climber	Convolvulaceae	Spiritual
58	*Millettia ferruginea*	Birbira	Tree	Fabaceae	Firewood , fences, house construction , fruits for fish poisoning , flea and protection seeds pests
59	*Momordica foetida*	Yekura hareg (enquriy)	Climber	Cucurbitaceae	Leaves for washing of utensil
60	*Myrtus communis*	Ades	Shrub	Myrtaceae	Firewood , fences leaves for traditional perfumes
61	*Nicotiana tabacum*	Tinbaho	Herb	Solanaceae	Firewood, fences
62	*Ocimium lamiifolium*	Dama kessie	Shrub	Lamiaceae	Firewood , fences
63	*Olea europaea* subsp. *cuspidata*	Woira	Tree	Oleaceae	Firewood, fences , traditional house construction, traditional agriculture tool making ,fumigate of traditional household utensil, tooth brushing
64	*Osyris quadripartita*	Keret	Shrub	Santalaceae	Firewood, fence, charcoal
65	*Otostegia integrifolia*	Tnjut	Shrub	Lamiaceae	Firewood, Fences , Fumigate of traditional utensil
66	*Periploca linearifolia*	Moider	Climber	Asclepiadaceae	Forage, roots for traditional perfumes making
67	*Physalis peruviana*	Nechi awut	Herb	Solanaceae	Edible fruits
68	*Phytolaca dodecandra*	Endod	Shrub	Phytolaccaceae	Firewood, fences, washing of clothes
69	*Plantago lanceolata*	Gorteb	Herb	Plantaginaceae	Forage
70	*Plectocephalus varians*	Este yohannes	Herb	Asteraceae	Forage ,decoration for celebration
71	*Plumbago zeylanica*	Amira	Herb	Plumbaginaceae	Firewood, fences
72	*Prunus persica*	Kok	Tree	Rosaceae	Edible fruits, firewood , fences
73	*Pterolobium stellatum*	Kentefa or	Shrub	Fabaceae	Fences , firewood

		kointer			
74	*Rhamnus prinoides*	Gesho	Shrub	Rhamnaceae	Leaves used for traditional alcohol making, firewood , forage , fences
75	*Rhus vulgaris*	Kammo	Shrub	Anacardiaceae	Edible fruits , charcoal , firewood, fences traditional agriculture tool making, termite protection from squeezing of leaf and spraying
76	*Ricinus communis*	Kachima or gulo	Herb	Euphorbiaceae	Firewood , fences Fruits used for making leather soft traditionally, forage
77	*Rosa abyssinica*	Keka	Shrub	Rosaceae	Edible fruits, firewood, fences , traditional agriculture tool making
78	*Rubia cordifolia*	Minchirir	Herb	Rubiaceae	---
79	*Rubus apetalus*	Enjory	Shrub	Rosaceae	Edible fruits,firewood, fences, forage
80	*Rumex abyssinicus*	Mekemeko	Herb	Polygonaceae	Rhizomes for food spices, firewood , forage
81	*Rumex nepalensis*	Yewusha mlas or tult	Herb	Polygonaceae	----
82	*Rumex nervosus*	Embacho	Shrub	Polygonaceae	Firewood, fences , washing of traditional jewelries
83	*Ruta chalepensis*	Tenadam	Herb	Rutaceae	Food spice
84	*Saliva merjamie*	Jawula (yewusha dimbilal)	Herb	Lamiaceae	Forage
85	*Salix mucronata*	Shunshuna	Shrub	Salicaceae	Firewood, fences, house construction,
86	*Schinus molle*	Kundoberberie	Tree	Ancardiaceae	Firewood, fences, House construction
87	*Schrebera alata*	Estemesewor	Tree	Oleaceae	Firewood, fences , forage, house construction , magical
88	*Sida schimperiana*	Chifreg	Shrub	Malvaceae	Cleaning for houses of waste materials, forage

89	*Solanecio gigas*	Boz or Habezamta	Shrub	Asteraceae	Firewood, fences
90	*Solanum anguivi*	Zerch embouy	Shrub	Solanaceae	Firewood, fences
91	*Solanum dasyphyllum*	Gebre embouy	Shrub	Solanaceae	Firewood, fences
92	*Solanum incanum*	Embouy	Shrub	Solanaceae	Firewood, fences
93	*Solanum nigrum*	Tikur awut	Herb	Solanaceae	Firewood , forage
94	*Steganotaenia araliacea*	Nechillo	Tree	Apiaceae	Firewood, charcoal, traditional house construction (hut), forage, fences
95	*Stephania abyssinica*	Yet areg (Este eyesus)	Climber	Menispermaceae	Leaves used for washing of milk container
96	*Stereospermum kunthianum*	Zana	Tree	Bignoniaceae	Firewood, fences, charcoal, house construction , forage , household tool making, teeth brushing
97	*Syzygium guineense*	Dokima	Tree	Myrtaceae	Household tool making , fences , firewood, edible fruits , house construction , traditional agricultural tool making, forage
98	*Tagetes minuta*	Awulesh agbi	Herb	Asteraceae	------
99	*Trichodesma zeylanicum*	Amera	Herb	Boraginaceae	Edible fruits
100	*Verbascum sinaiticum*	Ketetina or dabakeded	Herb	Scrophulariaceae	Forage
101	*Verbena officinalis*	Atuch	Herb	Verbenaceae	Forage
102	*Vernonia adoensis*	Ras kimir	Shrub	Asteraceae	Firewood , forage

103	*Vernonia amygdalina*	Grawa	Shrub	Asteraceae	Forage, firewood, fences, leaves used for washing of traditional alcohol container , traditional house construction
104	*Vernonia auriculifera*	Dangerotta	Shrub	Asteraceae	Firewood, fences , traditional agriculture tool making , traditional house construction
105	*Withania somnifera*	Githewa	Shrub	Solanaceae	Firewood , forage
106	*Xanthium strumarium*	Dha nikel	Herb	Asteraceae	-
107	*Ximenia caffra*	Enkoy	Shrub	Olacaceae	Edible fruits, firewood , fences , forage Traditional agriculture tool making, traditional household tool making, charcoal

For authorities to scientific names refer to Appendix 3

Appendix 3 List of medicinal plants in the study area include botanical names, family, local names, habit and collection number.

