



**Ethnobotanical study of medicinal plants in Wogde wereda
SouthWollo, Northeast, Ethiopia**

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STATEMENT OF AUTHOR/DECLARATION

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LIST OF ABBREVIATIONS/ACRONYMS

ANRS	Amhara National Regional State
CBD	Convention on Biological Diversity
CSA	Central Statistical Agency
EMA	Ethiopian Mapping Agency
FAO	Food and Agricultural Organization
FL	Fidelity Level
GPS	Geographical Position System
ICF	Informant Consensus Factor
M.A.S.L	Meter above Sea Level
M.Sc	Master of science
NMI	National Meteorological Institute
SWZ	South Wollo Zone
TVET	Technical and Vocational Education Training
WWAO	Wogde Woreda Agriculture Office
WWEO	Wogde Woreda Educational Office
WWHO	WogdeWoreda Health Office
WHO	World Health Organization

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Ethnobotanical Study of Medicinal plants In Wogde Wereda SouthWollo, Northeast, Ethiopia

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ABSTRACT

An ethnobotanical study of medicinal plants was conducted in Wogde Woreda between September, 2022 and June, 2024. The general objective of the study was to document the medicinal plants and associated knowledge on their use, preparation and other aspects of indigenous and local knowledge of the local people. 88 informants were selected using systematic sampling technique and of them 11 key informants were selected purposely. Data were collected through semi-structured interviews, group discussions and guided field walk. Priority ranking, paired comparison, direct matrix ranking and informant consensus factor (ICF) were used in data analysis. Eighty medicinal plant species of which 43 (53.75% wild), 17 (21.25% home gardens), and 20 (25% cultivated) habitats were recorded. A total of 58 (72.5) species were mentioned for the treatment of only human ailments, 5 species for livestock and 17 (21.25%) for both human and livestock ailments. Most popular families were Solanaceae 6 (7.5%), Both Fabaceae and Lamiaceae 5 (6.25%) species each. In terms of growth habit 36 (45%) species were herbs. Leaves (47.6%) and roots (20.4%) were frequently used plant parts. Pounding (28.57%) and powdering (22.72%) were most frequent mode of preparations. Oral (51.2%) and dermal (29.3%) constitute common route of administration. The highest ICF values were linked to ailments associated with abdominal pain and gastro intestinal problems (0.8) and ailments related to acute sickness (0.71). Preference ranking showed that Melia azedarach was the most preferred species for the treatment of wound. The most cited threats to medicinal plants in the area were agricultural expansion. Cultivation of medicinal plants in home gardens, creating discussion forum for both modern and traditional medicine practitioners regarding preparation, preservation, dosage and application of traditional medicine is recommended.

Key Words: *Ethnobotany, Indigenous knowledge, Informant consensus factor Medicinal plants, Wogde Woreda.*

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

Ethnobotany is a multidisciplinary science dealing with the interaction between plants and people. It is also defined as local people's relations with their natural environment: how they classify, manage and use plants available around them (Martin, 1995). The relationship between plants and human culture is not restricted to the use of plants for food, clothing, and shelter but also includes their use for religious ceremonies, ornament, and healthcare (Schultes, 1992). Traditional people around the world have unique knowledge of plant resources related to the use of plants for food, medicine, and general utility including tremendous botanical expertise (Martin, 1995). In general, Ethnobotany is the scientific investigation of plants used in indigenous and local culture for food, medicine, magic, rituals, building, household utensils and implements, musical instruments, firewood, pesticides, clothing, shelter, and other purposes (Kelbessa Urga *et al.*, 2004).

Since ancient times, plants have been vital sources of both preventive and curative traditional medicine preparations for human beings and livestock. The wide usage of traditional medicine has been attributed to cultural acceptability, efficacy against certain types of diseases, and economic affordability as compared to modern medicine (Asfaw Debela *et al.*, 1999). Considerable indigenous and local knowledge system, from the earliest times, is related to the use of traditional medicine in different countries (Farnsworth *et al.*, 1994). Medicinal plants have important contributions in the health care system of local communities as the main source of medicine for majority of rural population (Tesfaye Hailemariam *et al.*, 2009).

Traditional medicine is not only concerned with the curing of diseases but also with the protection and promotion of human physical, spiritual, social, mental, and material wellbeing (Mekonnen Bishaw, 1991). It is widely believed in Ethiopia that the skill of traditional health practitioners is 'given by God' and knowledge on traditional medicines passed orally from father to a beloved child, usually a son or is acquired by some spiritual procedures. Traditional healing knowledge is owned by certain families or social groups (WHO, 1990). Traditional medicine has been brought in to focus for meeting the goals of wider coverage of primary healthcare delivery, not only in Africa but also in all countries of the world. It is the first choice healthcare treatment for at least 80% of Africans who suffer from high fever and other common ailments (Hill, 1989).

In Ethiopia, up to 80% of the population uses traditional medicine due to the cultural acceptability of healers and local pharmacopeias, the relatively low cost of traditional medicine, and difficult access to modern health services (Kebede Deribe *et al.*, 2006).

Hamilton (2003) attributes the dependence on medicinal plants to the low proportion of medical doctors to patients in Africa. The ethnomedicinal healing systems vary across cultures. In Ethiopia, there is cultural diversity and the use sample of the various flora differ accordingly (Kebu Balemie *et al.*, 2004).

Medicinal plants play a key role in the development and expansion of modern health services by serving as a starting point for the development of originalities in drugs (Pramono, 2002). The knowledge and use of plants is an essential part of many ethnic rural cultures in Ethiopia, the quantity of which has not yet been studied in depth (Abbink, 1995).

Ethiopia is the origin and center of diversity for many medicinal plant species. The various literature available show the significant role of medicinal plants in primary health care delivery in Ethiopia where 80% of human and 90% of livestock population depends on traditional medicine similar to many developing countries particularly that of sub-Saharan Africa countries (Endashaw Bekele, 2007).

Traditional medicinal plant practice in the country is still continuing and widely accepted to use in the prevention and treatment of various ailments (Gebeyehu Getaneh *et al.*, 2013). The local communities have knowledge in the medicinal value of traditional medicine and relatively low cost in using them (Gebeyehu Getaneh, 2013).

Similarly in Wegde woreda the society widely uses traditional medicine to treat different human and livestock diseases. There are different medicinal plants species in the woreda which can be obtained from wild habitat, grass land, shrubs, in field margin and garden fence as weeds and in many micro habitat from where they are harvested when the need arise.

Thus, the main purpose of this ethnobotanical study is to gather, identify, document and analyze medicinal plant species and associated traditional knowledge in the study area. The findings of this study will help people to be aware of problems associated with medicinal plants and give attention for threatened medicinal plants. And also documentation of indigenous and local knowledge of medicinal plants can be part of the information source for those who want to conduct research in further ethnobotanical study and development of modern drug. Hence to this end, the study is initiated in the study area

1.2. Objective

1.2.1 General objective

The overall objective of this study to identify the traditional medicinal plants used in Wegde woreda and to document the associated indigenous and local knowledge of the people.

1.2.2. Specific Objectives

- To gather, record and document indigenous knowledge of the people on medicinal plants in the study area
- To collect and identify traditional medicinal plant specimens used in the study area for the treatment of human and livestock ailments.
- To assess the role of traditional practice and indigenous and local knowledge in maintaining medicinally important plant species in the study area
- To provide information for future modern phytomedicine research using medicinal plants with ethnobotanical information.
- To identify threats and conservation practices of medicinal plants.

1.3. Research questions

The main focus of this study was to investigate the traditional medicinal plants along with their uses in healthcare and other purposes, management as understood and applied by the local people of Wogde woreda. The work aimed at conducting research about the traditional medicinal plants used to treat both human and livestock ailments in the study area. Thus, the following key `research questions were generated in order to primarily find scientific answers as these would help in making appropriate strategies to facilitate their future sustainable use and management.

1. What species of plants are used as traditional medicine in the study area?
2. What are the diseases for which traditional medicinal plants are used in the study area?
3. How often people of the study area use traditional medicinal plants against different diseases?
4. Which parts of medicinal plants are used to treat ailments?
5. What traditional conservation systems of traditional medicinal plants are used?
6. How is the dosage of plant medicines measured?
7. How do traditional healers prepare the herbal medicines?

1.4. Statement of the problem

In Ethiopia, both human and natural factors heavily contribute to loss of medicinal plants and gradual loss of indigenous and local knowledge associated with these plants. In developing countries like Ethiopia, the indigenous and local knowledge about traditional medicinal plants is transferred secretly from generation to generation orally. Thus, there is a gap in documentation and records of medicinal plants in Ethiopia. In addition to indigenous and local knowledge on usage of medicinal plants as remedies are getting lost owing to migration of Knowledge holders from rural to urban areas, industrialization, expansion of modern education and the reluctance of specialized healers not to transfer their knowledge to next generation. There is a need for scientific documentation of the traditional medicine wealth of the country. In most parts of Ethiopia, the wild plants and forests are almost totally lost by human impacts like deforestation, agricultural expansion, over exploitation and population growth and hence there is evident loss of biodiversity along with medicinal plants (Zemedu Asfaw, 2001; Kebu Balemie *et al.*, 2004). Based on the information of wogde woreda administrative offices no researches on ethnobotanical study of medicinal plants were conducted in Wogde Wereda so far.

CHAPTER TWO

2. Literature Review

2.1 Indigenous Knowledge

Indigenous and local knowledge, belief and practice generally develops and changes with time and space, Hence such knowledge includes time tested practice that developed in the process of human interaction with their environment (Gebeyehu Getaneh *et.al.*, 2013).Therefore ,it is the result of many generations long years experience, careful observation and trial and error experiments (Martin,1995). Indigenous local knowledge is a body of knowledge built up by a group of people through generation of living in close contact with nature and it is cumulative and dynamic. It builds up on the historical experience of people and adapts to social , economic , environmental spiritual and political change. The quantity and quality of traditional knowledge differs among community members according to their gender , social standing ,profession and intellectual capability. For instance, societies concerned with biological diversity are most interested in knowledge about the environment. One of the widely used indigenous local knowledge system in many countries is the knowledge and application of traditional medicine. The knowledge involves traditional diagnosis collection of raw materials, preparation of remedies and its prescription to the patients (Wort, 1994). Indigenous local knowledge on remedies in many countries including Ethiopia passes from one generation to the other generation verbally with great secrecy (Janzen, 1981). The complex knowledge beliefs, and practice generally known as indigenous knowledge or traditional knowledge develops and changes with time. It includes time tested practices that developed in the process of interaction of human with their environment (Hunde Debela *et al.*, 2004). Indigenous people refers to people who follow traditional non industrial life style in area that they have occupied for generations (Balick and Cox, 1996). Indigenous knowledge is a result many generation long years experience careful observation and trial and error experiments (Martin, 1995). Traditional people around the world possess unique knowledge of plant resources on which they depend for food, medicine and general utility (Martine, 1995; Cotton, 1996; Khanal 2006 cited in Alemayehu (2013). The knowledge helps them to identify and use many plants for traditional medicine to treat different human and livestock diseases.

2.3. Traditional Medicinal Plants

2.3.1 Traditional Medicinal Plants in Africa

The world health organization (WHO, 2002) defined traditional medicine as the total combination of knowledge and practice that can be formally explained and used in 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 (Endalew Amenu, 2007). Traditional medicine as a major African socio cultural heritage, obviously in existence for several hundreds of years , and the first choice of health care treatment for at least 80% of Africans who suffer from fever and other common ailments (Elujoba *et al.*, 2005). In Africa, traditional healers and remedies made from plants play an

important role in the health of millions of people. The main problem facing the use of traditional medicine is the proof requirement that the active components contained in medicinal plants are useful, safe and effective, this required to assure the medicinal field and the public regarding the use of medicinal plants as drug alternatives. The proof of pharmacological activity that are available at present are mostly based on empirical experience. The scientific proof then becomes the most important thing in order to eliminate the concern of using medicinal plants as drug alternative treatment. International collaboration is important for African countries, as it would enhance the development of drugs obtained from medicinal plants to their benefits.

2.2.2. Traditional Medicinal plants in Ethiopia

Ethiopia is a country characterized by a wide range of climate and ecological condition, possesses enormous diversity of flora and fauna (Pankhurt, 2006). The country possesses a wide range of potentially useful medicine plants, more extensive indeed than available in many other parts of the world (Giday Yirga and Zeraburk Samuel, 2005). Popular knowledge of plants used by human is based on thousands of years of experience by trial and error people learn how to recognize and use plants, including those with a magic- religious function. In Ethiopia, even though the traditional medicinal practitioners are the best sources of information secret, only to be passed orally to their older son, at their oldest age (Janzen, 1981). Due to its long period of practice and existence, traditional medicine has become an integral part of the culture of Ethiopian people (Amenu Endalew. 2007). According to (Dawit Abebe (2001), there is a large magnitude of use and interest in medicinal plant in Ethiopia due to acceptability and bio medicinal benefits. In Ethiopia the long history use of medicinal plants is reflected in various medico-religious manuscripts produced on parchments and believed to have originated several centuries ago (Fassil Kibebew, 2001). Medicinal text books written in Geez and Arabic in Ethiopia between the 17 & 18 centuries employs that plants have been used as a source of traditional medicine in Ethiopia health care system . In Ethiopia little emphasis has been given to traditional medicinal studies over the past decades (Hunde *et al.*, 2004). There for it can be said that ethinobotanical studies are merely at the start in Ethiopia there have been some attempts in investigating medicinal plants uses and there is as yet , no in depth study on the relation between medicinal plants and indigenous knowledge on sustainable management of such plant species.

2.3. Threats and conservation of medicinal plants

2.3.1. Threats to medicinal plants

A number of the threats to medicinal plant species are similar to those causing endangerment to the general plant diversity. The most serious immediate threats are habitat loss, land degradation and over-harvesting (Hamilton, 1997) 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. 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). According to Zemedet Asfaw (2001), medicinal plants are considered to be at conservation risk due to over use and destructive harvesting. Root and bark collection may kill the plant in harvest (Dawit Abebe and Ahadu Ayehu, 1993). People use many wild species of plants for food, medicine, clothing, shelter, fuel, fiber, income generation and the fulfilling of cultural and spiritual needs throughout the world (Zemedet Asfaw, 2001). 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 (Zemedet Asfaw, 2001; Kibru Alemie *et al.*, 2004).

2.3.2. Conservation of medicinal plants

Conservation is defined as the protection, preservation, and careful management of natural resources. Medicinal plant conservation strategies need to be understood and planned based on an understanding of indigenous knowledge and practices (Berkes and Turner, 2006). The issue of medicinal plant conservation in Ethiopia today calls for aggressive studies and documentation before the accelerated ecological and cultural transformation distort the physical entities and the associated knowledge base (Endashaw Bekele, 2007). The most serious proximate threats when extracting medicinal plants generally are habitat loss, habitat degradation, and over harvesting (Hamilton, 2003). Developing markets for natural products, particularly those that are harvested from the wild, can trigger a demand that cannot be met by available or legal supplies and demands a conservation initiative (Swanson, 1998) so the local population are not exploited, causing more damage to their resources (Leony and Voeks, 2004). To Hamilton (2003), several themes consistently arise in the various sets of recommendations that have been compiled relating to the conservation of medicinal plants.

Chapter Three

3. Materials and Methods

3.1. Description of the study area

The study was conducted in Wogde district which found in the South Wollo zone of Amhara region, Ethiopia. Wogde towns found 182 km far away from zonal town of Dessie and 581 km from Addis Ababa. The district geographical location is between $10^{\circ}46'24''$ N and $38^{\circ}56'12''$ E with total area of 112188 hectare or 1121.88km^2 . This study area is bordered by Borena in the north, Dera (Semen shewa of oromia) in south, Shebelberenta (Gojam) in the west and Kelala in the east and Leganbo woreda in the north east. The altitude of the study area is 1500-2580 meters above sea levels (m.a.s.l) at north east point. According to Wogde Woreda Agriculture office (2021) the topography of the study area is 50% plain, 12% mountain, 27% undulating and the remaining of 11% categories as valley. The geographical area is mainly 60% weinadega (semi-arid), 39% kola (arid) and Dega (temperate climate) which covered small proportion of the study area just 1%. The total population in Wogde Woreda is 158,878 out which 70,074 are males and 80,823 are females and majority area is rural. The Woreda comprise 35 kebeles 34 rural and one urban center, Wogde Woreda Agricultural office (2021).

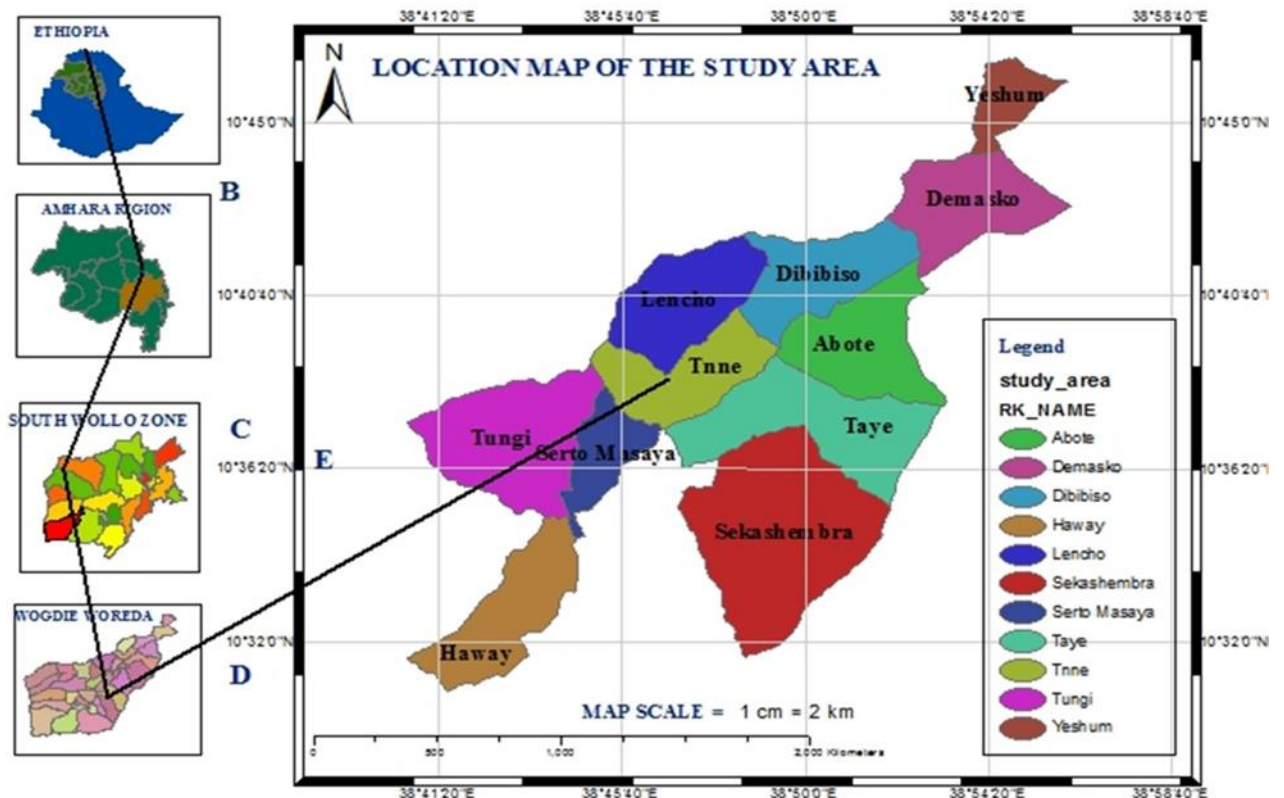


Figure 1, Map of the study area (EMA, 2020); modified for the purpose of the study).