Scientific name	Family	Local name (Amharic)	Habit	Collection no.
Acanthus polystachius Del.	Acanthaceae	Koshishelie	Shrub	GG31
Acacia abyssinica Hochst. ex Benth.	Fabaceae	Girar	Tree	GG22
Acacia pilispina Pic.-Serm.	Fabaceae	Cheba	Shrub	GG91
Achyranthes aspera L.	Amaranthaceae	Telenji	Herb	GG20
Acmella caulirhiza Del.	Asteraceae	Yemidir berberie	Herb	GG46
Aloe macrocarpa Tod.	Aloaceae	Eret	Herb	GG47
Allium sativum L.	Alliaceae	Nechi shinkurti	Herb	GG55
Asparagus scaberulus A. Rich.	Asparagaceae	Yesiet kest	Shrub	GG98
Bersama abyssinica Fresen.	Melianthaceae	Azamira	Shrub	GG64
Brucea antidysenterica J.F. Mill.	Simaroubaceae	Abalo	Shrub	GG07
Buddleja polystachya Fresen.	Loganiaceae	Amfar	Shrub	GG101
Calpurnia aurea (Ait.) Benth.	Fabaceae	Digita or zigita	Shrub	GG01
Capparis tomentosa Lam.	Capparidaceae	Gemero	Shrub	GG11
Carissa spinarum L.	Apocynaceae	Agam	Shrub	GG77
Chenopodium opulifolium Schrader ex Koch & Ziz.	Chenopodiaceae	Sinin	Herb	GG74
Clematis simensis Fresen.	Ranunculaceae	Yeazoareg	Climber	GG62
Clerodendrum myricoides (Hochst.) Vatke	Lamiaceae	Misrich	Shrub	GG104
Clausena anisata (Willd.) Benth.	Rutaceae	Limich	Shrub	GG97
Clutia lanceolata subsp. *lanceolata* Forssk.	Euphorbiaceae	Fiyelefeg	Shrub	GG60
Convolvulus steudneri Engl.	Convolvulaceae	Flasot	Herb	GG 93
Cordia africana Lam.	Boraginaceae	Wanza	Tree	GG 66
Croton macrostachyus Del.	Euphorbiaceae	Misana	Tree	GG 12
Cucumis ficifolius A. Rich.	Cucurbitaceae	Yemdir	Herb	GG 42

		embouy		
Cucurbita pepo L.	Cucurbitaceae	Duba	Herb	GG 58
Cynoglossum coeruleum Hochst. A. Rich. DC.	Boraginaceae	Shemigegit	Herb	GG14
Cyphostemma molle (Bak.) Descoings	Vitaceae	Ese zewie	Herb	GG18
Datura stramonium L.	Solanaceae	Astenager	Herb	GG05
Dipsacus pinnatifidus Steud. ex A. Rich.	Dipsacaceae	Kelem	Herb	GG51
Dodonaea angustifolia L.f.	Sapindaceae	Kitkita	Shrub	GG84
Echinops kebericho Mesfin	Asteraceae	Kebericho	Herb	GG48
Embelia schimperi Vatke	Myrsinaceae	Enkoko	Shrub	GG35
Eucalyptus globulus Labill.	Myrtaceae	Nech bahir zaf	Tree	GG44
Euphorbia platyphyllos L.	Euphorbiaceae	Anitrfa or avydem	Herb	GG65
Ficus carica L.	Moraceae	Quotle beles	Shrub	GG 68
Ficus sur Forssk.	Moraceae	Sholla	Tree	GG28
Ficus vasta Forssk.	Moraceae	Warka	Tree	GG61
Foeniculum vulgare Miller	Apiaceae	Ensillal	Herb	GG 39
Gardenia ternifolia Schumach. & Thonn.	Rubiaceae	Gambillo	Shrub	GG40
Glinus lotoides L.	Molluginaceae	Amikin	Herb	GG33
Gnidia involucrata Steud. ex A. Rich.	Thymelaeaceae	Boto	Herb	GG53
Grewia ferruginea Hochst. ex A. Rich.	Tiliaceae	Lenquata	Shrub	GG75
Guizotia schimperi Sch. Bip. ex Walp.	Asteraceae	Adey abeba	Herb	GG86
Hagenia abyssinica (Bruce) J.F. Gmel.	Rosaceae	Kosso	Tree	GG89
Jasminum grandiflorum L.	Oleaceae	Tembelel	Climber	GG95
Justicia schimperiana (Hochst. ex Nees) T. Anders.	Acanthaceae	Simiza	Shrub	GG02
Kalanchoe sp.	Crassulaceae	Endahula	Herb	GG99
Kanahia laniflora (Forssk.) R. Br.	Asclepiadaceae	Arust	Shrub	GG 71
Lagenaria abyssinica (Hook.f.) C. Jeffrey	Cucurbitaceae	Yekil enbouy	Climber	GG 37

Laggera crispata (Vahl) Hepper & Wood.	Asteraceae	Kes bedejie	Herb	GG102
Laggera tomentosa (Sch. Bip. ex A. Rich.) *Olivo* & *Hiern*	Asteraceae	Koskoso (gmie)	Herb	GG106
Lantana trifolia L.	Verbenaceae	Yeregna kollo	Shrub	GG 23
Leonotis ocymifolia (Burm. F.) Iwarsson	Lamiaceae	Feres zeng	Shrub	GG34
Lepidium sativum L.	Brassicaceae	Feto	Herb	GG79
Maesa lanceolata Forssk.	Myrsinaceae	Klawa	Shrub	GG80
Malva verticillata L.	Malvaceae	Yewusha nacha	Herb	GG17
Maytenus senegalensis (Lam.) Exell	Celastraceae	Koba	Tree	GG76
Merremia pterygocaulos (Steud. ex Choisy) Hall. f.	Convolvulaceae	Geste seb	Climber	GG105
Millettia ferruginea (Hochst.) Bak.	Fabaceae	Birbira	Tree	GG 67
Momordica foetida Schumach.	Cucurbitaceae	Yekura hareg (enquriy)	Climber	GG24
Myrtus communis L.	Myrtaceae	Ades	Shrub	GG50
Nicotiana tabacum L.	Solanaceae	Tinbaho	Herb	GG 69
Ocimium lamiifolium Hochst. ex Benth.	Lamiaceae	Dama kessie	Shrub	GG 45
Olea europaea subsp. *cuspidata* (Wall.ex G. Don) Cif.	Oleaceae	Woira	Tree	GG52
Osyris quadripartita Decn.	Santalaceae	Keret	Shrub	GG32
Otostegia integrifolia Benth.	Lamiaceae	Tnjut	Shrub	GG 09
Periploca linearifolia Quant.-Dill. & A. Rich.	Asclepiadaceae	Moider	Climber	GG63
Physalis peruviana L.	Solanaceae	Nechi awut	Herb	GG29
Phytolacca dodecandra L'Herit	Phytolaccaceae	Endod	Shrub	GG 36
Plantago lanceolata L.	Plantaginaceae	Gorteb	Herb	GG 04
Plectocephalus varians (A. Rich.) C. Jeffrey ex Cufod.	Asteraceae	Este yohannes	Herb	GG100
Plumbago zeylanica L.	Plumbaginaceae	Amira	Herb	GG57
Prunus persica (L.) Batsch	Rosaceae	Kok	Tree	GG54

Pterolobium stellatum (Forssk.) Brenan	Fabaceae	Kentefa or kointer	Shrub	GG 73
Rhamnus prinoides L'Herit.	Rhamnaceae	Gesho	Shrub	GG81
Rhus vulgaris Meikle	Anacardiaceae	Kammo	Shrub	GG 38
Ricinus communis L.	Euphorbiaceae	Kachima	Herb	GG56
Rosa abyssinica Lindley	Rosaceae	Keka	Shrub	GG10
Rubia cordifolia L.	Rubiaceae	Minchirir	Herb	GG26
Rubus apetalus Poir.	Rosaceae	Enjory	Shrub	GG72
Rumex abyssinicus Jacq.	Polygonaceae	Mekemeko	Herb	GG13
Rumex nepalensis Spreng.	Polygonaceae	Tult	Herb	GG49
Rumex nervosus Vahl	Polygonaceae	Embacho	Shrub	GG06
Ruta chalepensis L.	Rutaceae	Tenadam	Herb	GG27
Saliva merjamie Forssk.	Lamiaceae	Jawula	Herb	GG15
Salix mucronata Willd.	Salicaceae	Shunshuna	Shrub	GG107
Schinus molle L.	Ancardiaceae	Kundoberberie	Tree	GG92
Schrebera alata (Hochst.) Welw.	Oleaceae	Estemesewor	Tree	GG96
Sida schimperiana Hochst. ex A.Rich.	Malvaceae	Chifreg	Shrub	GG 43
Solanecio gigas Vatke	Asteraceae	Boz	Shrub	GG103
Solanum anguivi Lam.	Solanaceae	Zerch embouy	Shrub	GG16
Solanum dasyphyllum Schumach.	Solanaceae	Gebre embouy	Shrub	GG19
Solanum incanum L.	Solanaceae	Embouy	Shrub	GG105
Solanum nigrum L.	Solanaceae	Tikur awut	Herb	GG21
Steganotaenia araliacea Hochst. ex A. Rich.	Apiaceae	Nechillo	Tree	GG78
Stephania abyssinica (Dill and Rich). Walp.	Menispermaceae	Yet ar`eg	Climber	GG 08
Stereospermum kunthianum Cham.	Bignoniaceae	Zana	Tree	GG59
Syzygium guineense (Willd.) DC.	Myrtaceae	Dokima	Tree	GG82
Tagetes minuta L.	Asteraceae	Awulesh agbi	Herb	GG 41
Trichodesma zeylanicum (Burm. f.) R. Br.	Boraginaceae	Amera	Herb	GG85

Verbascum sinaiticum Benth.	Scrophulariaceae	Ketetina or dabakeded	Herb	GG25
Verbena officinalis L.	Verbenaceae	Atuch	Herb	GG70
Vernonia adoensis Sch. Rip. ex Walp.	Asteraceae	Ras kimir	Shrub	GG30
Vernonia amygdalina Del.	Asteraceae	Grawa	Shrub	GG 03
Vernonia auriculifera Hiern.	Asteraceae	Dangerotta	Shrub	GG90
Withania somnifera (L) Dunal	Solanaceae	Githewa	Shrub	GG94
Xanthium strumarium L.	Asteraceae	Dha nikel	Herb	GG85
Ximenia caffra Sond.	Olacaceae	Enkoy	Shrub	GG83
Prunus africana (Hook. f.) Kalkm.	Rosaceace	Komma	Tree	**GG108**
Schefflera abyssinica (Hochst. ex A. Rich.) Harms	Araliaceae	Ketem	Tree	**GG109**
Juniperus procera Hochst. ex Engl.	Cuppresaceae	Tid	Tree	**GG110**
Arundinaria alpina K. Schum.	Poaceae	Kerkeha	Woody bamboo	**GG111**
Eucalyptus camaldulensis Dehnh.	Myrtaceae	Bahir zaf	Tree	**GG112**

Collection number starting from GG108-112 indicated for the identification of plant community types but not medicinal purposes

Appendix 4 List of Geographical location, Altitude, Abundance (common, occasional, rare) and habitats of each medicinal plant species in the study area (Key to abbreviations: Hs – habitats of species, Nh – natural habitat, H – homegardens, Nh/H – natural habitats and homegardens).