3.1.2 Climate of the study area

The woreda receives moderate amount annual rainfall and characterized by unimodal rainfall pattern, which gradually increasing from March to June and reaching the pick in August. The rain starts to decline from September to November while November, December and January are the driest months (Fig. 2). The mean annual rainfall of the study site is 810mm while the monthly mean maximum and mean minimum temperature of the area is 28.6°C and 9.7°C, respectively. The mean annual temperature is 18.8°C and with slight variation from year to year (NAMSA, 2020)

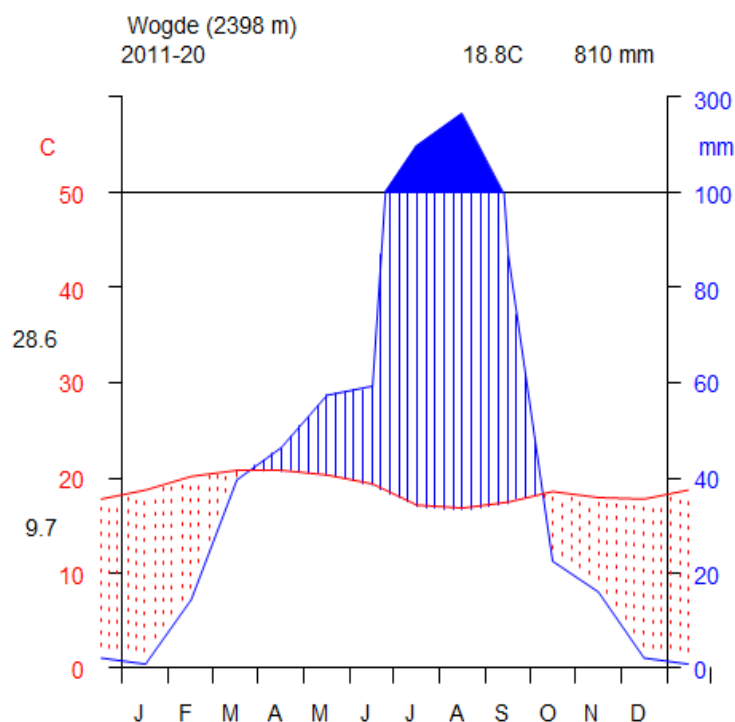


Figure 2: Climadiagram of the study area (source NAMSA, 2020)

3.1.3 Land Uses

The total area of this Woreda covers 112188 hectares, which consists of 28702 hectares of cultivated land and 4868 hectares covered natural forests, 78,618 hectares of grass land, irrigation and other purposes. The majority of households practiced mixed farming system. In the district, agriculture covered 85% and the rest are trades and others. In this Woreda mixed farming system is common practice prevailing in the district as result livelihood of rural population is dependent on crop production and livestock rearing. The common crop cultivated in the study area include *Eragrostis teff* 40%, *Triticum sativum* (Wheat) 38%, *Hordeum vulgare* (Barley) is 6%, *Pisum sativum* (peas) 5%, *Zea mays* (Maize) 3%, and 7% others such as fruits, vegetables, oil crops, WogdeWoreda Agriculture Office (2021).

3.1.4 Soil of the study area

A soil is simply porous medium consisting of 5 basic components. These are organic matter, gases, water, minerals and microorganisms. The elements presence in the proper amounts, are the backbone of terrestrial plants ecosystems. Each component is important in supporting plant growth microbial communities and chemical decomposition. According to WogdeWoreda agriculture office reported (2021) soil of the study area are classified by color: 9861 hectares clay soil, 2980 hectares black soil and 15861 hectares red soil in the study area. The texture of the soil in the study district is 65% clay, 28% silt, 7% sand soil.

3.1.5 Vegetation

In the study area the vegetation consists of various trees, shrubs, and herbaceous species. Some of the common plant species *Eucalyptus globulus* Labil, *Juniperus procera*, *Cordia africana*, *Acacia abyssinica*, *Citrus simenis*, *Ocimum lamifolium*, *Ruta chalepensis*, *Echinops kebercho*, *Lobila gibrillo* and different shrubs and herbaceous species. According to local community's information, two decades ago the southern and northern gorges of the district were characterized by dense forest covered by Acacia wood lands trees. Now a day the vegetation has declined because of agriculture expansion, urbanization expansion, and high demand of wood for construction, firewood and charcoal. Especially *Cordia africana* and *Juniper procera* are cut and highly used for furniture and other purposes. In some places of the study area few plantation of *Eucalyptus globulus* and *Arundnairia alpina* are also observed around the farm lands and home garden yards. Such remnant tree species give clues about the dominant vegetation of the area in the past (WogdeWoreda Agriculture Office, 2021).

3.1.6. Educational service in the study area

Wogde Woreda has 68 elementary schools, 4 general secondary and preparatory schools and 1 TVET school. There are 20,751 male, 19,046 female students and total number of students are 39,797 (WWAO, 2020).

3.1.7. Health care status in the study area

The wereda has 1 hospital, 6 health centers, 34 health posts, 10 private clinics and 5 drug stores (WWHO, 2020). The most commonly reported human diseases are tuberculosis, acute upper respiratory disease, pneumonia, diarrhea and dyspepsia (WWHO, 2020).

3.1.8. Livestock population and health status

There is high livestock population in Wogde woreda. According to (WWRAO, 2020), the livestock population consists of 64,663 heads of cattle, 15,442 sheep, 47,630 goat, 406 horse, 12,304 donkey, 297 mule, 38,457 hen and the total number of heads of livestock is 179, 200 (Wogde Woreda Rural Agricultural Office, 2020). In the woreda, there are different types of diseases on livestock population including endo-parasite (lung worm and liver worm), ecto-parasite (black, legand, anthrax), sheep and goat pox, colic, rabies and bovine pasteurellosis, ovine pasteurellosis, new castle disease, lumpy skin disease and African horse sickness. The

most common animal disease in the woreda include sheep and goat pox, black leg, new castle disease and, pasteurullosis. The disease is common during September, October, and December. Usually, sheep, goat, cattle, hen, horse, mule and donkey are attacked and the woreda veterinary clinics give treatment and vaccination beside cultural treatment. The woreda has 15 governmental, 2 private veterinary clinics and 1 drug store (WWHO, 2020). However their products; milk, meat, egg and honey are not plenty due poor management, low quality of feed supply and prevalence of various animal diseases.

3.2. Materials, reconnaissance survey, site selection and informant selection

3.2.1. Materials

Plant press and drying equipment, plant digger, knife, collecting bags, scissor, newspaper, plasters, digital camera, GPS, rope, card board, reference books for on the spot identification of plant species, field note book, pre-printed checklists of semi-structured questions for interview were materials used during the field work.

3.2.2. Reconnaissance survey

Reconnaissance survey was conducted at the beginning to have a mental picture of the study area. It was conducted from September 3, 2022 in order to obtain an impression about medicinal plants and general understanding of the characteristics of the study area to select study sites from the woreda.

3.2.3. Site selection

11 kebeles (study sites) of 35 were selected based on visual observation or the availability of vegetation abundance in collaboration with woreda experts from office of natural resource, traditional healers; and based on agro ecological zones (Kola, Woina dega, and Dega). From Kola agro ecology (Tungi, Seka shimbra & Lencho), Weina dega (Tinign, Dibibiso & Abote), and Dega (Serto masaya, Hawey, Demasiko, Yeshum & Taye) kebele were selected.

3.2.4. Informants selection

Following the choice of informant selection as recommended by Martin (1995) and Alexiades (1996) a total of 88 informants 57 males and 31 females (based on their indigenous knowledge) with the age of above 18 years from 11 kebeles and 11,252 households were selected using systematic sampling technique.

Eleven key informants, including assigning 1 key informant from each kebele and 88 informants were selected, following the choice of informant selection as recommended by Martin (1995) and Alexiades (1996). This is commonly purposive sampling technique way. Detail information from healers, association leader, local kebele administrators, knowledgeable elders and religious leaders as well as the local community was gathered using appropriate data collecting procedures. The required sample size was 88 and 11 key informant's calculated using proportion of the number of households in each kebele to the

total number of households of the 11 kebeles. Therefore, the sample size of Seka Shimbira Kebele with a total households of 1023 was 8 ($1023 \times 88/11252 = 8$). Same calculation was used for the other study kebeles.

3.3. Methods of ethnobotanical data collection

3.3.1. Sources of data

Ethnobotanical data were collected from both primary and secondary sources. Primary source of information were obtained from the field study whereas secondary sources of information from the governmental offices including health offices and veterinary clinics of the study area and information from previously conducted researches in the country and other internationally published literatures.

Ethnobotanical techniques were used to collect data on knowledge and management of medicinal plants in Wogde Wereda as described in Martin (1995). The data were collected from September 16 to November 30, 2022 during wet and dry seasons. Because, most plant parts such as leaves, root, stem, fruit, and flowers disperse during autumn. In addition, this season is best for voucher when pressing time. This helps to press plant parts well or keep its original features and avoid the gap of specimen identification.

The techniques of semi-structured interview (Appendix 9) field observation (Appendix 10 Fig. 1), group discussion (Appendix 10 Fig. 2), and marketing survey (Appendix 10 Fig. 3) were used to obtain indigenous knowledge of the local community on use, conservation and important medicinal plants.

3.3.2. Semi-structured interview

A semi-structured list consisting of 33 questions was prepared which was covered in discussion with informant in a particular order (Appendix 9). Semi-structured interview were conducted in places where the informants were most comfortable and during the time they have wanted or chosen. And questionnaires were employed for interviewing the informants to record and collect information on medicinal plants. The interview checklist include informants' name and address, common human and livestock ailments in the area, part of the medicinal plants used for treating different ailments, status of the medicinal plants in the study area, method of preparation and application, dosage, route of administration, other uses of the medicinal plants and threat and conservation status of the plants. All of the interviews were held in Amharic, the vernacular language of the people. The methods and techniques used to collect the needed information for ethnobotanical study of the area follow Martin (1995) and Cotton (1996) procedures.

3.3.3. Group discussion

Focus group discussions were conducted to verify the reliability of the data that had been collected through semi-structured interviews and to gain additional information on medicinal plant knowledge at the community level (Martin, 1995)

A brief group discussion was made with volunteer informants who are selected based on their knowledge about medicinal plants from 4 study sites (Dibibiso, Lencho, Seka shimbira and Demasiko) which are not included in the 88 informants. The discussions were undertaken with ten discussants at four study sites. Study sites for group discussions were selected based on the availability of vegetation. At the time of discussion with focus groups they were allowed to talk freely without interruption.

During group discussions discussants said that some traditional medicinal plants were becoming scarce from time to time due to natural and anthropogenic factors. Sometimes, it was difficult to find some medicinal plants during the dry season especially the herbs. Some of the participants that had traditional medicinal plants in their home gardens and others were planning to cultivate some of the most essential ones. They also agreed that the diversity of plant species used for traditional medicine have been declining even though there were attempts and tendencies to conserve and protect plant communities in which traditional medicine plants are also found.

3.3.4. Guided field walk

Field observations were performed with traditional healers and local guides who were interviewed to obtain the available data in the study area recommended by Cotton (1996) and Alexiades (1996). Guided field walk is a combination of observation and interview methods. In this method guided field walk observations were made to gather additional ethnobotanical information's from traditional healers instead of informants to increase the reliability of the study. Ethnobotanical data collected from the study area by means of guided field walk indicate that most of the local people used traditional medicine prepared from plant parts

During infection for both humans and livestock in different ways based on the type of ailments. Most field observations were carried out with a single informant so that information he/she provided was kept secret. The most common health problems mentioned were stomach pain, wound, leech, and itchiness. They also reflected that accessibility of plants decreased during the dry season when it becomes difficult to find especially the herbs. They also agreed that the diversity of plant species used for traditional medicine have been declining even though there were attempts and tendencies of conserving and protecting plant communities in which traditional medicine plants were also found.

3.3.5. Informant consensus

In order to confirm the reliability of the information each informant was contacted at least twice and if the responses that were given at different time contradict to each other, they were considered to be unreliable and are rejected or reliability of the information can be confirmed by similarity of information given by different informants on the same issue. This method was adopted from Alexiades (1996).

3.3.6. Field observation and market survey

According to Martin (1995), market survey was done with the help of local guide and interpreter. Market survey had taken in two markets within Wogde Woreda, Kabi and Robite

market. At the time of observation, important points including culture of the community, market value and cultivation practices of the medicinal plants were recorded.

3.3.7. Plant specimen collection

At the end of the interview, local name, habits and associated information of the plant specimens were recorded for each of the plant species, then, the plant specimens were pressed and dried for identification.

3.3.8. Plant specimen identification

Preliminary identification of the plant specimens was done in the field, and later taken to the teaching herbarium established at AAU to identify using taxonomic keys in the Flora of Ethiopia and Eritrea. Confirmation of the identification was made by the help of taxonomic experts. Then the identified specimens were stored at the Herbarium of Addis Ababa University.

3.4. Ethnobotanical data analysis

The data were mainly summarized and analyzed by descriptive statistics, preference ranking, paired comparison, direct matrix ranking, ICF and FL following Martin (1995).

3.4.1. Descriptive statistics

Both qualitative and quantitative analytical tools were used for data analysis following Martin (1995) and Cotton (1996). Ethnobotanical data were entered into Excel spreadsheet and summarized using descriptive statistics. Descriptive statistical method such as percentage and frequency were employed to analyze and summarize the data on medicinal plants use and associated knowledge. The most useful information gathered on medicinal plants reported by local people like medicinal value, application, methods of preparation, route of application, diseases treated, dosage, plant part used and plant habit were analyzed through descriptive statistics. Then, the result was presented in bar graphs, charts, table and texts.

3.4.2. Preference ranking

Preference ranking data were collected during the field study and later computed following Martin (1995). Eleven key informants have been selected to assess the degree of effectiveness or priority of nine medicinal plants against wound healing. The effectiveness of each medicinal plant was ranked between scores of 9 and 1 where the medicinal plant believed to be most effective to treat the illness received the highest value (9), and the one with the least effectiveness received the lowest value (1). The value of each species was summed up and the rank for each species was determined based on the total score. This helped to indicate the most preferred medicinal plant used by the community to treat the wound.

3.4.3. Paired comparison

Paired comparison was made after preference ranking exercise to verify the validity or consistency of individual informant's response about the pre preference ranking exercise on six medicinal plant species used to treat wound as described by Martin (1995). It involves presenting participants with a pair of items at one time in a randomized order. The number of possible combinations of pairs was given by the formula: $n(n-1)/2$ where, n is the number of items. Eleven key informants were asked to choose the best item in each case freely on the basis of their personal preference. Finally, their responses were recorded, total value summarized and ranking made based on the report of eleven key informants.

3.4.4. Direct matrix ranking

Direct matrix ranking was performed following Martin (1995) in order to compare seven multipurpose uses of medicinal plants. Based on the information gathered from informants, seven multipurpose tree species were selected out of the total medicinal plants and for use diversity of these plants (medicine, firewood, charcoal, construction, edible and tool) were listed for eleven selected key informants to assign use values to each species. According to each key informant that give use values for the seven multipurpose medicinal plants and the total values of each use of diversity for species were taken and the average score of each species summed up and ranked. The scores were ranked between 7-1 in each case indicate the scale interval.

3.4.5. Informants consensus factor

Informant consensus factor (ICF) was calculated for each disease category to identify the agreements of the informants on the reported cures for seven disease categories. The ICF was calculated as follows: number of use citation in each category (Nuc) minus use number of species used for each citation (Ns), divided by the number of use citations in each category (Nuc) minus one (1) (Heinerich et al., 1998). The factor provides a range of 0 to 1, where a high value act as a good indicator for a high rate of informant consensus.

$$ICF = \frac{Nuc - Ns}{(Nuc - 1)} \dots \dots \dots (1)$$

Where,

ICF=Informants Consensus Factor

Nuc =Number of use citation in each category

Ns = Number of species used for each citation

3.4.6. Fidelity level (FL)

Many medicinal plant species could be used in the same use category and due to this, it is interesting to determine the most preferred species used in treatment of a particular ailment. This can be done use with the fidelity level as used in (Friedman et al.1986). The

fidelity level (FL), the percentage of informants claiming the use of a certain plant species for the same major purpose, was calculated for the most frequently reported ailments as:

$$FL (\%) = \frac{N_i}{N} \times 100 \dots \dots \dots (2)$$

Where (N_i) is the number of informants that claim a use of a plant species to treat a particular disease and (N) is the number of informants that use the plants as medicine to treat any given disease (Alexiades, 1996).

3.5. Interviewing protocol and ethical consideration

In ethnobotanical research, ethics is imperative in creating and maintaining beneficial working relationships with a community (Martin, 1995). Initially, compliance was checked with Proclamation No. 482/2006, articles 11:4 and 22:2 providing for accesses to genetic resources, community knowledge, and community right (GOE, 2006). The content of this proclamation is aligned with those of the CBD as they relate and apply to Ethiopia. Thus, ethical clearance letter was obtained from Wogde Woreda Administration Office, Woreda Office and individuals who were willing to participate in the research. The verbal consent of each informant was obtained after explaining the purpose of the research before selecting study participants for ethnobotanical data collection using standard procedures. Data collection was conducted after permission was obtained from Administrative Office and the individuals who were willing to participate in the research. Special ethical considerations were taken from the beginning to the end of data collection. Finally, most informants accepted the idea and gave information freely on medicinal plants used in the study area.

CHAPTER FOUR

4. RESULTS AND DISCUSSIONS

4.1. Taxonomic diversity and endemism of medicinal plants

4.1.1. Taxonomic diversity

The people in the study area use diverse plant species for traditional medicinal purpose to treat both human and livestock ailments. A total of 80 medicinal plant species belonging to 41 families in 71 genera were collected identified and documented (Appendix 2). The most popular family was Solanaceae, which contributed six (7.5%) species in 6 genera followed by Fabaceae and Lamiaceae five (6.25%) species and 5 genera each. This high representation could be related to the fact that they are species rich families in the flora area, Ethiopia and Eritrea (Mesfin Tadesse, 2004; Ensermu Kelbessa and Sebsebe Demisse, 2014; Getu Alemayehu 2010). This could also be attributed to their wider distribution and abundance in the flora area. This is also confirmed by consistent recording of ethnomedicinal uses of species from the above-mentioned families in other Ethiopian ethnobotanical inventories (Haile Yineger *et al.*, 2007; Ermias Lulekal *et al.*, 2008; Tesfaye Hailemariam *et al.*, 2009; Tilahun Teklehaymanot, 2009; Mirutse Giday *et al.*, 2010).

4.1.2. Endemic medicinal plants of the study area

Of total medicinal plants recorded in the study five species are endemic to Ethiopia (Table 1). Five endemic medicinal plant species were harvested from the wild state than from managed landscape. This indicated similar findings recorded elsewhere (Haile Yineger and Delenasaw Yewhalaw, 2007). Out of the endemic medicinal plant species, the status of *Aloe percrassa* is rare in the study area may be related to different factors such as agricultural expansion in relation to population growth, over grazing and drought.

Table 1: Medicinal plants of the study area those are endemic to Ethiopia

No	Scientific Name	Family
1	<i>Acanthus senii</i>	Acanthaceae
2	<i>Aloe percrassa</i>	Aloaceae
3	<i>Impatiens rothii</i>	Balsaminaceae
4	<i>Laggera tomentosa</i>	Asteraceae
5	<i>Urtica simensis</i>	Urticaceae

4.2. Habitat of medicinal plants

In the study area medicinal plant species are collected in the wild, home garden and cultivation (Fig 3). In contrast to natural habitats, homegardens contributed 17 (21.25%) of the medicinal plants. This result is similar with the findings of other ethnobotanical studies in which wild areas are the most habitats of medicinal plants. This indicates that the practitioners inhabiting the study area mostly depend on the wild habitat or the natural environment rather than homegardens to obtain the medicinal plants.

According to Tesfaye Awas and Sebsebe Demissew (2009) most of the medicinal plants in Ethiopia are collected from the wild, some are cultivated and some others are grown in homegardens either purposely for medicinal use or non-medicinal purpose (Zemedu Asfaw and Ayele Nigatu, 1995). According to Zemedu Asfaw (1997), plant species cultivated in Ethiopian home gardens for the purpose of medicine is about 6%. This figure indicates that a large number of medicinal plant species that are used by herbalists are collected from natural vegetation. Local forests are sources of plant products processed into therapies used in traditional medical system (Balick and Cox, 1996). The natural ecosystems of the forests, grass lands, woodlands, wet lands, field margins contain a significant number of medicinal plants species. These are places where traditional healers and other members of the community collect medicinal plant species and use it (Endashaw Bekele, 2007).