Scientific name	Geographical Location	Altitude	Abundance of species	Hs
Acanthus polystachius Del.	11^0 15' 56 N, 037^0 13'14 E	2,207 m	Common	Nh
Acacia abyssinica Hochst.ex Benth.	11^0 16' 49 N, 037^0 15' 40 E	2,249 m	Common	Nh
Acacia pilispina Pic.-Serm.	11^0 16' 08 N, 037^0 13' 41 E	2,204 m	Occasional	Nh
Achyranthes aspera Lam.	11^0 12' 46 N, 037^0 09' 32 E	2,075 m	Common	Nh
Acmella caulirhiza Del.	11^0 17' 53 N, 037^0 19' 25 E	2, 180 m	Occasional	Nh
Aloe macrocarpa Tod.	11^0 17' 48 N, 037^0 18' 27 E	2,137 m	Common	Nh
Allium sativum L.	11^0 17' 55 N, 037^0 18' 55 E	2,178 m	Common	H
Asparagus scaberulus A.Rich.	11^0 13' 26 N, 037^0 17' 20 E	2, 642 m	Occasional	Nh
Bersama abyssinica Fresen.	11^0 17' 58 N, 037^0 18' 39 E	2,154 m	Common	Nh
Brucea antidysenterica Swiss Char	11^0 18' 20 N, 037^0 17' 55 E	2,101 m	Common	Nh
*Buddleja polystachya*Fresen.	11^0 15' 36 N, 037^0 13' 19 E	2,230 m	Occasional	Nh
Calpurnia aurea (Alt.) Benth.	11^0 17' 51 N, 037^0 19' 27 E	2, 178 m	Common	Nh
Capparis tomentosa Lam.	11^0 17' 41 N, 037^0 18' 43 E	2,134 m	Common	Nh
Carissa spinarum L.	11^0 17' 51 N, 037^0 19' 25 E	2, 176 m	Common	Nh
Chenopodium opulifolium Schrader ex Koch & Ziz.	11^0 24' 43 N, 037^0 09' 43 E	2, 013 m	Occasional	Nh
Clematis simensis Fresen.	11^0 17' 47 N, 037^0 18' 43 E	2,158 m	Common	Nh
Clerodendrum myricoides (Hochst.)Vatke	11^0 24' 32 N, 037^0 09' 34 E	2, 003 m	Rare	Nh/H
Clausena anisata (Willd.) Benth.	11^0 17' 46 N, 037^0 18' 43 E	2,157 m	Occasional	Nh
Clutia lanceolata subsp. *lanceolata* Forssk.	11^0 15' 55 N, 037^0 13' 48 E	2, 207 m	Occasional	Nh
Convolvulus steudneri Engl.	11^0 24' 51 N, 037^0 09' 34 E	1,994 m	Occasional	Nh
Cordia africana Lam.	11^0 17' 31 N, 037^0 18' 14 E	2,131 m	Common	Nh/H
Croton macrostachyus Del.	11^0 26' 53 N, 037^0 15' 24 E	2,026 m	Common	Nh/H

Cucumis ficifolius A. Rich.	11^0 16' 00 N, 037^0 13' 23 E	2,217 m	Occasional	Nh
Cucurbita pepo L.	11^0 17' 33 N, 037^0 17' 53 E	2,166 m	Common	H
Cynoglossum coeruleum (Hochst. A.Rich.) DC.	11^0 13' 38 N, 037^0 09' 47 E	2,088 m	Common	Nh
Cyphostemma molle (Bak.) Descoings	11^0 25' 04 N, 037^0 09' 26 E	1,997 m	Rare	Nh
Datura stramonium L.	11^0 25' 23 N, 037^0 09' 27 E	1,935 m	Common	Nh
Dipsacus pinnatifidus Steud. ex A. Rich.	11^0 12' 42 N, 037^0 17' 08 E	2,636 m	Occasional	Nh
Dodonaea angustifolia L.f.	11^0 18' 03 N, 037^0 18' 44 E	2,163 m	Occasional	Nh
Echinops kebericho Mesfin	11^0 16' 38 N, 037^0 19' 57 E	2, 175 m	Rare	Nh
Embelia schimperi Vatke	11^0 14' 41 N, 037^0 13' 14 E	2,454 m	Occasional	Nh
Eucalyptus globulus Labill.	11^0 12' 48 N, 037^0 18' 10 E	2, 444 m	Common	H
Euphorbia platyphyllos L.	11^0 25' 23 N, 037^0 10'13 E	2,043 m	Occasional	Nh
Ficus carica L.	11^0 17' 12 N, 037^0 18' 23 E	2,136 m	Occasional	Nh
Ficus sur Forssk.	11^0 12' 28 N, 037^0 13' 07 E	2,567 m	Occasional	Nh
Ficus vasta Forssk.	11^0 26' 56 N, 037^0 14' 01 E	2,010 m	Common	Nh
Foeniculum vulgare Miller	11^0 13' 56 N, 037^0 10' 17 E	2, 040 m	Occasional	H
Gardenia ternifolia Schumach. & Thonn.	11^0 16' 15 N, 037^0 13' 43 E	2,179 m	Occasional	NH
Glinus lotoides L.	11^0 24' 32 N, 037^0 09' 34 E	2,003 m	Occasional	H
Gnidia involucrata Steud. ex A. Rich.	11^0 25' 18 N, 037^0 10' 13 E	2, 116 m	Rare	Nh
Grewia ferruginea Hochst. ex A. Rich.	11^0 17' 45 N, 037^0 19' 29 E	2,177 m	Common	Nh
Guizotia schimperi Sch. Bip. ex Walp.	11^0 18' 01 N, 037^0 18' 55 E	2,180 m	Occasional	Nh
Hagenia abyssinica (Bruce) J.F. Gmel.	11^0 12' 40 N, 037^0 17' 13 E	2,674 m	Occasional	Nh/H
Jasminum grandiflorum L.	11^0 16' 52 N, 037^0 15' 24 E	2,170 m	Common	Nh

Justicia schimperiana (Hochst. ex Nees) T.Anders.	11^0 25' 23 N, 037^0 09 ' 27 E	1,997 m	Common	Nh/H
Kalanchoe sp.	11^0 15' 55 N, 037^0 13' 10 E	2,205m	Occasional	Nh
Kanahia laniflora (Forssk.) R. Br.	11^0 18' 33 N, 037^0 18' 06 E	2,078 m	Occasional	Nh
Lagenaria abyssinica (Hook.f.) C. Jeffrey	11^0 25' 11 N, 037^0 09' 23 E	1,995 m	Occasional	Nh
Laggera crispata (Vahl) Hepper & Wood	11^0 25' 49 N, 037^0 08' 37 E	1,981 m	Common	Nh
Laggera tomentosa (Sch. *Bip.* ex A. *Rich.) Olivo & Hiern*	11^0 13' 26 N, 037^0 17' 20 E	2,642 m	Common	Nh
Lantana trifolia L.	11^0 27' 01 N, 037^0 12' 53 E	2,053 m	Rare	Nh
Leonotis ocymifolia (Burm F.) Iwarsson.	11^0 12' 42 N, 037^0 17' 08 E	2,636 m	Occasional	Nh/H
Lepidium sativum L.	11^0 24' 44 N, 037^0 09' 43 E	2,007 m	Common	Nh
Maesa lanceolata Forssk.	11^0 14' 42 N, 037^0 13' 07 E	2,547 m	Common	Nh
Malva verticillata L.	11^0 25' 25 N, 037^0 09' 37 E	1,936 m	Common	Nh
Maytenus senegalensis (Lam.) Excell	11^0 17' 55 N, 037^0 19' 20 E	2, 173 m	Common	Nh
Merremia pterygocaulos (Steud. ex Choisy) Hall. f.	11^0 26' 55 N, 037^0 08' 18 E	1, 949 m	Rare	Nh
Millettia ferruginea (Hochst.) Bak.	11^0 21' 49 N, 037^0 02' 38 E	1, 936 m	Rare	Nh
Momordica foetida Schumach.	11^0 12' 11 N, 037^0 09' 21 E	2, 147 m	Common	Nh
Myrtus communis L.	11^0 17' 03 N, 037^0 18' 54 E	2, 202 m	Occasional	H
Nicotiana tabacum L.	11^0 16' 24 N, 037^0 13' 48 E	2, 196 m	Common	Nh
Ocimium lamiifolium Hochst. ex Benth.	11^0 17' 28 N, 037^0 17' 57 E	2, 160 m	Occasional	Nh/H
Olea europaea subsp. *cuspidata* (Wall.ex G. Don) Cif.	11^0 17' 54 N, 037^0 19' 00 E	2,166 m	Common	Nh
Osyris quadripartita Decn.	11^0 18' 03 N, 037^0 18' 44 E	2,173 m	Common	Nh
Otostegia integrifolia Benth.	11^0 17' 60 N, 037^0 19' 22 E	2,160 m	Occasional	Nh/H

Periploca linearifolia Quant.-Dill. & A.Rich	11^0 18' 11 N, 037^0 18' 50 E	2, 165 m	Rare	Nh/H
Physalis peruviana L.	11^0 17' 56 N, 037^0 12' 30 E	2,083 m	Occasional	Nh
Phytolacca dodecandra L'Herit.	11^0 14' 13 N, 037^0 17' 40 E	2,532 m	Common	Nh/H
Plantago lanceolata L.	11^0 26' 31 N, 037^0 12' 44 E	2,009 m	Common	Nh
Plectocephalus varians (A. Rich.) C. Jeffrey ex Cufod.	11^0 25' 58 N, 037^0 10' 13 E	2,117 m	Occasional	Nh
Plumbago zeylanica L.	11^0 25' 12 N, 037^0 09' 25 E	1,997 m	Rare	H
Prunus persica (L.)Batsch	11^0 18' 22 N, 037^0 19' 37 E	2,137 m	Occasional	H
Pterolobium stellatum (Forssk) Brenan	11^0 17' 50 N, 037^0 19' 25 E	2,170 m	Common	Nh
Rhamnus prinoides L'Herit.	11^0 24' 56 N, 037^0 09' 15 E	2,002 m	Common	Nh/H
Rhus vulgaris Meikle	11^0 17' 40 N, 037^0 18' 41 E	2,137 m	Occasional	Nh
Ricinus communis L.	11^0 17' 24 N, 037^0 19' 22 E	2,183 m	Common	H
Rosa abyssinica Lindley	11^0 17' 39 N, 037^0 18' 39 E	2,127 m	Common	Nh
Rubia cordifolia L.	11^0 18' 00 N, 037^0 19' 55 E	2,182 m	Occasional	Nh
Rubus apetalus Poir.	11^0 17' 45 N, 037^0 19' 25 E	2,185 m	Common	Nh
Rumex abyssinicus Jacq.	11^0 26' 54 N, 037^0 08' 19 E	1,954 m	Occasional	Nh
Rumex nepalensis Spreng.	11^0 24' 44 N, 037^0 09' 43 E	2,010 m	Common	Nh
Rumex nervosus Vahl	11^0 25' 23 N, 037^0 09' 27 E	2,009 m	Common	Nh
Ruta chalepensis L.	11^0 17' 31 N, 037^0 17' 55 E	2,167 m	Common	H
Saliva merjamie Forssk	11^0 27' 05 N, 037^0 15' 02 E	2,006 m	Common	N
Schinus molle L.	11^0 25' 06 N, 037^0 08' 55 E	1,999 m	Occasional	H
Salix mucronata Willd.	11^0 17' 31 N, 037^0 18' 29 E	2,120 m	Common	Nh
Schrebera alata (Hochst.) Welw.	11^0 17' 45 N, 037^0 19' 25 E	2, 189 m	Occasional	Nh/H
Sida schimperiana Hochst. ex A. Rich.	11^0 26' 53 N, 037^0 13' 22 E	2, 016 m	Common	Nh
Solanecio gigas (Vatke) C. *Jeffrey*	11^0 12' 43 N, 037^0 17' 13 E	2, 676 m	Rare	H
Solanum anguivi Lam.	11^0 20' 01 N, 037^0 12' 35 E	2,042 m	Occasional	Nh
Solanum dasyphyllum Schumach.	11^0 15' 54 N, 037^0 13' 11 E	2,210 m	Occasional	Nh/H
Solanum incanum L.	11^0 17' 02 N, 037^0 15' 42 E	2,229 m	Common	Nh