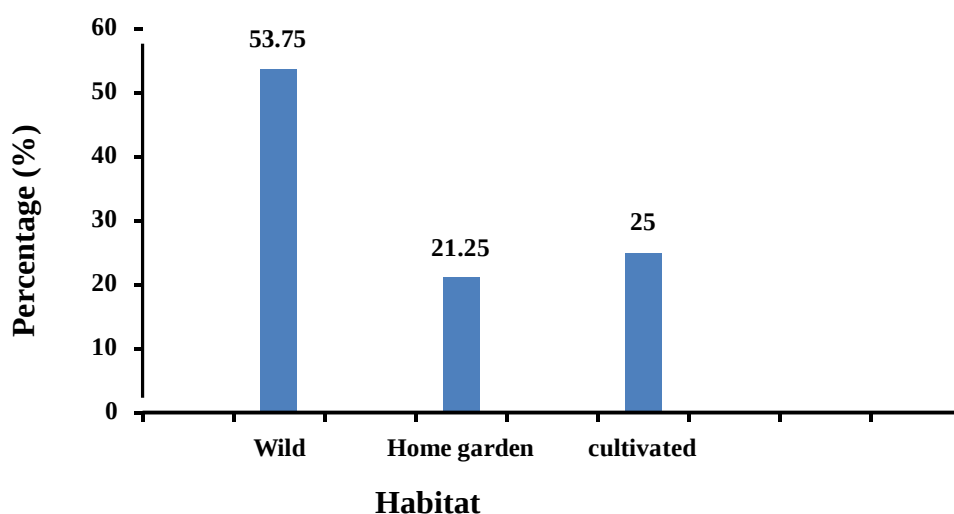


Figure 3: Habitats of medicinal plant species

4.3. Growth habit of medicinal plant species

Of the various growth forms of the reported medicinal plant species used to treat human ailments, herbaceous forms were dominant in the study area. This may be due to the

vegetation of the area in which trees, shrubs and other growth forms have been exploited in the study area and hence then are rare

In terms of growth habit of medicinal plants herbs constituted the largest category (Figure 4). This result agrees with other similar findings (Mirutse Giday *et al.*, 2003; Endalew Amenu, 2007; Tilahun Teklehaymanot and Mirutse Giday, 2007; Haile Yineger *et al.*, 2008). This is due to the fact that herbs can grow in every habitat including grazing land, homegardens, and farm land and wild and also easily available mainly during the wet seasons compared with other species such as trees, shrubs, herbaceous climber and succulent. In addition, herbs are not exposed to various threats compared with shrubs and trees and are also easily harvested and cultivated by the local people.



Figure 4: Growth habits of medicinal plants used for the treatment of human and livestock ailment

4.4. Abundance of traditional medicinal plants

According to informants report, all the medicinal plants were recorded as common, medium and rare as per healer perception gathered during the semi-structured interviews and group discussion. Out of 80 medicinal plant species, 20 (25%) were recorded as rare in the study area. This is due to the fact that the majority of these medicinal plants were distributed in the wild vegetation and hence the existence of pressure on wild medicinal plants. Twenty one (26.25%) of medicinal plants were recorded as common and thirty nine (48.75%) as medium. The latter proportions of medicinal plant species are cultivated in home gardens and farmlands by the local people mainly for other uses. This findings is related to (Chomchalow, 2002; Anjum *et al.*, 2012).

4.5. Medicinal plants used in the study area

4.5.1. Medicinal plants used to treat human and livestock ailments

In the study area, 67 ailments of both human, livestock and were reported to be treated traditionally using medicinal plants (Appendix 7). One species can be used to treat single ailment or a number of ailments. Out of the total collected and identified medicinal plants 58 (72.5%) species belonging to 56 genera and 34 families were reported for treatment of human ailments only (Appendix 3) and 5 (6.25%) species belonging to 5 genera and 5 families for treatment of livestock ailments only (Appendix 4). A total of 17 (21.25%) species belonging to 16 genera and 15 families were reported for treatment of both livestock and human ailments (Appendix 5). Less number of livestock ailments and medicinal plants were reported compared with humans. This showed that, the people of the study area are more knowledgeable and give more attention to human ailment as compared to that of livestock. Moa Megersa (2010) in Wayu Tuka District, East Wollega reported similar finding.

4.5.2. Plant parts used

In the study area according to informant's reports, leaves and roots were harvested respectively for majority of the remedy preparations. Hence, consuming of leaves of medicinal plants for most of the remedy preparations is good for the sustainability of the traditional medicinal plants in the area as compared to harvesting of roots. Using the leaf parts for traditional remedy preparations was also common in other findings elsewhere in Ethiopia (Mirutse Giday and Gobena Ameni, 2003) But, utilization of roots for human medicinal plant preparations is risk for the corresponding medicinal plants to become threatened. Exploiting of roots of medicinal plants was also commonly reported by other ethnomedicinal studies elsewhere in Ethiopia (Dawit Abebe and Ahadu Ayehu, 1993; Getachew Addis *et al.*, 2001; Haile Yineger *et al.*, 2007; Tilahun Teklehaymanot, 2009).

The local people collect different plant parts for preparation of traditional medicine. Leaves (47.61%) and roots (20.4%) were the most widely used plant parts in preparation of remedies (Figure 5), which is consistent with the findings of other researchers elsewhere (Mirutse Giday, 2001, Haile Yineger and Tesfaye Hailemariam *et al.*, 2009; Getnet Chekole, 2011).

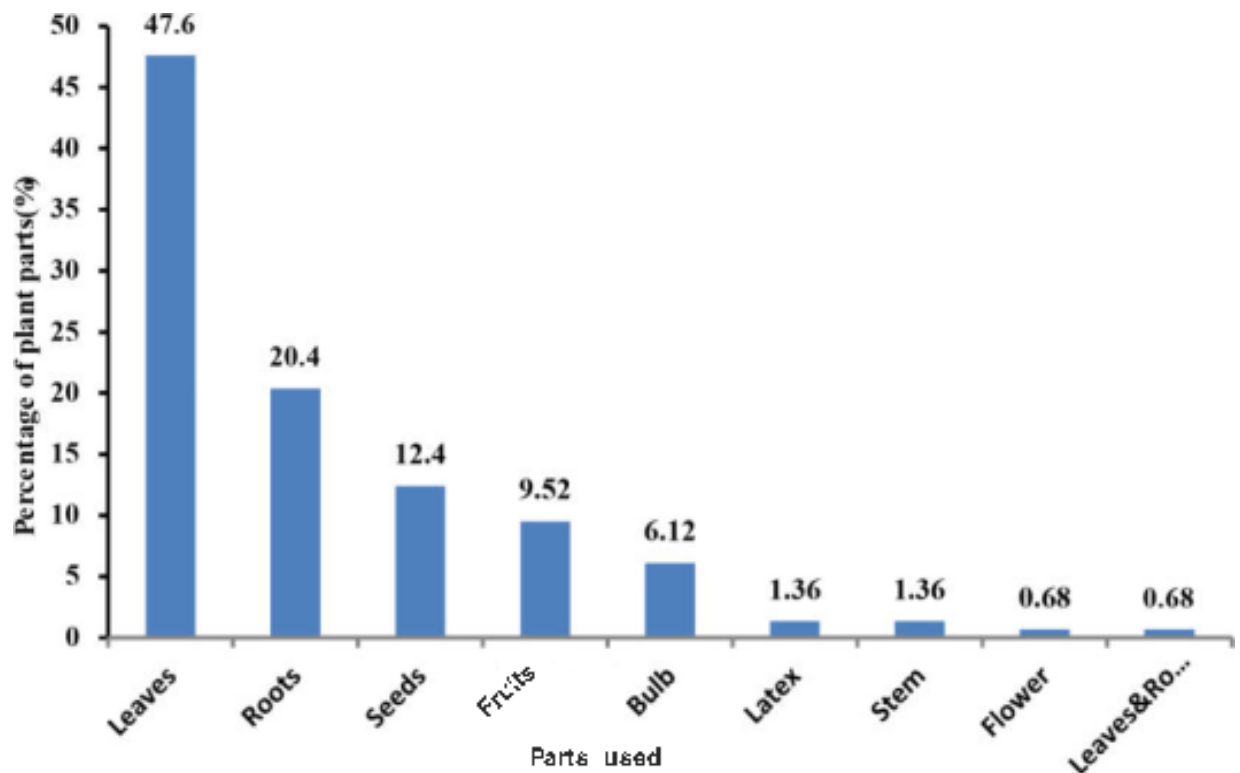


Figure 5: Plant parts used for preparation of remedies

4.5.3. Conditions of preparation of herbal remedies

The study showed that the majority of medicinal plants used for remedy preparations were in fresh form (61.64%) followed by dried (32.87%) and either of the two 5.47% (Figure 6). This is similar with the findings reported by Endalew Amenu (2007); Haile Yineger and Delenasaw Yewhalaw (2007); Haile Yineger *et al* (2008). This is related to the effectiveness of fresh materials in treatment as the contents are not lost before use compared to the dried forms

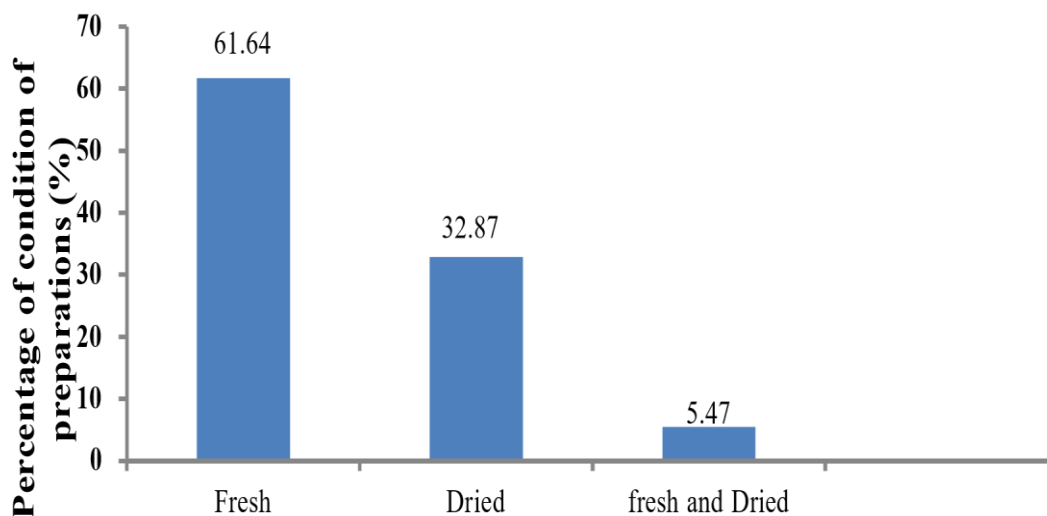


Figure 6: Condition of preparations of plant remedies

4.6. Method of preparation and application of remedies from medicinal plants

4.6.1. Methods of preparation

The local people employ several methods of preparation of traditional medicines from plants. Pounding and powdering were the most frequently used methods of traditional medicine preparation in the study area. According to the informants, both pounding and powdering as a strategy permit to preserve the plant materials that are not available both in dry and rainy seasons. It was also found that, these are effective for the complete extraction of the potential content of the plant and increase the curative power of the medicine or its efficacy, as both increases the healing power of the remedy through faster physiological reaction, as respondents reported (Table 2). After preparation, the remedies are either used soon or preserved for later use. Traditional practitioners often use any dry clean containers (16%) to preserve traditional medicines. Almost greater proportions of informants (45%) do not have the habit of keeping traditional medicines prepared for a long time. About 20% of them hang dried medicines on roofs and walls, 10% use plastic bags, while about 5% use sheet of clothes and 4% seal in bottles.

The majority (78%) of these preparations were drawn from mixtures of different plant species with different additive substances like honey, sugar, teff powder, butter, salt and ground honey for the treatment of single ailment. These additive substances have double function i.e. to improve flavor and reduce adverse effects such as vomiting and diarrhea, and enhance the efficacy and healing conditions. Similar results were also reported elsewhere (Mirutse Giday, 2001) and (Bayafers Tamene, 2000). Dawit Abebe (1986) has also identified the additive substances in herbal remedy preparations with their possible benefits.

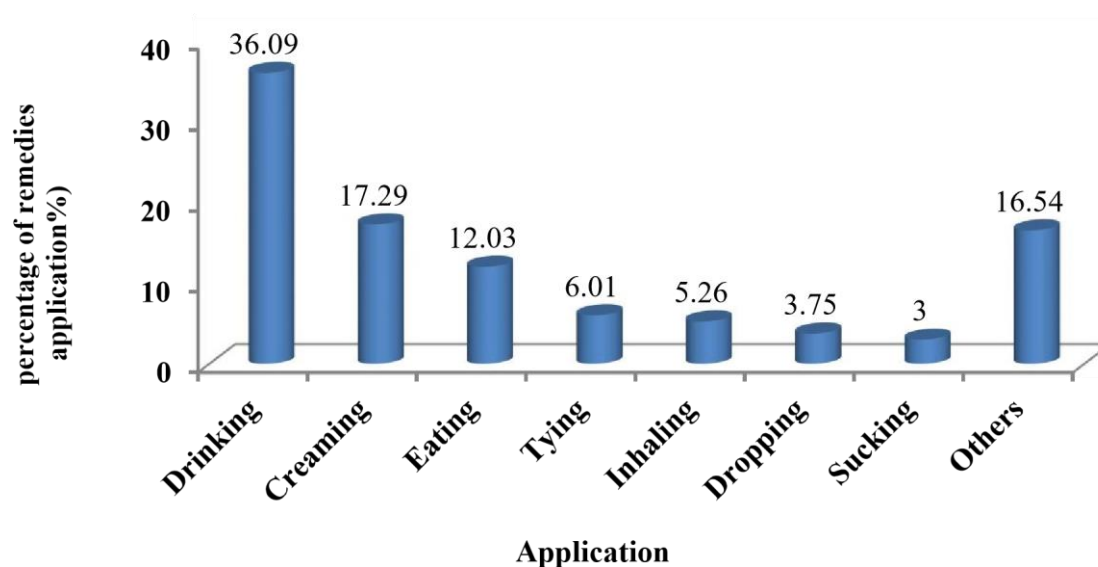
The current finding and other records elsewhere, which revealed the interrelationships of the use of medicinal plants in combination and high level of cure efficacy is not concordant to the findings of Dawit Abebe (1986), Debela Hundie (2004) and Etana Tolessa (2007). These authors have reported that the use of medicinal plants in a unit has high traditional medicinal efficacy. It was also reported that some medicinal herbs are mixed with food and drinks in such a manner that, they give special flavor and taste to it. For instance, *Allium sativum* and *Ruta chalepensis* are added to Coffee and cheese to improve the flavor and taste, and to avoid abdominal discomfort. Mixing and using some medicinal plants with common foods and drinks might be an easy way for effective treatment (Abdu and Hamed, 1982; cited in Etana Tolessa, 2007).

Table 2: Ways of preparation of remedy

Type of Preparation	No. of preparation (frequency)	Percentage
Pounding	44	28.57
Powdering	35	22.72
Squeezing	28	18.18
Crushing	20	12.98
Boiling	13	8.44
Chewing	5	3.24
Soaking	3	1.94
Cooking	2	1.29
Latex preparation	2	1.29
Smoking	2	1.29
Total	154	100%

4.6.2. Applications of remedies

The study revealed that traditional medicines were applied in a number of methods (Figure 7). This result agrees with the work of Endalew Amenu (2007) conducted in Chelya District which indicated that drinking was the predominant application method. Healers reported the need to additives to reduce the adverse effects and to improve the efficacy of traditional medicine. The additives include: water, honey, milk, butter, powder, sugar and salt.

**Figure 7:** Ways of application of plant remedies

4.6.3. Additives added to herbal preparations

The study showed that herbal remedies were processed using a grinder made of iron, black stone. They also use their palms and fingers to extract and squeeze out the plant juice. Some additives are added to the herbal to form herbal dilutions. Additives are used to reduce the adverse effects and to improve the efficacy of traditional medicine. The local people prepared herbal medicine with or without additives. Most 85 (57.82%) of the herbal medicines were prepared without additives in the study area (Table 3)

Table 3: Additives in the preparation of herbal remedies for human and livestock ailments

No.	Types of Additives		Number of preparation	%
1	No additives		85	57.82
2	Water		29	19.73
3	Butter		11	7.48
4	Honey		7	4.76
5	Milk		4	2.72
6	Coffee		4	2.72
7	Water and Honey		2	1.37
8	Few drops of oil		1	0.68
9	Milk or Water		1	0.68
10	Salt		1	0.68
11	Water & Sugar		1	0.68
12	Water, Sugar or Salt		1	0.68
	Total		147	100

4.6.4. Route of administration of traditional medicines

According to the respond of informants the most popular way of administration of traditional medicines were oral (51.02%) and dermal 29.93% (Table 4). Various ethnobotanical researches elsewhere in Ethiopia have indicated oral route as the predominant route of administration the reason of that is it is the simplest, most convenient for the patient, convenient for repeated and prolonged use, can be self-administered and pain free and does not involve extra cost for patient (Mirutse Giday, 2001; Etana Tolasa, 2007; Tilahun Teklehaymanot and Mirutse Giday, 2007; Ermias Lulekal *et al.*, 2008; Fisseha Mesfin *et al.*, 2009).

Table 4:Route of administration of herbal medicine

Route of administration	No. of informants	Percentage
Oral	75	51.02
Dermal	44	29.93
Oral and Nasal	8	5.44
Neck	6	4.08
Ear	4	2.72
Nasal	4	2.72
Eye	2	1.36
Tooth surface	2	1.36
Left nose/Ear for livestock	1	0.68
and oral for human	1	0.68
Oral and Dermal		
Total	147	100%

4.6.5. Dosage of medicinal plans

The findings showed that the local people used small coffee cups glass, spoon and in some cases a handful for measuring and quantifying doses of traditional herbal medicines but, which are not clearly standardized. Thus, there is a risk of treatment failure due to over dose. Although healers and knowledgeable elders determine the dosages based on different aspects included age, gender, physical appearance and state of the patient such as pregnancy. Similar findings were reported by Amare Getahun (1976), Sofowora (1982) and Dawit Abebe (1986) who had concluded that lack of precision and standardization are as one drawback of traditional medicines.

Children were given small doses of medicine as compared to adult patients for the same ailment treated by the same herbal product. As a result, the local healers and knowledgeable elders simply recommend or prescribe small amount such as drops, hand palms, coffee cups, and for larger dosages water glasses or other local materials that are used for drinking. Local healers and knowledgeable elders have special care for pregnant women and physically weak persons. For example, for pregnant women, take over dose juice from the herbal of *Phytolacca dodecandra* have side effects such as abortion and physically weak persons take over dose from any herbal medicines which may lead to basically vomiting and diarrhoea. These findings showed similarity with reports of (Ragunathan and Solomon Maquanente (2009).

4.6.6.Side effects and antidotes of administered herbal medicines

The findings showed that herbal preparations used to treat human ailments had no reported side effects in the study area. Herbal preparations administered against few human ailments had side effects but antidotes were not needed as burning sensation, diarrhea, itch,plummeting fluid from nose and tearing but no antidotes are administered by the local traditional healers and knowledgeable elders because they believe that such changes are inherent in the nature of the plant and they are the signs of healing. In general, the remedies were reported to have no serious adverse effects. The majority of the remedies that were used to treat ailments had no adverse effects on patients (Haile Yinger and Delenasaw Yewhalaw, 2007; Haile Yineger *et al.*, 2008).

Herbal medicines prepared from different plant species to treat the same ailments may or may not be with antidotes. Herbal medicine prepared from *Cucumis ficifolius* to treat stomachache, have a sign of gastritis and may need coffee as an antidote but herbal medicine prepared from *Ruta chalepensis* to treat stomachache does not need antidotes. There are variations in plant species used by traditional healers in the same area such as absence of standardized preparations, and dosages are problems of herbal medicine elsewhere (Ngarivhume *et al.*, 2015).

Side effects as well as antidotes to livestock were not common in the study area. herbal preparations administered against ailments that are with side effects were mentioned but they did not mention of antidotes. Such side effects were considered to be indications of the effectiveness of herbal medicine. Some drops of tobacco liquid were reported to be poured through the nostrils of the animal to treat leeches. The local people of the study area reported that patients are familiar with some side effects of herbal medicines as well as of antidotes. Unless the healers and knowledgeable elders take care while herbal medicines are administered, the patient may be harmed. Herbs that were used to shrink and dry sex organ tissue were observed aggravating the transmission of sexual transmitted (venereal) diseases (van Andel *et al.*, 2008).

4.6.7. Storage of drugs

Observation in the study area showed that healers and some knowledgeable elders store drugs in local storage containers including in bottles, papers, pieces of cloth and everywhere at home (Dawit Abebe and Ahadu Ayehu, 1993).

4.7. Ranking and scoring of important medicinal plants in the study area

4.7.1. Preference ranking

Ranking of nine plant species based on local perception of the degree of effectiveness to treat wound showed *Melia azedarach* in the first rank. In many literatures it has been used for the treatment of malaria, diabetes, purgative, cough and skin diseases. Followed by *Croton*

macrostachyus and *Buddleja polystachya* were ranked in respective order (Table 5). The finding also showed that the preference of a particular medicinal plant species against a particular ailment is not necessarily the same, it varied from species to species. Preference ranking exercise revealed the choice of local people elsewhere Endalew Amenu (2007); Ermias Lulekal *et al.* (2008); Mersha Ashagre (2011).

Table 5: Preference ranking of nine medicinal plants species used to treating wound

Medicinal plant species				Ranking value for each respondent (R1-R11)									
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	Total	Rank
<i>Acanthus sennii</i>	3	3	4	3	4	5	3	3	5	4	4	41	9th
<i>Buddleja polystachya</i>	8	7	8	8	6	8	7	6	6	7	8	79	3 rd
<i>Croton macrostachyus</i>	7	7	9	6	8	8	7	8	8	8	8	80	2 nd
<i>Melia azedarach</i>	8	6	9	9	7	8	7	9	8	9	8	88	1 st
<i>Clerodendrum myricoides</i>	3	3	4	3	4	5	4	5	5	4	5	45	8th
<i>Ficus vasta</i>	5	7	6	8	5	9	7	5	9	8	7	76	4th
<i>Carissa spinarum</i>	4	3	4	4	5	6	5	6	6	5	6	54	7th
<i>Rhus glutinosa</i>	5	5	6	5	6	4	8	7	5	5	4	60	6th
<i>Schinus molle</i>	6	6	5	7	8	5	5	5	6	8	7	68	5th

4.7.2. Paired comparison

In this study, paired comparison of 6 medicinal plants among 11 informants based on local perception of the consistency of the medicinal plants to treat wound, the same with the pre preference ranking exercise. This indicates informants have no contradiction with regards to preference to medicinal plants (Table 6). Paired comparison ranking exercise showed similar result with findings of other researches (Debela Hunde *et al.*, 2004; Endalew Amenu, 2007).

Table 6: Paired comparison of six medicinal plants used to treat wound

Medicinal plant species				Ranking value for each respondent (R1-R11)									
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	To	Ra
												Tal	nk
<i>Rhus glutinosa</i>	2	2	3	2	3	1	5	4	2	2	1	27	6th
<i>Croton macrostachyus</i>	4	4	6	3	5	5	4	5	5	5	5	51	2nd
<i>Schinus molle</i>	3	3	2	4	5	2	2	2	2	5	4	34	5th
<i>Ficus vasta</i>	2	4	3	5	2	6	4	2	6	5	4	43	4th
<i>Buddleja polystachya</i>	5	4	5	5	3	3	4	3	3	4	5	44	3 rd
<i>Melia azedarach</i>	5	5	2	6	4	5	4	6	5	6	5	53	1 st

4.7.3. Direct matrix ranking for multipurpose medicinal plants

Direct matrix ranking of multipurpose species in 6 use-categories with eleven key informants showed that *Juniperus procera* ranked first. *Eucalyptus globulus*, *Ficus vasta*, *Carissa spinarum*, *Cordia africana*, *Olea europaea subsp. Cuspidata* and *Hagenia abyssinica* were ranked in respective order (Table 7). This finding indicates that some medicinal plants have multiple uses in the study area. Use pressure on multipurpose species is intensified in the area.

Informants argued that modernization such as expansion of education; expansion of modern health services such as hospitals, clinics, health posts, western cultural diffusion affect the use of herbal medicines. According to Debela Hunde *et al.* (2004) and Mirutse Giday *et al.* (2009) the immediate and serious threat to local medicinal practice and transfer in Ethiopia arise from increasing influence of modernization such as increase of modern education; industrialization; changes in life style and migration from rural to urban areas.

Modern medical care, occupation and modern education have a negative effect on ethnomedicine and associated indigenous and local knowledge (Kiringe, 2005). To reduce this tendency, awareness has to be developed through different means among members of the communities especially through young generation including health workers. Youth associations, school clubs and mini media need to teach about the usefulness of the knowledge and practice of traditional medicinal plant use. Most young people showed a tendency of ignoring traditional medical practice (Mirutse Giday *et al.*, 2010).

Table 7: Average direct matrix ranking score of eleven key informants for the multipurpose of seven medicinal plant species with additional uses besides medicinal value (Values scale 1-7)

Medicinal plant species								Total	Total Score	Rank
	Firewood	Charcoal	Construction	Fence	Edible Fruit	Medicine	Tools			
<i>Hagenia abyssinica</i>	3	0	1	3	0	3	3	13	143	7 th
<i>Cordia africana</i>	3	1	5	1	0	2	5	17	191	5 th
<i>Carissa spinarum</i>	4	3	1	5	5	1	1	20	243	4 th
<i>Juniperus procera</i>	6	4	7	3	0	3	7	30	341	1 st
<i>Olea europaea subsp. cuspidate</i>	3	0	4	2	0	2	2	13	169	6 th
<i>Eucalyptus globules</i>	7	3	6	2	0	4	6	28	312	2 nd
<i>Ficus vasta</i>	3	2	4	2	5	4	2	22	266	3 rd

4.7.4. Informant consensus

The present study showed that some medicinal plants are more popular than others. Some are well known by the local people/ healers in the study area and cited repeatedly as remedy for the treatment of different diseases than others. Based on values obtained from informant's consensus, thirteen species which were independently cited by many of the informants for their medicinal uses against different human and livestock ailments are shown in (Table 8). Accordingly, *Allium sativum* was cited by 55 (68.75%) followed by *Ocimum lamiifolium* 52 (65%). The popularity of *Allium sativum* medicinal plant was due to the preference of the species product for treating abdominal pain and stomachache in the community for the disease and its easy access in the home gardens area. This finding relates to Mohammed

Adafa (2011) where he reported *Allium sativum* was the most preferred remedy in the treatment of several diseases in Tuhuledere District, Ethiopia.

Table 8: Top medicinal plant species in the study area

Medicinal plants	No. of informants	% of informants	Rank
<i>Allium sativum</i>	55	68.75	1 st
<i>Ruta chalepensis</i>	47	58.75	4 th
<i>Zehneria scabra</i>	34	42.5	7 th
<i>Artemisia abyssinica</i>	49	61.25	3 rd
<i>Cordia africana</i>	41	51.25	5 th
<i>Datura stramonium</i>	37	46.25	6 th
<i>Citrus aurantifolia</i>	19	23.75	11 th
<i>Lepidium sativum</i>	23	28.75	10 th
<i>Ocimum lamiifolium</i>	52	65	2 nd
<i>Otostegia tomentosa</i>	26	32.5	9 th
<i>Otostegia integrifolia</i>	12	15	13 th
<i>Eucalyptus globulus</i>	31	38.75	8 th
<i>Trigonella foenum-graecum</i>	15	18.75	12 th

4.7.5. Informant consensus factor for disease categories

The degree of consensus among traditional healers is presented in (Table 9). Informant consensus factor calculated on seven disease categories has identified highest ICF value (0.8) for an abdominal pain and gastrointestinal intestinal parasites, followed by acute sickness (0.71) due to the high incidence of the ailment in the area. High value of ICF (close to 1) indicates relatively few species are used by a large proportion high consensus of people, while low value indicates the informants disagree on the taxa to be used in the treatment within a category of illness (Canales *et al.*, 2005). It is essential to estimate use variability of the medicinal plants and to determine which plants are particularly interesting in the search for bioactive compounds. Different authors have determined ICF including Tesfaye Seifu *et al.*, (2006); Fisseha Mesfin *et al.* (2009); Ragupathy and New master (2009) and identified the level of agreement among informant's response.

Table 9: Informant consensus factor

Category of diseases	No. of Species (Ns)	No. of use Citation (Nus)	ICF=Nuc-1	Rank
Acute sickness: -acute sickness (dingetegna), emergency (sudden sickness), malaria, hypertension, Fever illness,evil eye, (eynewug).	15	50	0.71	2 rd
Ailments associated with respiratory organs and throat:- common cold, cough, tonsil, asthma, and bronchitis (Uvulitis)	7	14	0.53	4 th
Delivery problem:- retained placenta, Rh factor, abortion,erythroblastosis,STDs, orchiticl, infertility and insufficient breast milk	10	17	0.43	6 th
Dermatologyproblems:- eczema,Awound, circumcision wound, tinea nigra, fire burn, (kunchir), skin worm, allergic dermolitia, cancer, skin rash, athletes foot, hemorrhoids, herpes, pimple, dandruff and wart	33	83	0.61	3 rd
Disease related to abdominal and gastrointestinal problems:- Ascaris,tape worm, diabetes, abdominal pain, stomachache, gastritis, rabies, blotting, diarrhea, vomiting, typhus, body swelling, constipation and intestinal parasite	18	86	0.8	1 st
Livestock diseases:- Colic, leech and black leg.	6	9	0.37	7 th
Organ diseases:- eye disease, tumors, ear disease, toothache,earparasites,rheumatism, night blindness, jaundice (hepatitis), bone fracture, diuretic, kidney problem, liver problem and heart failure	20	36	0.45	5 th

4.7.6. Fidelity level (FL)

The fidelity level was calculated on those ailments frequently reported by informants (Table 10). The fidelity level of *Clutia abyssinica*, *Allium sativum* and *Datura stramonium* for evil eye, acute sickness and dandruff was respectively scored 100% or 1 followed by *Lepidium sativum* for diarrhea 97.14 (Table 10). Medicinal plants highest FL values is an indication of their good healing potential at least in the study area. According to Trotter and Logen (1998) herbals used again and again are more likely to be biologically active. This is similar with the findings reported by Endalew Amenu (2007), Etagegnehu Yirsaw (2011), and Mersha Ashagre (2018). Different authors Tilahun Teklehaymanot and Mirutse Giday, (2007); Haile Yineger, (2008); Tawfeeq, (2008); Mirutse Giday *et al.*, (2009), Mersha Ashagre, (2011).

Table 10: Fidelity value of traditional medicinal plants for the most frequently reported disease

Ailment Treated	Medicinal plants	Ni	N	$\frac{Ni}{N}$	$\frac{Ni}{N} \times 100$
Stomachache	<i>Allium sativum</i>	36	41	0.87	87.8
	<i>Ruta chalepensis</i>	25	29	0.86	86.2
Gastritis	<i>Linum usitatissimum</i>	25	27	0.92	92.59
	<i>Urtica simensis</i>	21	30	0.7	70
Evil eye	<i>Artemisia abyssinica</i>	28	34	0.82	82.35
	<i>Clusia abyssinica</i>	14	14	1	100
Ascaris	<i>Croton macrostachyus</i>	26	32	0.81	81
	<i>Ruta chalepensis</i>	36	41	0.87	87.8
Acute sickness	<i>Allium sativum</i>	38	38	1	100
	<i>Otostegia integrifolia</i>	24	33	0.72	72
Wound	<i>Ruta chalepensis</i>	29	32	0.9	90.62
	<i>Rumex nervosus</i>	24	29	0.82	82.75
	<i>Schinus molle</i>	33	36	0.91	91.66
	<i>Verbascum sinaiticum</i>	23	34	0.67	67.64
Diarrhoea	<i>Lepidium sativum</i>	34	35	0.97	97.14
	<i>Linum usitatissimum</i>	36	43	0.83	83.72
Dandruff	<i>Coffea arabica</i>	27	32	0.84	84.37
	<i>Datura stramonium</i>	31	31	1	100
	<i>Melia azedarach</i>	28	33	0.84	84.84
Cough	<i>Citrus aurantifolia</i>	36	39	0.92	92.3
	<i>Withania somnifera</i>	22	27	0.81	81.48

4.7.7. Reported marketability of medicinal plants

In the study area medicinal plants were sold in the open market for various purposes. The local market assessment showed that of 80 plants recorded during the study, products of 27 (33.75%) medicinal plants were sold in both markets Robite and Kabi. 12 (44.44%) of 27 species were mainly sold for their medicinal purposes and other uses. About 15 (55.55%) medicinal plant species were not sold in local markets for medicinal value but mainly sold as spice but occasionally used when the need arise as medicine. Accessibility of traditional medicinal plants in the market was reported in other studies elsewhere in Ethiopia (Mirutse Giday *et al.*, 2003; Ermias Lulekal *et al.*, 2008).

4.8. Threats to and conservation of medicinal plants in the study area

4.8.1. Threats to medicinal plants

People need plants for their daily life activity. In the study area from the interview of informants, various factors were recorded as the main threats to medicinal plants. According to informants' response the most cited threats to medicinal plants in the area were agricultural expansion related to population growth, charcoal making, fire wood, over grazing, drought and construction materials. Agricultural expansion was reported as the major threat to medicinal plants in the area followed by over grazing. The least threats to medicinal plants as perceived by informants was charcoal making (Table 12). Fisseha Mesfin *et al.*, (2009) and Nigussie Amsalu (2010) indicated that agricultural expansion was the major threat to medicinal plants in Wonago and Farta districts respectively. Environmental degradation, agricultural expansion, over-harvesting, fire, cultivation of marginal lands, overgrazing and urbanization appear to be the major threats to medicinal plants in Ethiopia (Endashaw Bekele, 2007).

According to the traditional healers, nowadays searching of medicinal plants require long time and moving long distance even going to neighboring Wereda to collect the plants. Even some healers have started to grow some medicinal plants in their homegardens as a result of scarcity of plants in the wild.

According to Sofowara (1982) the loss of medicinal plants associates with the missing of advantages gained from medicinal plants and indigenous and local knowledge associated with plants. Some of the traditional healers might have given much attention to the indigenous and local knowledge transfer while others have little concern regarding the value of indigenous and local knowledge. In general, the knowledge on medicinal plants become lesser and lesser due to its secrecy, unwillingness of young generation to gain the knowledge, oral based knowledge transfer, unavailability of the species, influence of modern education and awareness factors which all results in gradual loss of indigenous and local knowledge on medicinal plants in the study area.

Table 11: Ranking threats to medicinal plants

(Values scale 1-6) 1 is the least destructive threat and 6 is the most destructive)

Major Threats	Key Informants (R1-R11)											Total	Rank
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11		
Charcoal making	3	2	1	3	3	4	1	2	3	4	1	27	6 th
Drought	4	4	3	1	4	2	1	3	5	6	5	38	4 th
Construction material	1	4	6	3	6	2	4	5	3	4	4	42	3 rd
Agricultural expansion	5	5	6	5	6	3	6	4	4	6	5	55	1 st
Overgrazing	6	1	5	6	5	6	5	5	1	4	4	48	2 nd
Fire wood collection	3	3	4	5	2	4	2	4	1	2	3	33	5 th

4.8.2. Conservation of medicinal plants

As visually observed, members of the community are conserving medicinal plants especially through cultivation in home gardens. *Allium cepa*, *Citrus aurantifolia*, *Coffea arabica*, *Melia azedarach*, *Ruta chalepensis*, *Ocimum lamiifolium*, *Artemisia abyssinica* and *Allium sativum* were among plants cultivated ones. The results of the study showed that medicinal plants can be categorized as home gardens, wild and cultivated plant species. Thus, the finding shows that 17 of 80 species are collected from the homegardens (Appendix 1). In most situations, the homegardens are fenced to protect medicinal plants from any threats. Thus, home gardens are good places for conservation of medicinal plants and better means to transfer indigenous and local knowledge to the younger generation (Table 13). According to Cunningham (1997) promotion of homegardening and cultivation of medicinal plants are recommended as a guarantee for continuous survival of traditional medicinal plants for the coming generation.

Table 12: Ranking Conservation status of medicinal plants based on the response of 88 informants

No	Conservation status	Response of informants	Percentage	Ranking
1	Homegardens	22	25	1 st
2	Wild	4	4.54	8th
3	Semi wild	6	6.81	6th
4	Roadside	5	5.68	7th
5	Fallowed land	7	7.95	5th
6	Crop field	13	14.77	4th
7	Cultivated	17	19.32	2nd
8	Forest	14	15.90	3 rd

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Eighty (80) medicinal plant species belonging to 71 genera and 41 families were collected, identified and recorded. Solanaceae was the leading family which was represented by 6 plant species. From the total medicinal plants, 58 species were used only to treat human ailments, 5 species were used only to treat livestock ailments and 17 species used to treat both human and livestock ailments. 67 human and livestock ailments were reported to be treated by traditional medicine in the study area.

Records of 80 medicinal plant species from wild (43), from home garden (17) and from cultivated (20) claimed to be used by local people for the treatment of human and livestock ailments. However, home gardens contribute 17 species, hinting at the need for the local people to enhance home gardening in their area.

Herbs were found to be the dominant growth forms used for preparation of traditional remedies followed by shrubs, trees, lianas, herbaceous climber, and succulents. Leaves were the most frequently used plant parts followed by roots for preparation of traditional medicine. Most herbal remedies are prepared from fresh materials and administered orally. Many wild medicinal plant species are facing increasing pressure from various anthropogenic factors. The major threats to medicinal plants are agricultural expansion and conversion of grazing lands followed by construction materials.

The majority of medicinal plants used for remedy preparations were in fresh form (61.64%) followed by dried (32.87%) and either of the two 5.47%. The local people employ several methods of preparation of traditional medicines from plants. Pounding and powdering were the most frequently used methods of traditional medicine preparation in the study area.

The local people used small coffee cups, glass, can, spoon and in some cases a handful for measuring and quantifying doses of traditional herbal medicines but, which are not clearly standardized. Thus, there is a risk of treatment failure due to over dose. Healers and knowledgeable elders determine the dosages based on different aspects including age, gender, physical appearance and state of the patient such as pregnancy.

5.2. Recommendations

Based on the results of the study, the following recommendations are forwarded:

- Medicinal plants have curing potential for human and livestock disease, thus sustainable conservation must be developed by local people.
- Attention should be given to standardization of measurements and hygiene of the medicines made from plants by training both the traditional healers and other members of the local community.
- Medicinal plants are very rare in the study area, thus traditional healers and local communities should conserve in their homegardens and mixed with crop field.
- Young generation needs raising awareness to avoid negative impacts on the medicinal plants and associated knowledge in the area.
- Further ethnobotanical and ethnopharmacological investigation to discover novelties important.
- Protection of range lands and marginal areas harboring medicinal plants need be carried out by the local community and relevant organization.
- Leaves and roots are the most frequently plant parts used for remedy preparation and using of root part is the major threat for the corresponding medicinal plant species. Thus, priority should be given on conservation of those medicinal plant species for their future existence.
- As the local people harvest vegetation for business or for household use with little awareness of its threat or future sustenance, awareness should be created either, by development agents or agricultural workers through which sustainable harvesting be practiced. To conserve the biodiversity of the area and preserve the medicinal plants there is a need to create awareness and develop in-situ and ex-situ conservation of medicinal plants. In particular rare species such as *Allium sativum* and *Lepidium sativum* should be given conservation priority. *Allium sativum* and *Datura stramonium* are medicinal plants with high ICF are recommended for further phytochemical investigation.