Solanum nigrum L.	11^0 25' 28 N, 037^0 09' 03 E	1,996 m	Occasional	Nh/H
Steganotaenia araliacea Hochst. ex A. Rich.	11^0 18' 02 N, $037^0$18' 43 E	2,180 m	Rare	Nh
Stephania abyssinica (Dill and Rich). Walp.	11^0 15' 54 N, 037^0 13' 15 E	2,227 m	Common	Nh
Stereospermum kunthianum Cham.	11^0 26' 57 N, 037^0 13' 50 E	2,007 m	Occasional	Nh
Syzygium guineense (Willd.) DC.	11^0 17' 10 N, 037^0 15' 53 E	2, 206 m	Common	Nh
Tagetes minuta L.	11^0 17' 31 N, 037^0 17' 55 E	2,167 m	Common	Nh
Trichodesma zeylanicum Burm. f.	11^0 15' 49 N, 037^0 13' 01 E	2,161 m	Common	Nh
Verbascum sinaiticum Benth.	11^0 25' 58 N, 037^0 10' 13 E	2,116 m	Rare	Nh
Verbena officinalis L.	11^0 18' 21 N, 037^0 19' 37 E	2,131 m	Occasional	Nh/H
Vernonia adoensis Sch. Rip. ex Walp.	11^0 18' 16 N, 037^0 18' 44 E	2,145 m	Occasional	Nh
Vernonia amygdalina Del.	11^0 25' 21 N, 037^0 09' 27 E	2, 012 m	Common	Nh/H
Vernonia auriculifera Hiern	11^0 26' 48 N, 037^0 14' 81 E	2, 021 m	Common	Nh
Withania somnifera (L) Dunal	11^0 17' 32 N, 037^0 17' 55 E	2,164 m	Rare	H
Xanthium strumarium L.	11^0 27' 01 N, 037^0 12' 58 E	2,015 m	Common	Nh
Ximenia caffra Sond.	11^0 25' 38 N, 037^0 10' 05 E	2,064 m	Occasional	Nh

Appendix 5 Number of medicinal plant species in each family

Number	Family	Number of genera	Number of plant species	Percentage
1	Acanthaceae	2	2	1.86
2	Alliaceae	1	1	0.93
3	Aloaceae	1	1	0.93
4	Amaranthaceae	1	1	0.93
5	Anacardiaceae	2	2	1.86
6	Apiaceae	2	2	1.86
7	Apocynaceae	1	1	0.93
8	Asclepiadaceae	2	2	1.86
9	Asparagaceae	1	1	0.93
10	Asteraceae	**9**	**12**	**11.21**
11	Bignoniaceae	1	1	0.93
12	Boraginaceae	3	3	2.80
13	Brassicaceae	1	1	0.93
14	Capparidaceae	1	1	0.93
15	Celastraceae	1	1	0.93
16	Chenopodiaceae	1	1	0.93
17	Convolvulaceae	2	2	1.86
18	Crassulaceae	1	1	0.86
19	Cucurbitaceae	4	4	3.74
20	Dipsacaceae	1	1	0.93
21	Euphorbiaceae	4	4	3.74
22	Fabaceae	**4**	**5**	**4.67**
23	Lamiaceae	**5**	**5**	**4.67**
24	Loganiaceae	1	1	0.93
25	Malvaceae	2	2	1.86
26	Melianthaceae	1	1	0.93

27	Menispermaceae	1	1	0.93
28	Molluginaceae	1	1	0.93
29	Moraceae	1	3	2.80
30	Myrsinaceae	2	2	1.86
31	Myrtaceae	3	3	2.80
32	Olacaceae	1	1	0.93
33	Oleaceae	3	3	2.80
34	Phytolaccaceae	1	1	0.93
35	Plantaginaceae	1	1	0.93
36	Plumbaginaceae	1	1	0.93
37	Polygonaceae	1	3	2.80
38	Ranunculaceae	1	1	0.93
39	Rhamnaceae	1	1	0.93
40	Rosaceae	**4**	**4**	**3.74**
41	Rubiaceae	2	2	1.86
42	Rutaceae	2	2	1.86
43	Salicaceae	1	1	0.93
44	Santalaceae	1	1	0.93
45	Sapindaceae	1	1	0.93
46	Scrophulariaceae	1	1	0.93
47	Simaroubaceae	1	1	0.93
48	Solanaceae	**5**	**8**	**7.47**
49	Thymelaeaceae	1	1	0.93
50	Tiliaceae	1	1	0.93
51	Verbenaceae	2	2	1.86
52	Vitaceae	1	1	0.93
Total	**52**	**96**	**107**	**100**

Appendix 6 List of human and livestock diseases in the study area (Key: NMP- Number of medicinal plants)

No.	Diseases treated	Local name (Amharic)	Human		Livestock	
			NMP	%	NM P	%
1	Ascariasis	Wosfat	1	0.9	--	--
2	Asthma	Yeasm Beshta	2	1.9	--	--
3	Bloating	Hod Menfat	--	--	2	1.9
4	Birth control	Wolad mamkegna	1	0.9	---	--
5	Body lice	Yesewonet kimal or kimach	--	--	1	0.9
6	Boils	Buginj	1	0.9	--	--
7	Bone fracture	Sibrat	--	--	1	0.9
8	Chigger	Migelli	2	1.9	--	--
9	Circumcision	Yegrzat Kusil	1	0.9	---	---
10	Coccoides	Yedero Fengil/Maz	--	--	2	1.9
11	Common cold	Gunfan	7	6.5	--	--
12	Constipation	hod driket	1	0.9	---	---
13	Cut	Silet sikort	2	1.9	---	--
14	Dandruff	Forefor	1	0.9	--	--
15	Devil sickness	Yeseytan Beshta	--	--	1	0.9
16	Diabetes	Yeskuar Beshta	1	0.9	--	--
17	Diarrhea	Tekimat	1	0.9	2	1.9
18	Diuretic	Shint Mat	1	0.9	---	--
19	Donkey's wart	Yeahya Kintarot	2	1.9	--	--
20	Dry cough	Derek sal	3	2.8	--	---
21	Dysentery	Demi Yetekelakel Tekimat	3	2.8	--	---
22	Ear lesion	Yejero memigel	2	1.9	--	---
23	Eczema	Chifie	1	0.9	---	---
24	Emergency	Kurba	7	6.5	---	---
25	Emaciation	Kumegna	----	----	1	0.9

26	Epidemic	Worershign	1	0.9	3	2.8
27	Epitasis (nose bleeding)	Nesir	1	0.9	---	---
28	Evil eye	Buda	3	2.8	----	----
29	Eye diseases	Yeayni makatel (Tenbir) , yean maz, chinkur, yeayin mayet mefizez	8	7.5	2	1.9
30	Febrile illness	Mich	2	1.9	--	--
31	Fire accident	Yesat ADega	2	1.9	---	---
32	Gastritis	Yechegara Beshta	4	3.7	----	----
33	Giardia and ameba	Wuha Wold Beshta	2	1.9	---	---
34	Gonorrhea	Chebt	1	0.9	----	----
35	Headache	Rasmita	1	0.9	---	----
36	Heart tiredness	Lib dikam	1	0.9	-----	---
37	Hemorrhoids	Bulad	2	1.9	----	---
38	Herpes zoster	Shererit Meshnat	2	1.9	--	--
39	Hook worm	Menteko	1	0.9	--	--
40	Hypertension	Dem Gfit	1	0.9	--	--
41	Impotency in men	Sinfetewocib	2	1.9	---	--
42	Jaundice	Yewof Beshta	3	2.8	---	--
43	Leach infestation	Alekt	--	--	3	2.8
44	Leprosy	Sga dewie	2	1.9	--	--
45	Loss of appetite	Yemigib Filagot Mekenes	1	0.9	--	--
46	Lung tuberculosis	Sanba nekersa	3	2.8	--	--
47	Malaria	Woba	8	7.5	--	--
48	Rabies	Yewusha Kelb	3	2.8	1	0.9
49	Retained placenta	Sing Mekiret/ Adef	3	2.8	2	1.9
50	Rheutematim	Yemegetatemiya kurtimat	1	0.9	--	--
51	Ringworm	Chirt	1	0.9	--	--
52	Scabies / Itching	Ekek	4	3.7	--	--
53	Snake bite	Yebab Mendef	2	1.9	--	-

54	Stabbing Pain	Wugat	1	0.9	--	--
55	Stomach problem	Kurtet	6	5.6	3	1.9
56	Swelling	Ebet	3	2.8	2	1.9
57	Tapeworm	Kosso	5	4.7	1	0.9
58	Tinea nigra	Lashing	1	0.9	--	--
59	Tinea versicolor	Qukucha	2	1.9	--	--
60	Tonsillitis	Yegororo Himem /entil	3	2.8	--	--
61	Toothache	Yetrs Kurtmat	7	6.5	--	--
62	Tumor	Mekersa/ nekersa	4	3.7	---	--
63	Typhoid	Typhoid	1	0.9	--	--
64	Unspecified diseases	(Likifit, amenimin)	3	2.8	--	--
65	Vomiting	Tiwukia	1	0.9	--	--
66	Wart	Kintarot	3	2.8	--	--
67	Wound (piercing, sharping)	Kusil (Gormit, Eshohi gudat, Garieta)	7	6.5	1	0.9
	Total		**152**		**28**	

Appendix 7 Checklist of semi-structured questions used for discussion and interview for the collection of ethnobotanical data

I. General Information on Respondents

1. Kebeles----------Village (Specific locality)----------Date—
2. Name ----------Age ---------- Sex -----

   Marital status----------Educational status ----------Occupation ----

   Religion ----------Ethnic ----------For how long you lived in the area?
3. Tell me the most common diseases of humans in your areas? ---
4. What are the most common diseases of livestock in your area? ------
5. How local people prevent and control a given diseases in your areas? -----

II. Ethnobotanical Information

6. Tell me the traditional ways of classifying vegetation, soil and landscape in your areas

   Vegetation ----------Soil----------

   Landscape----------
7. List the criteria to traditional ways of classifying vegetation, soil and landscape in your areas.
8. List the plants species used to treat human disease and injuries in your area and give their local names

Name of plants	Disease treated	Parts used	Habit	habitat	Degree of abundance	Route admin.	Prep.	Other ingred.	Dosage	Side effect	Other use	Coll no.

9. List the plant species used to treat livestock diseases in your areas?

Name of the plants	Disease treated	Parts used	Habit	Habitat	Degree of abundance	Route of admin.	Prep	Other ingred.	Dosage	Side effects	Other uses	Coll no.

10. List the plants species used to treat both humans' disease and their livestock in your area?

Plant name	Disease treated	Parts used	Habit	Habitat	Degree of adundance	Route admin.	Prep	Ingred.	Dosage	Side effect	Other use	Coll no.

11. Are the medicinal plants marketable? ----------
12. Is the medicinal plant easily accessible and affordable? If not, why? ----------
13. Is there any interference between modern and traditional medicine used in your area? --
14. Are there community members who frequently depend on more traditional medicinal plants as compared to modern medicine? What members of the communities? ----Why? ----------
15. Are there any restrictions associated with collection of medicinal plants? What is that?

16. Are there restrictions in the use of medicinal plants in the locality? What is the implication of the restriction? --
17. State the major problems regarding medicinal plants in the area?
18. How is the accessibility of medicinal plants compared to the past years? -----
19. What are the threats to the medicinal plants in the area? ----------
20. Is there any effort made on the management and conservation of medicinal plants in your area? ---------- If no, what is the problem?
21. If you say yes in Q.20, how are medicinal plants conserved in your area? ----------
22. Is the plant currently cultivated in the study area?
23. How the indigenous knowledge of medicinal plants use transferred from generation to generation in the community? ----------

Appendix 8 List of informants in the study area (Key to abbreviations: No – no education/ illiterate, W&R – only writing and reading, Church – traditional education and 1, 2, 3 --- educational level).

Name	Sex	Age	Marital status	Educational status	Resident kebeles	Occupation
1. Ayele Gelaw	M	64	Married	No	Brakat	Farming
2. Degu Teka	M	56	Married	R &W	Brakat	Farming
3. Tihtna Sealu**	M	58	Married	Church	Brakat	Mergieta
4. Abrham Alemu	M	26	Single	10 complete	Brakat	Farming
5. Emebiet Erkihun	F	38	Married	No	Brakat	Housewife
6. Nega Tadesse	M	60	Married	R & W	Zemene hiwot	Farming
7. Abyu Kassie **	M	54	Married	Church	Zemene hiwot	Mergieta
8. Tiruye Alemu	F	35	Single	No	Zemene hiwot	Small trader
9. Tadesse Abie **	M	52	Married	6	Zemene hiwot	Farming
10. Mitkie Gebeyehu **	M	63	Married	Church	Zemene hiwot	Priest
11. Awoke Ayenew	M	38	Married	No	Felege brhan	Farming
12. Yhalem Abera **	M	54	Married	Church	Felege brhan	Farming
13. Gebey Alemieneh**	M	56	Married	Church	Felege brhan	Priest
14. Biresaw Ayele **	M	72	Married	No	Felege brhan	Farming
15. Malefiya Tilahun	F	48	Married	No	Felege brhan	Housewife
16. Tenagne Ygzaw	M	38	Divorced	R&W	Sira betegbar	Farming
17. Kes Takele Tadesse **	M	55	Married	Church	Sira betegbar	Priest
18. Asefa Alemneh	M	26	Single	10 complete	Sira betegbar	Farming
19. Ambelu Beyene	M	76	Married	Church	Sira betegbar	Farming
20. Nestanet Asmamaw	F	21	Single	12	Sira betegbar	Student
21. Workneh Anteneh	M	74	Married	No	Ynesa lemirt	Farming
22. Dagnanesh Yimer**	F	51	Married	No	Ynesa lemirt	Housewife
23. Firiew Mengesha	M	46	Married	Church	Ynesa lemirt	Priest
24. Sintie Gashaw	F	21	Single	12	Ynesa lemirt	Student
25. Habtamu Birhanie	M	24	Single	10 complete	Ynesa lemirt	Farming