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Appendix 1:List of medicinal plants recorded in the study area

Medicinal plants used by local people in the study area with scientific name, local name, family, **habitat** (Herb-H, herbaceous climber- Hc, lianas-L, Shrub-S, Tree-T and, succulent- Lu) **habitat** (Home garden-Hg, Wild-W, and cultivated-Cu), **geographical location**(longitude and latitude), Altitude, **Status** (medium, common and rare) and Collector number.

Sp .no	Scientific name	Local name (in Amharic)	Family	Habitat	Habitat	Geographical location		Altitude (m.a.s.l)	Status	Voucher No.
						Latitude (N)	Longitude (E)			
1	<i>Acacia abyssinica</i> Hochst. ex Benth.	Nech girar	Fabaceae	T	W	10°41'49"	38°42'48"	2486m	Common	YE/65
2	<i>Acanthus sennii</i> Chiov.D.	Shekori	Acanthaceae	S	W	10°42'38"	38°51'14"	2882m	Common	YE/66
3	<i>Achyranthes aspera</i> L.	Qey telenji	Amaranthaceae	H	W	10°43'22"	38°48'34"	2464m	Medium	YE/71
4	<i>Allium cepa</i> L.	Key-shinkurt	Alliaceae	H	Hg	10°40'8"	38°50'38"	2408m	Common	YE/22
5	<i>Allium sativum</i> L.	Nech-shinkur	Alliaceae	H	Hg	10°40'15"	38°50'36"	2483m	Common	YE/4
6	<i>Aloe percrassa</i> Tod.	Wonde ired	Aloaceae	Su	W	10°40'35"	38°51'14"	2583m	Rare	YE/46
7	<i>Artemisia abyssinica</i> Sch. Bip.ex A.Rich.	Chikugn	Asteraceae	H	W	10°40'42"	38°45'13"	2484m	Common	YE/59
8	<i>Artemisia absinthium</i> L.	Arite	Asteraceae	H	Hg	10°40'8"	38°49'39"	2480m	Medium	YE/30
9	<i>Arundo donax</i> L.	Shenbeko	Poaceae	H	Cu	10°41'49"	38°48'36"	2486m	Common	YE/60
10	<i>Brassica carinata</i> A. Br.	Gomenzer	Brassicaceae	H	Hg	10°40'42"	38°45'12"	2481m	Medium	YE/52
11	<i>Brassica nigra</i> (L.) Koch	Senafich	Brassicaceae	H	Hg	10°40'42"	38°45'12"	2480m	Medium	YE/53
12	<i>Brassica oleracea</i> L.	Tikelgomen	Brassicaceae	H	Hg	10°35'42"	38°45'12"	2408m	Common	YE/21

13	<i>Buddleja polystachya</i> Fresen.	Nech anfar	Loganiaceae	T	Cu	10°40'34"	38°51'14"	2580m	Medium	YE/48
14	<i>Calpurnia aurea</i> (Ait.) Benth.	Yehabesha digita	Fabaceae	S	W	10°40'36"	38°51'14"	2585m	Medium	YE/33
15	<i>Caparis tomentosa</i> Lam.	Gumero	Capparidaceae	S	W	10°40'41"	10°40'41"	2482m	Rare	YE/57
16	<i>Capsicum annuum</i> L.	Qaria	Solanaceae	H	Hg	10°40'18"	38°50'36"	2486m	Medium	YE/10
17	<i>Carissa spinarum</i> L.	Agam	Apocynaceae	S	W	10°40'6"	38°50'37"	2483m	Medium	YE/18
18	<i>Catha edulis</i> (Vahl) Forssk.ex Endl.	Chat	Celastraceae	S	Hg	10°40'5"	39°33'86"	2485m	Medium	YE/16
19	<i>Citrus aurantifolia</i> Christm.	Lomi	Rutaceae	T	Hg	10°41'39"	38°43'38"	2485m	Rare	YE/78
20	<i>Clematis simensis</i> Fresen	Azo-hareg	Ranunculaceae	Li	W	10°40'41"	38°45'11"	2482m	Rare	YE/55
21	<i>Clerodendron myricoides</i> Hochst vatke	Misirch	Lamiaceae	H	W	10°40'36"	38°51'14"	2586m	Medium	YE/32
22	<i>Clusia abyssinica</i> Jaub. & Spach.	Fiyele-fej	Euphorbiaceae	S	W	10°40'49"	38°51'14"	2575m	Medium	YE/31
23	<i>Coffea arabica</i> L.	Buna	Rubiaceae	S	Hg	10°42'39"	38°41'38"	2482m	Rare	YE/76
24	<i>Cordia africana</i> Lam.	Wanza	Boraginaceae	T	Hg	10°40'15"	38°50'36"	2481m	Common	YE/2
25	<i>Crinum abyssinicum</i> Hochst. ex A.Rich	Yejib shinkurt	Amaryllidaceae	H	W	10°40'36"	38°51'14"	2588m	Rare	YE/38
26	<i>Croton macrostachyus</i> Hochst. ex Delile	Bisana	Euphorbiaceae	T	W	10°40'19. 2"	38°50'36.2"	2479m	Medium	YE/11

27	<i>Cucumis ficifolius</i> A.Rich.	Yemder embuay	Cucurbitaceae	Hc	W	10°40'16"	38°50'36.2"	2484m	Medium	YE/3
28	<i>Cyathula polycephala</i> Bak.	Chegogit	Amaranthaceae	H	W	10°41'39"	38°42'34"	2479m	Medium	YE/68
29	<i>Cyphostemma adenocaula</i> (Steud. ex A.Rich) Desc.ex Wild & Dr.	Aserkush tebetebikush	Vitaceae	Li	W	10°41'38"	38°42'38"	2483m	Rare	YE/77
30	<i>Datura stramonium</i> L.	Astenaged	Solanaceae	H	W	39°08'80"	39°08'80"	3005m	Common	YE/7
31	<i>Daucus carota</i> L.	Carrot	Apiaceae	H	Cu	10°40'40"	38°45'11"	2484m	Medium	YE/54
32	<i>Dodonaea angustifolia</i> L.f.	Kitkita	Sapindaceae	S	W	10°35'41"	38°45'12"	2407m	Medium	YE/26
33	<i>Dombeya torrida</i> (J.F.Gmel.) P.Bamps	Wulkfa	Streculiaceae	S	W	10°41'36"	38°50'16"	2484m	Medium	YE/67
34	<i>Dovyalis abyssinica</i> (A.Rich.) Warb.	Koshime	Flacourtiaceae	S	W	10°40'19"	38°50'35"	2582m	Rare	YE/47
35	<i>Eucalyptus globulus</i> Labill.	Nech- bahirizaf	Myrtaceae	T	Cu	10°40'16"	38°50'36"	2479m	Common	YE/8
36	<i>Ficus sur</i> Forrsk.	Sholla	Moraceae	T	W	10°44'38"	38°53'36"	2487m	Medium	YE/75
37	<i>Ficus vasta</i> Fossk.	Warka	Moraceae	T	W	10°40'16"	38°50'36"	2585m	Rare	YE/49
38	<i>Foeniculum vulgare</i> Mill.	Ensilal	Apiaceae	H	W	10°40'16"	38°45'12"	2481m	Medium	YE/56
39	<i>Hagenia abyssinica</i> (Bruce) J.F.Gmel.	Kosso	Rosaceae	T	W	10°40'33"	38°48'49"	2487m	Common	YE/62
40	<i>Hordeum vulgare</i> L.	Gebiss	Poaceae	H	Cu	10°40'16"	38°50'37"	2478m	Common	YE/70

41	<i>Impatiens rothii</i> Hook.f.	Gursht	Balsaminaceae	H	W	10°35'42"	38°45'13"	2405m	Common	YE/27
42	<i>Jasminum grandiflorum</i>	Tenbelel	Oleaceae	Li	W	10°40'36"	38°45'13"	2586m	Rare	YE/39
43	<i>Juniperus procera</i> L.	Yehabesha tid	Cuppressaceae	T	W	10°40'35"	38°50'14"	2257m	Medium	YE/37
44	<i>Kalanchoe petitiiana</i> A. Rich	Endawula	Euphorbiaceae	H	W	10°40'42"	38°45'12"	2405m	Common	YE/24
45	<i>Lagenaria siceraria</i> (Molina) Standle.	Qil	Cucurbitaceae	Hc	Cu	10°43'36"	38°54'38"	2484m	Rare	YE/74
46	<i>Laggera tomentosa</i> (Sch.Bip.ex A.Rich.) Olive.&Hiern	Alashume	Asteraceae	H	W	10°40'15"	38°50'35"	2479m	Medium	YE/14
47	<i>Lepidium sativum</i> L.	Feto	Brassicaceae	S	Cu	10°41'42"	38°44'38"	2486m	Rare	YE/79
48	<i>Linum usitatissimum</i> L.	Telba	Linaceae	H	Cu	10°41'43"	38°43'38"	2486m	Medium	YE/80
49	<i>Lycopersicon esculentum</i> Mill	Timatim	Solanaceae	H	Hg	10°40'8"	38°49'38"	2479m	Medium	YE/29
50	<i>Malva verticillata</i> L.	Adguar (Lite)	Malvaceae	H	W	10°40'37"	38°42'18"	2478m	Common	YE/69
51	<i>Maytenus arbutifolia</i> (A.Rich.) Wilczek	Atat	Celasteraceae	S	W	10°40'7"	38°50'38"	2482m	Medium	YE/19
52	<i>Melia azedarach</i> L.	Mimi	Meliaceae	T	Cu	39°08'80"	38°50'35"	2482m	Medium	YE/13
53	<i>Myrtus communis</i> L	Adese	Myrtaceae	S	Hg	10°35'42"	38°45'12"	2401m	Rare	YE/23
54	<i>Nicotiana tabacum</i> L.	Tinbaho	Solanaceae	H	Cu	10°40'35"	38°51'14"	2583m	Medium	YE/36
55	<i>Ocimum americanum</i> L.	Zqaqebe	Lamiaceae	H	Hg	10°40'15"	38°50'36"	2483m	Medium	YE/5
56	<i>Ocimum lamiifolium</i> Hochst. Ex Benth.	Dama-kesie	Lamiaceae	H	Hg	10°40'18"	38°50'37"	2485m	Medium	YE/9
57	<i>Olea europaea</i> . c subsp uspidata (Wall. ex G. Don) Cif.	Woirra	Oleaceae	T	W	10°40'36"	38°51'14"	2586m	Medium	YE/42

58	<i>Otostegia tomentosa</i> <i>subsp.ambigiens</i> (chiov.) Sebald	Yeferes-zeng	Lamiaceae	S	W	10°40'41"	38°44'11"	2483m	Rare	YE/58
59	<i>Otostegia integrifolia</i> Benth.	Tunjit eshoh	Lamiaceae	S	W	10°40'8"	38°50'41"	2481m	Medium	YE/50
60	<i>Pisum sativum</i> L.	Ater	Fabaceae	H	Cu	10°40'16"	38°50'36.2"	2483m	Medium	YE/45
61	<i>Phytolacca dodecandra</i> L. Her.	Endod	Phytolaccaceae	Hc	Cu	10°40'6"	38°50'37"	2483m	Common	YE/17
62	<i>Rhamnus prinoides</i> L. Herit.	Gesho	Rhamnaceae	S	Cu	10°40'6"	38°50'38"	2485m	Rare	YE15
63	<i>Allophylos abyssinicum</i>	Embis	Anacardiaceae	T	W	10°40'35"	38°33'86"	2685m	Rare	YE/35
64	<i>Ricinus communis</i> L.	Gulo	Euphorbiaceae	S	Cu	10°40'16"	38°50'36"	2477m	Common	YE/40
65	<i>Rosa abyssinica</i> Lindley	Qega	Rosaceae	S	W	10°40'35"	10°51'14"	2583m	Medium	YE/43
66	<i>Rosa x richardii</i> Rehd.	Tigereda	Rosaceae	S	Hg	10°39'42"	38°49'37"	2485m	Rare	YE/61
67	<i>Rumex nervosus</i> Vahl.	Embacho	Polygonaceae	S	W	10°40'36"	38°51'14"	2582m	Medium	YE/34
68	<i>Rumex nepalensis</i> Spreng.	Tult	Polygonaceae	H	W	10°40'14"	38°50'36"	2482m	Medium	YE/1
69	<i>Ruta chalepensis</i> L.	Tenadam	Rutaceae	H	Hg	10°40'19"	38°50'35"	2485m	Common	YE/12
70	<i>Saccharum officinarum</i> L.	Shenkora- aged	Poaceae	S	Cu	10°35'42"	38°45'12"	2406m	Rare	YE/25
71	<i>Schinus molle</i> L.	Kundo beriberi	Anacardiaceae	T	Cu	10°38'80"	39°48'83"	3005m	Medium	YE/20
72	<i>Sida schimperi</i> Hochst. ex. A.Rich.	Chifrig	Malvaceae	H	W	10°40'38"	38°40'34"	2487m	Rare	YE/64

73	<i>Solanum nigrum</i> L.	Tikur awut	Solanaceae	H	W	10°40'48"	38°42'49"	2488m	Rare	YE/63
74	<i>Trigonella foenum-graecum</i> L.	Abish	Fabaceae	H	Cu	10°35'42"	10°35'42"	2401m	Common	YE/51
75	<i>Urtica simensis</i> Steudel.	Sama	Urticaceae	H	W	10°40'8"	38°349'3"	2481m	Medium	YE/28
76	<i>Verbascum sinaiticum</i> Benth.	Ye ahiya joro	Scrophulariaceae	H	W	10°40'35"	38°51'14"	2582m	Medium	YE/44
77	<i>Vernonia amygdalina</i> Del.	Grawa	Asteraceae	S	Cu	10°40'16"	38°50'36"	2477m	Common	YE/41
78	<i>Vicia faba</i> L.	Bakela	Fabaceae	H	Cu	10°46'35"	38°54'38"	2466m	Common	YE/72
79	<i>Withania somnifera</i> (L.) Dunalin	Gizewa	Solonaceae	S	W	10°41'36"	38°55'37"	2486m	Medium	YE/73
80	<i>Zehneria scabra</i> (Linn.f.) Sond.	Haregres	Cucurbitaceae	Li	Cu	10°40'15"	38°50'35"	2483m	Medium	YE/6

Key * YE- Yimam endrie

Appendix 2: Number of medicinal plant species and genera in each family

(Data taken from 80 collected medicinal plants)

Number	Family	Number of Genera	Percentage of Genera (%)	Number of plant Species	Percentage of Plant species (%)
1	Solanaceae	6	8.45	6	7.5
2	Fabaceae	5	7.04	5	6.25
3	Lamiaceae	3	4.22	5	6.25
4	Euphorbiaceae	4	5.63	4	5
5	Asteraceae	3	4.22	4	5
6	Brassicaceae	2	2.81	4	5
7	Cucurbitaceae	3	4.22	3	3.75
8	Poaceae	3	4.22	3	3.75
9	Rosaceae	2	2.81	3	3.75
10	Malvaceae	2	2.81	2	2.5
11	Anacardiaceae	2	2.81	2	2.5
12	Celastraceae	2	2.81	2	2.5
13	Amaranthaceae	2	2.81	2	2.5
14	Apiaceae	2	2.81	2	2.5
15	Myrtaceae	2	2.81	2	2.5
16	Rutaceae	2	2.81	2	2.5
17	Olliaceae	2	2.81	2	2.5
18	Alliaceae	1	1.4	2	2.5
19	Polygonaceae	1	1.4	2	2.5
20	Moraceae	1	1.4	2	2.5
21	Cupressaceae	1	1.4	1	1.25
22	Boraginaceae	1	1.4	1	1.25
23	Aloaceae	1	1.4	1	1.25
24	Apocynaceae	1	1.4	1	1.25
25	Amoryllidaceae	1	1.4	1	1.25
26	Ranunculaceae	1	1.4	1	1.25

27	Meliaceae	1	1.4	1	1.25
28	Caparidiaceae	1	1.4	1	1.25
29	Sapindaceae	1	1.4	1	1.25
30	Phytolaccaceae	1	1.4	1	1.25
31	Rhamnaceae	1	1.4	1	1.25
32	Urticaceae	1	1.4	1	1.25
33	Scrophulariaceae	1	1.4	1	1.25
34	Flacourtiaceae	1	1.4	1	1.25
35	Loganiaceae	1	1.4	1	1.25
36	Streculiaceae	1	1.4	1	1.25
37	Rubiaceae	1	1.4	1	1.25
38	Vitaceae	1	1.4	1	1.25
39	Linaceae	1	1.4	1	1.25
40	Balsaminaceae	1	1.4	1	1.25
41	Acanthaceae	1	1.4	1	1.25
	Total	71	100%	80	100%

Appendix 3: List of medicinal plants used for treating only human ailments

With scientific name, family, local name, habit (lianas- L, herb- H, herbaceous climber- Hc, shrub- S and tree- T, succulent- Lu), parts used (leaf- L, root- R, stem- St, bark- Br, bulb- Bu, latex- Lt, seed- Se, fruit-Fr and flower-Fl), CP- condition of preparations (fresh- F, dried- D and fresh or dried- F/D), disease treated, preparation and application and route of administration.

Sp.no	Scientific name	Local name	Family	Habit	Part used	CP	Disease treated	Preparation and application	Route
1	<i>Acacia abyssinica</i>	Bazragara	Fabaceae	T	Se	D	STDs	The seed of <i>Acacia abyssinica</i> is crushed, powdered, mixed with little water and drunk	Oral
2	<i>Acanthus sennii</i>	Shekori	Acanthaceae	S	L	D	Wound	The leaf of <i>Acanthus sennii</i> with leaf of <i>Hagenia abyssinica</i> are dried highly roasted then the powdered is mixed with butter and creamed on affected part	Dermal
3	<i>Aloe percrassa</i>	Wondie Iret	Aloaceae	Su	Lt	F	Stomach ache, Vomiting & Diabetes	The latex or sap of the leaf is mixed with honey and then drunk	Oral
4	<i>Artemisia absinthium</i>	Arite	Asteraceae	H	R	F	Abdominal pain & Stomach ache	The root is chewed and sucked the juice	Oral

5	<i>Arundo donax</i>	Shenbeko	Poaceae	s	R	F	Rh factors (Shotelay)	the root of Arundo donax is tie on neck part of the body	Neck
6	<i>Brassica carinata</i>	Gomenzer	Brassicaceae	H	Se	D	Cancer (lemte)	The seed of Brassica carinata with seed and leaf of “gulo” is crushed, powdered and mixed with honey and then creamedaaffected part	Dermal
7	<i>Brassica oleracea</i>	Tikelegomen	Brassicaceae	H	L	F	Gastritis	The leaf is boiled and the water drunk repeatedly	Oral
8	<i>Buddleja polystachya</i>	Anfar	Loganiceae	T	L	D/F	Wound	The leaf of Buddleja Polystachya is pounded, powdered and applied on wound	Oral
9	<i>Capparis tomentosa</i>	Gumero	Capparidaceae	S	R	D	Evil eye	Root will be smoked and inhaled	Oral & Nasal
10	<i>Capsicum annum</i>	Qaria	Solanaceae	H	Fr	F	Malaria	The Capsicum annum with bulb of Allium sativum are wittled, soaked with water and eaten by injera after once a day.	Oral
11	<i>Catha edulis</i>	Chat	Celastraceae	S	L	F	Asthma	The leaf of Catha edulis with leaf of coffea arabica are boiled with special honey and drunk	Oral
12	<i>Citrus aurantifolia</i>	Lomi	Rutaceae	T	Fr	F	Athletes foot	The fruit of Citrus aurantifolia is squeezed and creamed on affected for continuous days	Dermal
				L	D	Cough		The leaf of Citrus aurantifolia is pounded, powdered, mixed with milk and boiled and added sugar then drunk pure liquid during feeling pain	Oral

13	<i>Clematis simensis</i>	Ye'azohareg	Ranunculaceae	Li	R	D	Wart	The root of Clematis simensis powdered and mixed with special honey and creamed on affected part	Dermal
					L	D	Eczema	The leaf of Clematis simensis with root of Urtica simensis are dried, crushed, powdered, mixed with butter and creamed affected part	Dermal
14	<i>Clerodendrum myricoides</i>	Misirch	Lamiaceae	H	L	D&F	Wound	The leaf of Clerodendrum cordifolium with Croton macrostachyus is pounded, powdered and applied on the wounded parts	Dermal
15	<i>Coffea arabica</i>	Buna	Rubiaceae	S	Se	D	Diarrhea	Its seed of Coffea arabica is roasted, crushed, powdered, boiled and the filtrate one cup of tea, mixed with few drop of oil then drunk	Oral
					Se	D	Fire burn	Its seed of Coffea arabica is roasted, crushed, powdered and applied on wounded part	Dermal
16	<i>Cordia africana</i>	Wanza	Boraginaceae	T	L	D	Tumors (nekersa)	The leaf of Cordia africana with the root of Plumbago zeylanica is powdered, mixed with butter and then creamed affected part until recovery	Dermal
					L	D	Fire burn and Dandruff	The leaf of Cordia africana is roasted, powdered and mixed with butter and creamed affected part until recovery	Dermal

17	<i>Crinum abyssanicum</i>	Yejib shinkurt	Amaryllidaceae	H	R	F	Ear disease	The root of <i>Crinum abyssanicum</i> is pounded, squeezed and then its drop is through ear	Ear
18	<i>Croton macrostachyu S</i>	Bisana	Euphorbiaceae	T	L	D	Ascariasis	The leaf of <i>Croton macrostachyu</i> is crushed, powdered, mixed with <i>Cicer arietinum</i> powdered, water and eaten before any food for 3 days	Oral
					L	D	Liver problem	The seven pieces of immature leaves are pounded, powdered and mixed with milk or “awaze” without spices and <i>Allium sativum</i> and then eaten by injera or drunk	Oral
19	<i>Cucumis ficifolius</i>	Yemder Embay	Cucurbitaceae	Hc	Lt	F	Wound	The fresh latex is applied on the Dermal	Dermal
					R	D	Stomachache	The root of <i>Cucumis ficifolius</i> is chewing and swallowing during the feeling of ache	Oral
20	<i>Cyphostemma adenocaula</i>	Aserkush tebetebikush	Vitaceae	Li	R	D	Kunchir’	Root powder mixed with water and creamed onto the skin	Dermal
21	<i>Datura stramonium</i>	Astenaged	Solanaceae	H	L	F	Ear disease	The leaf of <i>Datura stramonium</i> with leaf of <i>Vicia faba</i> is crushed, mixed with little water and then added few solution through ear	Ear
					L	F	Dandruff	The fresh leaf of <i>Datura stramonium</i> is squeezed and creamed affected part	Dermal
					L	F	Ear parasites (“Konuk”)	The leaf of <i>Datura stramonium</i> with leaf of <i>Nicotiana tabacum</i> is squeezed and then added few solution through	Ear

					Se	D	Toothache	The seed of Datura stramonium is placed on fire, roasted and fumigated by smoke	Tooth Surface
					L	F	Kunchir	The leaf is squeezed and creamed the affected part.	Dermal
22	<i>Daucus carota</i>	Carrot	Apiaceae	H	R	F	Kidney problem & Night Blindness	Eating of the root repeatedly	Oral
23	<i>Dodonaea angustifolia</i>	Kitkita	Sapindaceae	S	L	D	Eczema	The leaf of Dodonaea angustifolia powdered and mixed with butter and creamed on affected part	Dermal
24	<i>Dombeya torrida</i>	Wulkfa	Streculiaceae	S	L	F	Fire burn	The fresh leaf of Dombeya torrida is squeezed and creamed the affected part	Dermal
25	<i>Dovyalis abyssinica</i>	Koshime	Flacourtiaceae	S	Fr	F	Intestinal Parasites	Its fruit is eaten as food for the case of intestinal parasite before breakfast every morning	Oral
26	<i>Ficus sur</i>	Sholla	Moraceae	T	Fr	F	Constipation	Eating the fruit, after eating the milk drunk.	Oral
27	<i>Foeniculum vulgare</i>	Ensilal	Apiaceae	H	L	D	Diuretic	The leaf of Foeniculum vulgare with leaf of Lycopersicon esculentum is pounded, powdered mixed with Coffea arabica and boiled and drunk	Oral
28	<i>Hagenia abyssinica</i>	Kosso	Rosaceae	T	L	L	Allergic Dermolitia	The leaf is highly roasted, powdered, mixed with butter and creamed on affected part.	Dermal

					L	D	Wound	The leaf of Hagenia abyssinica with leaf of Echinops longisetus are dried highly roasted, powdered, mixed with butter and creamed on affected part.	Dermal
					F	D	Tapeworm	The flower is powdered, mixed with milk and drunk for three days.	Oral
29	<i>Hordeum Vulgare</i>	Gebbs	Poaceae	H	Se	D	Diarrhoea	The seed is roasted, powdered, mixed with little hot water, salt and sugar and then ate	Oral
30	<i>Impatiens rotti</i>	Gursht	Balsaminaceae	H	R	F	Rheumatism	The rhizome of Impatiens tinctoria is crushed, roasted and creamed affected part	Dermal
31	<i>Kalanchoe petitiiana</i>	Endawula	Euphorbiaceae	H	R	F	Ear disease	The root Kalanchoe petitiiana is squeezed and added few drops through ear	Ear
					L	F	Gastritis & Heart- Failure	Eat in the form of stew (wot) by injera against gastritis.	Oral
32	<i>Lagenaria siceraria</i>	Qil	Cucurbitaceae	Li	Fr	D	Body swelling	The fruit of Lagenaria siceraria is first heated and then put on infected part of body	Dermal
33	<i>Laggera tomentosa</i>	Alashume	Asteraceae	H	L	F	Gastritis stomach complaint	Pounded leaf will be drunk with water	Left nose/ ear/ for livestock's and oral for humans

					L	F	Gastritis, stomach ache	Pounded leaf will be drunk with water	Oral
					L	F	Tape worm deworming	Pounded leaf will be drunk with water	Oral
34	<i>Lepidium sativum</i>	Feto	Brassicaceae	H	Se	D	Diarrhea with Blood	The seed of Lepidium sativum is crushed, mixed milk then filtrate the solution and drunk	Oral
					St	F	Hemorrhoids	The stem of Lepidium sativum is first heated and then put on the infected part of the body until recovery	Dermal
35	<i>Malva verticillata</i>	Lite (Adguar)	Malvaceae	H	L	D	Hypertension	Dried leaves of the plant with the leaves of Solanum marginatum are powdered mixed with honey and eaten	Dermal
36	<i>Maytenus arbutifolia</i>	Atat	Celastraceae	S	R	F	Kidney Problem	The root of Maytenus arbutifolia with Croton macrostachyus are crushed, powdered, mixed with water and one sini drunk every morning until	Oral
					L	F	Tonsillitis	The leaf of Maytenus arbutifolia is squeezed and drink	Oral
37	<i>Melia azedarach</i>	Mimi	Meliaceae	T	L	F/D	Skin worms (kukucha)	The leaf of Melia azedarach is squeezed and creamed on affected part	Dermal
					L	F	Toothache	The leaf of Melia azedarach is hold by the infected teeth during the feeling of ache	Tooth Surface

					L	F	Rheumatism	The leaf of Melia azedarach is chopped and boil with water and immersed affected part	Dermal
					L	F	Wound	The leaf of Melia vertilata is chopped and boiled with water and immersed affected part	Dermal
38	<i>Myrtus communis</i>	Adese	Myrtaceae	S	L	D	Dandruff	The leaf of Myrtus communis is powdered, mixed with butter and creamed on affected part	Dermal
39	<i>Ocimum americanum</i>	Zqaqebe	Lamiaceae	H	L	F	Sudden Sickness	The fresh leaf of Ocimum basilicum is chewing and swallowing during feeling pain	Oral
40	<i>Ocimum lamiifolium</i>	Dama-kesie	Lamiaceae	S	L	F	Fever illness	The leaf is squeezed and the juice drunk	Oral
41	<i>Olea europaea subsp.cuspidata</i>	Weyra	Oleaceae	T	L	D	Eye disease	The leaf of Olea europaea subsp. Cuspidata is crushed, powdered and added through the eye	Eye
42	<i>Otostegia tomentosa subsp.</i>	Yeferes zeng	Lamiaceae	S	L	F	Swelling	Pounded leaf will be drunk with water	Oral
43	<i>Pisum sativum</i>	Ater	Fabaceae	H	Se	D	Buginge(Bugir)	The seed of Pisum sativum is crushed and then placed on the wound until disappearance of the swelling	Dermal
44	<i>Rhamnus prinoides</i>	Gesho	Rhamnaceae	S	L	F	Uvulitis	The apex part of leaf is pounded, mixed with water and drunk	Oral

					Fr	F/D	Orchitidl	Fruits are boiled with water and the water drunk	Oral
					Fr	D	Orchitidl	The fruit is dried, powdered, mixed with butter and creamed on affected	Dermal
45	<i>Ricinus communis</i>	Gulo	Euphorbiaceae	S	Fr	D	Cancer	The fruit of <i>Ricinus communis</i> is pounded and creamed on affected part	Dermal
46	<i>Rosa abyssinica</i>	Qega	Rosaceae	S	Fl	F	Rh factors “shotelay”	The flower of <i>Rosa abyssinica</i> is pounded and eaten with injera	Oral
					Se	F	Ascariasis and stomachache	The raw seed of <i>Rosa abyssinica</i> is eaten	Oral
47	<i>Rumex nepalensis</i>	Tult	Polygonaceae	H	R	F	Acute sickness & Stomach ache	The root is chewed and then sucked	Oral
					R	F	Bone fracture	The root is pounded and then tied on affected part	Dermal
48	<i>Ruta chalepensis</i>	Tenadam	Rutaceae	H	Fr	F	Hypertension, Abdominal pain, Acute sickness & Stomach ache.	Eating of the fruit.	Oral
					Fr	F	Ascaris	The fruit of <i>Ruta chalepensis</i> with bulb of <i>Allium sativum</i> are pounded, soaked and then eaten by injera after three days	Oral

					Fr	D	Tinea nigra	The fruit of Ruta chalepensis with bulb of Allium sativum are pounded, and mixed with butter and then creamed on affected part	Dermal
					Fr	F	Diabetes	The fruit is pounded, boiled with water and then drunk	Oral
49	<i>Saccharum officinarum</i>	Shenkora Ageda	Poaceae	S	St	F	Cough	The stem bark is peeled and removed; the peeled stem is chopped, boiled with water for long time and then water drunk	Oral
50	<i>Schinus molle</i>	Kundo berbere	Anacardiaceae	T	Fr	F	Cough	Fruit pounded, cooked with food and eaten	Oral
					L	F	Wound	Crushed leaf will be put on the wound	Dermal
51	<i>Sida schimperi</i>	Chifrig	Malvaceae	H	L&R	D	Wound and Tumors (nekersa)	The leaf and root of Sida schimperi is pounded, powdered and then applied on affected part	Dermal
52	<i>Solanum nigrum</i>	Tkur awut	Solanaceae	H	L	F	Fire burn	The leaf of Solanum nigrum is squeezed and then creamed on affected part	Dermal
53	<i>Trigonella foenum-graecum</i>	Abshe	Fabaceae	H	Se	D	Body swelling	The seed of Trigonella foenum graecum is crushed, powdered, mixed with honey and little water then boiled like porage and eaten	Oral

54	<i>Urtica simensis</i>	Sama	Urticaceae	H	L	F	Gastritis & Heart failure	Eat in the form of stew (wot) by injera against gastritis	Oral
55	<i>Vernonia amygdalina</i>	Grawa	Asteraceae	S	L	F	Herpes	The leaf of Vernonia amygdalina is pounded, powdered and applied on affected area	Derma L
					L	F	Athletes foot	The leaf of Vernonia amygdalina is crushed, squeezed and creamed on affected part for continuous days	Derma L
56	<i>Vicia faba</i>	Bakela	Fabaceae	H	Se	D	Buginge	The seed of Vicia faba with seed of Lepidium sativum is crushed, mixing with salt and then placed on the wound until disappearance of the swelling	Dermal
57	<i>Withania somnifera</i>	Gizewa	Solanaceae	S	L	F	Cough	Leaf crushed and boiled with milk and drunk	Oral
					Fr	D/F	Evil eye	Pounded, crushed, burn the fruit and mixed with water then drunk	Oral & Nasal
58	<i>Zehneria scabra</i>	Haregres	Cucurbitaceae	Li	L	F	Acute sickness	The leaf of Zehneria scabra is pounded mixed with honey and then eaten	Oral
					L	F	Eye disease	The leaf is boiled and evaporate steamed	Oral & Nasal
					R	F	Wart	The root is pounded and tied on affected part	Dermal

Appendix 4:List of medicinal plants used for treating only livestock ailments in the study area

Included scientific name, local name, family, hab habit (lianas -Li, herb- H, herbaceous climber- Hc, shrub- S and tree- T, succulent- Lu), it part used, condition of preparations CP(fresh- F, dried- D and fresh or dried- F/D), disease treated, preparation and application and route of administration.

No	Scientific name	Local name	Family	Habit	Part used	CP	Disease treated	Preparation and application	Route
1	<i>Calpurnia aurea</i>	Yehabesha digita	Fabaceae	S	Seed	D	Erythroblastosis (shotelay)	Fruit will be crushed/ powdered with roots of <i>Ferula communis</i> and <i>Gardenia ternifolia</i> mixed with honey and consumed and also creamed crushed leaf will be used wash the infected animal	Oral & Dermal
2	<i>Ficus vasta</i>	Warka	Moraceae	T	Leaf	F/ D	Wound	The fresh leaf of <i>Ficus vasta</i> is pounded, squeezed and creamed the affected part	Dermal
3	<i>Juniperus procera</i>	Yehabeshatid	Cuppressaceae	T	Leaf	F	Black leg	The leaf of <i>Juniperus procera</i> with leaf of <i>Eucalyptus globulus</i> are pounded, squeezed and the juice drunk	Oral
4	<i>Nicotiana tabacum</i>	Tinbaho	Solanaceae	H	Leaf	F	Leech	The leaf of <i>Nicotiana tabacum</i> is pounded squeezed and the juice is added through the nose	Nasal
5	<i>Rosa x richardii</i>	Tsigiereda	Rosaceae	S	Root	F/ D	Eye disease	The root of <i>Rosa x richardii</i> is warped and tied around the neck	Neck

Appendix 5: List of medicinal plants used for treating both human and livestock ailments

Included scientific name, local name, family, habit (lianas -Li, herb- H, herbaceous climber- Hc, shrub- S and tree- T, succulent- Lu), part used (leaf- L, root- R, stem- St, bark- Br, bulb- Bu, latex-Lt, seed- Se, fruit- Fr and flower- Fl), use (Hu- Human, Livestock- Ls), condition of preparations (fresh- F, dried- D and fresh or dried-F/D), disease treated, preparation and application and route of administration.

No	Scientific name	Local name	Family	Habit	Part used	Uses	CP	Disease treated	Preparation and application	Route
1	<i>Achyranthes aspera</i>	Qey Telenj	Amaranthaceae	H	R	Hu	F	Diarrhea, Stomachache	Roots of this species pounded together, mixed with water and drunk ½ of coffee cup	Oral
					L	Hu	F	Fever Illness	Leaves squeezed and the juice drunk with coffee	Oral
					R	Ls	F	Eye disease	Roots chewed and applied into the infected part	Eye
					R	Ls	F	Colic	Roots mix with the leaves of Verbena officinalis then pounded together, mix with boiled water	Oral
2	<i>Allium cepa</i>	Key Shinkurt	Alliaceae	H	Se	Hu	F	Hypertension	The seed Allium cepa is crushed and immersed in little water for 1 day and then filtrated by clean cloth and drunk before food	Oral

3	<i>Allium sativum</i>	Nech Shinkurt	Alliaceae	H	Bu	Hu	F	Abdominal Pain	The bulb of <i>Allium sativum</i> is peeled and eaten	Oral
					Bu	Hu	F	Hepatitis	The bulb of <i>Allium sativum</i> with <i>Capsicum annuum</i> are whittled and eaten by injera	Oral
					Bu	Hu	F	Malaria	The bulb of <i>Allium sativum</i> with <i>Capsicum annuum</i> are whittled, soaked with water and eaten by injera after once a day.	Oral
					Bu	Hu	D	Acute sickness	The bulb of <i>Allium sativum</i> with <i>Lepidium sativum</i> are powdered and mixed with water and drunk before eating	Oral
					Bu	Hu	F	Ascaris	The bulb of <i>Allium sativum</i> with <i>Lepidium sativum</i> and fruit of <i>Ruta chalepensis</i> are pounded, soaked with little water and then eaten by injera after three days	Oral
					Bu	Hu	F	Tinea nigra	The bulb of <i>Allium sativum</i> with fruit of <i>Ruta chalepensis</i> are pounded, dried, powdered and mixed with butter and then creamed on affected part.	Dermal
					Bu	Hu	D	Stomach ache	The bulb of <i>Allium sativum</i> with seed of <i>Lepidium sativum</i> is crushed, powdered, mixed with coffee and then drunk	Oral
					Bu	Ls	D	Eynewug	The bulb of <i>Allium sativum</i> with root of <i>Cucumis ficifolus</i> , <i>Datura stramonium</i> and <i>Capparis tomentosa</i> are pounded dried put on fire and the smoke is inhaled	Oral and Nasal

					Bu	Hu	F	Colic	The bulb of Allium sativum is crushed mixed with powdered seed of Lepidium sativum and water and then drunk	Oral
4	<i>Artemisia abyssinica</i>	Chikungu	Asteraceae	H	L	Hu	F	Common Cold	Inhaling the fresh leaves through the nose	Nasal
					L	Hu	D	Evil eye	The leaf of Artemisia abyssinica is pounded and tied with a piece of cloth around the neck	Neck
					L	Hu	D	Typhus	The leaf of Artemisia abyssinica with leaf of Laggera tomentosa are pounded and put on fire and the smoke is inhaled	Oral and Nasal
					L	Ls	D	Eynewug	The leaf of Artemisia abyssinica with root of Cucumis ficifolus and Datura stramonium are pounded and tied with a piece of cloth around the neck	Neck
5	<i>Brassica nigra</i>	Senafich	Brassicaceae	H	L	Hu & Ls	F	Insufficient breast milk supply	The leaf of is Brassica nigra pounded, squeezed and mixed with honey and water then drunk the solution for 5 days	Oral

6	<i>Carissa spinarum</i>	Agam	Apocynaceae	S	R	Hu	D	Evil eye	The root of <i>Carissa spinarum</i> with root of <i>Ocimum lamiflia</i> and <i>Caparis tomentosa</i> are dried, pounded, put on fire and the smoke is inhaled	Oral and Nasal
					R	Hu	F	Wound	The root of <i>Carissa spinarum</i> with leaf of <i>Solanum anguvi</i> are crushed then put on wound	Dermal
					R	Ls	F	Eynewug	The root of <i>Carissa spinarum</i> with root of <i>Withania somnifera</i> are crushed mixed with water and then drunk	Oral
7	<i>Clutia abyssinica</i>	Fiyele-fej	Euphorbiaceae	S	R	Hu	D	Evil eye	The root of <i>Clutia lanceolata</i> with root of <i>Otostegia fruticosa</i> are dried pounded put on fire and the smoke is inhaled	Oral and Nasal
					L	Hu	F	Hepatitis	The leaf of <i>Clutia lanceolata</i> with leaf of <i>Croton macrostachyus</i> are squeezed, the juice mixed with milk and one glass drunk for three days	Oral
					R	Ls	D	Eynewug	The root of <i>Clutia lanceolata</i> with root of <i>Asparagus africanus</i> are dried, crushed and then tied with a piece of cloth around the neck	Neck