26. Addis Simieneh	M	24	Married	6	Felege hiwot	Farming
27. Muluken Teshome	M	57	Married	Church	Feleg hiwot	Farming
28. Misganaw Wunetu	M	46	Married	R&W	Felege hiwot	Farming
29. Belaynesh Matebu	F	62	Married	No	Felege hiwot	Housewife
30. Birkie Anagaw**	F	42	Divorced	No	Felege hiwot	Farming
31. Kassa Lake **	M	61	Married	No	Kurt bahir	Farming
32. Amare Fetene**	M	38	Married	6	Kurt bahir	Farming
33. Anteneh Demlie **	M	52	Married	No	Kurt bahir	Farming
34. Tirusew Birku	F	24	Married	10 complete	Kurt bahir	Housewife
35. Muchitie kassie	F	35	Married	No	Kurt bahir	Housewife
36. Dagnaw Agdew	M	53	Married	No	Enashenfalen	Farming
37. Chalie Demelash	M	39	Single	No	Enashenfalen	Farming
38. Melkamu Genetu	M	37	Married	No	Enashenfalen	Farming
39. Bazezew Demssie	M	58	Married	No	Enashenfalen	Farming
40. Yeneblo Worku	F	20	Single	12	Enashenfalen	Student
41. Misganaw Wunetie	M	58	Married	No	Amarit	Farming
42. Tiruwork Yeshanbel	F	45	Married	No	Amarit	Housewife
43. Nestanet Gedfew	M	21	Single	11	Amarit	Student
44. Shimelis Awoke	M	23	Single	11	Amarit	Student
45. Mulie Wasie	M	36	Married	R&W	Amarit	Farming
46. Tafere Alamnie **	M	60	Married	Church	Merawi	Mergieta
47. Yeshiwas Niway **	M	67	Married	12 +TTI	Merawi	Healer + teacher
48. Fentanesh Desalegn	F	36	Divorced	5	Merawi	Small trader
49. Tegegnemuhamed**	M	58	Single	5	Merawi	Healer
50. Melkie Getnet	M	53	Married	10	Merawi	Carpenter
51. Matiewos Zemenu	M	48	Married	Church	Bachma	Priest
52. Nigatu Alene	M	74	Married	R&W	Bachma	Farming
53. Antigegn Kassie	M	48	Married	No	Bachma	Farming
54. Awoke Getahun	M	57	Married	Church	Bachma	Mergieta
55. Dasash Alehegn	F	42	Married	No	Bachma	Housewife
56. Wudie Mengsitie **	F	42	Divorced	No	Anbomesk	Farming

57. Antehun Feleke	M	52	Married	Church	Anbomesk	Farming
58. Derese Antigegn	M	25	Single	10 complete	Anbomesk	Farming
59. Dinkitu Debasu	F	29	Married	No	Anbomesk	Housewife
60. Manchilie kndu	M	37	Single	No	Anbomesk	Farming
61. Wotet Menkir	F	52	Married	3	Wotet abay	Small trader
62. Degu Worku	M	68	Married	Church	Wotet abay	Priest
63. Gasheye Endalew **	M	62	Married	5	Wotet abay	Farming
64. Alemstehay Masresha	F	54	Married	No	Wotet abay	Housewife
65. Manaye Smegh **	M	55	Married	No	Wotet abay	Small trader
66. Meselie Ayalew	F	42	Married	No	Lehulum selam	Housewife
67. Shiferaw Zegeye **	M	47	Married	6	Lehulum selam	Tailor
68. Geremew Smalegn	M	58	Married	R&W	Lehulum selam	Farming
69. Melkie Belachew	M	36	Married	6	Lehulum selam	Farming
70. Chalie Demil	M	38	Married	No	Lehulum selam	Farming
71. Tekaum Mengistu**	M	52	Married	Church	Rim	Mergieta
72. Genet Ayana	M	42	Married	R&W	Rim	Small trader
73. Ayal Belie	F	38	Married	No	Rim	Housewife
74. Genetie Snishaw	F	59	Married	No	Rim	Housewife
75. Tenagne yigzawu	M	34	Single	No	Rim	Farming
76. Emebiet Tayachew	F	38	Single	No	Dagi abyot	Farming
77. Tewachew Belay	M	23	Single	11	Dagi abyot	Student
78. Yeshwas Limenih	M	28	Single	8	Dagi abyot	Farming
79. Tilahun Yeshu	M	37	Married	No	Dagi abyot	Farming
80. Desalegn Simineh	M	52	Married	R&W	Dagi abyot	Farming

**** -- Key informants**

Merigeta - referes to traditionally skilled man (in traditional church education).

Healer –refers traditional healing practitioners perform legally.

Declaration

I declare that this thesis is my original work. It is entitled as "An Ethnobotanical Study of Traditional Use of Medicinal Plants and Their Conservation Status in Mecha Wereda, West Gojjam Zone of Amhara Region, Ethiopia". Therefore, it has not been presented for a degree or diploma in any university. All sources of materials used in the thesis have been correctly acknowledged.

Name: Getaneh Gebeyehu

Signature ----------

Date ----------

Advisors: Zemede Asfaw (PhD)

Signature ----------

Date ----------

Sebsebe Demissew (Prof.)

Signature ----------

Date ----------