8	<i>Cyathula Polycephala</i>	Chegogit	Amaranthaceae	H	L	Hu	F	Skin rash (chiffee)	The leaf of <i>Cyathula polycephala</i> is crushed, squeezed and the pure solution is applied on affected body part until recovery	Dermal
					L	Hu&Ls	F	Fiber illness	The root of <i>Cyathula polycephala</i> is pounded, squeezed and drunk	Oral
9	<i>Eucalyptus globules</i>	Nech bahirizaf	Myrtaceae	T	L	Hu	F	Common Cold	The leaf is boiled and fumigates with vapor	Oral and Nasal
					L	Hu	F	Fever illness	The leaf is boiled and steamed the Vapour	Oral and Nasal
					L	Ls	F	Blacke leg	The leaf of <i>Eucalyptus globulus</i> with leaf of <i>Leonotiso cymifolia</i> and <i>Juniperus procera</i> are pounded, squeezed and drunk one cup of juice	Oral
10	<i>Jasminum grandiflorum</i>	Tenbelel	Oleaceae	Li	L	Hu&Ls	F	Infertility	The leaf <i>Jasminum abyssinicum</i> is pounded,	Oral
									squeezed and drunk the pure liquid for 7 days	
11	<i>Linum usitatissim m</i>	Telba	Linaceae	H	Se	Hu	D	Gastric	The seed of <i>Linum usitatissimum</i> is crushed, powdered, mixed water and sugar and then drunk during feeling pain	Oral
					Se	Ls	D	Retained placenta	The seed of <i>Linum usitatissimum</i> is mixed water and boiled and then drunk the solution is cooled	Oral

					Se	Hu	D	Diarrhea	The seed of Linum usitatissimum is immersed in water for one day and drunk	Oral
12	<i>Lycopersicon esculentum</i>	Timatim	Solanaceae	H	Se	Hu	F	Eye disease	The seed of Lycopersicon esculentum is eaten	Oral
					L	Ls	F	Leech	The leaf of Lycopersicon esculentum is pounded and give by nasal	Nasal
13	<i>Otostegia Integrifolia</i>	Tunjit	Lamiaceae	S	L	Hu	F	Blotting	The leaf is squeezed and the juice drunk	Oral
					L	Hu	F	Acute Sickness	The leaf of Otostegia integrifolia with leaf of Leonotis ocymifolia are squeezed and drunk	Oral
					L	Hu	F	Abdominal Pain	The leaf is squeezed and the juice drunk	Oral
					R	Ls	D	Eynewug	The root of Otostegia integrifolia with root of Asparagus africanus are pounded and tied with a piece of cloth around the neck	Neck
14	<i>Phytolacca dodecandra</i>	Endod	Phytolacaceae	Hc	L	Hu & Ls	F	Rabies	The leaf of Phytolacca dodecandra is pounded mixed with Linum usitatissimum or Coffea arabica and drunk a tea cup every morning for evening until recovery	Oral

					R	Hu	F	Body swelling (kuriba)	The root Phytolacca dodecandra is crushed, squeezed and mixed with little water and drunk	Oral
					L	Hu	F	Abortion	The leaf of Phytolacca dodecandra is squeezed and drunk the juice	Oral
					R	Hu & Ls	F/D	Rabies	The root of Phytolacca dodecandra with Rumex nepalensis and Solanum dasyphyllum is crushed, mixed with milk and drunk	Oral
15	<i>Allophylos abyssinicus</i>	Emebs	Anacardiaceae	T	L	Hu	D/F	Wound	The leaf of Rhus glutinosa is crushed, powdered and applied on wounded area	Dermal
						Ls	F	Leech	The fresh leaf of Rhus glutinosa is pounded, squeezed and added few solution through nose	Nasal
16	<i>Rumex Nervosus</i>	Embacho	Polygonaceae	S	L	Hu	F	Circumcisi on Wound	The leaf is soaked in boiled water and heated the wounds	Dermal
					L	Ls	F	Leech	The leaf is crushed, squeezed and then drunk	Oral

17	<i>Verbascum Sinaiticum</i>	Ye ahiya joro	Scrophulariaceae	H	L	Hu	F	Tape worm	The leaf of <i>Verbascum sinaiticum</i> with leaf of <i>Guizotia schimperii</i> is pounded mixed with water and then drunk.	Oral
					R	Hu	F	Allergic Dermolitia	The root is pounded and put on affected part.	Dermal
					R	Hu	F	Diarrhoea	The root is pounded, mixed with water and then drunk.	Oral
					R	Hu&Ls	F	Retained Placenta	The pounded root of <i>Verbascum sinaiticum</i> with powdered <i>Linum usitatissimum</i> is mixed with water and then drunk.	Oral
					R	Ls	D	Eynewug	The root is dried, pounded and ate with forage	Oral

Appendix 6: List of multiple uses of medicinal plants other than medicinal uses

Scientific Name	Local Name	Family	Habit	Other uses
<i>Acacia abyssinica</i>	Bazra girar	Fabaceae	Tree	Traditional agriculture tools making, traditional house tools making, charcoal, firewood
<i>Acanthus sennii</i>	Kosheshila	Asteraceae	Shrub	Firewood, fences
<i>Achyranthes aspera</i>	Qey Telenj	Amaranthaceae	Herb	-----
<i>Allium cepa</i>	Key-shinkurt	Alliaceae	Herb	Food as spice
<i>Allium sativum</i>	Nech-shinkur	Alliaceae	Herb	Food as spice
<i>Aloe percrassa</i>	Wonde ired	Aloaceae	Succulent	Leaves for forage
<i>Artemisia abyssinica</i>	Chikugn	Asteraceae	Herb	Used as aromatic
<i>Artemisia absinthium</i>	Arite (Ashuban)	Asteraceae	Herb	Used as aromatic
<i>Arundo donax</i>	Shenbeko	Poaceae	Herb	Fire wood, fence
<i>Brassica carinata</i>	Gomenzer	Brassicaceae	Herb	Leaves for food
<i>Brassica nigra</i>	Senafich	Brassicaceae	Herb	Oil or mashsha
<i>Brassica oleracea</i>	Tikelgomen	Brassicaceae	Herb	Leaves for food
<i>Buddleja polystachya</i>	Anfar	Loganiaceae	Tree	Firewood , fence, washing pots
<i>Calpurnia aurea</i>	Yehabesha digita	Fabaceae	Shrub	Fire wood, fence, teeth brushing
<i>Caparis tomentosa</i>	Gumero	Capparidaceae	Shrub	Firewood, fences
<i>Capsicum annum</i>	Qaria	Solanaceae	Herb	Edible fruit
<i>Carissa spinarum</i>	Agam	Apocynaceae	Shrub	Fences, firewood, edible fruit
<i>Catha edulis</i>	Chat	Celastraceae	Shrub	Leaves for stimulant
<i>Citrus aurantifolia</i>	Lomi	Rutaceae	Tree	Edible fruit
<i>Clematis simensis</i>	Azo-hareg	Ranunculaceae	Liana	Fire wood
<i>Clerodendron myricoides</i>	Misirch	Lamiaceae	Herb	Fences, fire wood
<i>Clusia abyssinica</i>	Fiyele-fej	Euphorbiaceae	Shrub	Fire wood
<i>Coffea arabica</i>	Buna	Rubiaceae	Shrub	Fruits for stimulant

<i>Cordia africana</i>	Wanza	Boraginaceae	Tree	Fire wood, traditional house construction, furniture making, traditional agriculture tool making, charcoal, household tool making, spiritual tool making
<i>Crinum abyssinicum</i>	Yejib shinkurt	Amaryllidaceae	Herb	-----
<i>Croton macrostachyus</i>	Bisana	Euphorbiaceae	Tree	Traditional agriculture tool making, charcoal, fire wood
<i>Cucumis ficifolius</i>	Yemderembay	Cucurbitaceae	Herb	-----
<i>Cyathula polycephala</i>	Chegogit	Amaranthaceae	Herb	-----
<i>Cyphostemma adenocaulis</i>	Aserkush tebetebikush	Vitaceae	Liana	-----
<i>Datura stramonium</i>	Astenaged	Solanaceae	Herb	Fire wood
<i>Daucus carota</i>	Carrot	Apiaceae	Herb	Edible root
<i>Dodonaea angustifolia</i>	Kitkita	Sapindaceae	Shrub	Fire wood, fences, charcoal
<i>Dombeya torrid</i>	Wulkfa	Steculiaceae	Shrub	Fire wood & washing hair
<i>Dovyalis abyssinica</i>	Koshime	Flacourtiaceae	Shrub	Edible fruit, fire wood
<i>Eucalyptus globulus</i>	Nech- bahirizaf	Myrtaceae	Tree	Fire wood, charcoal, fences, traditional house construction, traditional agriculture tool making, household tool making.
<i>Ficus sur</i>	Sholla	Moraceae	Tree	Edible fruit, furniture making, traditional house construction, traditional agriculture tool making
<i>Ficus vasta</i>	Warka	Moraceae	Tree	Charcoal, firewood, furniture making, traditional house construction, traditional agriculture tool making, spiritual tool making
<i>Foeniculum vulgare</i>	Ensilal	Apiaceae	Herb	----
<i>Hagenia abyssinica</i>	Kosso	Rosaceae	Tree	Fire wood, traditional agriculture tool making, household tool making.
<i>Hordeum vulgare</i>	Gebiss	Poaceae	Herb	Food, forage

<i>Impatiens rothii</i>	Gursht	Balsaminaceae	Herb	Roots for finger color
<i>Jasminum grandiflorum</i>	Tenbelel	Oleaceae	Liana	Traditional house construction, fire wood
<i>Juniperus procera</i>	Yehabeshatid	Cuppressaceae	Tree	Fences, fire wood, traditional agriculture tool making, traditional house construction, Shade
<i>Kalanchoe petitiiana</i>	Endawula	Euphorbiaceae	Herb	The fleshy leaves are used in baking local bread
<i>Lagenaria siceraria</i>	Qil	Cucurbitaceae	Liana	Household utensils
<i>Laggera tomentosa</i>	Alashume	Asteraceae	Herb	Sweep of the house
<i>Lepidium sativum</i>	Feto	Brassicaceae	Herb	Forage
<i>Linum usitatissimum</i>	Telba	Linaceae	Herb	Food, forage
<i>Lycopersicon esculentum</i>	Timatim	Solanaceae	Herb	Fruits for food
<i>Malva verticillata</i>	Adguar(Lite)	Malvaceae	Herb	Animal food
<i>Maytenus arbutifolia</i>	Atat	Celasteraceae	Shrub	Fences
<i>Melia azedarach</i>	Mimi	Meliaceae	Tree	Fire wood, fences & shade
<i>Myrtus communis</i>	Adese	Myrtaceae	Shrub	Leaves for spice
<i>Nicotiana tabacum</i>	Tinbaho	Solanaceae	Herb	---
<i>Ocimum americanum</i>	Zqaqebe	Lamiaceae	Herb	Qimem preparation
<i>Ocimum lamiifolium</i>	Dama-kesie	Lamiaceae	Shrub	Firewood
<i>Olea europaea subsp.cuspidata</i>	Weyra	Oleaceae	Tree	Charcoal, fire wood, furniture making, traditional agriculture tool making, spiritual purpose, fumigate of traditional household utensil, tooth brushing
<i>Otostegia tomentosa subsp. ambigiens</i>	Yeferes-zeng	Lamiaceae	Shrub	Fire wood
<i>Otostegia integrifolia</i>	Tunjit	Lamiaceae	Shrub	For fumigate of traditional alcohol container

<i>Pisum sativum</i>	Ater	Fabaceae	Herb	Animal food
<i>Phytolacca dodecandra</i>	Endod	Phytolaccaceae	Liana	Fire wood, washing of cloth
<i>Rhamnus prinoides</i>	Gesho	Rhamnaceae	Shrub	Leaves used for traditional alcohol making, tooth brushing
<i>Allophylos abyssinicus</i>	Embis	Anacardiaceae	Tree	Fire wood, charcoal, traditional agriculture tools making
<i>Ricinus communis</i>	Gulo	Euphorbiaceae	Shrub	Fruits used for making leather soft traditionally, fire wood
<i>Rosa abyssinica</i>	Qega	Rosaceae	Shrub	Edible fruit, fences
<i>Rosa x richardii</i>	Tigereda	Rosaceae	Shrub	Ornament
<i>Rumex nervosus</i>	Embacho	Polygonaceae	Shrub	Fire wood
<i>Rumex nepalensis</i>	Tult	Polygonaceae	Herb	-----
<i>Ruta chalepensis</i>	Tenadam	Rutaceae	Herb	Food spice
<i>Saccharum officinarum</i>	Shenkora-ageda	Poaceae	Shrub	Stem for food
<i>Schinus molle</i>	Kundo beriberi	Anacardiaceae	Tree	Fire wood, fences, traditional agriculture tool making
<i>Sida schimperi</i>	Chifrig	Malvaceae	Herb	Washing household utensils
<i>Solanum nigrum</i>	Tikur awut	Solanaceae	Herb	Source of food
<i>Trigonella foenum-graecum</i>	Abish	Fabaceae	Herb	Food, forage
<i>Urtica simensis</i>	Sama	Urticaceae	Herb	Food, forage
<i>Verbascum sinaiticum</i>	Yahiya joro	Scrophulariaceae	Herb	Firewood
<i>Vernonia amygdalina</i>	Grawa	Asteraceae	Shrub	Fences, firewood
<i>Vicia faba</i>	Fabaceae	Bakela	Herb	Animal & human food
<i>Withania somnifera</i>	Gizewa	Solonaceae	Shrub	Fire wood
<i>Zehneria scabra</i>	Hareg resa/Este sabek	Cucurbitaceae	Liana	-----

Appendix 7: Human and livestock disease which are treated by medicinal plants in the study area

No	Disease treated	Local name	Human		Livestock		Both Human & Livestock	
			NMP	%	NMP	%	NMP	%
1	Abdominal pain	Yehod beshta	2	1.98	-----	-----	3	4.54
2	Abortion	Masiwored	-----	----	-----	-----	1	1.51
3	Acute sickness	Dingetegna	3	2.97	-----	----- -	3	4.54
4	Allergic dermolitia	Yegir megagna	1	0.99	-----	----- -	1	1.51
5	Ascaris	Wosfat	3	2.97	-----	----- -	1	1.51
6	Asthma	Asim	1	0.99	-----	----- -	-----	-----
7	Athletes foot	Ye egir fenges beshita	2	1.98	-----	----- -	-----	-----
8	Black leg	Aba gorba	-----	-----	1	-20	1	1.51
9	Blotting	Hod menfat	-----	-----	-----	----- -	1	1.51
10	Body swelling	Kuriba	2	1.98	-----	----- -	1	1.51
11	Bone fracture	Sibrat	1	0.99	-----	----- -	-----	-----
12	Cancer	Lemit	2	1.98	-----	----- -	-----	-----
13	Circumcision wound	Yegrzat kusil	-----	----	-----	----- -	1	1.51
14	Colic	Hod himem	-----	-----	-----	----- -	2	3.03
15	Common cold	Gunifan	-----	-----	-----	----- -	2	3.03
16	Constipation	Yehod dirket	1	0.99	-----	----- -	-----	-----
17	Cough	Sali	4	3.96	-----	----- -	-----	-----
18	Dandruff	Forefor	4	3.96	-----	----- -	-----	-----
19	Diabetes	Yesikuar beshta	2	1.98	-----	-----	-----	-----

20	Diarrhoea	Tekimat	4	3.96	-----	-----	4	6.06
21	Diuretic	Yeshint mebizat	1	0.99	-----	----- -	-----	-----
22	Ear disease	Yejoro beshita	3	2.97	-----	-----	-----	-----
23	Ear parasites	Kunkun	1	0.99	-----	----- -	-----	-----
24	Eczema	Chifie	2	1.98	-----	----- -	-----	-----
25	Erythroblastosis	Shotely	-----	-----	1	20	-----	-----
26	Evil eye	Buda	2	1.98	-----	----- -	4	6.06
27	Eye disease	Yeayin besheta	2	1.98	1	20	3	4.54
28	Eynewog	Eynewog	-----	-----	-----	-----	5	4.54
29	Fever illness	Mich	1	0.99	-----	-----	4	6.06
30	Fire burn	Yesat katelo	4	3.96	-----	----- -	-----	-----
31	Gastritis	Cheguara	5	4.95	-----	----- -	1	1.51
32	Heart failure	Lib dikam	2	1.98	-----	-----	-----	-----
33	Hemorrhoids	Kintarot	1	0.99	-----	----- -	-----	-----
34	Hepatitis	Yewof besheta	-----	-----	-----	----- -	2	3.03
35	Herpes	Almaz balechira	1	0.99	-----	----- -	-----	-----
36	Hypertension	Dem gifet	2	1.98	-----	----- -	1	1.51
37	Infertility	Mekaninet	1	0.99	-----	-----	-----	-----
38	Insufficient breast milk	Ytut wotet etret	-----	-----	-----	-----	1	1.51
39	Intestinal parasites	Ye anjet beshita	1	0.99	-----	----- -	-----	-----
40	Kidney problem	Kulalite besheta	2	1.98	-----	----- -	-----	-----
41	Kunchir	Kunchir	2	1.98	-----	-----	-----	-----
42	Leech	Aliket	-----	-----	1	20	4	6.06
43	Liver problem	Yegubet beshita	1	0.99	-----	----- -	-----	-----

44	Malaria	Webá	1	0.99	-----	----- -	1	1.51
45	Night blindness	Dafinet	1	0.99	-----	-----	-----	-----
46	Orchitid	Yebt ebtet(wondoch)	2	1.98	-----	----- -	-----	-----
47	Pimple	Bugingeor bugir	2	1.98	-----	----- -	-----	-----
48	Rabies	Yeebidwusha beshita	-----	----	-----	----- -	2	3.03
49	Retained placenta	Yegede lij mekiret	-----	----	-----	----- -	2	3.03
50	Rheumatism	Kurtman	2	1.98	-----	----- -	-----	-----
51	Rh factor	Shotellay	2	1.98	-----	-----	-----	-----
52	Skin rash	Chiffe	-----	-----	-----	-----	2	3.03
53	Skin worms	Kuakucha	1	0.99	-----	-----	-----	-----
54	STDs	Ye abalazer beshita	1	0.99	-----	-----	-----	-----
55	Stomach ache	Hod kurtet	5	4.95	-----	----- -	3	4.54
56	Sudden sickness	Dingetegna beshita	1	0,99	-----	-----	-----	-----
57	Tape worm	Kosso	1	0.99	-----	----- -	-----	-----
58	Typhus	Tesibo	-----	---	-----	-----	1	1.51
59	Tinea nigra	Lash	-----	---	-----	-----	1	1.51
60	Tinea nigra	Qukucha	-----	----	-----	-----	1	1.51
61	Tonsillitis	Tonssil	1	0.99	-----	----- -	-----	----
62	Toothach	Yetirs kurtmat	2	1.98	-----	-----	-----	-----
63	Tumors ("Nekersa")	Nekersa	2	1.98	-----	----- -	-----	-----
64	Uvulitis	Etil mewred	1	0.99	-----	-----	-----	-----
65	Wart	Kintarot	2	1.98	---	----	-----	-----
66	Wound	Kusil	7	6.93	1	20	3	4.54
67	Vomiting	Tiwuket	1	0.99	-----	-----	-----	-----
	Total		101	100%	5	100%	66	100%

(Key: NMP- Number of medicinal plant)

Appendix 8: List of informants in the study area

No	Name	Sex	Age	Marital status	Educational status	Kebele	Occupation	Religion
1	Demissie Shifaw	M	50	Married	10	Dibibiso	Farmer	Orthodox
2	Gebeyaw Tsigie	M	48	Married	Read Write	Dibibiso	Farmer	Orthodox
3	Demissew Leulseged	M	45	Married	12	Dibibiso	Farmer	Orthodox
4	Debalkie Tadesse*	M	53	Married	12	Dibibiso	Teacher	Orthodox
5	Alemu Geto	M	42	Married	10	Dibibiso	Teacher	Orthodox
6	Yimegnushal Kebede	F	66	Married	Read and Write	Dibibiso	Housewife	Muslim
7	Hayat Kassaw	F	69	Married	Illiterate	Dibibiso	Housewife	Muslim
8	Enanu Shifaw	F	46	Married	5	Dibibiso	Housewife	Muslim
9	Arega Tadesse	M	55	Married	4	Dibibiso	Farmer	Orthodox
10	Adamu Belay*	M	50	Married	6	Abote	Farmer	Orthodox
11	Tesfaye Hawas	M	50	Married	12	Abote	Teacher	Muslim
12	Alebachew Fentaw	M	48	Married	10	Abote	Farmer	Muslim
13	Mulugeta Abi	M	40	Married	10	Abote	Teacher	Muslim
14	Emebet Ali	F	35	Married	Read & write	Abote	Housewife	Muslim
15	Fatuma Hussien	F	67	Married	Read & write	Abote	Housewife	Muslim
16	Etenesh Endrie	F	58	Married	Read and Write	Abote	Housewife	Muslim
17	Priest Nigussie Abate*	M	55	Married	Religious Education	Taye	Farmer	Orthodox
18	Sileshi Abebe	M	46	Married	3	Taye	Farmer	Muslim
19	Yimer Mekonnen	M	54	Married	7	Taye	Farmer	Muslim
20	Geremew Kebede	M	64	Married	Read and Write	Taye	Farmer	Orthodox
21	Habtamu Chanie	M	38	Married	8	Taye	Merchant	Muslim
22	Medina Gebeyehu	F	35	Married	10	Taye	Housewife	Muslim
23	Merema Ahmed	F	49	Married	Illiterate	Taye	Housewife	Muslim
24	Yeshe Muhye	F	48	Married	2	Taye	Housewife	Muslim
25	Hussien Ali	M	60	Married	6	Tinign	Farmer	Muslim

26	Awole Mahmud	M	51	Married	8	Tinign	Farmer	Muslim
27	Shume Nurye*	M	52	Married	8	Tinign	Farmer	Muslim
28	Alebachew Ali	M	43	Married	4	Tinign	Farmer	Muslim
29	Mengistu Oumer	M	40	Married	3	Tinign	Farmer	Muslim
30	Asya Hussien	F	45	Married	Read & write	Tinign	Housewife	Muslim
31	Mintiwab Shifaw	F	40	Married	4	Tinign	Housewife	Muslim
32	Ayalnesh Ayele	F	32	Married	Read and Write	Tinign	Housewife	Muslim
33	Mulu Tareke*	M	47	Married	6	Lencho	Farmer	Orthodox
34	Ali Muhie	M	45	Married	Read and Write	Lencho	Farmer	Muslim
35	Arega Mengesha	M	65	Married	Read and write	Lencho	Farmer	Orthodox
36	Dejen Gebeyahu	M	55	Married	Illiterate	Lencho	Farmer	Orthodox
37	Afewerk Abate	M	64	Married	4	Lencho	Farmer	Orthodox
38	Ejigie Ali	F	50	Married	Illiterate	Lencho	Housewife	Orthodox
39	Tayta Tareke	F	60	Married	Illiterate	Lencho	Housewife	Orthodox
40	Belaynesh Abate	F	37	Married	8	Lencho	Housewife	Orthodox
41	Arega Beshir	M	50	Married	12	Lencho	Teacher	Orthodox
42	Getachew Belay*	M	45	Married	7	Demasiko	Farmer	Muslim
43	Hamza Hussien	M	41	Married	4	Demasiko	Farmer	Muslim
44	Belay Abegaz	M	69	Married	Illiterate	Demasiko	Farmer	Orthodox
45	Mohammed Ahmed	M	45	Married	4	Demasiko	Merchant	Muslim
46	Lubaba Hussien	F	35	Married	6	Demasiko	Housewife	Muslim
47	Mitikie Girma	F	28	Married	10	Demasiko	Teacher	Orthodox
48	Aregu Agegnehu	F	56	Married	Illiterate	Demasiko	Housewife	Muslim
49	Sileshi Minas*	M	50	Married	7	Sekshimbra	Farmer	Orthodox
50	Arega Mekonnen	M	42	Married	Illiterate	Sekshimbra	Farmer	Muslim
51	Hussien Yimer	M	52	Married	Illiterate	Sekshimbra	Farmer	Muslim
52	Jemal Tadesse	M	50	Married	7	Sekshimbra	Farmer	Muslim
53	Yimer Ejigu	M	52	Married	12	Sekshimbra	Teacher	Muslim`

54	Zuriash Assefa	F	52	Married	Illiterate	Sekshimbra	Housewife	Muslim
55	Asselef Eshetu	F	45	Married	7	Sekshimbra	Housewife	Orthodox
56	Sofya Bogale	F	35	Married	10	Yeshum	Housewife	Muslim
57	Ayalew Misganew	M	40	Married	5	Yeshum	Farmer	Orthodox
58	Priest Tequam Cheru	M	53	Married	3	Yeshum	Farmer	Orthodox
59	Abew Temesgen	M	55	Married	3	Yeshum	Farmer	Muslim
60	Moges Zeleke*	M	61	Married	8	Yeshum	Farmer	Muslim
61	Abera Belay	M	64	Married	8	Yeshum	Farmer	Orthodox
62	Enanu Terfo	F	40	Married	7	Yeshum	Housewife	Orthodox
63	Alem Abera	F	60	Married	4	Yeshum	Housewife	Muslim
64	Messeret Yibza	F	40	Married	8	Yeshum	Housewife	Orthodox
65	Abaye Yimamu*	M	60	Married	4	Tungi	Farmer	Muslim
66	Gidafe Assefa	M	63	Married	9	Tungi	Farmer	Orthodox
67	Taye Assefa	M	55	Married	5	Tungi	Farmer	Orthodox
68	Ahmed Yimam	M	28	Married	Illiterate	Tungi	Farmer	Muslim
69	Bushira Eshetu	M	48	Married	Illiterate	Tungi	Farmer	Muslim
70	Nurye Ahmed	M	38	Married	9	Tungi	Farmer	Muslim
71	Shewaye Yimam	F	45	Married	Illiterate	Tungi	Housewife	Muslim
72	Hawa Jemal	F	36	Married	8	Tungi	Housewife	Muslim
73	Seid Tasew	M	54	Married	Illiterate	Serto masaya	Farmer	Muslim
74	Nurye Ahmed	M	47	Married	4	Serto masaya	Farmer	Muslim
75	Getachew Sileshi*	M	64	Married	6	Serto masaya	Farmer	Orthodox
76	Ebrahim Yasin	M	8	Married	8	Serto masaya	Farmer	Muslim
77	Mohammed Hussien	M	53	Married	2	Serto masaya	Farmer	Muslim
78	Habtam Yitbarek	F	41	Married	Illiterate	Serto masaya	Housewife	Orthodox
79	Kasaye Legesse	F	38	Married	6	Serto masaya	Housewife	Orthodox

80	Toyba Mohammed	F	46	Married	5	Serto masaya	Housewife	Muslim
81	Assen Yimer	M	60	Married	5	Serto masaya	Farmer	Muslim
82	Ayalew Mohammed	M	65	Married	7	Hawey	Farmer	Muslim
83	Temesgen Tsegaye*	M	66	Married	3	Hawey	Farmer	Orthodox
84	Abye Mekonnen	M	48	Married	Illiterate	Hawey	Farmer	Orthodox
85	Aytenew Demeke	M	57	Married	Illiterate	Hawey	Farmer	Orthodox
86	Getachew Assen	M	32	Married	8	Hawey	Farmer	Muslim
87	Alemtsehay Dante	F	36	Married	Illiterate	Hawey	Housewife	Orthodox
88	Jenbere Chane	F	44	Married	44	Hawey	Housewife	Orthodox

Key*- key informants

Appendix 9: Checklist of semi-structured questions used for discussion and interview for the collection of ethnobotanical data

Checklist of semi-structured interview guide for collecting ethnobotanical data during interviews with informants in the study sites

I. General information on respondents' name, age and occupation

Date _____ Residence area (Village) _____ Kebele code _____

Name _____

of respondent _____ Gender _____ Age _____

II. Marital status

Married _____ Unmarried _____ Occupation (main job) _____

Religion: Muslim _____ Orthodox _____ Protestant _____ Others (specify) _____

III. Information related to the medicinal use of the plants

Health status _____ and use of traditional medicinal plants

Mention the name of plants used to treat a given disease in the study area?

What are the human diseases in this area?

What are the livestock diseases in this area?

What are the major human diseases in this area?

What are the major livestock diseases in this area?

Recording table of medicinal plants and disease from informants

No	Name of medicinal plants	Disease treated					Locality
		Only human	Only livestock	Both H & L	Major disease		
					Human	Livestock	
1							

6. What part/ parts of the medicinal plants are used? (Mark an "X")

Flower (Fr) _____ Latex (Lt) _____

Fruit (Ft) _____ Bulb (Bu) _____

Seed (SD) _____ Leaf (L) _____

Root (R) _____ Leave & Root (L & R) _____ Stem (St) _____

7. What is the habit of the plant? (Mark "X")

Tree (T) _____ Herb (H) _____

Liana (L) _____ herbaceous climber (Hc) _____

Shrub (S) _____ Succulent (Su) _____

8. From where do collect the medicinal plants? (Place of collection?) (Mark’')

In home gardens _____ Crop field _____

Fallowed land _____ Wild _____

In forest _____ Semi wild _____

Roadside _____ Cultivated _____

9. What is the state of preparation of medicinal plants? (Mark’')

Dried or fresh (D) _____ Fresh (F) _____

Crushed (C) _____ Powdered (P) _____

Latex (Lt) _____ Smoking (S) _____

Cooking (Co) _____ Mixed with others (Mw) _____ Soakin

(S) _____ Boiling (Bo) _____

Squeezing (Sq.) _____ Chewing (Ch) _____ Dried (D) _____

10. What are the causes of human and livestock ailments?

11. What are the symptoms of human and livestock ailments?

12. How do you diagnose each ailments / health problems?

13. How do you control /prevent health problems / ailments?

14. Does the amount used/dosage vary among age groups, weakness, and sex? If yes, state for each. _____

15. Have you ever heard any danger of using traditional medicine? If you say yes, where, when and how did the problem happen? What are any antidotes you take for these side effects? _____

16. How are the prepared remedies taken by the patient (s)/routes of administration? (Mark’')

Dermal (D) _____ Eye(Y) _____

Anal (A) _____ Nasal (N) _____

Vaginal (V) _____ Oral (O) _____

Penis (P) _____ Other (Specify) _____

Ear (E) _____ Neck (N) _____

Tooth surface (Ts) _____

17. List other uses of a particular medicinal plant other than its medicinal value? _____

18. Are the medicinal plants accessible medium or rare? Why? _____

19. How does modernization interfere with the use of traditional medicinal knowledge?

20. How do you judge the price of traditional medicines comparing than modern medicines?

21. Do you use your indigenous knowledge as a source of income, or only help the patients? _____
22. What are the ways of transferring of this knowledge to the next generation?

23. Do the communities believe that traditional medicines have more effective value comparing than modern medicine? _____
24. Do the modern health professionals give support to the traditional healer?

25. Do the traditional healers use only a single traditional medicinal plant or more to prepare one remedies? _____
26. At what time do the patients take the traditional medicine? _____
27. Which season of preferred for collection of medicinal plants in your area? (Mark")
 - a. Wet season _____
 - b. Dry season _____
 - c. All-the-year round _____
28. Why you prefer that particular season?
29. How is the plant part collected? (Including the amount collected at time) _____
30. Do you store the medicines? If yes, where? _____
31. What are the threats to the medicinal plants? _____
32. . What are the conservation measures that you use? Do you plant them?

33. Are the medicinal plants marketable? If so, where are their sources? _____

(ለጥናትናምርምር የሚያገለግል ቃለመጠይቅ) (በአማርኛ)

ቀን _____

ስም _____ ጾታ _____ እድሜ _____ ቀበሌ _____ ጎጥ _____

በክፍት ቦታ ወላይ “X” ምልክት በማድረግ ሙሉ

ሃይማኖት፦

ኦርቶዶክስ _____ ሙስሊም _____ ፕሮቴስታንት _____ ሌላ _____ የጋብቻ

ሁኔታ፦ ያገባ (ች) _____ ያላገባ (ች) _____

የትምህርት ደረጃ፦ ከ 11-12 _____ ዲፕሎማ _____ ዲግሪ _____ ያልተማረ _____

ስራ፦ አርሶአደር _____ ነጋዴ _____

ጥያቄዎች

1. በዚህ አካባቢ መድሃኒት ነት የሚወለድ እጽዋቶችን ዝርዝር (ሪ)? _____
2. በዚህ አካባቢ ሰዎችን የሚያጠቁበሽታዎች ምን ምን ናቸው? _____
3. በዚህ አካባቢ እንስሳትን የሚያጠቁበሽታዎች ምን ምን ናቸው? _____
4. በዚህ አካባቢ ሰውን የሚያጠቁ ዋና ዋና በሽታዎች ምን ምን ናቸው? _____
5. በዚህ አካባቢ እንስሳትን የሚያጠቁ ዋና ዋና በሽታዎች ምን ምን ናቸው? _____

የባህላዊ እጽዋት መድኃኒት እና በሽታዎች ማስፈሪያ ሰንጠረዥ

ለፈውስ የሚያገለግለው የእጽክፍል የቱ ነው? (የ “X” ምልክት በማድረግ ሙሉ)

ተ.ቁ	የባህላዊ እጽዋት መድሃኒት	የታከመው በሽታ ዋና ዋና በሽታዎች			በሽታው ያለበት አካባቢ
		የሰው ብቻ	የእንስሳት ብቻ	የሁለቱም	
1					

ለፈውስ የሚያገለግለው የዕፅዋት ክፍል የቱ ነው? (የ “X” በማድረግ ሙሉ)

አበባው _____ ሁሉም ክፍሉ _____

ፍሬው _____ ቅጠሉ _____ ስሩና ቅጠሉ _____

ዘሩ ስሩ _____

ፈሳሹ _____ ቅርፊቱ _____ ግንዱ _____

እጽዋቶችን በምን መልኩ ማግኘት ይቻላል? (የ “X” ምልክት በማድረግ ሙሉ)

በዛፍ _____ በቅጠላ ቅጠል _____

በሃረግ _____ ሌሎች _____ በቁጥቋጥ _____

8.ለመድኃኒት የሚያገለግሉ እጽዋት የት የት ይበቅላሉ? (ከየት ታገኛለህ) (ሽ)? (የ“X” ምልክት በማድረግ ሙሉ)

ከእዳሪ _____ ከሰብል _____ ማሳ _____

በእንክብካቤ ካደጉ _____ ከጫካ _____ ከዱር _____ ከጓሮ አትክልት _____ ከመንገድ ዳር _____ ከመንደር አካባቢ _____

9.የመድኃኒቱ አዘገጃጀት ዘይቤ እንዴት ነው? (የ“X” “ምልክት በማድረግ ሙሉ)

በመቀጥቀጥና በማድረቅ _____ በማድቀቅ _____ በዱቂት _____

መልኩ _____ በመበጥበጥ _____ ብቻውን _____ ወይስ ከሌላ ጋር _____

በመቀላቀል _____ በመዘፍዘፍ _____ በማፍላት _____ ወድያ ውኑ በመቁረጥ _____

10.በዚህ አካባቢ የሰው እና የከብት የበሽታ መነሻዎች ምን ምን ናቸው?

11.በዚህ አካባቢ የሰው እና የከብት የበሽታ ምልክቶች ምን ምን ናቸው?

12.በሽታዎችን እንዴት መመርመርና ማወቅ ይቻላል?

13.በሽታዎችን እንዴት መከላከል ይቻላል?

14.የመድኃኒት አወሳሰዱ በመጠን በእድሜና በጾታ በጥንካሬ ልዩነት አለው? መልስ ህ/ሽ አወከሁለን እያንዳንዱ

እድሜና ጾታ እንዴት እንደሆነ ተናገር (ሪ)? _____

15.ስለ ባህላዊ መድኃኒት አደጋ ስምተህ/ሽታው ቃለህ/ሽ? የት? መቼ? እንዴት ተከሰተ? ምን እርምጃ

ወሰድህ/ሽ? _____

16.የመድኃኒቱ አሰጣጥ ከሰውነት ውስጥ ነው ወይስ ውጪ? _____

ከሰውነት ውስጥ ከሆነ በምን መልኩ? _____

ውጭዊ ከሆነ ስለምን መልኩ? _____

17.ለመድኃኒት ነት የሚያገለግሉት እጽዋት ሌላ ጥቅም ካላቸው ዘርዘር (ሪ)? _____

18.የእጽዋት መድኃኒት በቀላሉ ይገኛል? ካልሆነ ለምን? _____

19.የባህላዊ መድኃኒትን በመጠቀም ላይ ዘመናዊነት የሚያሳድረው ተጽእኖ ምን ድን

ነው? _____

20.የባህላዊ መድኃኒት ዋጋ ከዘመናዊ መድኃኒት ዋጋ ጋር ሲነጻጸር እንዴት ታየዋለህ

(ሽ)? _____

21. ባህላዊ የህክምና እውቀት ህን/ሽን እንደገቢ ምን ጭወደስ ህመምን ለመርዳት ወይስ ለሁለቱም? ትጠቀምበታለህ/(ሽ)? _____ ይህን እውቀት ከየት አገኛችሁት? _____

22. ለቀጣዩ ትውልድ እውቀት ህን የምታሸጋግርባቸው (ሪባቸው) መንገዶች ምን ምን ናቸው?

23. ህብረተሰቡ ባህላዊ መድኃኒት ከዘመናዊ መድኃኒት ይልቅ በሽታዎችን ለማከም የተሻለው ጤነት አለው ብሎ ያምናል? _____

24. ዘመናዊ ሀኪሞች ለባህላዊ ሀኪሞች (ፈዋሾች) ድጋፍ ያደርጋሉ? _____

25. ባህላዊ ሀኪሞች አንድን መድኃኒት ለማዘጋጀት አንድ ገንዘብ ቻይጦር መቀማሉ ወይስ ከዚያ በላይ?

26. ህመማት የባህላዊ መድኃኒት የሚወስዱት በምን በምን ሰአት ነው? _____

27. ለሚወስዱት ስጋት የሚፈጥሩ ነገሮች ምን ምን ናቸው? _____

28. ለባህላዊ መድኃኒት የሚያገለግሉ እጽዋቶችን በአካባቢ ህእንዴት ትንኮሳ ከባለህ? በመትከል ወይስ በሌላ? _____

29. እጽዋቶችን ለመሰብሰብ እመች ወቅት የቱነው?

መከር _____ በጋ _____ በልግ _____ ክረምት _____ ሁሉም ወቅት _____ ለምን? _____

30. ይህን ወቅት ለምን መረጥኸው (ሺ.ወ.)? _____

31. የእጽዋቶችን ክፍሎች በምን መልኩ ትሰበስባላችሁ? _____

32. ያዘጋጀኸውን መድኃኒት በምን መልኩ ታስቀምጠዋል ህ (ጭዋልሺ)? _____

33. እጽዋቶችን ከገቢያ ማግኘት ይቻላል? _____ ከተገኙ የት የት ገቢያዎች? _____

Photograph showing field activities in study sites



Figure 1: Protected vegetation area inTulu lemi study site photo taken



Figure 2: Samples of market survey field observation from Robite and Kabi market photo taken



Figure 3: Unprotected vegetation area (Lencho study site) as compared to Fig.1



Figure:4 plant press area